

Problems and solutions of rice consumption pattern in West Java

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Abstract

West Java is one of the provinces in Indonesia where the staple food is rice. The high ability of rice provisioning and the government's encouragement through the policy of uniformed staple food gave a negative impact on rice consumption patterns of West Java population. This pattern of consumption will become a problem when faced with the fact that the rice production area has declined (0.67% per year) and the population increased (1.41% per year). Based on projection of production and needs of rice, it is predicted that West Java will experience shortages in 2040. Therefore this research aimed to discuss efforts to prevent rice dependency problem. The entire study used case study approach. By using secondary data, basically the government has made many efforts to resolve the problems. In fact, there are some obstacles and the mismatch on results. Therefore the alternative solutions are: a). diversification efforts with rice commodity substitution based on geographical location, b). socialization, c). rice price policy, and c). improved education and economics.

Keywords: rice, food diversification, consumption pattern, rice substitution

1. Introduction

West Java is one of the provinces in Indonesia where the staple food is rice. Not only being a consumer, West Java is also one of the rice production centers that contributed the most to national rice production, averaging 17.6% over a period of eight years (2001-2008) [3]. Rice production in West Java is not only able to fulfill the needs of rice for about 42,2 million West Java population with average rice consumption level of 105,87 kg / capita / year, but also able to meet the needs of rice for people outside of West Java with surplus value of more than 1 million tons [3].

The high ability of rice provisioning and the government encouragement through the policy of staple food uniformity gave the negative impact for consumption patterns of West Java society on rice. This is indicated from the high level of consumption of rice in West Java that is as much as 97% [4].

West Java's dependency on rice consumption is reflected in the high level of public expenditure for this grain group compared to other types of food. Rice consumption is higher compared to other types of food, which reach 17.56% in urban areas and 24.57% in rural areas, while other commodity expenditure is only around 1-7%. Differences in urban and rural areas in terms of rice consumption are influenced by lower household income in rural households than in urban households [2].

In addition, there is a tendency to decrease household expenditure for grain products as income increases, both in urban and rural communities. This explains that low income households tend to focus their income on buying grain products while higher income households can allocate their income to food products other than grains [1,2]. Nevertheless, both urban and rural areas show a high degree of dependence on rice consumption compared to other staple foods.

The current condition of food dependency is still not a problem as it is accompanied by sufficient food availability. However, shrinkage of land accompanied by an unstoppable population growth will certainly affect the sufficiency of West Java and national food in the future. According to Maltus Theory (1798), "population increases as a series of measurements, while food availability increases as a series of arithmetic". If the consumption pattern of rice product dependence is maintained while the level of availability decreases then there will be a critical point where food conditions become unstable. Therefore, it is necessary to have a strategy of handling proper rice consumption patterns to achieve food security.

Indonesian people rely too much on rice as their main food. This condition leads Indonesian government to fulfill people needs of rice through some programs. Availability of rice was highly dependent on the availability of rice

field in Indonesia. In this case study, we used time series data of rice field area and its productivity in West Java Province to predict the capacity of West Java in rice production every year. The capacity of West Java in rice production illustrates rice availability for West Java's people consumption every year.

Rice field area was predicted to decrease every year in West Java [5]. On the other hand, West Java population tends to increase every year. This condition would lead to inability of West Java to fulfill people's needs of rice in the future. Combination of inability to produce sufficient rice and people's dependence on rice in West Java would be a big problem in the future. This paper aimed to generate some solutions for the problem of West Java's people food consumption pattern that highly depends on rice as their staple food.

2. Methodology

2.1 Data collection and information

This study uses data from various institutions and agencies such as the Badan Pusat Statistik (BPS), Badan Ketahanan Pangan (BKP), and related research journals. Data and information sought are rice field, land productivity, rice production, rice conversion, population, consumption pattern, and population demand for rice. The data's scope is West Java.

2.2 Case study

This research thoroughly used case study method, which was adopted from the book *Learning From Case Studies* by Easton (1992). Based on the book, Easton states that case study is a method that aims to describe a case through critical thinking, analytical, scientific and creative, using seven phases. Here are seven stages done in the study:

1. Understanding the situations. Collection of related information and make the big picture of the conditions that are currently happened related to the fulfillment and consumption patterns of rice in West Java. The first stage is useful to know and understand the situation without any judgment or judgmental opinion first. This is done through the processes of organizing and evaluating information.
2. Diagnosing the problems. At this stage the problem is determined from the whole picture that has been obtained. Selection of problems seen from the gap between ideal conditions with the actual conditions. This is done by projection comparing population needs and rice supply in West Java.
3. Generating the solutions. At this stage, an appropriate solution to the problem has been obtained.
4. Predicting the outcome. In a synthesized solution an in-depth study is conducted to estimate the impacts and outcomes gained in anticipation of unexpected possibilities as well as to obtain an actual and dynamic solution.
5. Choosing among alternatives. At this stage evaluation and selection of the best alternative solutions will be conducted through a range of various evaluation processes from simple and implicit to complex and explicit alternative solutions.
6. Rounding out the analysis. This stage is carried out to determine more detailed solutions, to actual activities, as well as to set up unexpected plans for the chosen solution.
7. Communicating results. The researcher writes the results of the study and communicates the results of the research in scientific writing.

3. Result and Discussion

3.1 Pattern of Rice Consumption in West Java

Consumption issue in West Java was high dependancy of commonly West Java and Indonesian population on rice as staple food. According to history of both ecological and environmental before the era of 1970, the rural population of West Java and Banten already cultivating rice plant strongly based on local wisdom and knowledge [6].

3.2 Pattern of Community Consumption that causes Deficit on Future Rice Supply

Java would encounter rice deficit in 2040 if there were no changes on current consumption pattern and dependancy. The main causes of the phenomenon was the declining of rice production areal on the rate of about

0,67% per year^[5]. On the other hand, population will keeps growing on average rate 1,41% per year [7]. According to projection result, rice production areal in West Java on 2040 would be about 771.585 Ha.

Assumed that land productivity about 5.97 ton/ha [8] and conversion rate on 62.56% [9-11], rice production on 2040 predicted would reached 2.881.740 ton. According to rate of rice consumption on 2011-2015 was about 86,53 kg per capita peryear [8], which generates the demand for rice on 2040 that reaches 2.895.007 ton. As shown that the gap of supply and demand would be about 13.267.77 ton of rice deficit to fulfill the consumption requirement. It shows that on 2040, West Java no longer could satisfy its own consumption if the population keeps depend on rice as staple food (Figure 1).

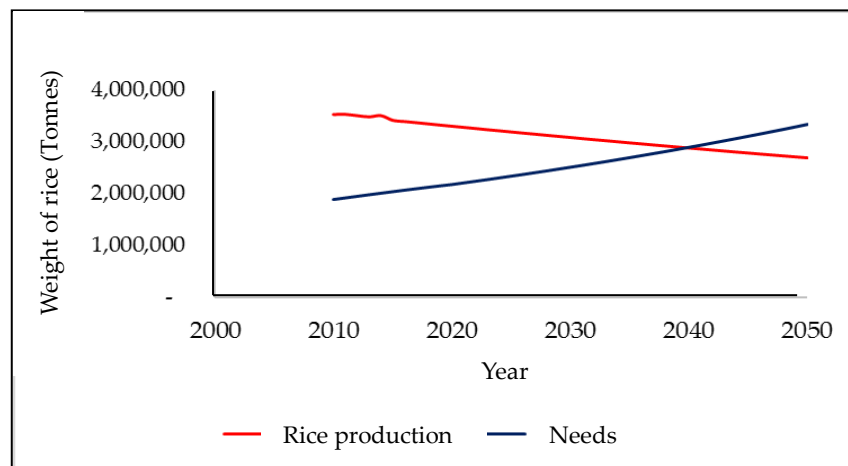


Figure 1. Projected demand and supply of rice in West Java

3.3 Government's Effort on Rice Consumption Pattern and Dependency

Found that the condition of West Java Population related to consumption pattern, Government conducted various efforts to solve the issues. There are two main policy, through diversification policy, to alter current consumption pattern and through production policy.

3.3.1 Production increasement as goverment effort on current rice consumption fulfillment

The effort conducted for the last decade have been done on many production aspects. Both programs and activities to increase the production specially on rice, maize and, soybean through Bimbingan Massal, Intensifikasi Massal, and Primatani programs that succeded to brought Indonesia to self-sufficient state on rice production in 2008. Trend of increasement in rice production occured in the last 20 years, indicated its succes effort. However, West Java rice production faces challenges on land conversion and climate change [12] that threatened the rice stock to fulfill population necessity of rice in the future.

Consumption pattern of rice dependent, affected by availability of rice, causes that community tend to sticks on current consunsion pattern as long as the rice is adequately avail. According to that phenomenon, the increasement of production effort was not quite finished to solved the issue, because its still maintaining the high consumption on rice [13,14]. From the facts gathered, suggests that the needs of other altenative in term of consumption pattern.

3.3.2 Food diversification as the goverment alternative to solve the consumption pattern issue

Diversification concept was not a brand new concept on the development and establishment policy in Indonesia, because of the concept was oftenly formulated and implemented by the goverment [15] seeing the food diversification as an effort, strongly related to increasement of quality in agricultural sector, specially on quality increasment of human resource, development aspect and, in term of nutrition aspect that includes production, consumption, marketing and, distribution. Effort to actualize the diversification was intialized since 1960. The stand out program was the recommendation on food combining of rice and maize, cassava and beans.

In term of reducing the dependancy on rice as staple food, the goverment devise the diversification policy through Inpres (president instruction) No. 14/1974 about "Efforts to Improve People's Food Menu" (UPMMR). The policy was later completed through Inpres No. 20/1979. Another policy continues in 1998/1999 to revitalize the DPG program (Diversification of Food and Nutrition). The goal of the program was to generate better response on increasing the food diversification [16]. In order to attain consumption patter of diverse, nutritious and, balanced

food, the government release the Food Hope Pattern (PPH) policy. PPH recommends every person to consume combined food of 275 grams rice, 100 grams tubers, 150 grams of meat, about 20 grams of oily and fat, 10 grams of oily fruits/seeds, 35 grams of beans, 30 grams of sugar and, 250 grams of fresh vegetables and fruits [15]. On the other hand, the government oftently suggest the society to diverse their food without any real action on the maintaining the availability of the diversification commodities. The effort to change the current consumption pattern already conducted through formal and non-formal education, but the impact currently insignificant [15].

Another program that conducted by the government was *One Day Without Rice* program, which was the first program planned in Mataram, Nusa Tenggara Barat since 2008. West Java itself started the program since 2011 by the governor Achmad Heryawan, and only could be maintained for a short period. The program was first noticed by the public when Depok's major, Nur Mahmudi Ismail whos revise the program in order to reduce the needs of rice for about 90 kg per capita in Depok area. The truth was, the policy emerged as result of discussion that held between Djoko Said Darmadji and Nur Mahmudi Ismail about its success in South Korea. The program encourage the society to diverse their food by consuming tubers and maize as their staple food. Currently the program is deactivated due to lack of effectiveness. The program was also being implemented in many cities in Indonesia, but ended up without any follow ups. Even though various effort have been conducted, the dependancy on rice is still on dangerous level [17].

3.4 Alternative solutions

Reflecting on the obstacles and incompatibility resulting from the government's efforts in solving the rice products dependency problems. Accordingly, these are some solutions that can be used as alternative steps as follows:

3.4.1 Diversification program: Determination of substitute commodities from rice based on geographical location

The determination of substitution commodities is basically not intended to replace rice relatively, but to change the pattern of food consumption of the people, so that the dependence of the people on rice consumption decreases by consuming more diverse, nutritious and balanced food types. The indicators used in the determination of substitute food commodities from rice based on geographical location can be determined by several parameters used, namely; a). nutritional value of food commodities replacement of Rice, b). the availability of food commodities that has been selected especially in West Java.

Table 1. The nutritional value of the food commodities at 100 grams consumed

No	Name of Comodities	Calories (kcal)	Total Carbohydrate (gram)	Protein (gram)	Total Fat (gram)	Calcium (mili gram)
1	Rice	362	76	7,9	2,7	33
2	Potatoes	76,7	15,71	1,68	0,1	12
3	Maize	365	19,02	3,22	1,18	7
4	Sweet Potatoes	85.8	20,12	1,57	0,05	51
5	Sorghum	329	70,7	10,4	3,1	25
6	Millet	289	76,4	14,1	7,9	54
7	Cassava	159,4	7,49	0,27	0,41	16
8	Taro	112	26,46	1,5	0,2	25

Source: Results of data analysis from [18,19]

Based on Table 1, Maize (365 kcal) and Sorghum (329 kcal) have the closest value of calories with Rice (362 kcal) compared to other commodities. The similarity between calories of Maize and Sorghum with Rice makes both commodities has potential to become comestible that support food diversification program. Here's a description of the commodities of Sorghum and Maize.

a. Sorghum (*Sorghum bicolor*)

Sorghum is one of alternative source of food that can replace Rice as a staple food. Sorghum can grow in tropical and subtropical areas and can adapt well to various environmental conditions. In Indonesia Sorghum can grow in the lowlands to an altitude of 800 masl (meters above sea level). with optimum growth temperature of 23-30°C [18]. As food, Sorghum can be used as a substitute or a side dish with Rice. Sorghum can be used directly cooked

and can also be further processed into flour to be used as raw materials of various types of food such as noodles, bread, and various types of cakes [20].

Sorghum has an advantage in terms of environmental adaptability compared to Rice or other food crops, so in general Sorghum can be grown on land that can not be utilized for other types of plants [18], besides that Sorghum is also more resistant to climate change [21]. Sorghum can grow in a variety of soils ranging from stagnant to sandy soils with low water content. While Rice should be grown on wetland with a clear water requirement is higher than sorghum. Among the various food commodities, Sorghum has the lowest water requirements whereas Rice has a high water demand [18]

In 2010-2014 the area of rice fields, farm, and land that is not used in Bandung regency, West Bandung regency, and in the central of Bandung are quite fluctuating. Wetland area tends to decrease every year, while unused land area tends to fluctuate. In general in all three areas there are 680 ha of land that still are not utilized by 2014 [18]. Unused land usually has a low fertility and low water content that can not be planted, it becomes a potential land for Sorghum planting due to the need for soil fertility and the needs of lower water content when compared to other food crops [21,20]. These facts indicate the availability of land for planting Sorghum around Bandung amid declining land area for rice production, so sorghum has the potential to be developed as alternative food especially in Bandung areas. On the other hand, until 2013 the area of Sorghum cultivation in West Java has reached 258 ha [22].

Sorghum productivity ranges from 1-3 tons / ha and is predicted to reach 6-7 tons / ha if accompanied by intensive fertilization and good soil management [23]. Based on data from 2013-2014 the potential of land for cultivation of Sorghum in West Java is 938 ha, consisting of 258 ha of Sorghum cultivation area and 680 ha of land around Bandung areas that can be utilized [18]. If it is assumed sorghum productivity of 2 tons / ha, we can conclude that with an one-time harvest in West Java can produce about 1,360 Ton of sorghum. Sorghum can be harvested after the age of 4 months, so that in one year West Java potentially can produce 4080 tons of sorghum. Although is not as big as rice production, Sorghum production in West Java has the potential to provide food alternatives in support of food diversification of the people in West Java.

b. Maize / *Zea mays* L.

Maize (*Zea mays* L) is an annual crop (annual). Maize is one of the most important carbohydrate-producing crops in the world, besides wheat and rice. Countries that consume maize as a staple food are the Central and South America, while in Indonesia averages people tend to consume rice as its a staple food. As a source of carbohydrates, some people use Maize for a staple food for everyday meals. Therefore, no wonder if the needs of Maize from year after year continue to increase. In addition to a staple food, Maize is also used as refined cooking oil, cornstarch, ethanol, organic acids, and for animal feed industries [24].

Maize in West Java cultivated by farmers initially was to replace soybeans at which time the price of soybean fell so that the government provided an alternative plant that has a higher price than Maize. Maize in West Java itself stands as a food crops or not as a secondary crop, the varieties used are *White horse's tooth maize* [25]. One of the largest Maize producing in the centers of West Java is the City of Garut and Majalengka City.

Besides being a substitute food of rice consumed directly by the community, Maize is also as a raw material of animal feeds that has a fairly dominant composition. Productivity and land area for Maize commodity in West Java have fluctuated value. Based on data [7] Maize productivity of 1,028,653 tons, in 2013 of 1,101,998 tons, 2014 of 1,047,077 tons and in 2015 of 959,933 tons while of the land area in 4 consecutive years from the year 2012-2015 i.e amounted to 148,601 ha, 152,923 ha, 142,964 ha, 126,828 ha.

3.4.2. Public campaign

Efforts to change the community food consumption pattern through the diversification of staple food is still hampered by the mindset of people who consider rice as the only staple food while the tubers are inferior food. Therefore it is necessary to change the mind-set of society through, one of them socialization activities. Socialization is the process of planting or transferring habits or values and rules from one generation to another in a group or society. In general, the content in the socialization is about food diversification by regulating the nutritious, balanced, and diverse diet pattern.

The process of public campaign can be done extensively to various societies with appropriate methods so it needs to be planned technically by considering the audience or target socialization. The target of socialization is generally among the middle and upper economic class, because it is easier in the provision and adaptation of food with new or unusual raw materials.

One of the more specific targets for public campaign is housewife. This is because housewives who serve food to the family, including children. Children are more receptive to new things than adults. The process of socialization can also be done to children and adolescents in schools about the importance of nutritional fulfillment, food variety, introducing staple foods besides rice. Socialization activities can also be routine, for example by visiting educational institutions, community masyarakat, to then be socialized. The right target for people younger than 20 years old.

Methods for socialization activities should not be done face-to-face, but through social networks, for example through mass media and social media, which are considered more effective and comprehensive. Things that need to be well prepared and mature is the content to be conveyed with appropriate media (eg video, pictures, text, etc.). The content and manner of the submitter will impact on the message delivered, will be viral or not. Content that is inviting (persuasive) gave birth to dietary trends for social media users, while providing knowledge related to the importance of diversification related to nutrition fulfillment and improvement of food pattern.

3.4.3 Rice Price Policy

The price of rice and grain is influenced by the amount of rice consumption that can be interpreted as demand, the amount of large production that can be interpreted as supply, and inflation that occurred. Based on these three factors, in an effort to change the rice consumption pattern and increase the diversification of basic foods, one of the efforts that can be done is through rice price policy. The alternative offered with that purpose is not to interfere with the actual price of rice in the community.

Inflation is an event when the exchange rate weakens so that food stuffs seem to "rise" in price. The main causes of inflation in rice are domestic market prices, corn prices, real exchange rates, and grain prices. Therefore, without government intervention in rice price regulation, it is expected that rice can follow market mechanism. It also gives the farmers the flexibility at the producer level to determine the desired big price

Giving rice to the market mechanism means the government needs to issue rice as one of the commodities in the market operation. The hope of this effort is for people to have rice consumption patterns based on fluctuations in rice prices. So that the rice consumption of the community is expected to fluctuate and also with the substitution of rice, should the consumption pattern that is too dependent on rice can be improved.

3.4.4. Improving Education and Economy

Determination of the type of rice as a main food product is certainly influenced by various factors, including education and income. Increasing education and income is one of the proposed solutions, because these two aspects are considered to be able to encourage the decrease of rice consumption as staple food in West Java. A person's formal education level is often positively associated with an increase in household food consumption patterns. This includes efforts to achieve good nutritional status in the household. A higher level of education will allow one to absorb information and implement in everyday behavior and lifestyle, especially in terms of health and nutrition [27].

Based on Sitanggang [28], there is a difference between the consumption of household rice with upper secondary education (longer education) and households with basic education (relatively short education). This indicates that the level of sufficiency of household rice consumption for longer education will be better and more prudent in choosing better quality rice for household consumption compared with relatively shorter households.

In addition to education, income also significantly affects the pattern of household rice consumption, where the income level will affect the ability of purchasing power. High purchasing power will provide more and more choices for selected food products. Therefore, high income levels increase opportunities to buy more diverse food. Conversely, a decrease in income will lead to a decrease in the diversity of food sources of selected carbohydrates [29]. Based on this, the increase in education and income can be selected as an alternative solution to encourage the decrease of rice consumption and support food diversification program.

Conclusion

There was a problem in food consumption pattern in Indonesia. Indonesian people have high dependency on rice as their main food. Rice production depends on rice field area as the production field. Rice field area predicted to decrease every year in West Java, this condition would lead to decreasing in rice production in West Java. In other hand, the population of people tend to increase every year in West Java. Combination of that two conditions would cause rice deficiency in West Java in the future. Using data of rice field area and its productivity, we predict in 2040 West Java could not fulfill people needs of rice. We predict that food diversification program could be a good solution that can change people's food consumption pattern and reduce people dependence on rice. To reach good result, this solution must be integrated with other solution like socialization program, education improvement program, household income improvement program, and the most important program is provision of new commodities that can be used as main food like rice.

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