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The Surplus Producer as a Measure of Household Welfare Levels in Rice Crops: A Case Study of Rice Cultivation in Low and Medium Lands

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Abstract: The objective of the study is to find the appropriate surplus producer analysis model to measure farmer family welfare levels in paddy rice fields in the low and medium land. The study was implemented in Indonesia with the lead location of low and medium lands of rice fields on the island of Lombok. Low land rice fields are represented in Kediri district while medium lands rice fields are represented in the Narmada district. In each district, it has been chosen 30 rice farming units, then the number of sampling units were 60 rice farming units rice field. Data was collected using observation, survey, and interview where the respondents are farmers of paddy rice fields. Data analyzed using improvement profit function to become surplus producer function. This study showed that the appropriate model of analysis of the surplus of the producer as measurement level family well-being farmer paddy rice field is ½ ∫(P - MC)*Q. This model can be applied to rice paddy agriculture such as rice paddy farmer household welfare level in the low land higher than in the middle land.

Keywords: household, rice, farmers, agriculture

文章标题

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摘要：摘要的总字数不得超过 200 字。 摘要应该是一个单独的段落，并且应该遵循结构化摘要的风格，但没有标题： 1) 背景：将所解决的问题置于广泛的背景中并突出研究的目的； 2) 方法：简要描述应用的主要方法或处理方法。 包括任何相关的预注册编号，以及使用的任何动物的物种和品系。 3) 结果：总结文章的主要发现； 4) 结论：指出主要结论或解释。 摘要应该是文章的客观表示：它不能包含在正文中没有呈现和证实的结果，也不应该夸大主要结论。

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1 Introduction

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The decline in the area of agricultural land in Indonesia continues to this day, including in West Lombok Regency. This is as a result of ongoing industrial and housing development on a large scale. Ironically, the development uses productive agricultural lands. While productive agricultural land is very useful for the provision of food for regional and national residents. [1] stated that as reported by the Food and Agriculture Organization of the United Nations, in 2050 it is estimated that there will be an increase of 70 percent of global food needs. The first impact felt from the conversion of agricultural land into industrial land is reduced food production. Land conversion will make paddy fields and other agricultural land narrower, automatically agricultural land will become narrower. According to [2] conversion of agricultural land can reduce rice production by 12.276 tons/ha/year in Majalengka Regency, West Java. So, the development considerations for the industrial and housing sectors should use non-productive land and maintain productive land. Therefore, consideration of the adjustment of agricultural land for agricultural production in the future is important. The suitability factor of agricultural land both for the suitability of various rice varieties and altitude needs to be considered by farmers. According to [3] that land suitability is the suitability of a land for a particular use, for example land suitable for irrigated land, ponds, annual crop farming or seasonal crop farming. Thus, land suitability for food crops needs information support.

Each plant has the ability to grow and adapt to the environment in which it is planted, including the altitude where it is cultivated. Although rice planting must be adjusted to the suitability of the planting site, the rice planting location must be able to produce high rice production. [4] classifies the altitude for agriculture into four classes, namely <100 m, 100 – 200 m, 200 – 800 m, and > 800 m. Meanwhile, according to [5] that the topography of West Lombok Regency based on altitude is divided into four, namely (0-100 m) covering an area of 34,800 ha, (100-500 m) covering an area of 40,966 ha, (500-1000 m) covering an area of 8,650 Ha, and > 1000 m area of 885 Ha. The data shows that the area of agricultural land in the lowland areas still dominates, especially in the high-altitude areas (0-100 m) and (100 - 500 m) above sea level.

Land use that pays little attention to land suitability class, agroecology, and planting height tends to produce less optimal agricultural business and will even bring losses to farmers because it will use very large production factors to increase soil fertility. In line with the opinion [7] which states that the productivity of food crops depends on the quality of the land used. If the selection of land at the beginning of development does not select productive areas, then considerable (financial) losses will occur later. Therefore, the evaluation of land suitability can answer the level of land suitability for the development of a commodity and economically it will answer the feasibility of farming.

Besides the suitability of agricultural land, pre-harvest and post-harvest issues of paddy rice also need attention. In the pre-harvest or rice production period, farmers are faced with seed problems (high-yielding varieties). The price of superior rice seeds makes it difficult for farmers to meet production targets. Because superior rice varieties will produce high rice productivity. This rice seed problem can be overcome through the implementation of a price subsidy policy for certified rice seeds. [8] The government cooperates with state-owned enterprises and local breeders in each region in procuring and supplying subsidized certified rice seeds. The indicator of success in this program is the provision, sale and distribution of subsidized rice seeds to farmers or farmer groups. Likewise said [9] that producing superior varieties and distributing them to farmers requires an efficient and effective formal seed system in order to obtain optimal benefits. Another policy during the pre-harvest period carried out by the government is the fertilizer subsidy policy. Provision of balanced fertilizer on rice plants will provide high production yields. [10] government through the Ministry of Trade no. 4 of 2023 has

stipulated the procurement and distribution of subsidized fertilizers for the agricultural sector. According to [11] the implementation of the distribution of fertilizers to farmers as a whole is quite effective and efficient, but sometimes the quantity and price are not right and the flow does not comply with the official provisions set by the government.

The problem during the post-harvest period of rice is that in general the facilities owned by farmers in grain management are still inadequate, such as not having a drying floor and not having grain storage warehouses. This will impact marketing, revenue, and profits for lowland rice farmers. [12] states that in general farmers have characteristics in marketing the results where the bargaining position of rice farmers tends to be weak. The failure of the local grain market is a strong reason for the need for government intervention in the grain and rice market. [13] stated that the government is very interested in controlling for farmers the stability of rice supply and prices through grain or rice policies both protective and promotive in nature, all of which have a direct or indirect impact on the welfare of farmers. Therefore, the government has provided support for grain prices or the basic price of grain for farmers every year so that the price of grain received by farmers is not too low.

From the various problems faced by farmers and the implementation of various government policies both during the pre-harvest and post-harvest periods, it will be able to have an impact on the income and welfare that farmers expect. [15] stated that the welfare of farmers will be achieved if each farmer can meet the desired rice price target, which can be seen in the desired farmer's net income. Unfortunately, the price of unhusked rice (paddy) which is desired to meet the welfare of farmers cannot be separated from the "forces" that play in various fields. This is a big problem for farmers because a weak bargaining position makes farmers unable to receive prices that are in line with expectations, which can threaten farmers' income and farmers' welfare. The problem that arises is whether the suitability of the height of the rice planting area (low and medium land) in West Lombok Regency will result in production, profit, and producer surplus (welfare) for farmers from different lowland rice farming. Therefore, it is necessary to conduct a study on: Producer Surplus as a Measuring Level of Welfare of Paddy Rice Farming Households: Learning from the Case of Rice Farming in the Lowlands and Medium Land

The objective of this study is to find an appropriate producer surplus analysis model as a measure of the welfare level of paddy rice farming households in the lowlands and medium land. In particular, this study aims to analyze the differences in production and profit and find differences in the producer surplus of rice farming in the lowlands and medium.

2 Materials and Methods

2.1 Research Subject

This research was carried out on West Lombok Regency, West Nusa Tenggara, Indonesia. The Research topics were cultivation which were grown during the 2021/2022 rainy seasons.

2.2 Research Design

The research was designed using an explanatory method, that is, research that explains and relates one variable to another that is different but interrelated and produces a causal relationship [8].

The main variables that are connected and sought for correlation are the level of production and factor production of paddy. Profit with productivity, cost of labor, cost of capital, surplus producers that is connected production with price paddy.

The research locations were determined stages (multistage purposive sampling) starting from the districts,and sub-districts to the village level. The selection of districts was based on the production centers of paddy, thus West Lombok Regency was selected. Additionally, two sub-districts/villages were selected which cultivate the paddy, each sub-district/village is expected to represent lowland (< 100 mpl) and midland (100 – 500 mpl).

[5] and [16]. The location selection was based on the hight of of the area and the result of previous research that the altitude of the area affects the production, income, and producer surplus of paddy farming and this expected to apply to paddy farming (fig. 1). On the bases of these considerations, Jagaraga Indah village in Kediri Sub-district was chosen to represent the lowland area, and Grimax Indah Village in Narmada Sub-district was chosen to represent the Midland area.

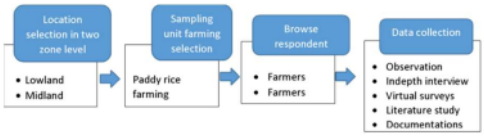

Fig. 1. Stage of The Research

2.3 Research Respondents

Farmers who were the object research were farmers who cultivate paddy during the rainy seasons in 2021/2022 and had experience cultivating these paddy. Initial information of the paddy farmers was obtained from farmers groups in each sample village. Then we randomly selected (random sampling) each 30 respondent farmers with the criteria according to the aforementioned provisions. Therefore the research obtained 60 respondents.

2.4 Data Collection

The Data collection was carried out by combining several methods simultaneously, namely observation, survey, and in-depth interview. Observations were made through direct observation at the location of the farm and where the farmer lives. The survey was carried out by interviewing rice farmers using a list of questions, while in-depth interviews were conducted to verify the data with the documents or records of their farming.

2.5 Procedure for the Data Analysis

Measuring the welfare of lowland rice farmer households through producer surplus starts from measuring production using the Cobb-Douglas production function. Then measure the profit of rice farming through the Unit Output Price Cobb-Douglas Profit Function (UOP-CDPF) technique. Lastly measure the welfare of producers through the measurement of producer surplus which is derived from the profit function.

Fig. 2. The Stage of The Producers Surplus

2.5.1 Variables and Data Analysis

The data collected from the survey was then edited, tabulated and analyzed. The analysis model used is:

1) Cobb-Douglas production and profit functions. Yotopoulos and Lau (1979) in [17], and [18] state that the profit function can be derived using the Unit Output Price Cobb-Douglas Profit Function (UOP-CDPF) technique, with the assumption that producers maximize satisfaction for profits. UOP-CDPF is a function that includes production and factors of production normalized to output prices.
2) Cobb-Douglas Production Function with four independent variables, namely seed costs, fertilizer costs, labor costs, and the dummy variable altitude.

$q = \alpha X \beta Z \Upsilon$ ..... (1)

Information:

q = output quantity

X = quantity of the variable input

Z = quantity of the fixed input

α = intercept (constant)

β and Υ = elasticity of output from input X and Z

The empirical model of the Cobb-Douglas Production Function in this analysis is shown in the following equation:

$qi = \alpha Xi \beta Zi \Upsilon Di^{\Phi}$ ..... (2)

To facilitate the estimation of equation (12) and data in the production distribution and determination of the normal distribution, the equation is transformed into a linear form by making it with logarithms, then the equation becomes:

$\ln qi = \ln \alpha + \beta \ln Xi + \Upsilon \ln Zi + \Phi Di + \varepsilon i$ .... (3)

qi = Paddy production (kg), at an altitude of < 100 m and an altitude of 100-500 m

α = constant

Xi = cost of production factors (seeds, fertilizers, labor) (Rp)

Zi = fixed costs (Rp)

Di = 1 for altitude (100-500 m) for altitude < 100 m

2.5.2 Receiving Function

$$R = p*q$$

$$R = p*\int \alpha X\beta Z\Upsilon$$

Information:

R =Revenue

p = prices

q = quantity of productions

X = quantity of the variable input

Z = quantity of the fixed input

α = intercept (constant)

β and Υ = elasticity of output from input X and Z

2.5.3 Cost Function:

$$C(q) = vZ + wX \quad \ldots\ldots\ldots\ldots \quad (4)$$

Information:

v = capital rent for fixed input

w = price of variable input

2.5.4 Profit function

$$\pi(X,Z) = pq - C(q)$$

$$= Pf(X,Z) - (\omega X) \quad \ldots\ldots\ldots\ldots\ldots (5)$$

Information:

π = profits

p = output price per unit

If ω = ω/p means the normalized price of the input variable, then equation (3) can be normalized with the output price so that the output price profit (UOP Profit) becomes:

$$\pi/p(X,Z) = pq - C(q)$$

$$= pf(X,Z) - (\omega/vX) \quad \ldots\ldots\ldots\ldots\ldots\ldots (6)$$

The main requirement for maximizing profit is that the first derivative of the profit function is equal to zero:

$$\pi = p\int \alpha X\beta Z\Upsilon - \omega X$$

$$\partial\pi/\partial X = \beta p\int \alpha X\beta-1\ Z\Upsilon - \omega = 0 \quad \ldots\ldots \quad (7)$$

$$\beta p\int \alpha X\beta-1\ Z\Upsilon = \omega \quad \ldots\ldots\ldots\ldots\ldots\ldots (8)$$

$$X\beta-1 = [\omega / \beta p\int \alpha\ Z\Upsilon] \quad \ldots\ldots\ldots\ldots \quad (9)$$

$$X^* = [\omega / \beta p\int \alpha\ Z\Upsilon\ ]\ 1/\beta-1 \quad \ldots\ldots\ldots \quad (10)$$

Equation (8) indicates that the amount of input needed to obtain maximum profit depends on the output price, input price and fixed input. By substituting equations 8 and 1, the optimum output will be obtained as follows:

$$q = \alpha X\beta Z\Upsilon$$

$$q = \alpha[(\beta\alpha\ Z\Upsilon\ P/\omega)\ 1/\beta-1]\beta\ Z\Upsilon$$

$$q = \alpha[(\alpha\ Z\Upsilon\ )\ 1/\beta-1\ (\beta.P/\omega)\ \beta\ /\ 1-/\beta\ Z\Upsilon/1-\beta]$$

$$q = \alpha 1/\beta-1[(\beta.P/\omega)\ \beta\ /\ 1-/\beta\ Z\Upsilon/1-\beta] \quad \ldots\ldots \quad (11)$$

Equation (11) shows that the optimum amount of output produced to achieve maximum profit depends on output prices, input prices and fixed costs Z. is formulated as:

$$X^* = X^*(p,\omega,Z) \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots (12)$$

By substituting equations (10) and (11) into the profit function, then the maximum profit becomes:

$$\pi^* = p[\alpha 1/1-\beta[(\beta.P/\omega)\ \beta/1-/\beta\ Z\Upsilon/1-\beta] - \omega[\alpha\beta Z\Upsilon.v/\omega]\ 1/1-\beta$$

$$= p[\alpha 1/1-\beta\beta\ \beta/1-/\beta.(P/\omega)\ \beta/1-/\beta\ Z\Upsilon/1-\beta] - \omega[\alpha 1/1-\beta\ \beta 1/1-\beta\ Z\Upsilon/1-\beta\ .(v/\omega)\ 1/1-\beta]$$

$$= \alpha 1/1-\beta\ \beta\ \beta/1-/\beta\ (1-\alpha)\ Z\Upsilon/1-\beta\ P1/1-\beta\ \omega\ -\beta/1-/\beta \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (13)$$

Equation 13 shows that the maximum profit (π*) received by farmers depends on the output price (p), input prices (v), and fixed inputs (Z)

The empirical model used in the profit analysis of rice farming is the Cobb-Douglas profit function model with the following equation:

$$\pi i = v\alpha\ \omega\beta\ Z\Upsilon\ Di^{\Phi} \quad \ldots\ldots\ldots\ldots\ldots \quad (14)$$

To estimate equation (14) and data on the profit distribution and determine which is close to the normal distribution, the equation is transformed into a logarithmic form

$$\ln \pi i = \ln \lambda + \alpha \ln v + \beta \ln \omega + \Upsilon \ln Z + {}^{\Phi}Di + \varepsilon i \quad \ldots(15)$$

Information:

πi = Rice farmer profit (Rp) at planting height < 100 m and (100-500 m), which is normalized

ƛ = profit function line

V = productivity of rice farming (kg/ha), in the lowlands and medium land

ω = cost of capital (Rp/ha) for farmers in the lowlands and medium land

Z = labor costs (Rp/ha) for farmers in the lowlands and medium land

Di = 1 for farmers in medium land

= 0 for farmers in the lowlands

Producer surplus is the difference between the prices of goods that producers can sell and the prices that producers can accept from the number of goods sold. Producer surplus also means the ability of producers to obtain revenue

from goods sold at a sacrificed cost. Mathematically, the grain supply equation is made through the Total Cost equation. Generally, the cost function used is a cubed function, so the equation is as follows:

$TC = C + \beta 1Q1 + \beta 2Q2 + \beta 3Q3$ ..... (16)

$MC = \beta 1 + 2\beta 2Q1 + 3\beta 3Q2$ ..... (17)

Information:

TC = Total cost (Rp)

MC = Marginal cost (Rp)

C = Constanta

Q = amount of grain production (kg)

Because the marginal cost is equal to the supply, the supply equation is the same as equation (17). Maximum profit is achieved when price (P) equals marginal cost (P=MC).

Calculating the amount of producer surplus will use the following equation:

$SP = \delta TR - \delta TC$ ..... (18)

$SP = MR - MC$

$SP = \frac{1}{2} \int (MR-MC)*Q$

$SP = \frac{1}{2} \int (P - MC)*Q$ ..... (19)

Information:

SP = producer surplus (Rp)

TR = P * Q = total revenue

TC = total cost

MR = marginal revenue = P

P = equilibrium price or market price of grain (Rp/kg)

MC = marginal cost

3 Results

3.1 The Effect of Planting Altitude on Rice

Rice production can be influenced by how much the use of production factors is used by farmers. In this study, the production factors used included rice seeds, fertilizers, labor, and the height of the planting site. The results of the regression analysis can explain the estimation of how much use of production factors is used and at what stage of return can be achieved. The estimation results can be shown in table 1 below:

Table 1. Estimated Factors of Production of Rice Farming in West Lombok Regency 2022

Variables	Unstandardized Coefficients B	std. Error	t	Sig.
(Constant)	-.212	.790	-.268	.790
ln Seed Cost	.383	084	4,572	.000*
ln Fertilizer Cost	.198	.070	2,835	.006*
ln Labor Costs	.413	.067	6.127	.000*
Altitude Dummy	-.147	048	-3,085	.003*

Dependent variable: ln Production
Adjusted R2 = 0.956
F = 320.029 *

* shows significance at the 1% level

3.2 Empirical Results of Profit Models

Economic theory states that the profit received depends on the amount of income and costs incurred. The results show that the profit for rice farmers in the lowlands is higher than that of farmers in the medium land. The profit of farmers in the lowlands is 41.83% greater than rice farmers in the medium land and the difference is significant with a p-value of 0.000 (Table 2).

The high profit of rice farmers in the lowland areas is due to higher revenues compared to farmers in the medium land. The income of farmers in the lowlands is 33.14% greater than that of rice farmers in the medium land and the difference is significant at a p-value of 0.000 (Table 2). The high income of farmers in the lowlands is due to the productivity and selling price of grain, even though the capital costs and labor costs are higher than those of farmers in the medium land.

Table 2. Profits from rice farming per hectare in West Lombok Regency, 2022

No	Items	Rice Farmers Lowland	Middle Land	t-stat	p-values
1.	Profit (Rp/ha)	17,901,11	12,621,16	-8,243	0.000
2.	Revenue (Rp/ha)	1	5	-9,448	0.000
3.	Productivity (kg/ha)	26,980,22 3	20,264,41 1	-10,229	0.000
4.	Capital Cost (Rp/ha)	6,889	5.194	11083	0.000
5.	Labor Costs (Rp/ha)	1,379,869	2,437,595	-9,064	0.000
		7,297,152	4,970,035		

The results show that the productivity of rice in the lowland areas is higher than that of rice farming in the medium land. The productivity of rice in the lowland areas is 32.63% greater than rice farmers in the medium land and the difference is significant with a p-value of 0.000 (Table 2). The average selling price of grain per kilogram received by farmers in the lowland areas is IDR 3,917, while for farmers in the medium land it is IDR 3,897 per kg.

In general, the results show that the average cost of capital incurred for rice farmers in the lowland areas is lower than that of farmers in the medium land. The cost of capital for farmers in the lowlands is 43.39% lower than rice farmers in the medium land and the difference is significant with a p-value of 0.000 (Table 2).

The results show that the labor cost for rice farmers in the lowland areas is higher than that of farmers in the medium land. value 0.000 (Table 2).

The Effect of Planting Altitude on Rice Farming Profits

To test the hypothesis that there is an effect of planting height on the profit of rice farming, a statistical test of the profit function was carried out for groups of farmers in the lowlands and groups of farmers in the medium land, and a combination of farmer groups in the dummy variable. Testing the influence of productivity variables, capital costs, and labor costs on profits is made using the Cobb-Douglas profit function regression model which is summarized in table 3

Table 3. Estimated Profits Earned by Rice Farming in Lowland and Medium Regions in West Lombok Regency, 2022

No	Explanatory Variables	Farmer Profit Function		
		Lowland	Middle Land	combined
1	Intercepts	11036 (0.742)*	13,402 (2,952)*	9,627 (1,660)*
2	Productivity (ln X1)	1,496 (0.059)*	1931 (0.243)*	1,540 (0.138)*
3	Cost of Capital inputs (ln X2)	-0.004 (0.020)	-0.552 (0.152)*	-0.125 (0.061)**
4	Cost of Labor input (ln X3)	-0.476 (0.046)*	-0.356 (0.112)*	-0.302 (0.079)*
5	Dummy of Planting Hight	-	-	0.028 (0.061)
	Adjusted R^2	0.957	0.676	0.836
	F Calculate	214,294*	21.174*	76,296*
	Number of Observations	30	30	60

Source: Profitability model analysis of two growing altitude areas and their combination in one analysis package shown from t-test statistics

** indicates the statistical significance of 5%

* shows the statistical significance of 1% The dependent variable is ln Profit (π/ha)

3.3 Producer Surplus Analysis

Producer surplus is one measure to assess the welfare of producers or farmers. The producer surplus is very dependent on the production per hectare of rice or the level of productivity and the difference between the market price of grain and the minimum price of grain that producers are still able to accept. The results of the study (Table 4.) can explain that the average productivity of rice yields in the two lands is very different where in the lowlands it is 32.63% greater than rice farmers in the medium land and the difference is significant with a p-value of 0.000 (Table 2). Next, the difference in productivity with Break Even Point Production is quite large, where in the lowland areas the difference in production is 3539 kg/ha or 108% and in the medium land it is 2202 kg/ha or 73.57%.

Table 4. Producer Surplus of Rice Farmers in West Lombok Regency in 2022

No	Items	Rice Farmers		Combination
		Lowland	Middle Land	
1	Grain Market Price (Rp/kg)	3,917	3,897	3,907
2	Production Break-Even Point (kg/ha)	3,270	2,993	3.316
3	Average Productivity (Kg/Ha))	6,889	5.194	6,042
4	Producer Surplus (Rpx1000)	12,481	6,555	9,625

4 Discussion

The overall test results (Table 1) show that all independent variables (seeds, fertilizers, labor and altitude) jointly affect rice production. This information can be seen from the F value of 320,029 which is significant at the 99% confidence level or 1% error level. Also, the value of Adjusted R2 = 0.956, which means that 95.6% of the variation in the dependent variable (rice production) can be explained by the independent variables (seed costs, fertilizer costs, labor costs, and altitude). It also means that all of these independent variables affect rice production in West Lombok Regency. In line the results of research [19] stated that all independent variables such as seeds, fertilizers, labor jointly affect rice production in Central Sulawesi, Indonesia.

Partial testing (Table 1) through the t-test found the estimation results of the four independent variables, namely all of these variables had a significant effect on rice production. To find out how much influence each independent variable has, it can be explained in the following explanation.

The cost of rice seeds, all the respondent farmers planted the Inpari 32 rice variety. Statistically the estimated results of the regression coefficient were 0.383 with a significant level of 0.000 (probability). This means that the variable cost of seeds has a significant effect on rice production, where each additional 1% of seed costs will increase rice production by 0.383%. However, if you look at the magnitude of the regression coefficient, the magnitude is still less than 1, this means that there are still opportunities for farmers to increase the use of seeds to achieve optimal production results. The results of research [20] state that the cost of rice seeds has a significant effect and has a positive contribution to rice production in irrigated land in Isabela Province, Philippines.

Fertilizer costs. Statistically, the estimated regression coefficient is 0.198 with a significant level of 0.006 (probability). This means that the variable cost of fertilizer has a significant effect on rice production, where every 1% additional cost of fertilizer will increase rice production by 0.198%. However, if you look at the magnitude of the regression coefficient, the magnitude is still less than 1, this means that there is still an opportunity for farmers to increase the use of fertilizers to achieve optimal production results. In accordance with the results of research [19] stated that fertilizer inputs had a significant effect on rice production in Central Sulawesi.

Labor Costs. Statistically the estimated results of the regression coefficient are 0.413 with a significant level of 0.000 (probability). This means that the labor cost variable has a significant effect on rice production, where every 1% increase in labor costs will increase rice production by 0.413%. However, if you look at the magnitude of the regression coefficient, the magnitude is still less than 1, this means that there are still opportunities for farmers to increase the use of labor to achieve optimal production results. In line with the results of research [20] which states that labor costs have a significant effect and have a positive contribution to rice production in irrigated land in the Province of Isabela Philippines.

Planting Height, Statistically the estimated results of the regression coefficient are -0.147 with a significant level of 0.003 (probability). This means that the variable height of the planting area has a significant effect on rice production, where the medium land produces rice production 0.147 times lower than the lowland areas. It also means that higher areas where rice is planted produce lower rice production. According to the results of research [6] that the number of productive tillers and grain filling in the highlands is lower than the lowlands.

The regression model for the profit function for rice farmers in table 3 shows that the value of the coefficient of determination R2 for farmers in the lowland region is 0.957 and for farmers in the medium land region is 0.676, and the combination in both regions is 0.836. This means that 95.70% of the variation in profits for farmers in the lowlands is then 67.60% of the variation in profits for farmers in the medium land, and 83.36% of the variation in profits for farmers in the two highlands can be explained by explanatory variables such as productivity of rice farming, capital costs, costs labor, and the height of the planting site. This means that there are 4.30% for farmers in the lowlands, 32.40% for farmers in the medium land, and 16.

Based on the results of the t-test or partial test, most of the variables included in the regression model have a significant effect on the profits of rice farming in West Lombok Regency. In addition to the significance seen, it is also necessary to pay attention to the magnitude and sign of the regression coefficient.

First, the productivity variable has a positive sign with a magnitude of more than 1. This means that every 1% increase in rice productivity will increase

profits by 1.49% for groups of farmers who are in the lowland areas, then 1.391% for groups of farmers who are in the medium land. and 1,540% for the combination of the two regions. This means that the increase in productivity provides an increase in profits from rice farming which is more responsive or the elasticity is more than 1 and can be classified as elastic. This increase in productivity can be due to the use of production facilities in a balanced way, such as the use of Inpari 32 rice seeds, urea, ponska, and ZA.

Both capital cost variables are negative with a magnitude of less than 1. This means that a 1% increase in the cost of capital will reduce profits by 0.004% for the lowlands, and 0.552% for the medium land, and 0.125% for the combination of the two regions. The variable response of capital input costs for the medium land region is greater than that for the lowland areas for the profit of rice farming. When compared to the average costs incurred by farmers for rice seeds and fertilizers, the average capital cost of the farmer group in the medium land is higher than that of the farmer group in the lowlands, which is IDR 329,667 compared to IDR 308,000 (the cost of rice seeds) and IDR 1,301,008.- compared to IDR 553,583.- (for the cost of fertilizer). There are allegations that excessive use of fertilizer costs at high prices has caused capital input costs to increase even more. The results of the study [22] state that the capital cost factor has a significant effect on rice farming income in Rwanda. The results of the study [23] state that the cost of capital or production facilities has a significant effect on the income of rice farmers in Gowa Regency, Indonesia.

Third for variable labor costs, where the magnitude is less than 1 with a negative sign. This means that every 1% increase in labor input costs will reduce rice farming profits by less than 1%, namely 0.476% for the lowland areas, and 0.356% for the medium land regions and 0.079% for the combination of the two regions. This means that the use of labor in the lowlands is more than in the medium land so that the response to profits is greater. The results of the study [22] state that the labor cost factor has a significant effect on the income of rice farming in Rwanda.

The four variables are the height of the rice planting area, where the magnitude is less than 1 with a positive sign, meaning that in the medium land the response is 0.028 times greater than in the lowland areas to the profit of rice farming. However, this height variable does not significantly influence the profit of rice farming. This means that the profit of rice farming does not require a special place because what determines profit is the quantity of production and the selling price of grain. The price of grain in the two regions is different where the price of grain received by farmers in the lowland areas is an average of IDR 3,916.67 per kilogram while in the medium land the average is IDR 3,896.67 per kilogram. This price difference is not too big (the results of the t-test on grain prices show a significance value of 0.

The difference in the price of grain received by farmers in the two regions is caused by first, most farmers in the medium land area sell grain with relatively lower quality, namely the grain moisture content is still relatively high, secondly, producers are dealing with several wholesalers so that the bargaining position of farmers is still weak. Third, at harvest time most farmers need money for household needs, for example for children's education, health, and social activities. In line with the opinion [8] which states that in general farmers have characteristics in marketing results where the bargaining position of rice farmers tends to be weak, because: generally farmers sell rice immediately after harvest in the form of dry grain harvest and even by slashing, farmers are faced with the need for cash for the cultivation of land in the next period, Therefore, the added value from post-harvest is mostly enjoyed by traders, and rice supply is not elastic and the rice market is segmented locally. Then what often becomes a problem is the low quality of grain that is sold due to the high-water content due to cloudy weather which often occurs during the rainy season. The price range for grain received by farmers is between IDR 3,500/kg to IDR 4,100/kg in the medium land area. Meanwhile, farmers in the lowlands sell unhulled rice at prices ranging from IDR 3,900/kg to IDR 4,000/kg. Then what often becomes a problem is the low quality of grain that is sold due to the high-water content due to cloudy weather which often occurs during the rainy season. The range of grain prices received by farmers is between IDR 3,500/kg to IDR 4,100/kg in the medium land area. Meanwhile, farmers in the lowlands sell unhulled rice at prices ranging from IDR 3,900/kg to IDR 4,000/kg. Then what often becomes a problem is the low quality of grain that is sold due to the high-water content due to cloudy weather which often occurs during the rainy season. The range of grain prices received by farmers is between IDR 3,500/kg to IDR 4,100/kg in the medium land area. Meanwhile, farmers in the lowlands sell unhulled rice at prices ranging from IDR 3,900/kg to IDR 4,000/kg.

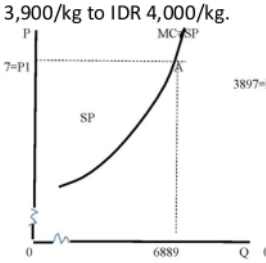

Fig. 3. Producer Surplus (SP) in the lowlands

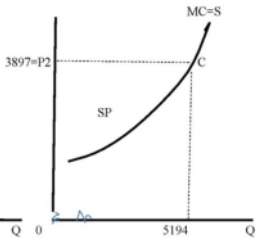

Fig. 4. Producer Surplus (SP) in the midland

To plan rice farming that provides maximum profit, farmers must be able to calculate the return point for farming or it is called the Break Even point, where at this point it will be seen how far the farmer will

estimate the profit to be obtained. The results of the Production Break Even Point analysis are shown in Table 4. The Break Even Point of Production in the lowland areas is higher than in the medium land, but the difference is not too stark. The results showed that the productivity of rice produced by farmers was still above the break even point, this meant that farmers were able to generate revenue and income from the costs that were sacrificed. In other words, from the socio-economic size, farmers have been able to generate sufficient profits to carry out farming socio-economic activities at a later time, and this can be categorized as farmers who have achieved prosperity. In line with the results of research [23] which states that the level of welfare of farmers in narrow, medium and large areas has achieved a high level of welfare seen from socio-economic indicators or the Central Bureau of Statistics.

So based on the previous description it can be seen that the producer surplus in the two regions is very different where the producer surplus in the lowland region is higher than that in the medium land region. This shows that farmers in the lowlands are more prosperous than farmers in the medium land. The magnitude of this producer surplus can be interpreted as the government's success in establishing a policy to increase rice production and at the same time the welfare of rice farmers through several policies including the policy of subsidizing the price of urea fertilizer, increasing the purchase price of grain for farmers, increasing the area of rice planting areas, and increasing irrigation areas. Besides, from the side of the farmers themselves also have a role in improving their welfare such as how to manage farming well starting from preparing rice seeds, maintaining planting, fertilizing properly, up to harvest handling. In line with the results of research [24] stated that the capacity of farmers affects the welfare of farmers, namely about the abilities of farmers themselves such as cultivation techniques, capabilities from seeding, seeding, planting, weeding, fertilizing to handling plant pests. It was also said [25] that a combination of government policies through policies to increase irrigation areas, increase the purchasing price of farmers' grain, increase the rice planting area, and decrease the price of urea fertilizer, led to a larger producer surplus. The results of the study [26] also stated that the level of welfare of paddy rice farming households as a whole or on average in narrow, medium.

5 Conclusions

Producer surplus analysis model 1/2∫(P-MC)*Q can be used as a measurement of the welfare level of paddy rice farming households. The welfare level of rice farming households in the lowland areas is higher than that of lowland rice farming households in the medium land areas. In measuring the welfare level of paddy rice farming households, the 1/2 equation model can be used∫(P-MC)*Q.

There is evidence that the height of the lowland rice cultivation has a significant effect on lowland rice production. The productivity of lowland rice farming in the lowlands is higher than the productivity of lowland rice farming in the medium land. The results of this study recommend that the government prevent land conversion from agriculture to non-agriculture in lowland areas, preferably housing and industrial development locations on unproductive land.

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References
参 考 文 献

[1] UTAMI, SILMI NURUL. Impact of the conversion of agricultural land into industrial land. Kompas.com.2021. https://www.kompas.com/skola/read/2021/12/24/185858869/dampak-konversi-lahan-pertanian-jadi-lahan-industri?page=all .
[2] HIDAYAT, Y., ISMAIL, A., EKAYANI, M. The impact of agricultural land conversion on the household economy of rice farmers (case study in Kertajati district, Majalengka regency, West Java). Agricultural Technology Assessment and Development Journal, Agricultural Research and Development Agency. 2017, 20(2), 171–182.
[3] ERNAWATI, ANDRESWARI, D., ALEXANDER, T. Land suitability prediction model for food crops with backpropagation neural network (case study: Bengkulu Hilir Sub-Das). Pseudocode Magazine. 2020, 7(1), 35-40
[4] LI, YUEJIAU., X. YANG, H. CAI, L. XAO, X. XU AND L. LIU. Topographic features of agricultural potential productivity during the transformation of farmland in China. Sustainability, 2015, 7(1), 96-110.
[5] NATIONAL LAND AGENCY OF WEST LOMBOK REGENCY (2021). West Lombok Regency Surveying, 2021.
[6] GUO, L., M. LIU, Y. ZHANG, Y. TAO, F. ZHANG, G. LI, K. DITTERT AND S. LIN. Yield differences increase with ascending altitude between traditional paddy-rice production systems and water-saving mulch rice production systems. European Journal of Agronomy. 2017, 92, 9-16.
[7] AZIS A., SUNARMINTO, BH, RENANTI, MD. Assessing the suitability of land for growing food crops using artificial neural networks. MIPA Gajah Mada University Periodical Magazine. 2006, 16(1):1-10.
[8] GENERAL DIRECTORATE OF FOOD CROPS. Technical Instructions Seed Subsidy Year 2017. Ministry of Agriculture. 2017, 1-31
[9] SINGH, R.P and AGRAWAL, R.C. Improving Seed System Efficiency by Seizing Farmers' Rights in India by Adopting and Implementing Quality Declared Seed System Policies in Parallel. MOJ Ecology and Environmental Sciences, 2018, 3(6),387-391
[10] MINISTER OF TRADE OF THE REPUBLIC OF INDONESIA. Acquisition and Distribution of Subsidized Fertilizers for the Agricultural Sector. Regulation of the Minister of Commerce Number 4 of 2023. 2023, 1-27
[11] NUGROHO, AD, SIREGAR, AP, ANDANNARI, E., SHAFIYUDIN, Y., CHRISTIE, J.I. The distribution of subsidized fertilizers in Bantul Regency, special region of Yogyakarta province. AGRISOCIONOMICS Magazine of Agricultural Socioeconomics. 2018, 2(1): 70-82
[12] MAULANA, M., AND RACHMAN, B. Government rice purchase price in 2010: its effectiveness and implications on DOLOG's rice purchase. Journal of Agricultural Policy Analysis. 2011, 9(4), 331-347
[13] BROTHER, SAPTANA. Rice pricing policy revised from the dimensions of price endings. Journal of the Agroeconomic Research Forum, 2017, 35(1): 31–43.
[14] SUPARMIN, ZAINI, A., SIDDIK, M., TAJIDÁN. The effectiveness of the government's purchase price policy for paddy and rice as a price stabilization tool on the island of Lombok, West Nusa Tenggara. Agricultural Policy Analysis Journal. 2022, 20(2), 147-159
[15] RONALD S. BADU., SITI PRATIWI HUSAIN. Farm Accounting: Net Farm Income Farmers Welfare. International Journal of Innovative Science and Research Technology, 2021, 6(9), 361-369
[16] CENTRAL BUREAU OF STATISTICS FOR THE WEST LOMBOK REGENCY. West Lombok Regency in figures, 2016.
[17] SADOULET, E. AND DE JANVRY, A. Quantitative Analysis of Development Policy The Johns Hopkins University Press. 1995, 61-63

[18] SUHARYANTO, MAHAPUTRA, ARYA. Relative Economic Efficiency of Lowland Rice Crop Using the Profit Function Approach in the Field School Integrated Crop Management Program in Bali Province. Agricultural Informatics, 2015, 24 (1): 59 – 66
[19] MUHARDI AND EFENDIA. Technical Efficiency And The Factors Affecting It In Rice Production In Indonesia. Asian magazine of agricultural and rural development. 2021, 11(3): 230-235
[20] CANETE, D.C., TEMANEL, B.E. Factors influencing productivity and technical efficiency of rice farmers in Isabela, Philippines. Journal of Advanced Agricultural Technologies, 2017, 4(2): 111–122.
[21] WILUJENG, E.D. and FAUZIAH, E. Technical efficiency and factors influencing rice production in Lamongan Regency. Agroscience Magazine. 2021, 1(3): 712-727.
[22] NGANGO, JULES. Does empowering women improve yields and income? Evidence from rice farmers in Rwanda. Asian magazine of agricultural and rural development. 2022, 12(3): 201-209.
[23] ALFRIDA, A., NOOR, T.I. Analysis of Income and Welfare Level of Rice Households Based on Area. Agroinfo Galuh. 2017, 4(3), 426-433
[24] SULISTIYAWATI, R., KUSRINI, N., IMELDA. Influence of Farmer Characteristics and Management Capacities on the Welfare of Rice Farmers. Magazine of economic development analysis. 2021, 4, 403-412
[25] MULWANYI, A., HUTAGAOL, P., SINAGA, B.M. Impact of rice purchasing policy on the welfare of producers and consumers in Indonesia. International Society for Agricultural Sciences of Southeast Asia (ISSAAS). 2011, 17(2), 48-57
[26] PUTRI, CK, NOOR, T.I. Analysis of Income and Welfare Level of Rice Farming Households Based on Land Area in Sindangsari Village, Banjarsari District, Ciamis District, West Java Province. Agroinfo Galuh Magazine. 2018, 4(3), 927-935
[27] PRATAMA, N., ZULFANETI, UMIYAT, E. Welfare analysis of rice farmers in Warm Water District East Kerinci Regency. Economic Paradigm Magazine. 2021, 6(4), 705-716
[28] GEORGE T, MARKUS J. Explanatory research: definition, guide, & examples. Scribbr Publisher, 2022. https://www.scribbr.com/methodology/explanatory-research/

COVER LETTER

Title of the manuscript: **The Surplus Producer as a Measure of Household Welfare Levels in Rice Crops: A Case Study of Rice Cultivation in Low and Medium Lands**

Abstract: The objective of the study is to find the appropriate surplus producer analysis model to measure farmer family welfare levels in paddy rice fields in the low and medium land. The study was implemented in Indonesia with the lead location of low and medium lands of rice fields on the island of Lombok. Low land rice fields are represented in Kediri district while medium lands rice fields are represented in the Narmada district. In each district, it has been chosen 30 rice farming units, then the number of sampling units were 60 rice farming units rice field. Data was collected using observation, survey, and interview where the respondents are farmers of paddy rice fields. Data analyzed using improvement profit function to become surplus producer function. This study showed that the appropriate model of analysis of the surplus of the producer as measurement level family well-being farmer paddy rice field is ½ ∫(P - MC)*Q. This model can be applied to rice paddy agriculture such as rice paddy farmer household welfare level in the low land higher than in the middle land.

Keywords: household, rice, farmers, agriculture

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The Surplus Producer as a Measure of Household Welfare Levels in Rice Crops: A Case Study of Rice Cultivation in Low and Medium Lands

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PAGE 1

PAGE 2

PAGE 3

PAGE 4

PAGE 5

PAGE 6

PAGE 7

PAGE 8

PAGE 9

PAGE 10

PAGE 11

PAGE 12