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# FARMER RISK ANALYSIS ON SUPERIOR RICE FARMING IN TIDAL SWAMP LAND OF BARITO KUALA DISTRICT, SOUTH KALIMANTAN, INDONESIA

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## ABSTRACT
This study aims to analyze what factors affect the risk of superior rice production in tidal swamp land, Barito Kuala District. This research will be conducted in Barito Kuala District, South Kalimantan Province. This research will start from March-June 2022. The analytical tool used is the Just Pope function model. The results of the analysis show that the determinant of the risk of superior rice production in tidal swamp land is labor input. Labor input is risk decreasing, meaning that the use of labor input is able to reduce the risk or variation in the results achieved. If farmers add more labor, it means that the handling of farming will be more intensive starting from the process of seeding, fertilizing, controlling pests and diseases until the harvest period.

## KEY WORDS
Production risk, tidal swamp, harvest period, Indonesia.

South Kalimantan Province is one of the areas that develop rice farming with a production yield of 1,134,450.21 tons (2.06%) of the total rice production in Indonesia in 2020 from a harvested area of 292,026.78 ha. Rice productivity has increased by 3.05% in 2020, but rice production has decreased by 15.52% (208,411.61 tons). This is because one of them is the rice harvested area which has decreased by 18.03% (64,219.17 ha) (BPS Province of South Kalimantan, 2021).

Bartio Kuala Regency is one of the centers of rice production in South Kalimantan Province. Rice production in 2020 is 20.85% (236,565.61 tons) of the total production in South Kalimantan Province with a harvested area of 66,483.70 ha. However, over a period of three years (2018-2020) rice production has decreased by an average of 27.20% (18,627 tons). This is because the harvested area has decreased by an average of 25.41% (66,383 ha) with a decrease in productivity of 0.58% (0.01 kw/ha) (BPS Kabupaten Barito Kuala, 2021).

One of the efforts that must be made in order to increase the production and productivity of rice commodities in Barito Kuala Regency is to use high-quality seeds of superior varieties, one of the advantages of which is that they are short-lived, so that they can be harvested up to 2 or even 3 times a year. These efforts are closely related to the use of agricultural equipment and machinery technology (ALSINTAN), both pre-planting, planting and harvesting ALSINTAN.

The majority of rice farmers in Barito Kuala Regency are local rice farmers. However, there are some farmers who cultivate superior rice in the Districts of Belawang and Mandastana. Farmers in the area usually cultivate superior rice twice a year.

In cultivating superior rice plants, it is inseparable from the production risk in farming. This production risk can be seen from the existence of crop failures and the unstable number of superior rice yields. Productivity fluctuations are an indication of production risk. These fluctuations in productivity can be caused by pest and disease attacks, erratic weather conditions and the treatment of farmers in the use of production factors.

The production factors or inputs that are usually used in the cultivation of superior rice in the Districts of Belawang and Mandastana include land area, seeds, fertilizers, medicines and the number of workers. Among these production factors, it is suspected that there are production factors that can pose a production risk but there are also production factors that can reduce production risk.

The purpose of this research: analyze the factors that influence the risk of superior rice production in tidal swamp land, Barito Kuala District.

## METHODS OF RESEARCH

This research will be conducted in Barito Kuala District, South Kalimantan Province. This research will start from March-June 2022.

In this study, the data used were primary data obtained by direct interviews with superior rice farmers as research respondents. In addition, secondary data is needed to support primary data obtained from literature studies, related institutions or agencies.

Analyzing the factors that influence the risk of superior rice production faced by farmers in tidal swamp land in Barito Kuala Regency using the Just Pope function model analysis. Production risk analysis of the Just Pope function model which can be explained that production is influenced by production factors and risk factors:

$$y = f(x,\beta) + u = f(x,\beta) + g(x,\alpha)\varepsilon$$

Where: Y - the results achieved; $f(x)$ - production function; $g(x)$ - risk function; x - input used; β - estimated production function parameter; α - parameter of estimated risk function; ε - *error term* with $E(\varepsilon) = 0$ and var $(\varepsilon) = \sigma_\varepsilon^2$.

The production function and the risk function are assumed to be in the form of a Cobb-Douglas production function:

$$f(x) = \beta_0 . \sum_{j=1}^{5} xj^{\beta j} . e^{\varepsilon i}$$

$$g(x) = \alpha_0 . \sum_{j=1}^{5} xj^{\alpha j} . e^{\varepsilon i}$$

$$y = f(x_1, x_2, x_3, x_4, x_5) + g(x_1, x_2, x_3, x_4, x_5)$$

Where: y - superior rice production; $f(x_i)$ - production function; $g(x_i)$ - risk function; $x_1$ - land area (ha); $x_2$ - number of seeds (kg); $x_3$ - amount of fertilizer (kg); $x_4$ - number of drugs (liters); $x_5$ - labor (HKO); $\varepsilon_i$ - *error term of production risk function*.

The estimation of the production risk function faced by farmers is carried out through the following stages:

1. Regressing the value of y to x so that the residual value is obtained;
2. Performing the MNLS (Multi Stage Non-Linear Least Square) step to avoid the occurrence of a heteroscedastic relationship between the error term value and the input variable in order to obtain a BLUE (Best Linear Unbiased Estimation) risk function estimate (Fufa, 2002) by:
   - Regressing absolute value of residual, |ε| resulting from step (1) to ln f(x) so that the parameter is obtained which is used as a weight for the mean f(x) function;
   - The production value of y and the value of f(x) are weighted by ln f(x,γ), so that the values of $y^* = \frac{\ln y}{\ln f(x,\gamma)}$ and $f(x)^* = \frac{\ln f(x)}{\ln f(x,\gamma)}$;
   - Regressing the value of y* against f(x)* and obtained the residual value ε* which is used to estimate the production risk function.
3. Estimating the risk function parameters by regressing the value of ε* with respect to x.

## RESULTS AND DISCUSSION

Analyzing the factors that influence the risk of superior rice production faced by farmers in tidal swamp land in Barito Kuala Regency using the Just Pope function model analysis. Analysis of production risk faced by farmers uses the Just Pope function model which can be explained that the resulting production is not only influenced by production factors, but is also influenced by risk factors. The results of the estimation of the production function and the risk function in organic and non-organic rice farming. The production risk faced by farmers is caused by the use of farming inputs, it can be seen the characteristics of the inputs used in farming, including inputs that are risk increasing or risk reducing/risk decreasing.

The factors that influence the production of superior rice and the risk of superior rice production are land area ($X_1$), number of seeds ($X_2$), amount of fertilizer ($X_3$), amount of medicines ($X_4$) and number of workers ($X_5$). Of the five factors, it will be seen which one has a significant effect on superior rice production and the risk of superior rice production and how big the effect is.

The cost of tomato farming for planting season I is the cost of tomato farming organized by farmers in 2020. The average tomato planting area that farmers organize is 0.21 ha with an average number of tomato planting 5,713 trees with a spacing between rows of 60-80 cm and spacing in rows 40-50 cm. The cost of planting tomatoes for planting season II uses the same land, but the number of tomatoes planted is only 4,509 trees.

Table 1 – The results of the estimation of the production function and the risk function of superior rice production

| *Model* | *Unstandardized Coefficients* | | *t* | *Sig.* | *Collinearity Statistics* | |
|---|---|---|---|---|---|---|
| | *B* | *Std. Error* | | | *Tolerance* | *VIF* |
| Production function | | | | | | |
| Constant | -560,445 | 243,854 | -2,298 | 0,24 | | |
| Land area ($X_1$) | 1.843,491 | 236,537 | 7,794 | 0,000 | 0,195 | 5,121 |
| Seed ($X_2$) | 120,025 | 6,134 | 1,960 | 0,053 | 0,269 | 3,714 |
| Fertilizer ($X_3$) | 0,516 | 0,202 | 2,551 | 0,012 | 0,232 | 4,317 |
| Druqs ($X_4$) | -21,534 | 19,702 | -1,093 | 0,277 | 0,958 | 1,044 |
| Labor ($X_5$) | 4,208 | 2,322 | 1,813 | 0,073 | 0,688 | 1,453 |
| *$R^2$-Adjusted* = 0,879; F-statistics = 137,008; *p* = 0,000; DW = 1,974 | | | | | | |
| Production risk function | | | | | | |
| Constant | 0,204 | 0,012 | 16,597 | 0,000 | | |
| Land area ($X_1$) | -0,10 | 0,012 | -0,859 | 0,393 | 0,195 | 5,121 |
| Seed ($X_2$) | 0,000 | 0,000 | 0,881 | 0,380 | 0,269 | 3,714 |
| Fertilizer ($X_3$) | 1,040 | 0,000 | 1,021 | 0,310 | 0,232 | 4,317 |
| Druqs ($X_4$) | -6,389 | 0,001 | -0,064 | 0,949 | 0,958 | 1,044 |
| Labor ($X_5$) | 0,001 | 0,000 | 4,948 | 0,000 | 0,688 | 1,453 |
| *$R^2$-Adjusted* = 0,311; F-statistics = 8,496; *p* = 0,000; DW = 2,018 | | | | | | |

*Source: Primary data processing, 2022.*

Based on the results of the regression analysis in Table 1, it can be seen that the coefficient of determination ($R^2$-adjusted) of the superior rice production function is 0.879 and the superior rice production risk function is 0.311. This shows that the high and low production of superior rice 87.9% is determined by the size of the production factors (land area, number of seeds, fertilizers, medicines and labor) in this function, while the remaining 12.1% is determined by other variables. which is not included in the function model. In addition, the high and low risk of superior rice production at 31.1% is determined by the size of the production factors (land area, number of seeds, fertilizers, medicines and labor) in this function, while the remaining 68.9% is determined by other variables. not included in the function model.

For the F-test on the production function, it is known that the F-statistics value (137,008) with a probability value of 0.000 <0.05 ($\alpha$ = 5%), means that the hypothesis $H_0$ is rejected and $H_1$ is accepted. This shows that land area ($X_1$), number of seeds ($X_2$), amount of fertilizer ($X_3$), amount of medicines ($X_4$) and number of workers ($X_5$) together have a significant effect on superior rice production (Y). For the F test on the production risk function, it is known that the F-statistics value (8.496) with a probability value of 0.000 <0.05 ($\alpha$ = 5%), means that the hypothesis $H_0$ is rejected and $H_1$ is accepted. This shows that the area of land ($X_1$), the number of seeds ($X_2$), the amount of fertilizer ($X_3$), the amount of medicine ($X_4$) and the number of workers ($X_5$) together have a significant effect on the risk of superior rice production (Y).

*Land Area ($X_1$).* The variable area of land has a significant effect on superior rice production, this can be seen from the results of the t-test, namely t-test (7.794) with a probability value of 0.000 < 0.01 (α=1%) (Table 1). So that the hypothesis $H_1$ is accepted and $H_0$ is rejected, this means that the land area has a significant effect on superior rice production at the level of = 1%. In other words, the increase in land area by 1% can increase the production of superior rice by 1,834.491%. This shows that the addition of land area will result in farmers being able to increase their production.

In the risk function, the variable area of land has no significant effect on the production risk faced by farmers. This can be seen from the results of the t test, namely t-test (-0.859) with a probability value of 0.393 > 0.05 (α = 5%) (Table 1). So that the hypothesis $H_0$ is accepted and $H_1$ is rejected, this means that the land area has no significant effect on the risk of superior rice production at the level of = 5%. The average area of land used by farmers for superior rice farming is 1.28 hectares.

*Number of Seeds ($X_2$).* The variable number of seeds has a significant effect on superior rice production, this can be seen from the results of the t-test, namely t-test (1.960) with a probability value of 0.053 < 0.1 (α = 10%) (Table 1). So that the hypothesis $H_1$ is accepted and $H_0$ is rejected, this means that the number of seeds has a significant effect on superior rice production at the level of = 10%. In other words, an increase in the number of seeds by 10% can increase the production of superior rice by 120.025%. This shows that increasing the number of seeds will result in farmers being able to increase their production yields on conditions in accordance with the recommendations recommended by local extension workers. In addition, according to the quality or quality of the seeds used by farmers.

In the risk function, the variable number of seeds has no significant effect on the production risk faced by farmers. This can be seen from the results of the t test, namely t-test (0.881) with a probability value of 0.380 > 0.05 (α = 5%) (Table 1). So that the hypothesis $H_0$ is accepted and $H_1$ is rejected, this means that the number of seeds has no significant effect on the risk of superior rice production at the level of = 5%.

Seed input is risk increasing, which means that if the input is added or increased its use will increase the risk of production or vice versa if it is reduced, it will minimize variations in production. It is possible that this is the reason why seeds are one of the inputs that increase production risk. Quality seeds will produce high productivity. On the other hand, if the quality of the seed is not well known, it will result in lower production.

*Amount of Fertilizer ($X_3$).* The variable amount of fertilizer has a significant effect on superior rice production, this can be seen from the results of the t-test, namely t-test (2.551) with a probability value of 0.012 < 0.05 (α = 5%) (Table 1). So that the hypothesis $H_1$ is accepted and $H_0$ is rejected, this means that the amount of fertilizer has a significant effect on superior rice production at the level of = 5%. In other words, increasing the amount of fertilizer by 5% can increase the production of superior rice by 0.516%. This shows that increasing the amount of fertilizer will result in farmers being able to increase their production.

In the risk function, the variable amount of fertilizer has no significant effect on the production risk faced by farmers. This can be seen from the results of the t-test, namely t-test (1.021) with a probability value of 0.310 > 0.05 (α = 5%) (Table 1). So that the hypothesis $H_0$ is accepted and $H_1$ is rejected, this means that the amount of fertilizer has no significant effect on the risk of superior rice production at the level of = 5%.

The use of fertilizers is risk increasing, meaning that fertilizers play a role in increasing the production risk experienced by farmers. Fertilizer is one source of risk from superior rice farming.

Number of Drugs ($X_4$). The variable amount of drugs did not significantly affect the production of superior rice, this can be seen from the results of the t-test, namely t-test (|1.093|) with a probability value of 0.277 > 0.1 (α=10%) (Table 1). So that the hypothesis $H_0$

is accepted and $H_1$ is rejected, this means that the amount of drugs does not significantly affect the production of superior rice at the level of = 10%.

The regression coefficient on the variable number of drugs is negative, it does not mean that the use of pesticides has been excessive, but it is because the pattern of pest eradication carried out by farmers is curative, i.e. farmers take pest control actions after an attack occurs. This condition is in contrast to the pattern of pest and disease control carried out by superior rice farmers in Barito Kuala Regency which is preventive in nature or prevents pests and diseases from occurring.

In the risk function, the variable amount of drugs has no significant effect on the production risk faced by farmers. This can be seen from the results of the t test, namely t-test (-0.064) with a probability value of 0.949 > 0.05 (α=5%) (Table 1). So that the hypothesis $H_0$ is accepted and $H_1$ is rejected, this means that the amount of medicine does not significantly affect the risk of superior rice production at the level of = 5%.

The input of drugs is risk decreasing or is reducing risk. The use of drugs can reduce the risk of production caused by pests and diseases. If the use of drugs is added, it will have an impact on reducing the risk of production.

*Number of Workers ($X_5$).* The variable number of workers has a significant effect on superior rice production, this can be seen from the results of the t-test, namely t-test (1.813) with a probability value of 0.073 > 0.1 (α = 10%) (Table 1). So that the hypothesis $H_1$ is accepted and $H_0$ is rejected, this means that the number of workers has a significant effect on superior rice production at the level of = 10%.

In the risk function, the variable number of workers has a significant effect on the production risk faced by farmers. This can be seen from the results of the t-test, namely t-test (4.948) with a probability value of 0.000 > 0.01 (α = 1%) (Table 1). So that the hypothesis $H_1$ is accepted and $H_0$ is rejected, this means that the number of workers has a significant effect on the risk of superior rice production at the level of = 1%.

Labor input is risk decreasing or risk reducing, meaning that the use of labor input is able to reduce the risk or variation in the results achieved. If farmers add more labor, it means that the handling of farming will be more intensive starting from the process of seeding, fertilizing, controlling pests and diseases until the harvest period. The variation in production achieved can be reduced if seeding is done well, replanting rice seeds that do not grow, doing light soil tillage when the seedlings are 20 days old to facilitate the exchange of oxygen in the soil, weeding weeds and nuisance plants. Pest and disease control carried out by superior rice farmers is generally preventive and integrated. So the outpouring of labor is one of the risk reducing factors.

## CONCLUSION

Based on the results and discussion of research regarding risk analysis of farmers in superior rice farming in tidal swamp land, Barito Kuala Regency, South Kalimantan Province, it is concluded that the determinant of risk of superior rice production in tidal swamp land is labor input. Labor input is risk decreasing, meaning that the use of labor input is able to reduce the risk or variation in the results achieved. If farmers add more labor, it means that the handling of farming will be more intensive starting from the process of seeding, fertilizing, controlling pests and diseases until the harvest period.

Recommendations:

- Need to improve the quality of seeds used by superior rice farmers. If the seeds used are not good, it will result in low production despite intensive care and eradication of pests and diseases. Quality seeds will produce healthy rice plants, uniform growth and strong clumps;
- It is necessary for farmers to start reducing the use of chemicals such as chemical fertilizers and instead use organic fertilizers. However, the change from conventional farming to organic farming requires a long process because adjustments are needed in various technical matters;
- The need for pest and disease control carried out by superior rice farmers in a

preventive and integrated manner. Farmers spray pesticides, although there has not been an attack. Farmers carry out physical and organic pest control. Physically, namely by catching or with bait. Organically, namely by using animal or vegetable pesticides that are made by themselves or made in groups;

- Further research is conducted on production risks that are not only caused by the use of farming inputs, but also analyze production risks caused by weather/climate conditions;
- Raise the issue regarding the price risk of superior rice farming commodities faced by farmers, because superior rice farmers in tidal swamp land also face the risk of superior rice prices.

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