

# Rice Distribution Pattern: A Study on Food Security in South Kalimantan

Arief RM Akbar<sup>\*,1</sup>, Alan Dwi Wibowo<sup>1</sup>, Alia Rahmi<sup>1</sup> and Sigit Prabawa<sup>2</sup>

<sup>1</sup> Agro-industrial Technology Department, Faculty of Agriculture, Lambung Mangkurat University, Jl A Yani KM 36, Banjarbaru, Kalimantan Selatan, Indonesia 70714

<sup>2</sup> Food Science and Technology Department, Faculty of Agriculture, Universitas Sebelas Maret, Jl Ir. Sutami No 36A, Surakarta, Indonesia 57126

E-mail: ariefrma@yahoo.com\*

## Abstract

*In recent years, South Kalimantan has experienced rice surplus and been appointed as one of the nation's rice barns. However, the distribution pattern of rice produce in the province is not clearly described. The distribution pattern itself plays an important role in the context of rice availability and food security. The study is aimed at investigating the rice distribution pattern in South Kalimantan. The method used was supply-demand model with system dynamics approach. Price was the experimental variable. Initially, the stakeholder roles were investigated, followed by the development of causal loop diagram (CLD), stock and flow diagram (SFD), validation, verification, and finally simulations. South Kalimantan rice supply chain is generally operated by farmers, village middleman, larger collectors, rice millers, urban wholesalers (distributors), retail sellers, and consumers. The distribution pattern is influenced by the location of rice producing area, the location of large miller/collector/wholesaler area, rice variety, and consumer preferences.*

**Keywords:** *distribution pattern, rice, system dynamics*

## 1. INTRODUCTION

In order to boost national rice production, the Indonesian Ministry of Agriculture in 2018 made a breakthrough policy by expanding the area of rice cultivation and optimizing agricultural machinery in all stages of rice cultivation. Expansion of the area of rice plantations is focused on wetlands areas such as in South Kalimantan, which are said to be sleeping giants given their enormous potential. This great potential however is accompanied by the problems which are very familiar among rice cultivation practitioners in wetlands.

An example of the problems is the limited rice cultivation to once a year as a result of water availability issues which cannot be overcome by traditional methods. In this light, technology approaches are necessary to improve land productivity to 2 times of cultivation a year. Despite the once a year cultivation, today, the rice production in South Kalimantan has a surplus (Kirnadi and Firahmi, 2010). The production of local varieties of South Kalimantan's rice reached an average of 3 tons/ha. It is important to note that the productivity uses minimum chemical fertilizers

and relies more on the availability of nutrients carried by the tidal flow from the river. The favorable geographical position, Kalimantan Selatan gives an opportunity to be able to supply rice to other regions (Akbar et al., 2017).

With the current condition of surplus production, South Kalimantan is still faced with problems, especially on the volatile prices of rice in the market. The surplus rice production in South Kalimantan turned out to have no effect on the stability of rice prices, due to the unknown pattern of rice distribution in each district. It is thought that South Kalimantan rice price fluctuation is associated with the poor rice supply chain management.

However, this assumption is still questionable. The aim of this study is to determine the pattern of rice distribution carried out by farmers and rice traders at the village level to agents at the district level. The development of alternative model for the provision of rice may have an impact on sustainable production and distribution of rice, improve the welfare of farmers, and ensure that all communities can easily get rice both in terms of quantity and affordability of rice prices.

## 2. MATERIALS AND METHOD

The aim of this study is to determine the pattern of rice distribution in South of Kalimantan. Using supply-demand model approach that involves the influence of prices on the market as an experimental variable. The supply-demand model developed using a dynamic system approach. The relationship between variables will be tested with a simple statistical approach. Some variables that cannot be controlled by the system are became an exogenous variable group. This study did not develop alternative policy solutions for problem owners but only provided an in-depth picture of the pattern of rice distribution in South Kalimantan as a basic study of the formulation of food security policies in South Kalimantan (Wibowo et al., 2016; Badan Ketahanan Pangan Kalimantan Selatan, 2012).

The stage of model development begins with the study of the role of existing stakeholders, followed by the development of causal loop diagrams (CLD), and this model will be transformed into a detailed system in the form of stock and flow diagrams (SFD). The model that has been developed will be validated and verified (Irawan, 2005). Furthermore, this model will be tested by entering the price variable as an experimental model (Arbnor and Bjerke, 1997; Sharma et al., 2004; Roberts, 1978).

Distribution pattern investigation used a surveys and deep interview method with 50 respondents consisting of large traders, retailers and farmers throughout South Kalimantan.

## 3. RESULTS

Causal loop diagram was developed. It shows relationship between each variable in the rice system. CLD is constructed by mental data processing which involved all stakeholders in rice management such as researchers, farmers, government, and private sectors. CLD of this research is presented in Fig.1.

Population, rice consumption, paddy cultivation area, and rice production modules as SFD are shown in Figure 2. The level of rice consumption in South Kalimantan is influenced by several factors, predominantly by the rate of rice consumption per capita, rate of rice consumption for industrial purposes, and the substitution of rice through national program

for the reduction of rice dependency. From the said factors, the absorption of rice for industrial purposes and the substitution of rice through national program are not easily measured, reliable data from related institutions and field surveys have not been obtained. Therefore, simulation is run solely on rice per capita consumption.

As the result of the simulation model, it can be seen that the population is the most dominant influence in the level of consumption, additionally to several other parameters such as industrial needs, which is yet to be included in this report. Based on the description above if the assumption of South Kalimantan's population growth is at an average of 1.9%, the annual consumption rate will experience an increase of around 7,500 tons of rice per year. The level of rice consumption increases by the growth of population.

Considering the growth of planted area between 2006 and 2016, the model predicts the planted area up to 2027 which grows around 1.6% per year. There are two factors that may influence the growth of planted area. The first is the desire of farmers to cultivate their land more widely. The second is the assistance program from the service which is a stimulus for farmers to plant more extensively. The amount of land that is not cultivated is merely due to economic constrains where farmers with limited capital have difficulty in planting as well as in land ownership.

The level of rice production is strongly influenced by the main parameter, which is the size of planted area. In this model the planted area will be affected by factors of crop failure (puso) caused by several conditions such as drought, floods and attacks of pests. The production is also influenced by the size of harvested area and the productivity of the land. The model developed has considered these factors to obtain total production in the form of harvested dry grain (GKP). To get the total rice production which will be used as a reference in policy making, in the model the amount of GKP must be converted first to milled dry grain (GKG) by including the drying shrinkage factor (GKP-GKG). The conversion of total rice production is influenced by the absorbance by the food and feed industry. This model development is using data from the last 10 years (2007-2016).

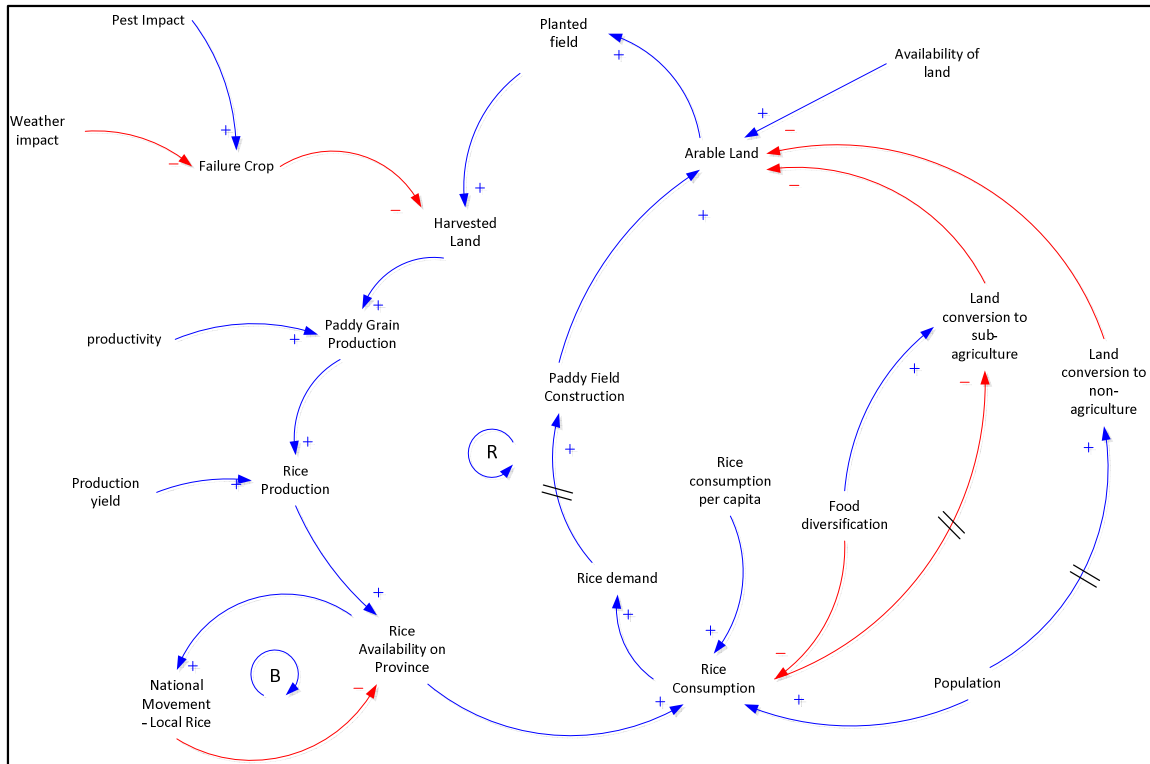


Figure 1. Causal Loop Diagram Rice System in Kalimantan Selatan

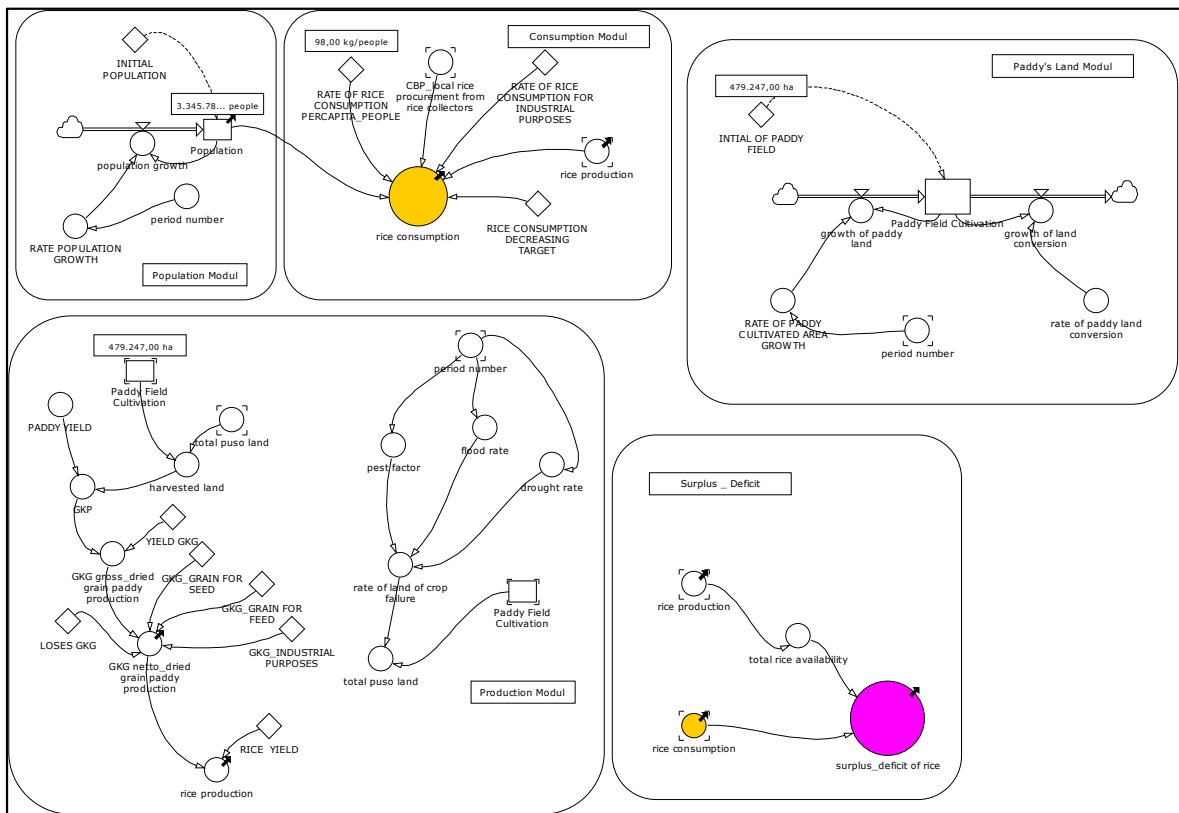


Figure 2. Stock and Flow Diagram on Rice System in Kalimantan Selatan

#### 4. DISCUSSION

The rice distribution at the village level is carried out by 2 actors, they are the farmers and the village-level collectors. The village-level collectors will supply the larger collectors who mostly own rice milling units. Furthermore, these large collectors will distribute the milled rice to other large agents or distributors in various large cities in districts/regencies in the province of South Kalimantan. Rice distributors provides the retailers and large customers (plantation company, mining company catering services and restaurants). In general, the rice supply chain in the South of Kalimantan can be described as follows (see Fig 3).

In details, collectors tier 2 which is the collectors in the village buy grain from the surrounding neighborhood. The grain is then stored in minimum warehouse facility in the collector's house, if not, stacks of 25 kg grain jute bags are arranged in the collectors living room. Upon collections of 3 tons of grain the collectors will immediately sell the produce to larger collectors (tier 1). Collectors tier 1 operates at a larger scale compared to collector tier 2. Collectors tier 1 then sell grains to large agents, distributors, or rice millers in the city within the district (regency) and to the surrounding regions within the province. Most large agents or distributors act as collector traders also own rice milling units, hence sells in the form of rice.

There are 13 regencies/cities in South Kalimantan, i.e. Banjarmasin city, Banjarbaru city, Banjar regency, Barito Kuala regency, Tapin regency, Hulu Sungai Selatan regency, Hulu Sungai Tengah regency, Hulu Sungai Utara regency, Tabalong regency, Balangan regency, Tanah Laut regency, Tanah Bumbu regency and Kotabaru regency. Barito Kuala regency and Banjar regency are the highest rice producing areas in South Kalimantan. On the other hand, the rice mill centers owned by large traders in Gambut sub-district of Banjar regency and in Banjarmasin city are the two largest operating traders in the province which are referenced by almost all large collectors and large traders. The biggest turnover of large traders or rice wholesalers in Banjarmasin city can reach 4 - 6 tons daily. Rice traded in both wholesalers are mostly originated from Barito Kuala regency, Banjar regency, and Tapin

regency. In smaller amounts, rice is also supplied from the Hulu Sungai regencies. This is also the case for large traders in Tapin regency (Rantau city), Hulu Sungai Selatan regency (Kandangan city), Hulu Sungai Tengah regency (Barabai city), Hulu Sungai Utara regency (Amuntai city), Tabalong regency (Tanjung city), Balangan regency (Paringin city), and Tanah Laut regency (Pelaihari city). Different rice origin is observed in Tanah Bumbu regency (Batulicin city) and Kotabaru regency where rice is traded from within the regency itself.

A unique rice distribution pattern was observed in Tapin regency and Hulu Sungai Tengah regency. Collectors tier 1 in both the areas sell rice grains to rice milling centers (large traders) in Gambut and Banjarmasin. At the same time, rice available in Tapin regency and Hulu Sungai Tengah regency markets are supplied from Gambut. Questions raised if the two regencies do not have rice milling facilities in their respective regencies. Further interview with the actors in the province's rice supply chain resulted in valuable information about the location of rice producing area, the location of large miller/collector/wholesaler area, rice varieties, and consumer preferences.

Rice varieties and customer preferences regulate the distribution pattern in the way that local rice varieties have their own loyal customers. Similarly, superior rice varieties have their own. Local rice varieties are difficult to cultivate in Tapin regency and Hulu Sungai Tengah regency. However, the loyal customers of local rice varieties are in significant numbers in both the regencies. Therefore, superior rice is harvested in both the regencies, then sold to large traders in Gambut and Banjarmasin. In return, Tapin and Hulu Sungai Tengah will purchase local rice varieties to supply their local rice devoted customers. This is also the case of company catering services which prefers certain varieties of rice which is available in Gambut and Banjarmasin. High capital wholesalers are more favorable among collectors because their purchasing power is significant to allow high volume rice trading. The cashflow allows the collectors to operate further in their business.

The distribution pattern above is limited to rice produced by local farmers in South Kalimantan. There are also superior rice varieties available in the market which is not

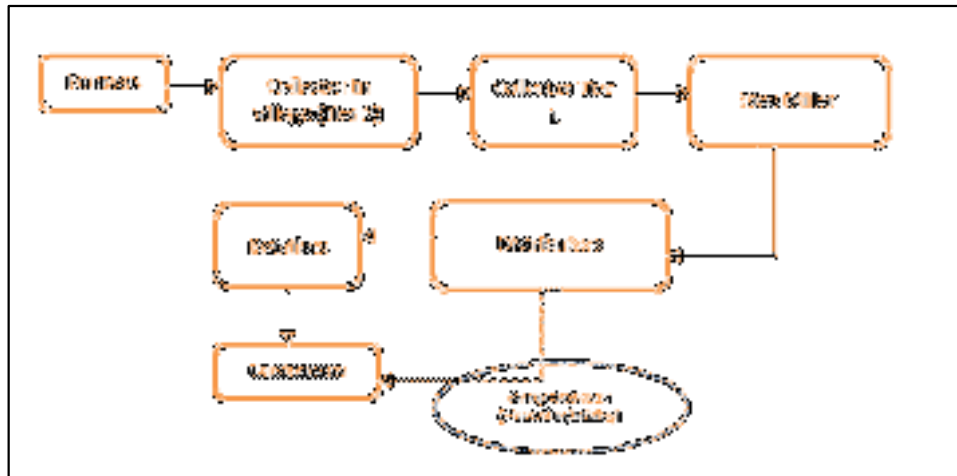


Figure 3. Rice distribution path in Kalimantan Selatan

cultivated in the province, rather being absorbed from Java and Sulawesi. Data on the exact number of the size of rice distribution is very difficult to obtain. Officials have been contacted and field survey have been done, but it is yet to collect reliable data. Tracking of grains and rice distributed in and out of the province was not well recorded. However, it is frequently mentioned in the market that a certain volume of South Kalimantan Rice is distributed to Central Kalimantan and East Kalimantan. Call for further research on interprovincial rice distribution is pressing.

There are at least 6 supply chain actors before the rice is received by the consumer, starting from the grains produced by the farmers bought by the village level traders then purchased by a large collection trader then enters the mill, then sold to distributors who then distribute the rice to retail traders around the residential area. Distribution pattern will affect the price of grain at the farm level and the price of rice in consumers.

## CONCLUSION

The distribution pattern of rice from South Kalimantan's wetlands is currently concentrated in 6 supply chain actors, which are the farmers, the village level collecting traders (the collector tier 2), larger collecting traders (the collector tier 1), rice millers, distributors, and retailers. Rice yields from Barito Kuala regency and Banjar regency are distributed to almost all areas in the South of Kalimantan region. The distribution pattern is

influenced by the location of rice producing area, the location of large miller/collector/wholesaler area, rice variety, and consumer preferences. Rice cultivated in South Kalimantan is known to be distributed to the neighboring provinces which are Central Kalimantan and East Kalimantan, however the exact size of the interprovincial trading is not well recorded by the officials hence is not available.

## REFERENCES

- Akbar, A.R.M; Wibowo, A.D.; Rahmi, A.; Prabawa, S. 2017. Penyediaan Beras di Lahan Basah: Sebuah Studi Kebijakan di Kalimantan Selatan. Prosiding Seminar Nasional PERTETA, (pp. 600-605). Banda Aceh: PERTETA.
- Arbnor and Bjerke. 1997. *Methodology for Creating Business Knowledge*. Sage Publication.
- Badan Ketahanan Pangan. 2012. Kalimantan Selatan (Board of Food Security of Kalimantan Selatan), Food Security Annual Report, BKP Kalimantan Selatan.
- Dinesh Sharma, B.S. Sahay, Amit Sachan. 2004. Modelling distributor performance index using system dynamics approach. *Asia Pacific Journal of Marketing and Logistics*, Vol. 16 Issue: 3, Page 37 – Page 67.
- Irawan. 2005. National Rice Availability Analysis: A Simulation Study of Systems Dynamics Approach. *Multifunction Agriculture Proceeding*.
- Kirnadi, A. J. and Firahmi, N. 2010. Produksi dan Kebutuhan Konsumsi Beras di Kalimantan Selatan (Rice Production and

- Consumption in Kalimantan Selatan).  
*Al'Ulum* Vol 44 No.2. pp. 1-8.
- Roberts, E.B. 1978. *Managerial Applications of System Dynamics*. Cambridge, MA: MIT Press.
- Wibowo, A D., Surjandari, I., Moeis, A O. 2016. Rice Availability Policy for Industrial Region: Study in Kalimantan Selatan, *Proceeding of the 3rd Asia future Conference Environment & Coexistence*. Kitakyushu, Japan, September 29 – October 2.