

AVAILABILITY RICE PROCUREMENT POLICY SCENARIOS TO MAINTAIN PRICE STABILITY

JOKO SUPRIANTO

¹Informatics, Faculty of Engineering, Bhayangkara Surabaya University

Jl. Ahmad Yani 114 Surabaya, East Java

e-mail: ¹supriantojoko1985@gmail.com

ABSTRACT

East Java province with a population of more than 37 million people, mostly consume rice as a staple food. SUSENAS data in 2010 showed that the people of East Java rice consumption stood at 125kg / capita / year. With a population growth rate of 0.76% per year, the population of East Java increased as much as 3,659 lives each year. Addition of the population of these consequences on additional ballooning rice requirement of 457 409 tonnes / year. In this study, using the approach of dynamic system models with three scenarios, the Land Intensification scenario 1, scenario 2 Ekstensifikasi land, and scenario 3 Combined Intensification and extensification Land. The most optimal results from the third scenario is the scenario 3 (combined intensification and extensification Land), whereas in the scenario 3 rice production at the beginning of the simulation in 2012 reached 6.5359 million tons and production at the end of the simulation in 2021 reached 7.61593 million tonnes (the most optimal). While the price of rice at the beginning of the simulation in 2012 reached Rp 7,153 and the price of rice at the end of the simulation in 2021 reached Rp 13.213. Pada scenario 3 rice prices are relatively stable from year 2012 to 2021 between Rp 7,153 to Rp 13 213.

Keywords: *Rice, Dynamic Systems, intensification, extensification, Price of Rice.*

1. INTRODUCTION

Rice is the staple food for the majority of the population in Indonesia in general and in East Java in particular. East Java province with a population of more than 37 million people, mostly consume rice as a staple food. SUSENAS data in 2010 showed that the people of East Java rice consumption stood at 125kg / capita / year. With a population growth rate of 0.76% per year, the population of East Java increased as much as 3,659 lives each year. Addition of the population of these consequences on additional ballooning rice requirement of 457 409 tonnes / year. Assuming the average productivity of rice in East Java 5.132 tonnes per hectare, then the additional requirement of rice is equivalent to 4,743 ha / year of rice land.

The National Logistics Agency (Bulog) regional divisions (Divre) East Java is one of the government agencies were given the main tasks of maintaining national food availability in general and particularly East Java. So here Bulog has a very important role in keeping prices stable by absorbing the results of paddy and rice from farmers at a price that does not harm farmers.

In previous studies has been a lot of research on the development of rice availability of dynamic systems. In research [4], menggunakan simulation of dynamic systems to support strategic decision to develop a dynamic system rice supply. In the study using a dynamic systems approach to studying the habits and relationships within the supply for perishable goods. Results of research above can be used to determine the relationship between actors variable supply of rice and analyze the effects of changes in the value of the model variables. In this study, researchers focused on the procurement scenario availability beras untuk maintain price stability using dynamic system modeling approach in East Java.

Dynamical systems framework can be used to analyze the model and generate scenarios to increase system performance because of the ability to represent the physical and information flows, based on the control of information feedback continuously converted into decisions and actions [3].

2. METHODOLOGY

According [2], that the dynamic system is the most popular in the modeling process because it can describe the environmental conditions that will be modeled as closely as possible the conditions that exist in the real environment. It can be said that it is a dynamic system feedback or feedback interrelated structure and toward balance. Here is a small picture of a feedback system which terdapatdalam dynamical systems:

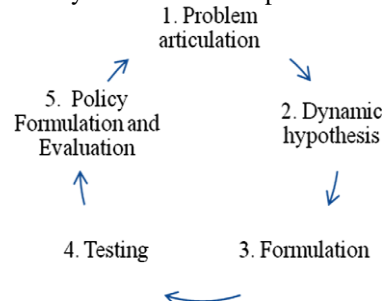


Figure 1 Processes in modeling of dynamic systems (Stermann, 2000)

In the book [2] tried to give a general picture of the processes that occur in the modeling of dynamic systems as seen in Figure 2.2 Chou, [3], describes in his journal that the cycle is in figure 2.2 is part of a cycle that is greater than learning and No action modeling dynamic system that will continue in the organization, the explanation is as follows:

Step 1: Problem Articulation: at this step, we need to find the real problems that are in the system that we modeled, then identify the key variables and concepts contained therein, determine the length of time in the simulation and find the characteristic problems that are dynamic to understand and designing policies to address them.

Step 2: Dynamic hypothesis: the model makers have to develop a theory of how problems arise in the system. it is done in an effort to create a guide for modeling with a focus on a particular structure. At this stage, we need to developing a causal loop diagram that describes causal relationships between variables and change the causal loop diagram to flow diagram.

Step 3: Formulation: after converting a causal loop diagram in the diagram simulation, we will be able to determine the model of a dynamic system that we will make, the system description should also translate into some level, it can help kia in determining the equation. We need to estimate some of the parameters, the relationship of behavior and initial conditions. Then we can write the equations that will reveal gaps and inconsistencies that should be corrected in the previous description.

Step 4: Testing: In this process the model will do the testing with the goal of comparing the simulated model behavior of the actual behavior of the system.

Step 5: Policy formulation and evaluation. After modelers have confidence in the behavior of the structures developed in the model, we can use it to design and evaluate policy improvements. The interaction of different policies should also be noted, as the system is actually highly nonlinear, the impact of the policy combination is usually only comes from the policy itself.

3. DEVELOPMENT MODEL

The development of this model will be explained on the implementation of dynamic system models the availability of rice. Such implementations use some help of software such as: Vensim Version 5.2a and Microsoft Office Excel 2007. Vensim as software for modeling and simulation of food logistics fulfillment of rice. While Microsoft Excel is used as a tool for data storage and processing the results of validation of simulation.

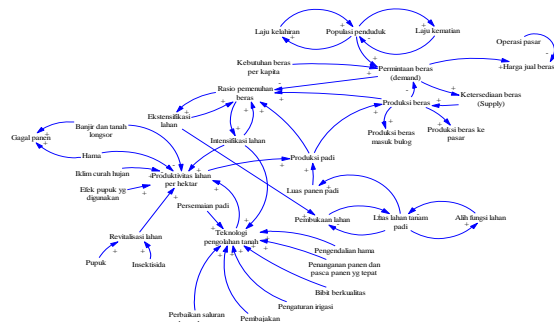


Figure 2 Causal Loop Diagram Availability Rice

3.1 Data

The data used for this study are the data obtained from the Department of Agriculture of East Java, Central Bureau of Statistics and Perum Bulog East Java consisting of:

1. Population East Java
2. The land area of rice planting
3. The rice harvest
4. Productivity per hectare of rice land
5. Production of rice
6. Rice Production
7. Size swamp land unplanted

3.2. Data modeling

Having obtained the relationship between variables, then performed the manufacturing flow diagram base models using vensim application. Modelling conducted for verification and validation of relationship between variables (the model formulation) for suitability models with reality system.

3.2.1. Sub Model Population and Demand Rice

Flow diagram for the sub-population models and demand can be seen in Figure 3. Rice demand influenced by the needs of rice per capita and population in a given year. So they make a flow diagram needs common rice as shown Figure 3.

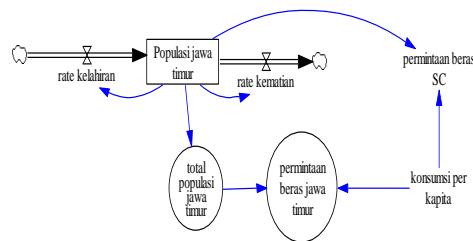


Figure 3 Flow Diagram Sub- Population and Demand Model

The population of East Java is the value of the birth rate minus death rate (using the simple formula of the total population), according to data from the central statistical agency eastern Java in the period 2000 to 2011 the birth rate reached 1.4% per year and the death rate reached 0.3% per year.

Here are the results charts of sub models of population and demand (without scenario) as in Figure 4-5.

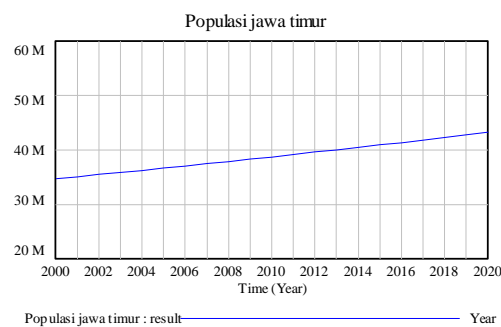


Figure 4 Graph Population East Java

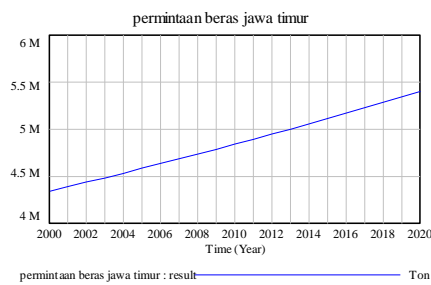


Figure 5 Graph Query Rice East Java

3.2.2. Sub Model Size Rice Fields

Rice area in East Java province has the rate of increase through clearing and the rate of reduction through land conversion. Flow diagram of sub - this model can be seen in Figure 6.

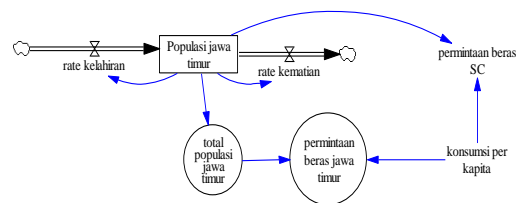


Figure 3 Flow Diagram Model Sub-Population and Demand

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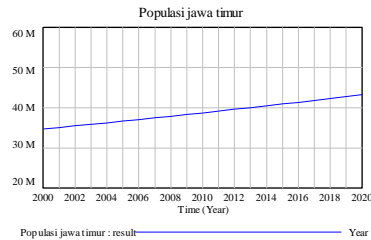


Figure 4 Graph Population East Java



Figure 5 Graph Query Rice East Java

3.3.3. Sub Model Rice Production

Rice production obtained through the process of rice production will be obtained dry grain harvest (GKP) amounted to 86.02% of rice production, then HSIL of GKP will get the results of milled rice (GKG) sebesar 62,74 kg per 100 kg GKP. The variable data of east Java province has undergone a process of data processing. Flow diagram of sub-models can be seen in Figure 8.

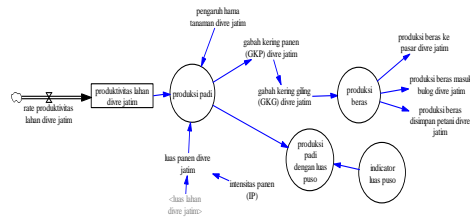


Figure 8 Flow Diagram Sub-Model Rice Production

The following graph results from sub model of rice production (without scenario) as in Figure 9.

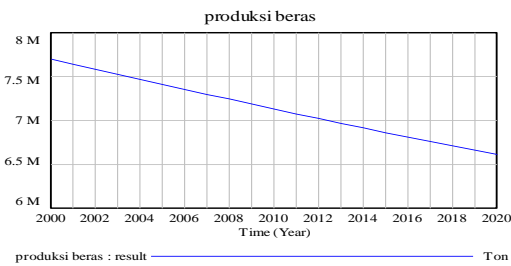


Figure 9 Graph Rice Production

3.3.4. Sub Model Land Productivity

Jatim Divre land productivity is influenced by variable rate Divre jatim land productivity and land productivity Divre jatim. The variable data of east Java province has undergone a process of data processing. Flow diagram of sub-models can be seen in Figure 10.

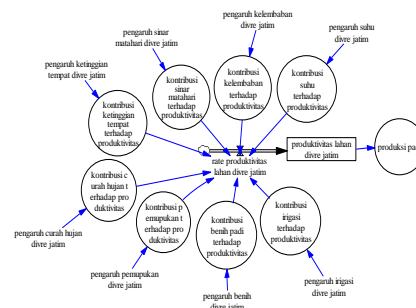


Figure 10 Flow Diagram Sub-Model Land Productivity

The following graph results from sub model of rice production (without scenario) as in Figure 11.

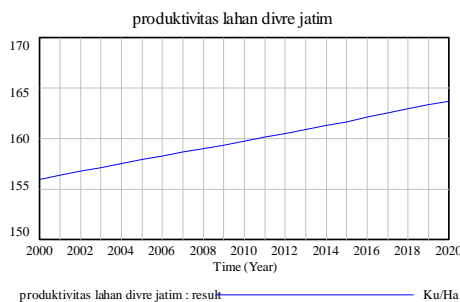


Figure 11 Graph Productivity of Land

3.3.5. Sub Rice Distribution

Distribution of rice Divre eastern Java to describe the stock of rice and rice demand in East Java province. Demand for rice is obtained from a population of east Java multiplied Mean levels of per capita consumption of 125 kg per year or 0,125 tonnes per year.

Flow diagram for a sub-model of distribution of rice stocks can be seen in Figure 12.

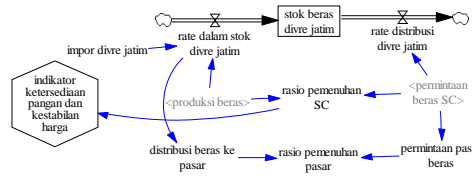


Figure 12 Flow Diagram Sub - Model Stock Distribution of rice

The following graph of the results of the rice sub distribution model (without scenario) as in Figure 13.

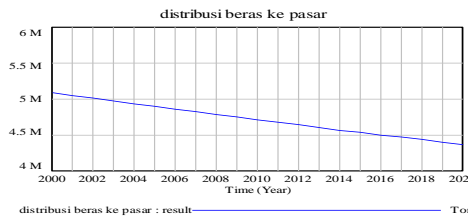


Figure 13 Graph Rice Distribution

4. Model Validation

Validation aims to check whether the conceptual model simulation is an accurate representation of the real system being modeled. Validation method used is the mean amplitude variations comparison and comparison. Tests on a model from the calculation of mean and amplitude variations comparison comparison can be seen as follows:

a) Validation Population can be seen in Figure 14 and Table 1.

Table 1 Value mean comparison and amplitude variations comparison-Population East Java Original Data Simulation Data Validation

Validation	Original data	Simulation data
Mean	36.314.890	36.266.334
Std.Deviation	978.271	1.026.604
E1	1%	
E2	4,9%	

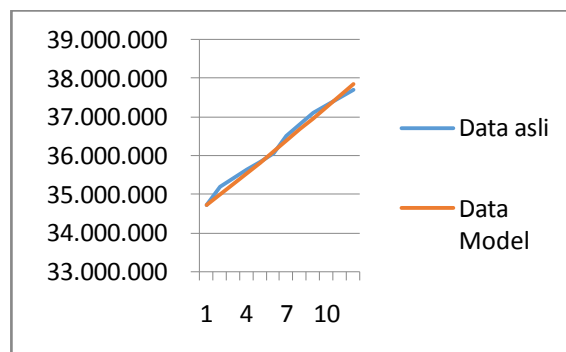


Figure 14 Mean Value Comparison Comparison and Amplitude Variation-Population E1 and E2 $\leq 5\% \leq 30\%$ so that the model population declared invalid.

b) Validation Request rice can be seen in Figure 15 and Table 2.

Table 2 Value mean comparison and amplitude variations comparison-Demand Rice

Validation	Original data	Simulation data
Mean	4.801.860	4.612.417
Std.Deviation	187.690	174.138
E1	3,9%	
E2	7,2%	

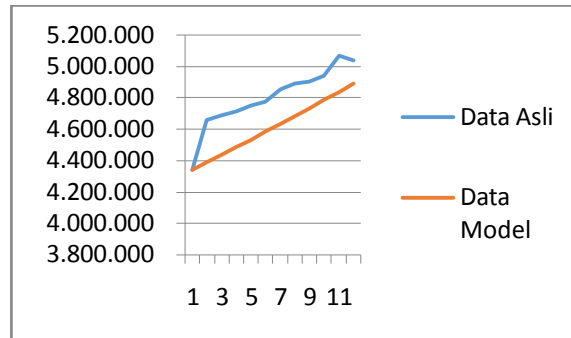


Figure 15 Mean Value Comparison Comparison and Amplitude Variation-Demand Rice
 E1 and E2 $\leq 5\% \leq 30\%$ so that the model population declared invalid.

c) Validation area of East Java rice fields can be seen in Figure 16 and Table 3.

Table 3 Value mean comparison and amplitude variations comparison-Size Rice East Java

Validation	Original data	Simulation data
Mean	1.511.612	1.490.391
Std.Deviation	236.000.	207.683
E1	1%	
E2	12%	

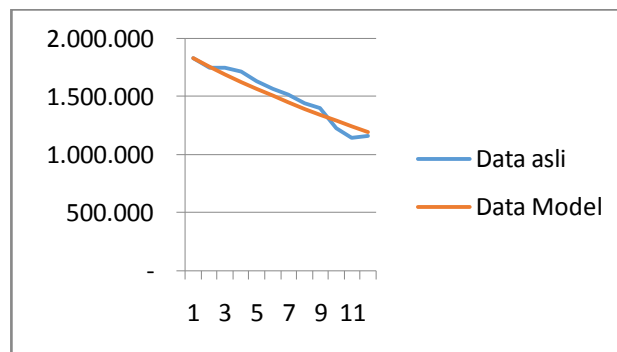


Figure 16 Mean Value Comparison and Amplitude Variation Comparison- Size Sawah East Java

E1 and E2 $\leq 5\% \leq 30\%$ so that the model population declared invalid.

d) Validation Rice Production can be seen in Figure 17 and Table 4.

Table 4 Value mean comparison and comparison-amplitude variations Rice Production

Validation	Original data	Simulation data
Mean	4.813.987	4.881.000
Std.Deviation	103.901	133.415
E1	1,4%	
E2	28%	

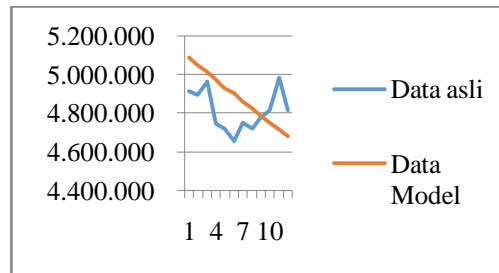


Figure 17 Mean Value Comparison Comparison and Amplitude Variation-Rice Production

E1 and E2 $\leq 5\% \leq 30\%$ so that the model population declared invalid.

e) Validation of Land Productivity can be seen in Figure 18 and Table 5.

Table 5 Value comparison and amplitude variations mean comparison-productivity land

Validation	Original data	Simulation data
Mean	156	158
Std.Deviation	27	25
E1	1,2%	
E2	7,7%	

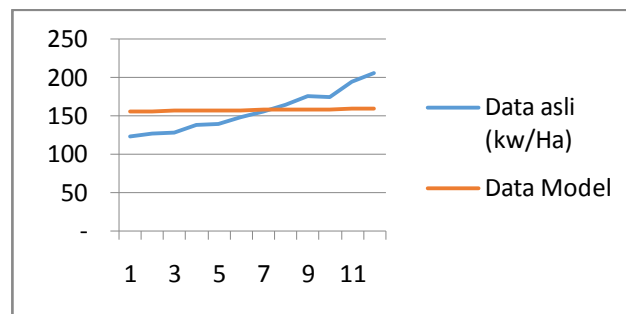


Figure 18 Mean Value Comparison and Amplitude Variation-Productivity Comparison of land

E1 and E2 $\leq 5\% \leq 30\%$ so that the model population declared invalid.

4. EQUATIONS

In this study the variables that affect the availability of rice is the number of population, per capita consumption of rice. Variables in inventories is land productivity, rice production, rice area. Variables in the price is the market price, the impact of the disparity, the impact of inflation. While the variable on land productivity is rice seeds, fertilizer, irrigation, land, temperature, rainfall, elevation of the land surface. From the existing policy scenario, the policy scenario through a combination of the availability of rice intensification and extension yan g most suitable because it can increase the productivity of land, increase the production of rice and keep rice prices to remain stable. The development of further research can be added more variables that affect the productivity that can be developed scenario intensifying and extending more diverse.

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