

PRODUCTION RISK OF RICE IN KEBONSARI, MADIUN REGENCY

Risiko Produksi Padi di Kebonsari, Kabupaten Madiun

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ABSTRACT

This study aims to determine the risks, factors affecting risk and investigate the attitude toward risk in Kebonsari, Madiun regency. This research used primary and secondary data. Primary data obtained purposively by 61 respondents. Coefficient of variation (CV) method was used to analyze the risk, while Just and Pope model was used to analyze the factors affecting production risk. Attitude toward risk was analyzed with Moscardi and de Javnry model. The result of production risk analysis shows that production of rice farming in Kebonsari Madiun regency has a low variation which is about 14,80%. It means that production risk faced by paddy farmers in this area is low. Phonska fertilizer and other fertilizer are risk-increasing variables whereas liquid pesticide is risk decreasing variable. The result of K (s) indicated that 91,60% or 56 paddy farmers are risk averter. About 4,92% of paddy farmers are risk lover and 3,28% are risk neutral. The farmers are behaving in rational manner which avoid the possible risk that might be higher than the revenues to be earned.

Keywords: attitude toward risk, paddy rice, risk

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INTISARI

Penelitian ini bertujuan untuk mengetahui risiko dan faktor-faktor yang mempengaruhi risiko serta mengetahui perilaku petani terhadap risiko produksi padi di Kecamatan Kebonsari Kabupaten Madiun. Data yang digunakan adalah data primer dan data sekunder. Data primer diperoleh secara sengaja dengan sampel sebanyak 61 responden. Metode yang digunakan untuk menganalisis risiko adalah dengan menghitung nilai koefisien variasi (KV), untuk faktor-faktor yang mempengaruhi risiko produksi digunakan model Just and Pope. Analisis perilaku petani terhadap risiko dengan menggunakan metode Moscardi dan de Javnry. Hasil analisis risiko produksi menunjukkan bahwa produksi usahatani padi di Kecamatan Kebonsari Kabupaten Madiun memiliki variasi yang rendah yaitu sebesar 14,80%. Artinya risiko produksi yang dihadapi petani padi di lokasi penelitian rendah.

Variabel pupuk phonska dan pupuk lain merupakan variabel yang meningkatkan risiko (risk-increasing) sedangkan variabel pestisida cair merupakan variabel yang menurunkan risiko (risk-decreasing). Hasil penghitungan nilai K(s) menunjukkan bahwa 91,60% petani padi cenderung bersikap enggan terhadap risiko produksi (risk averter). Sebesar 4,92% bersikap menyukai risiko dan 3,28% netral terhadap risiko. Petani bersikap rasional yaitu menghindari risiko yang mungkin lebih tinggi dari pendapatan yang akan diperoleh.

Kata Kunci: *Padi, Perilaku terhadap risiko, Risiko*

INTRODUCTION

Rice is considered as one of the most consumed staple food worldwide. Thus, it is not surprising that rice has always become the prioritized commodity to be developed in agricultural sector. The demand of rice is increasing significantly due to the growing number of population. In Indonesia, the annual consumption rate of rice is 124.89 kg per capita. On the other hand, the number of Indonesians has reached 255.46 million with 1.31% rate of population growth showing that this escalation could affect supply and demand of rice (Pusdatin Kementrian Pertanian, 2016). East Java is one of the rice granaries in Indonesia. About 33.75% of total rice producer in Java Island comes from this province. It indicates that East Java has a pivotal role in supplying it within national level.

To be more specific, Madiun is one of paddy producers in East Java. Its paddy harvesting area continued to rise, and experienced a sharp improvement in the last 2 years from 85,741 ha in 2015 to 95,432 ha in 2016. This escalation also occurred in the quantity of paddy production. The paddy production in

Madiun Regency in 2016 was increasing from 543,378.55 ton to 596,135.1 ton (Badan Pusat Statistik Kabupaten Madiun, 2017). However, in the last two years, rice productivity has declined, even in the time of sharp improvements were occurred on its production and harvesting area. The declining productivity can be a sign of inefficient farming. Thus, the yield is not optimal. Futhermore, there are possibilities that the existing risk in farming was not considered by farmers. Production risk can be caused by external and internal factors. In this study, it focuses on internal factors, by including input factors of rice farming. Moreover, the effect of inputs on the production risk can be identified.

Farmer's attitude towards risk plays a major role in rice farming. Nainggolan et al., (2017) states that it would determine farmer's decision in allocating the input that will influence the technical efficiency rate achieved by farmer. Thus, it will affect the level of rice productivity. Futhermore, Abdullah et al., (2015) states that it also generates an impact for each decision made by farmers in their farming business. While the decision in production activities

is characterized by the uncertainty or the unavailability of information or complete knowledge, farmers usually take a current-time decision which will determine their output or yield in the future. Farmers have to deal with the changes in several factors such as weather, government policies, and technology which will put them in difficulty to forecast the future of their agricultural situation. Referring to the importance of understanding farmer's attitude towards production risk, this research aims to discover the factors affecting production risk of rice and the farmers' attitude towards the risk in Kebonsari District of Madiun Regency. This research is focused on farmers' land with technical irrigation and artesian well. It is due to the limited discharge of irrigation water in the study area that irrigation line has not been able to fulfil the crop's needs.

Based on previous study, such as Suharyanto et al., (2015) used the coefficient of variation (CV) and Just and Pope models to analyze the risk of rice production. Meanwhile, Guttormsen & Roll (2013) used multiple linear regression analysis with heteroscedasticity multiplicative method (Just and Pope) and Yang et al., (2016) used stochastic frontier to analyze inefficiency and the marginal production risk to analyze risk. This study used three methods consisting of (1) Coefficients of Variation and (2) Just and Pope to analyze risk and (3) the Moscardy and

de Javnry method to determine farmer's attitude towards risk. The expected result is that all input factors can increase rice production. Labor and seeds are variables that are expected to reduce risk. Other variables such as land area, all fertilizers and pesticides can increase risk. Increasing fertilizer to a certain point will have a good impact on plants, further use of fertilizer will reduce the quality of crops. The use of pesticides has a negative impact on human health and the environment (Guttormsen & Roll, 2013). In addition, all the farmers are expected to averse the risk.

METHODS

Location and Data

Location selection in this research was performed purposively. Kebonsari District was selected because this district is the third largest producer of paddy in Madiun Regency and Kebonsari District is one of the four districts with the condition of paddy fields that already have technical irrigation line with largest harvesting area.

This research used primary data that was acquired through interview towards paddy farmers in Kebonsari District. The sample farmers were selected purposively which result in 61 respondents as the paddy farmers in Rejosari and Tambak Mas Villages of Kebonsari District. The collected data was the data of one plantation season of 2017. The secondary data was acquired from various related institutions.

Method of Analysis

This research was analyzing the production risk, the factors that determine the production risk and the farmer attitude towards the production risk of paddy in Kebonsari District of Madiun Regency.

Risk Analysis

The number of risk value of rice production in this research was measured through CV value. Coefficient of variation is the size of relative risk by dividing the deviation standard with the expected average value. The value of coefficient of variation (CV) can be written systematically as follows:

$$CV = \frac{\sigma}{\bar{y}}$$

$$\sigma = \sqrt{\frac{\sum(X - \bar{X})^2}{n}}$$

Notes :

- CV : coefficient of variations
 σ : standar deviation of yield
 X : yield of rice (kg/ha)
 \bar{X} : average of yield (kg/ha)
 n : total of sample

The amount of influence of production factor utilization towards risk can be analyzed by using the multiple linear regression model of heteroscedasticity method by Just and Pope (Just & Pope, 1979). The estimation model used to analyze the determining factors of production risk of rice is:

$$\text{Ln } y = \text{Ln } \alpha_0 + \alpha_1 \text{ Ln } X_1 + \alpha_2 \text{ Ln } X_2 + \alpha_3 \text{ Ln } X_3 + \alpha_4 \text{ Ln } X_4 + \alpha_5 \text{ Ln } X_5 + \alpha_6 \text{ Ln } X_6 + \alpha_7 \text{ Ln } X_7 + \alpha_8 \text{ Ln } X_8 + \alpha_9 \text{ Ln } X_9 + \alpha_{10} \text{ Ln } X_{10} + \varepsilon_1$$

$$(\varepsilon_1^2) = \text{Ln } \beta_0 + \beta_1 \text{ Ln } X_1 + \beta_2 \text{ Ln } X_2 + \beta_3 \text{ Ln } X_3 + \beta_4 \text{ Ln } X_4 + \beta_5 \text{ Ln } X_5 + \beta_6 \text{ Ln } X_6 + \beta_7 \text{ Ln } X_7 + \beta_8 \text{ Ln } X_8 + \beta_9 \text{ Ln } X_9 + \beta_{10} \text{ Ln } X_{10} + \varepsilon_2$$

Notes :

- y : yield (kg)
 ε_1^2 : production risk
 X_1 : land area (ha)
 X_2 : seed (kg)
 X_3 : urea fertilizer (kg)
 X_4 : ZA fertilizer (kg)
 X_5 : phonska fertilizer(kg)
 X_6 : organic fertilizer (kg)
 X_7 : another fertilizer (kg)
 X_8 : liquid pesticide (litre)
 X_9 : solid fertilizer (kg)
 X_{10} : labors (HOK)
 α_0, β_0 : intercept
 α_i, β_i : parameter coefficients, $i = 1, 2, 3, \dots, 10$
 $\varepsilon_1, \varepsilon_2$: error term

The estimated regression coefficient value
 $-\beta_1 - \beta_9 < 0$

Hypotheses Tests:

$H_0 : \beta_i = 0$, input-i has generated no influence towards the production risk

$H_1 : \beta_i \neq 0$, input-i has generated an influence towards the production risk

Attitude towards Risk

Moscardi and de Javnry method was used to determine the farmers' attitude towards risk. There are three stages of analysis performed to obtain K(s) value. First, estimating the production function, in this research the production function of paddy was estimated. Second, selecting the most determining variable towards the regressed paddy production variable. Third, conducting a calculation of K(s) in accordance with the most determining variables that have been selected in prior. K(s) was calculated through the equation as follows:

$$\sigma_Y = \sqrt{\frac{\sum(X_i - \bar{X})^2}{n}}$$

$$\theta = \sigma_Y / \bar{X}$$

$$K(s) = \frac{1}{\theta} \left[1 - \frac{P_i X_i}{P_y f_i \bar{X}} \right]$$

Notes :

σ_Y : standar deviation of yield

θ : coefficient variation

X_i : input i

\bar{X} : average of yield

P_i : price of input i

P_y : price of rice

f_i : elasticy of input i

K(s) : parameter of avoiding the risk

The formulation of K(s) in the method of Moscardi and de Javnry (Moscardi & Javnry, 1977) was based on the farmer attitude which tends to avoid risk which is categorized into three types, including:

1. Risk lover atau low-risk aversion ($0 < K(s) < 0,4$)
2. Risk neutral atau intermediate-risk aversion ($0,4 \leq K(s) < 1,2$)
3. Risk averter atau high-risk aversion ($1,2 \leq K(s) < 2,0$)

RESULTS AND DISCUSSION

Risk Analysis

Production risk was measured by dividing the deviation standard value of production with the average value of yield in the research location. According to Table 1, it indicates that the value of coefficient of variation is 14.80%. It means that the value variation of average productivity is low.

Table 1. Productivity Risk of Rice

Variable	Production Risk
Mean of productivity	5,608.6
Standart deviation	829.83
Coefficient of variation	0.1480
CV (%)	14.80%

Source: Primary Data Analysis, 2018

The production risk might be resulted from internal or external factor. The risk can be caused by an excessive or a minimum allocation of production input and climate factor such as an unpredictable weather. The climate change becomes the trigger of a pest attack or a disease that is able to bring yield loss. However, the impact of pest and disease attack in the research area was not significant, but the climate change was. Some pest attacks occured in the research area were sundep, caterpillars, and the most

severe attack was done by brown planthopper. Most of the farmers' fields in the research area were attacked by brown planthopper pests, but its intensity is low that farmers still can eradicate them. Consequently, they do not cause a severe damage on the farm field. Se et al., (2014) said that Brown planthopper explosion is triggered by global climate change that affect the pest attitude to rice crops. Planting outside unison is the second thing that can cause the explosion of brown planthopper. Another cause of that explosion is inappropriate use of insecticides.

The factors affecting the production and its risk were analyzed by using the method of Just and Pope through the regression process of quadrant residual

value from the pre-determined regression formulation. Table 2 shows the results of factors affecting rice production and its risk in Kebonsari District of Madiun Regency.

The t test results show that the constant variable is significant at α level of 1%. The value of coefficient of cost variable amounted to 8.566 with anti-Ln value of 5.250.087. It shows the actual minimum value of production achieved by the farmers. Land area variable has real and positive effect on rice production at α level of 1%. It means that the addition of land area will increase rice production. Land area has a regression coefficient value of 1.026 which means that the addition of 1 percent land area will increase 1.026

Table 2. Factors Affecting Production and Risk of Rice

Variable	Production Function		Risk Function	
	Koef.	t-ratio	Koef.	t-ratio
Constant	8566***	34.307	-0.002	-0.042
Land area (X1)	1.026***	14.986	-0.003	-0.282
Seed (X2)	-0.015	-0.218	0.008	0.737
Urea (X3)	0.006	0.981	0.001	0.722
ZA (X4)	-0.002	-0.444	0.000	-0.267
Phonska (X5)	-0.002	-0.386	0.002**	2.169
Organic (X6)	-0.002	-0.604	0.000	0.067
Another Fertilizer (X7)	-0.009**	-2.188	0.001*	1.426
Liquid Pesticide (X8)	-0.008	-1.095	-0.003***	-2.954
Solid Pesticide (X9)	-0.005	-0.840	0.001	0.835
Labor (X10)	0.020	0.718	-0.003	-0.587
R-Square		0.959		0.262
Adj R-Square		0.950		0.115
F-Statistik		115.884***		1.778*

Source: Primary Data Analysis, 2018

Notes

* : significant at α 10% (1.297)

** : significant at α 5% (1.674)

*** : significant at α 1% (2.398)

F-table : significant at α 10% (1.759)

percent of rice production. The mean of cultivated land in Kebonsari is 0.28 ha with production mean of 1,576.04 kg of dry milled rice. Farmers with wider land have a greater opportunity to increase the number of paddies. Under an effective farm management, rice production can be improved. Kea et al., (2016) stated the provinces cultivating higher number of additional rice field have the ability to maintain reasonable levels of other necessary inputs in order to increase the rate of production faster than those with low rates of rice cultivated land. While Prihtanti (2014) found that the wider the area of rice farming, the smaller the risk faced. It can be seen from the coefficient of production variation. It happens since farmers with large fields are more advanced in managing their farms, both in organic and conventional rice farming system.

Another fertilizer variables consist of SP36, TS, NPK or KCL fertilizer used by small sample farmers. Not all the farmers used all the fertilizers classified in another fertilizer. NPK fertilizer is used by 6 farmers, SP36 and KCL fertilizer used by 5 farmers, while TS fertilizer is used by 10 farmers. Thus the four fertilizers were combined into one variable called another fertilizer. Another fertilizer variables individually have significant and negative effect on rice production and significant at α 5% level. The addition of another fertilizers such as NPK, KCL, SP36 and TS can actually decrease rice

production. The use of chemical fertilizers will have a good impact on rice production if applied in the appropriate dosage and in accordance with the recommendation (according to the condition of the land) and adapted to the needs of the plant itself. Excessive use of chemical fertilizers can actually reduce rice production, and can reduce the quality and soil fertility. Another fertilizer has coefficient value of -0.009 means that with 1 percent addition another fertilizers such as NPK, SP36, TS or KCL will reduce rice production by 0.009 percent.

Risk function was analyzed with Just and Pope model and shows that the variables of phonska fertilizer, another fertilizers and liquid pesticide are individually having actual influence towards the risk of yield. Phonska fertilizer is significant at α -5% level with coefficient value of 0.002, meaning that the variable of phonska fertilizer is individually having actual and positive effect towards the production risk. The addition of phonska fertilizer utilization will increase the production risk. The excessive use of chemical fertilizers in a long period of time combined with the imbalance portion of organic fertilizer utilization will generate impacts on the quality and fertility of soil (Suharyanto et al., 2015). Phonska fertilizer is not significant in the analysis of factors that determine the production. In other word, that the phonska fertilizer does not have an actual influence towards paddy production. However, phonska fertilizer

has a risk-increasing tendency. Thus, the addition of phonska fertilizer will increase the risk but will not increase or decrease the rice production.

The variable of another fertilizers has t statistic value of 1.426 which is higher than t table (1.297) at α -10% level. It means that another fertilizer has actual and positive influences towards production risk. The coefficient value of another fertilizer variable is 0.001. It indicates if the farmers add 1 percent utilization of another fertilizer, it will increase 0.001 percent production risk. The addition of another fertilizers such as NPK, SP36, TS, and KCL will decrease the production and increase the risk of production.

Liquid pesticide is the risk-decreasing variable which significant on the T statistic in α -1% level. The coefficient regression value of liquid pesticide is -0.003 which means that an addition of 1 percent of liquid pesticide in Kebonsari District will decrease 0.003 percent of production risk. Liquid pesticide does not affect the production significantly, but found negatively significant towards the production risk. It means that an addition of liquid pesticide will not increase or decrease the production. However, the increase of liquid pesticide utilization can decrease the production risk.

Based on result of production function and risk analysis, variables of land area have positive effect while another fertilizer have

negative effect on rice production. Risk function indicates that phonska fertilizer and another fertilizer variables can increase risk while liquid pesticide can reduce risk. It can be concluded that farmers can increase the land area but also reducing the use of another fertilizers and phonska fertilizers, and by controlling the use of liquid pesticides. The farmers in the research location have applied liquid pesticides properly.

Attitude Towards Risk

The analysis of farmer attitude towards risk is measuring the level of farmer's aversion in facing risk which can be categorized into risk lover, risk neutral, and risk averter. The attitude towards risk is measured by referring to the most determining variables towards production through the regression process of production function.

According to the analysis result (Table 3), it can be concluded that a land area is the variable which will be set as a parameter in determining the value of $K(s)$. The standardized value of land area variable is the highest value, indicating that this variable is the biggest influence towards dependent variable (Y).

Land is the constant and primary input required in every production process. The land used in this research is the paddy field that used the technical irrigation line and drilled well. Most of the respondent farmers are the farmers who work their own lands, only 4

Table 3. Standardized value of Factors Affecting Production Risk

Variabel	Parameter	Standardized Coefficient
Constant	α_0	-
Land area (X1)	α_1	0.990
Seed (X2)	α_2	-0.014
Urea (X3)	α_3	0.033
ZA (X4)	α_4	-0.014
Phonska (X5)	α_5	-0.013
Organic (X6)	α_6	-0.020
Another Fertilizer (X7)	α_7	-0.070
Liquid Pesticide (X8)	α_8	-0.034
Solid Pesticide (X9)	α_9	-0.025
Labor (X10)	α_{10}	0.030

Source: Primary Data Analysis, 2018

Table 4. Parameter of K(s)

Variable	Θ	Pxi	Xi	Py	Fi	\bar{X}
Land area	0.8103	Price of land rent	Sum of land area each farmers	Price of rice each farmers	1.026	1,576.045

Source: Primary Data Analysis, 2018

Table 5. Parameter of risk aversion

Risk aversion parameters	Dry season	
	Sample	Percentage
1. Risk lover ($0 < K(s) < 0,4$)	3	4.92
2. Risk neutral ($0,4 \leq K(s) < 1,2$)	2	3.28
3. Risk averter ($1,2 \leq K(s) < 2,0$)	56	91.60
Sum	61	100

Source: Primary Data Analysis, 2018

respondents who are the tenant farmers. Thus, the rent price that is included in the parameter of K(s) value calculation is about 2,000,000 per 1,400 m² or about Rp. 14,285,714.29 per ha. Some parameters that will be used in the calculation of K(s) value are shown in Table 5.

The farmer's attitude in facing risk is an essential part influencing the allocation of input on farm indirectly. Therefore, it will also influence the production. About

3 respondents are included as the risk lover farmers, and 2 respondents (3.28%) are the risk neutral respondents. About 56 respondents (91.60%) are included as the risk averter respondents.

The farmers who love risk are those who target bigger benefits although the risk which they receive is also higher (Lucas & Pabuayon, 2011). The farmers who love risk are the tenant farmers. About 2 respondents are the tenant farmers with

0.42 ha of the rented land and 1 respondent with 0.63 ha of the rented land. Those farmers are taking the risk by renting 3 and 4.5 squares of land. The land area of each square in Kebonsari District is about 1.400 m². The farmers who rent more than 1 square of land area are braver to take a risk. They plant paddy in the rented area in a massive amount with the expectation to obtain bigger profits.

The farmers who are neutral towards risk are two tenant farmers with the rented land which only one square each. It is about 1400 m². Imelda et al., (2008) found that the farmers who tend to be neutral towards risk are those who farm based on a hereditary scheme. Reviewed from the production perspective, the cultivation that has been conducted since the past made the farmers more well-experienced in facing the production risk. Kurniati (2015) states that risk-neutral farmers tend to be rational farmers when facing the risks, a business has an opportunity to increase profits as well as opportunities for risk.

Most of farmers in the research area (91.6 percent) are tent to be risk averter. The farmers in Kebonsari who averse the risk are those who do farming in their own land. Their land area is ranged between 0.7 and 0.28 ha. Whereas, based on land ownership status, it is seen that the non-ownership rice farming land has a higher risk compared to self-ownership land. Sriyadi (2010) stated the life of farmers in

a village is quite close to the subsistence boundaries and dealing with unpredictable weather. Farmers will act rationally by preventing a failure, rather than attempt to obtain big profits by taking a risk. Lucas and Pabuayon explained that farmers are tend to avoid risk. This argument is in accordance with the safety-first rule in which the farmers will usually attempt to fulfill their household needs first. Most of the farmers are showing the attitude of risk aversion or more concern about their safeties rather than gambling on uncertain situations (Lucas & Pabuayon, 2011).

CONCLUSION AND SUGGESTION

The rice productivity in Kebonsari District of Madiun Regency has a low variation level which is about 14.80%. There are two variables influencing rice yield, land area and another fertilizer. The variable of land area has a positive influence on yield while another fertilizer variable has negative effect on rice yield. Three variables affecting the risk of yield are phonska fertilizer, another fertilizer and liquid pesticide. The phonska fertilizer and another fertilizer are the risk-increasing variables while the liquid pesticide is the risk-decreasing variable. Moscardi and de Janvry method was used to analyze the farmer's attitude toward risk. The calculation results of K(s) value shows 56 farmers tend to avoid risk.

A high risk of production is a threat for paddy farmers. Therefore, the farmers

have to be careful in their farming, especially on input allocation which has to be as efficient as possible. Farmers should follow the recommendation for fertilizer which needs to be efficient on farm and reduce the production risk. The role of the government in providing supports is necessary. Increasing yield can be reached through expansion of planting area with expansion of crop index (IP) in accordance with IP 400 government program: planting rice 4 times in one year in one farm. Supported by good and adequate technical irrigation line in research area and abundant water source, farmers are expected to implement the program in order to increase crop's production.

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