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Food independence determinant (Rice) In Supporting The Availability Of National Rice

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Abstract

In maintaining the stability of national rice availability, 3 supporting aspects are needed, namely increasing domestic rice production, procuring government rice reserves through Bulog and importing rice. The purpose of this study is 1) to find out the factors that influence the availability of national rice, 2) to find out the factors that influence food independence, especially rice. The data used is secondary data sourced from BPS, FAO statistics and IRRI statistics. The research design used in this study is a time series study from 1970-2016. The model used in the study is Least Square (LS). The results of the analysis show partially the availability of national rice influenced by domestic rice production, government rice reserves and rice imports. While the ability of domestic rice production in supplying the availability of national rice, which is represented in the substance of food independence, is influenced by productivity, rice supply stability, price gap of rice / rice and farmers' welfare. However, it is not influenced by the application of appropriate technology (in this case the use of subsidized fertilizer). The conclusion of this study is that the availability of national rice is not only supplied from within the country but must still be supported by the procurement of imported rice. In increasing food independence, productivity must be increased, ensuring that government rice reserves are always available, monitoring the development of rice / rice prices are always stable, and paying attention to the welfare of farmers as the main actors in rice trading. Whereas the government's policy of providing subsidized fertilizers needs to be refined and monitored in the field because so far only serves as a complement in the provision of rice to the community.

INTRODUCUTION

The availability of national rice is the main driving factor to achieve food stability. Rice is still a commodity that plays a role in fulfilling people's livelihoods because (1) rice is the main source of carbohydrate for most Indonesians and almost 90% of the total population of Indonesia consumes rice

(2) most of the livelihoods of Indonesians grow crops so that the provision of fields the largest occupation is the food crop sector (3) the total expenditure of poor households as much as 30% is used for rice consumption (4) in terms of health, the AKG (Nutrition Adequacy Rate) of the grain group is 50% of the total energy consumption of food groups (Suryana , 2014). The availability of national rice depends on 3 aspects, namely:

1) domestic rice production;
2) procurement of rice reserves through Bulog; and
3) Policy for procurement of rice from abroad.

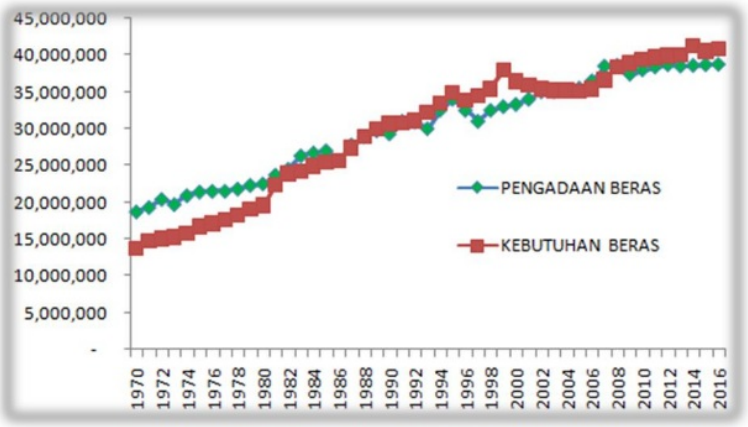
The basic objectives of the government in the national rice policy are to maintain the continuity of domestic rice production, protect farmers so that the yield of crops is distributed, guarantee prices for farmers and easy access to rice in the community. According to Law Number 18 of 2012 concerning Food states that the source of food availability comes from domestic procurement, namely domestic rice production and national food reserves, but if the two sources cannot be fulfilled, the shortfall can be carried out rice imports.

Government rice reserves are procured by Bulog partners by buying farmers' grain / rice. Rice reserves are issued under certain conditions, namely the provision of rice to the poor every month (Rastra rice), during Market Operations (OP) to stabilize rice price volatility or during natural disasters. To maintain the stability and supply of rice in the country, Bulog must prepare 1.5-2 million tons of rice reserves each year, obtained from outside farmers and exporters.

According to the FAO (2015), Indonesia is among the third largest rice producing countries in the world after China and India. Chinese rice production amounted to 741 million tons, in India amounted to 153 million tons while rice production in Indonesia amounted to 75.6 million tons. But on the other hand, Indonesia with a large population is the country with the fourth largest rice consumption after Myammar, Vietnam and Bangladesh. Seeing these conditions, efforts should be made for self-sufficiency in rice so that domestic needs are not dependent on foreign products.

To achieve self-sufficiency in rice, the government uses two ways, namely from the supply side, namely to encourage increased domestic rice production by applying appropriate technology and from the demand side, namely vigorously promoting a "one day no rice" campaign through food diversification activities. To see the availability of national rice and the needs that exist in the community can be seen in the picture below.

Figure 1. Domestic Rice Production And Rice Consumption Needs In Indonesia 1970-2016

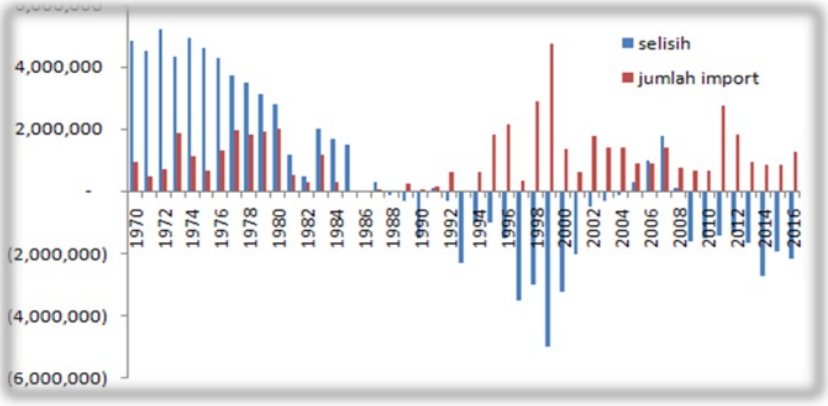


Source: Statistics and processed (2017)

Based on Figure 1 in 1988-2002 there was a surge in rice demand that exceeded the existing domestic rice supply. In accordance with Thomas Malthus's theory that the number of people will increase exponentially, while efforts to increase food supplies can only increase arithmetic. This is proven, with decreasing fertility in agricultural land. Proof of law The Law of diminishing returt or decreasing yield is increasingly being felt, where productivity reaches a maximum but the tendency of production results is actually decreasing.

In addressing the inability of rice production to support the availability of national rice, the government is trying to procure imported rice. To see the development of rice imports can be seen graphs as follows.

Figure 2. Graph Comparison Of Rice Imports With The Difference Between Domestic Rice Production And Rice Consumption Needs In 1970-2016



Source: Statistics and processed (2017)

Based on picture 2, the amount of imported rice is getting bigger in fulfilling the needs of national rice availability. The initial purpose of imports

to meet the existing shortages of rice in the country, shifted its role. The rise of imported rice, if not anticipated, will erode the role of local rice products. Therefore, government efforts to improve domestic rice products continue to be carried out, both by encouraging technological innovation, providing fertilizer /seed subsidies and providing a guaranteed price of grain / rice for farmers.

Although the procurement of rice imports is an alternative solution in meeting the availability of national rice, the government still targets to achieve rice self-sufficiency to meet domestic demand. Darmanto (2005) in his research Production-Based Food Security and Farmers' Welfare with the aim of knowing the factors that influence the availability of rice and the level of contribution of these factors to the growth of national rice availability. As for answering the research using empirical studies and multiple linear regression analysis. The results of research to ensure food security through increasing rice availability need long and short term policies. In the long term, import restriction policies will be reduced gradually, policies to increase domestic production are still being pursued, policies on food diversification by reducing dependence on rice continue to be promoted. For the short term, farmers support by issuing import restriction policies, efforts to increase productivity, especially in areas outside Java, There is a shift in the contribution to the availability of rice, from domestic production (43%) before the crisis and imports (45%) after the crisis. This condition has an impact on the welfare of farmers where before the crisis contributed 13% and after the crisis reduced to 0.8%

According to research conducted by Maisyaroh (2013) in his research Analysis of Import of Vietnamese Rice on National Rice Reserves with the aim of analyzing the condition of national rice reserves and the role of the National Logistics Agency, analyzing Vietanam rice imports of rice reserves and analyzing rice reserves in Indonesia. To answer the research used OLS (ordinary Least Square) method. The results of research that affect rice reserves managed by Bulog are large import tariffs, domestic rice prices, total rice procurement, domestic rice production and domestic demand. The five variables affect the increase or decrease in rice stock reserves in Bulog. While Vietnam's rice import variable does not affect the stock of Bulog rice reserves. In the study discussed the mechanism of rice stock where the distribution of margins of rice trading entrepreneurs is still lame. Farmer dependence on middlemen / traders due to limited capital and institutional farmers who are not solid causes farmers to get the lowest margins.

Fuad (2009) with the study of Food Stock Analysis in Distribution Systems Supporting Food Security aims to find out the description of the food stock system and identify factors that affect food stocks in the distribution system. This research uses a problem identification method with Ishikawa diagram which is a graphical device to identify, explore and illustrate problems and cause and effect relationships. The result is that food stocks, especially rice, come from domestic production, government rice reserves and rice reserves. Factors affecting food stocks in food distribution systems include production facilities and distribution infrastructure, geographical conditions, logistics management and government regulations.

In the study of Wijayanti et al (2011) Analysis of National Rice Supplies in Meeting National Rice Needs at the National Logistics Agency, Bulog aims to find out trends in national rice supplies and factors that affect national rice supplies. To support the use of small squares methods for trend analysis and multiple linear regression with the SPSS program. The results of research for national rice supply trends tend to decrease because the increase in the distribution of quantum exceeds the increase in domestic procurement so that the national rice supply decreases. Factors affecting the national rice supply are domestic rice production and domestic distribution while rice imports are complementary when needed.

According to Widodo (2011) with research on Factors Affecting National Rice Prices and Availability aims to find out the factors that influence domestic rice prices at the national level and factors that affect rice availability at the national level. The method used is OLS (Ordinary Least square) Eviews program. The factors that significantly influence the domestic price of rice are the price of grain and world rice prices. While rice production, corn prices, rice imports and farmer exchange rates, do not affect national rice prices. Factors affecting the national rice supply significantly are domestic procurement, farmer exchange rates, harvested area and dummy conditions before and after the economic crisis. Whereas that does not affect is the level of consumption per capita and the ratio of domestic to international rice prices.

Rice productivity, although increasing every year, but the supply of domestic rice production is still weak in meeting people's consumption demand. When compared to the need for rice which continues to increase due to the increasing number of population and the growing number of dependence on community consumption of rice, it is feared that the supply of national rice production will not be able to meet the needs resulting in a national food shortage disaster. Based on this, the issues that will be discussed in this study are: what factors influence the availability of national rice and what factors support food independence, especially rice.

METHOD

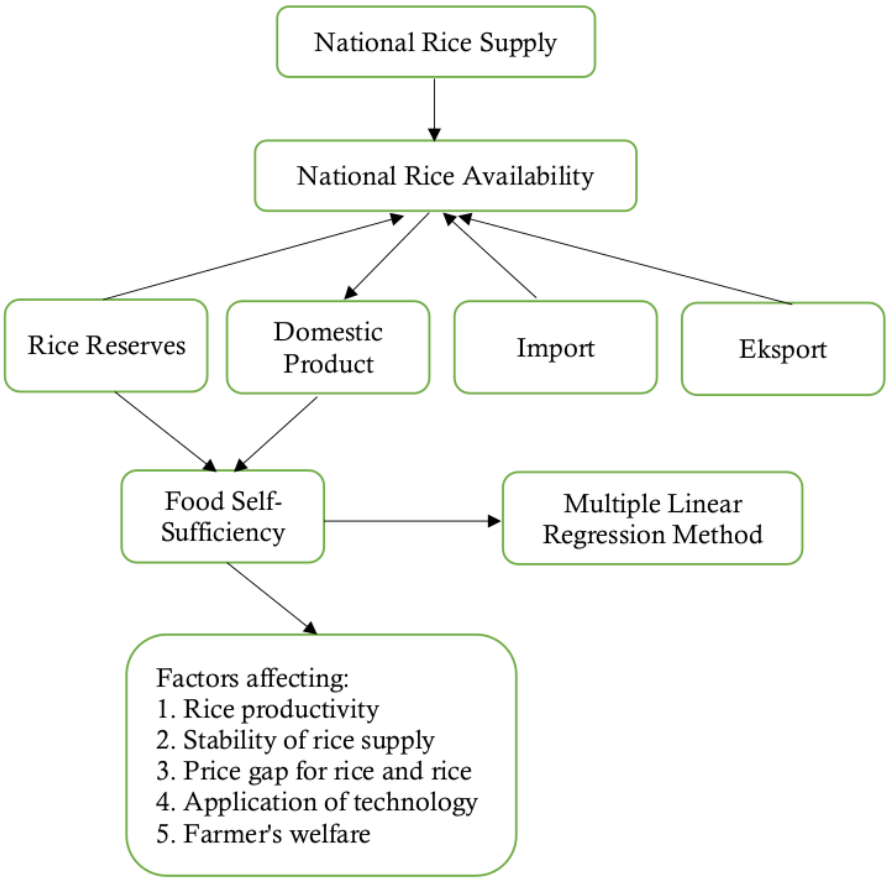
Framework

This research looks at the supply side of meeting the availability of national rice. The fulfillment comes from domestic rice production, procurement of government rice reserves and procurement of foreign rice. Although exports affect the availability of national rice, but its nature reduces the availability of stock so it is not examined in research.

So that the availability of rice is expected to always be stable to meet people's livelihoods, the most important factor is fulfillment from domestic sources. Fulfillment of rice fulfillment is realized in the form of food independence.

According to Law number 18 of 2012, food independence is the ability of the state to produce food domestically so as to ensure adequate food needs. But so far food independence is still being pursued. The Ministry of Agriculture targets 5 commodities to achieve food self-sufficiency, namely rice, corn, soybeans, beef and sugar. In this study only discusses rice because it is considered the most strategic and crucial commodity for the community.

The flow of thought in research can be seen as follows:



RESULT AND DISCUSSION

Model Limits

System dynamics modeling is an attempt to represent real world phenomena into a computer simulation model whose purpose is to describe real world phenomena, predict the short-term and long-term outcomes of a problem and also policy solutions, and more importantly, to provide an understanding more comprehensive about a phenomenon or problem that occurs. It is hoped that the best policy can be based on this understanding.

Many experts argue that the quantification of qualitative variables used in modeling dynamics systems often creates uncertainty, therefore simulation results from modeling dynamics systems are often considered to be misdirected, or at least very fragile (Coyle, 2000). It is the limitations of knowledge and perceptions that humans have that cause this to happen. Therefore, in modeling dynamics systems, model constraints need to be made to be able to represent phenomena and also improve understanding of phenomena or problems. These

restrictions will categorize which variables are included endogenous, exogenous, and also variables that are outside the model boundary. Endogenous variables are variables whose value is determined by the interaction of the model included in the causal circle, exogenous variables are variables that affect the state and dynamics of the model, but are not influenced by the model. While variables outside the boundary are variables that cannot be influenced or affect the model.

As mentioned above, rice production is affected by the area of paddy fields, yield of rice varieties planted, soil fertility, pest disturbance and intensity of rice cultivation. The area of paddy fields is affected by land conversion to non-agricultural land as a result of increasing population in Bandung Regency. Based on data and conditions in the field, the rice varieties used do not always reach the maximum value (optimal) due to the influence of soil fertility and pest disturbance. The intensity of planting even though it cannot be maximally carried out because it is influenced by water availability. Therefore, in this study the variables related to the rice production model in this study are as follows:

Table 1. Limitation of Rice Production Models

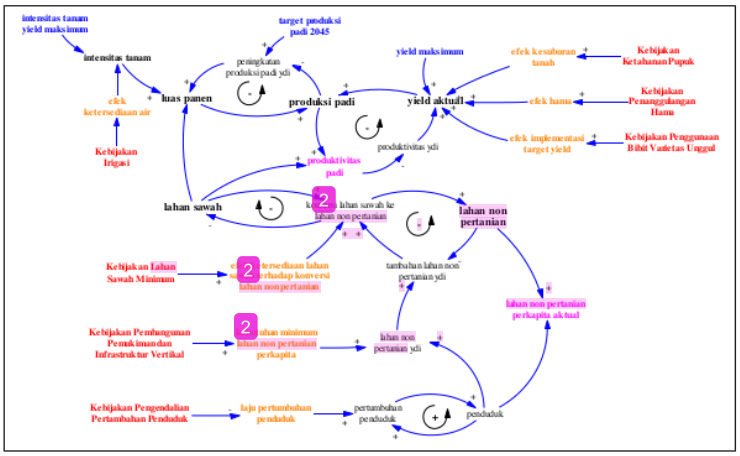
Endogenous Variables	Exogenous Variables	Beyond the Model Boundary
Rice Production	Paddy fields	Weather
not land	Population	human Resources
	Planting Intensity	subsidy
	yield	

Source : analysis data

Structure of Rice Production Model

The behavior of a model depends on the components that exist and the interrelationships between these components and the parameters inherent in each component. Building a model structure means making a causal loop diagram that can reflect the real system. The structure of the model is then developed and studied the behavior of each observed variable. Then the behavior of each variable is assessed and formulated so that it can be simulated to find out the behavior of the variables reviewed in relation to changes in time. The following is a causal loop diagram of rice production in Bandung Regency:

Figure 1. Rice Production Causal Loop Diagram in Bandung Regency



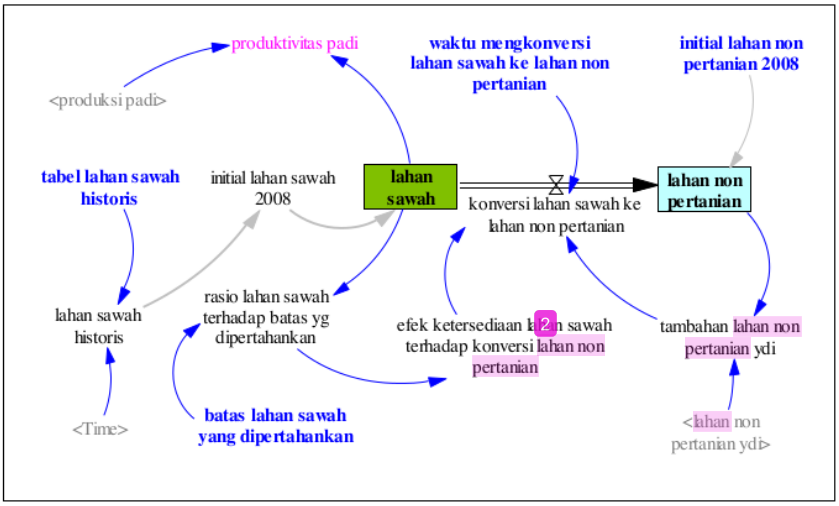
Source : analysis data

The structure of the global model in this study consists of causal loop diagrams of several sub models interacting to form the overall system. Each sub-model, in addition to interacting with other sub-models also has an internal interaction between the structural components owned by the sub-model concerned. The global model of rice production in Bandung Regency is formed by 4 sub-models, namely the sub-land model, the desired non-agricultural land sub-model, the rice production sub-model, and the target yield implementation sub-model.

Land Sub Model

The land sub-model illustrates the dynamics of the function of changing paddy fields to non-agricultural land. Transfer of paddy land is influenced by the need for non-agricultural land, such as for housing, industry, infrastructure, and other commercial buildings. The amount of land conversion is limited by the large area of paddy fields that must be maintained, because otherwise the paddy fields will be exhausted, so that Bandung Regency can no longer produce rice. Following is the flow diagram of the sub-land model:

Figure 2. Flow Chart of Land Model Sub

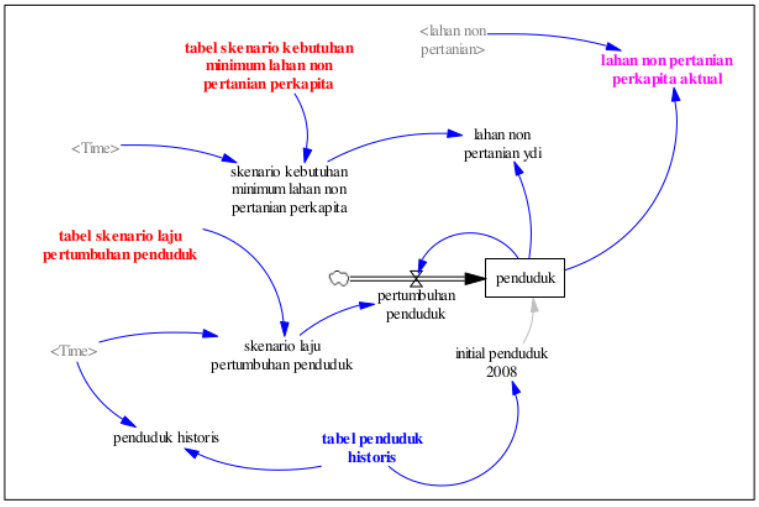


Source : analysis data

Desired Non-Agricultural Land Model

Desired non-agricultural land models describe the dynamics of non-agricultural land requirements due to population growth. The higher the number of population, the greater the need for non-agricultural land. But the availability of non-agricultural land is also not unlimited, therefore the need for non-agricultural land is also influenced by the minimum non-agricultural land requirements per capita. Following is the flow diagram of the desired non-agricultural land sub-model:

Figure 3. Flow Chart of Desired Non-Agricultural Land Model

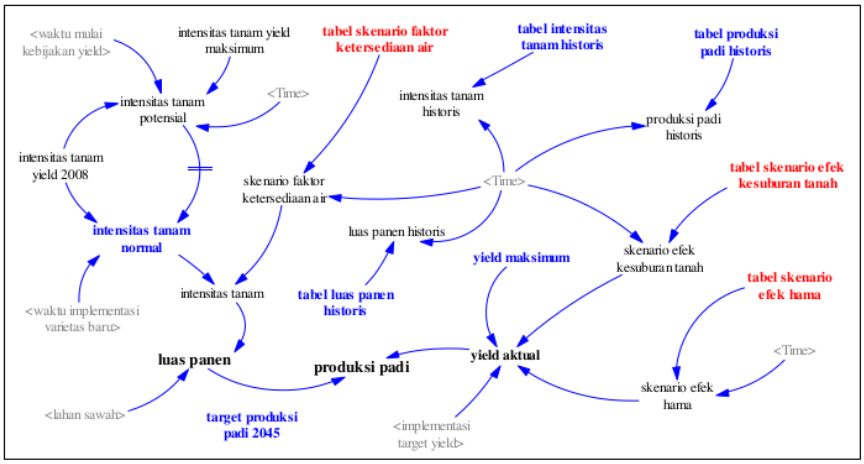


Source : analysis data

Rice Production Sub Model

The rice production sub-model illustrates the dynamics of rice production which is influenced by harvest area and yield factors. Harvested area is influenced by the size of rice fields and cropping intensity. The amount of cropping intensity depends on the variety of rice seeds used, as well as the amount of yield. Each rice seed variety has its own cropping intensity and potential yield. The optimal intensity of planting depends on the availability of water in the paddy field. While the optimal yield obtained depends on whether soil fertility and pest problems. Following is the flow diagram of the rice production sub-model:

Figure 4. Flow Diagram of Rice Production Sub-Model

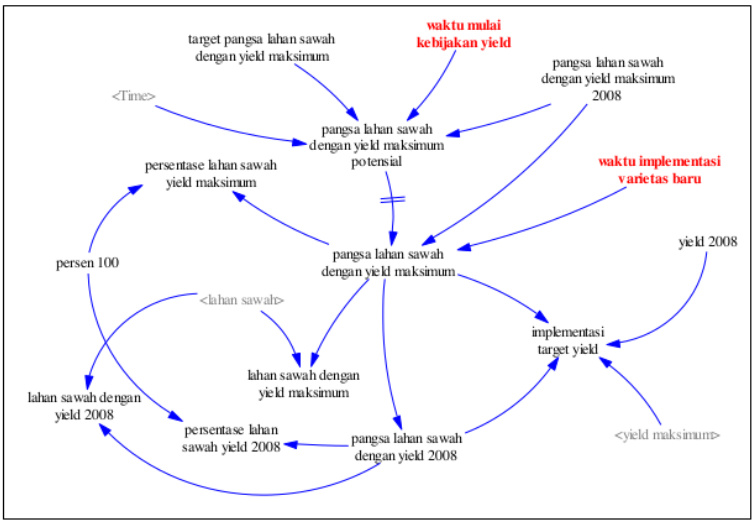


Source : analysis data

Implementation of Target Yield Sub Models

The implementation of the yield target is influenced by the potential yield of seed varieties used in 2008, where the average farmer uses ciherang seed varieties, the maximum yield of current rice seed varieties, the share of paddy fields with 2008 yields, and the share of paddy fields with maximum yields also affects the share of paddy fields with 2008 yields and paddy fields with maximum yields. While the share of paddy land with maximum yield is influenced by the share of paddy land with potential maximum yield, share of paddy land with maximum yield of 2008, and the time of implementation of new varieties. the share of paddy land with maximum yield is potentially influenced by the share of paddy land with maximum yield of 2008, the time of yield yield policy, and the target of the share of paddy land with maximum yield. Following is the flow diagram of the target yield implementation sub-model:

Figure 5. Flow Diagram of Target Yield Implementation Sub Models

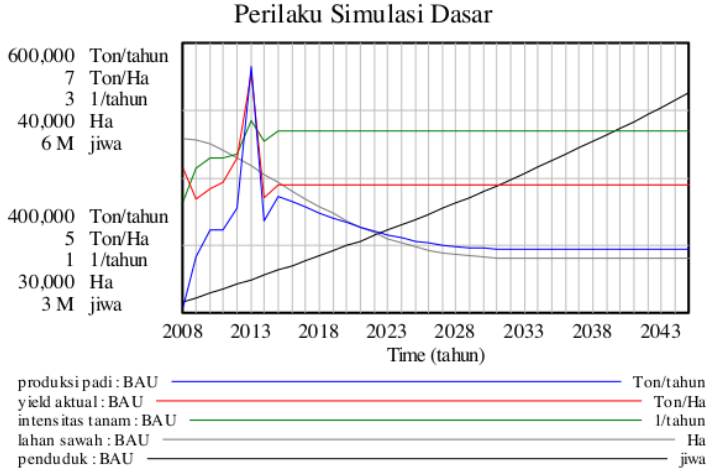


Source : analysis data

Model Behavior in Basic Scenarios

Basically, the simulation is done to find out how the model will tend to behave in the future. To find out the future behavior of the model, a simulation is carried out until 2045, which is 100 years of Indonesian Independence. The start time of the simulation is 2008 and ends in 2045. In the basic scenario there is no change in the values of variables and parameters or no intervention is carried out. Simulation results are shown in the following figure.

Figure 6. Basic Scenario Simulation Results



Source : analysis data

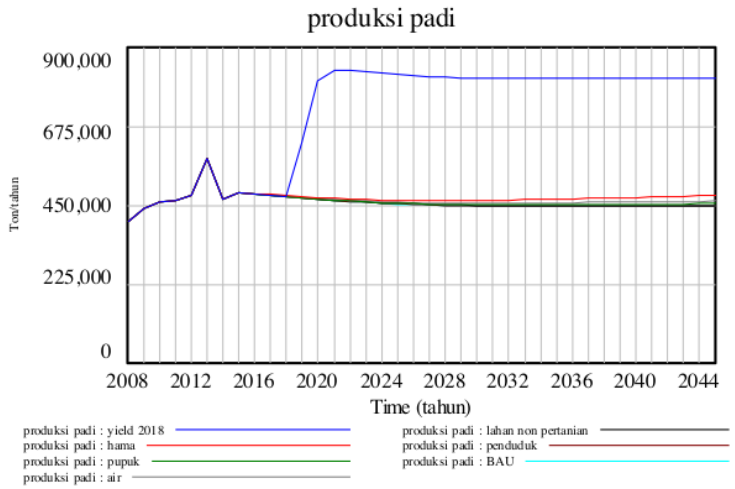
From the simulation results it can be seen that the behavior of the model has not improved from historical simulations, this shows that when the structure of the model is not carried out any intervention on variables that are considered sensitive then the behavior of the model will not change. The basic scenario model without any improvement efforts, especially on the availability of water, pest control, increasing soil fertility, and research on new rice seed varieties that are the authority and responsibility of the government, rice production will not achieve maximum results.

The results of the basic scenario simulation in the model are not expected conditions for future rice production in the real world, especially if you want the government's target as a world food barn to be achieved in 2045. For this reason it is necessary to intervene the variables in the model that are considered sensitive that can improve behavior model. By improving the behavior of the model it is hoped that it can become input in developing alternative policies to improve the real world phenomenon in the future.

Model Behavior in Policy Scenarios

To improve the behavior of the model an analysis of the behavior of certain variables is carried out. In accordance with the objectives of this study, intervention scenarios were carried out mainly on sensitive variables that would change the behavior of the model. The first policy scenario is to intervene in each variable except the time variable starting the implementation of new varieties. Obtained simulation results as follows:

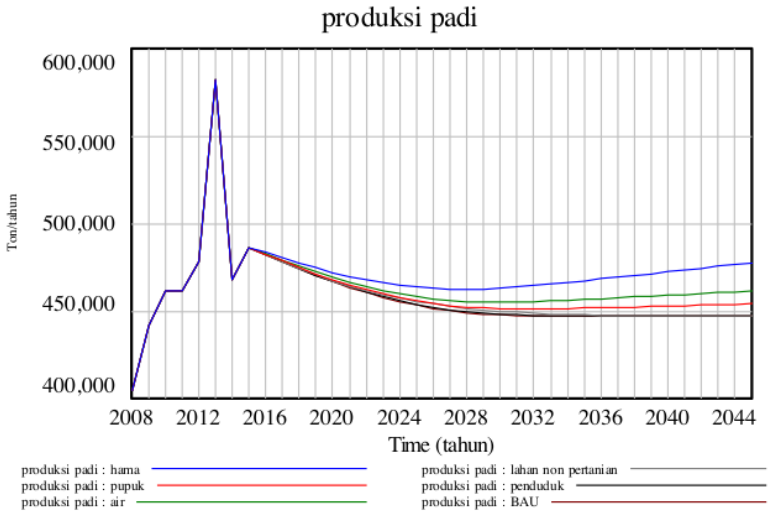
Figure 7. Results of the Policy Simulation to be Implemented in 2018



Source : analysis data

It appears that the policy for the use of new seed varieties is the most sensitive variable with the most significant rice production. If the variable usage of new seed varieties is not implemented, the following graph is obtained:

Figure 8. Results of Policy Simulation Starting to be Implemented in 2018 Without Yield Policy

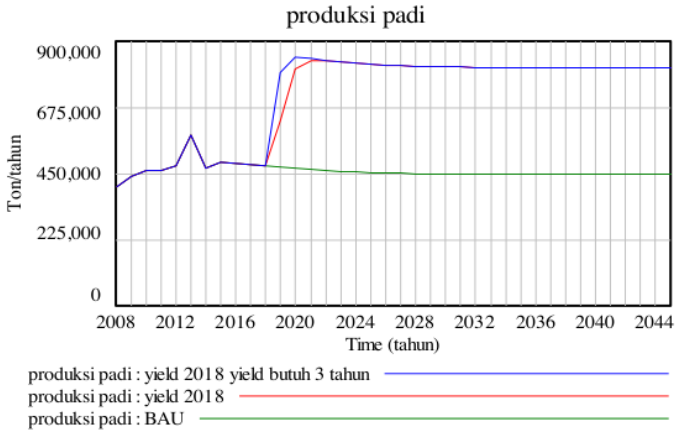


Source : analysis data

It appears that sufficiently sensitive variables produce significant rice production after the variable use of new seed varieties are effective pest control, adequate water supply, and appropriate fertilizer application.

As stated above, the use of new seed varieties is the most sensitive variable with the most significant results of rice production simulation, but the policy is only implemented after 5 years. The following is a chart comparison with the time to implement the new varieties of seeds 3 years and 5 years.

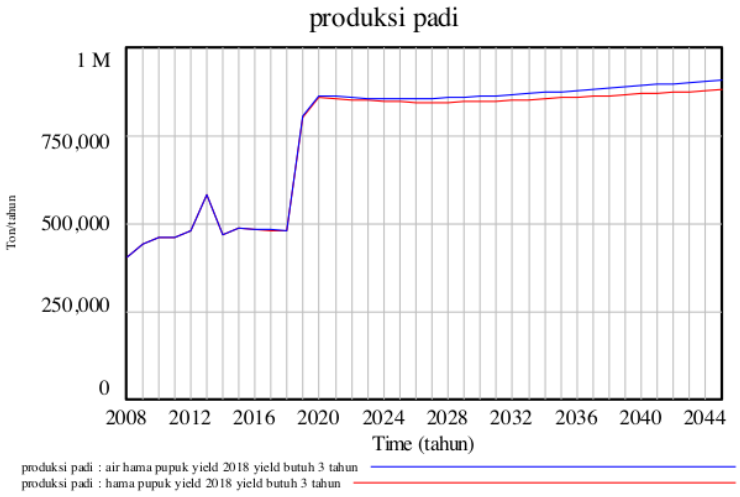
Figure 9. Results of Yield Policy Simulation Starting to be Implemented in 2018, Delay of 5 Years vs. Delay of 3 Years



Source : analysis data

It can be seen that the policy for the use of new seed varieties with a 3-year delay results in a better simulation of rice production than the use of new seed varieties with a 5-year delay. Based on some of the simulation results above, if several sensitive policies are implemented simultaneously the following graph is obtained.

Figure 10. Several Policies Implemented Simultaneously Starting in 2018



Source : analysis data

From the graph, it can be seen that the policy to use new varieties of seeds with implementation time as soon as possible, in this simulation that is 3 years, if coupled with effective pest management policies, the use of appropriate fertilizers and sufficient water supply will result in higher rice production than if the policy which is only accompanied by effective pest control and the use of appropriate fertilizers.

The simulation results by changing the variable population growth rate or the minimum non-agricultural per capita land need variable does not show much difference compared to the scenario without policy, this shows that the minimum non-farm per capita land requirements and the population growth rate do not have too much impact on the model results. This is because the paddy fields needed to grow rice have reached the lower threshold. It is impossible to do the addition of paddy fields by changing the function of non-agricultural land to paddy fields. In addition, the availability of land as well as mutual attraction with the needs of non-agricultural land, such as housing, industrial buildings, commercial buildings, infrastructure and others. In this scenario, the minimum per capita non-agricultural land demand will fall, which means that in the coming years development will be implemented with upward development, no longer on the sidelines. For example, increasing the construction of flats, construction of industrial and commercial buildings vertically, overpass construction, and so forth. Likewise, the rate of population growth is made down, meaning that in the future the government is more

aggressively conducting small family programs, such as Family Planning (KB), and so forth. These two things indeed cannot directly increase rice production, but with the decrease of these two variables can at least maintain the availability of land to produce rice.

The development of agriculture, especially rice food in Bandung regency, has not yet shown encouraging results. Basic simulation results show that the rate of growth of rice production has not yet yielded satisfactory results. Under these conditions, efforts to achieve an increase in the rate of growth of rice production by 5 percent per year may not be achieved until 100 years of Indonesian independence, namely in 2045. Many factors affect this, including the conversion of paddy fields to non-agriculture which not only seizes land rice fields are available, but result in a lack of water availability for rice fields. If the weather is good, in the sense of being in accordance with the conditions of agriculture, of course the availability of water is not a problem for farmers to produce rice optimally. It is different if the weather enters the dry season, where rice fields can experience drought, this is certainly an obstacle for farmers. In this case the role of government is needed. The government can budget irrigation improvement if indeed the irrigation channel is experiencing problems either damaged due to age or because it is obstructed by the construction that was established between the water source and the rice fields. There are many ways that the government can do with various policies to ease the burden on farmers. Provision of water pumps for farmers when they are experiencing drought, one of them. Currently in Bandung Regency the supply of pumps is already running, but the number of pumps available with rice fields that require water assistance is still not comparable. Not to mention the cost of transporting pumping equipment and fuel costs that must be borne by farmers is a constraint for farmers.

New improved seed varieties can basically be a solution in increasing rice production. Substitution of new varieties can reduce pest failure problems because pests do not recognize the new varieties. But in reality the application is not easy. The habit, culture, and taste of rice produced from the rice varieties currently used is one of the obstacles of the government to implement new varieties to farmers. Therefore, integrated counseling is needed in order to introduce new varieties to farmers. At present there are many agricultural extension agents assigned by the Agriculture Office in each region as a bridge to connect farmers with the government in dealing with all kinds of problems related to rice, including the problem of new varieties. But this has not been done optimally due to several things both from the farmers themselves and agricultural extension officers assigned by the local Agriculture Service. Drought and pest problems that often occur that result in decreased or not optimal rice production can basically be dealt with immediately so that it does not harm the farmers if the communication between farmers and agricultural extension workers can go well.

In addition, human resources must also be considered by the government to increase rice production. The reluctance of people, especially the productive age to become farmers, is an obstacle to increasing rice

production. Income which is considered insufficient is the main reason for Indonesia's agricultural sector experiencing a shortage of human resources. The high value of production to produce rice is also an obstacle in the agricultural sector. Some policies related to subsidies have been widely implemented by the government to increase rice production, but in reality there are still many irregularities that occur, this must also be a concern of the government in order to be anticipated.

Provision of agricultural tools that can facilitate the task of farmers in working on the fields is not yet done by the government at this time. However, these programs are often not well targeted or not in accordance with the conditions of the fields cultivated by the farmers who received the assistance. Therefore, two-way communication between farmers and policy makers is one solution that can overcome various agricultural problems, especially the problem of rice. If communication goes well, of course farmers can get assistance programs in accordance with what is needed so that rice production can increase.

CONCLUSION

Based on the results of simulations and analyzes that have been done there are several things that can be concluded regarding the increase in rice production in Bandung Regency as follows:

The most significant policy is the yield increase policy, namely by replacing the seed varieties used today, namely Ciherang, potential yields of 7 tons / ha, with suggested high yielding varieties namely INPARI 42, potential yields of 10.58 tons / ha, while other policies are less significant in increasing rice production. The policy in point 1 is recommended to be implemented with a time delay of 3 years. This can be done through efforts to ensure the availability of superior seeds needed by farmers, according to the amount needed at an affordable price through the independent seed program. The policy on the use of new varieties, namely INPARI 42 with a implementation delay of 3 years, coupled with policies on pest control, fertilizer resistance, and irrigation improvement can further increase rice production in the long run.

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