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Projection of Rice Production and Consumption with The Application of The Partial Adjustment Model

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A B S T R A C T

Food consumption requires physical and economic access to food. As a result of insufficient output to meet rising demand, there is an ongoing increase in the price of meat in Indonesia Any prediction based on the biased model will not be accurate because the elasticities-prices for each parameter estimation calculated from this response model are unquestionably skewed. This study aims to analyze how the supply of meat producers responds to changes in the prices of inputs and outputs. This study also attempted to assess the response of Indonesian mason producers' supply using the model error correction method (ECM). This study makes use of secondary data. One of the most appropriate strategies is the use of a partially adjusted Nerlove model. This adjustment model is widely used in research on the offer response. The findings demonstrate that this method can lessen the error in the estimation of the parameters of each explanatory variable used in the projection. When estimating the parameters of the model, adjustments are also made to the model within the framework of this methodology.Farmers' supply of corn is influenced by soybean prices, labor wages, seed prices, urea fertilizer prices, feed prices, and imported corn prices. Corn farmers are also responsive to corn prices, therefore, price stability policies and basic price policies can be reinstated to support corn self-sufficiency. This study advises that in order to increase the supply of meat, land development policies and intrant subsidies will still be necessary.

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INTRODUCTION

The production response is in fact an agricultural commodity to price changes and other determinants that require a time lag. Rice production activities, for example, biologically require time, so that when there is a price change, producer farmers cannot respond immediately when the production process is running (John, 1991). Other factors that also determine production performance are policy elements related to institutions, for example: intensification, production targets, credit) which do not allow for changes to the ongoing production process (Mulyana, 1988).

Basically, producer farmers can respond to changes in determining factors, especially prices in years t, t-1, t-2 etc., but still need a grace period. To find out the price in which year the supply of an agricultural commodity is positive, lag variables can be included as explanatory variables in the area response model, productivity, and production as the main elements on the supply side.

associated with economic and political aspects in Indonesia (Silalahi et al., 2019). This is because food is a basic human need to sustain life. Therefore, the fulfillment of food needs for every population at all times is a human right that must be pursued by the government. Food consumption requires both physical and financial access to food. The quantity and variety of food consumed by households reflect accessibility. In order for the data on food consumption to demonstrate in concrete terms the households' ability to access food and describe their level of food provisioning (FS da Mota, 1980).

Food security is not only determined by the physical availability of food, but also by the economic and social access to food, the biological utilization of food, and the stability of these dimensions over time (Suryadharma, 2010).

Food consumption is one of the indicators that reflects the level of welfare of a household (Aboueva, et.al, 1973). The quantity and quality of food consumed by a household are influenced by various factors, such as income, food prices, preferences, culture, and health status. Food consumption data can be used to measure the adequacy of food intake, the diversity of food sources, and the nutritional status of the population.

Rice is a very strategic food commodity for Indonesia, especially in countries in the Asian region. The important role of rice exceeds other staples, such as wheat, corn, cassava, and potatoes, because around 95% of Indonesia's population still relies on rice as the main food commodity (Quartina Pudjiastuti et al., 2021). The global production of rice keeps rising year after year. The demand for rice in Indonesia is continuing to rise in tandem with demographic growth and rising per-capita and per-year rice consumption (Yusuf et al., 2024). In these circumstances, the availability and distribution of rice as well as the financial accessibility of the population's purchasing power are essential issues that play a significant role in the development of social, political, and economic stability (Moldenhauer, 2012).

One of the important things in rice is knowing the level of supply and demand so that there is no shortage or surplus of rice in the market which ultimately harms the community as consumers and farmers as rice producers (Production, 1966). At the desired level, a decent and affordable rice price will be achieved by the community and will benefit farmers as producers.

Ensuring the availability of food in sufficient quantities, of adequate quality, and at a price level that is affordable by the population is the target and target to be achieved in the preparation and formulation of national food policies.

`Rice needs cannot be replaced by other foodstuffs. This can be seen from the Based on a report by the United States Department of Agriculture (USDA), global rice production reached 507.4 metric tons in the 2022/2023 season, while global rice consumption reached 521.37 million metric tons consumption of rice which is the highest compared to the consumption of other foodstuffs, although the government has promoted food diversification from rice to non-rice, some people in Jambi feel that they have not eaten if they have not eaten rice.(Natasha, n.d.) The government may make measures to: (1) import foreign rice if necessary and (2) increase domestic rice production in order to meet the rising demand for the grain (Isvilanonda & Zimmer, 2014).

The increasing population has resulted in an increase in the demand for rice. (Directed-Seeded, n.d.). If under conditions of constant rice production and demand for rice increases due to population growth, then production will not meet the demand for rice, which consequently requires rice imports from outside .L. R. P. Handbook (1999).

By assuming that an increase in income is used to address basic needs like food, shelter, education, and health care, the increase in individual incomes reflects an improvement in community well-being. An increase in rice prices which also means a decrease in people's purchasing power can result in a decrease in consumption levels in terms of quantity and quality, especially for people with low incomes (Fayetteville, 2001). Long-term reductions in the population's consumption of rice, both in quantity and quality, may result in a decline in the quality of human resources. The market's mechanisms, traders' speculation, and the supply of rice on the market are more likely to blame for changes in rice prices (Pavithran & under Geographical, 2014).

The reason for the importance of conducting research related to rice consumption and demand issues related to changes in population, price levels and incomes of the population is to estimate the parameters of rice demand. This is crucial information for political decision-makers to plan for the population's dietary needs and the effects of changing income and price levels on food demand.

The use of these variables in the response model can lead to multiple collinearities. Thus, it is necessary to modify the model to avoid the possibility of double collinearity between the grace period variables above. One of the modifications that have been developed related to the above problem is the partial adjustment of the Nerlove model. This adaptation of the Nerlove model is well known in supply response studies. This approach is also applied in calculating the elasticity of each explanatory variable which is then used in the projection. The elasticity calculation technique in the Nerlove partial adjustment model is also applied in the demand model.

Based on the information above, the writer is interested in analyzing the demand for rice in Indonesia, the factors that influence it and the elasticity of demand. So, the following goals of this study are: Determine the impact of demographic factors, rice prices, blé fare prices, population incomes, and rice demand from the previous year on rice demand in Indonesia. knowledge of the demand for rice's short- and long-term elasticities. Knowing the rice needs in the ten years to come and taking the appropriate steps.

This article's goals are to (1) apply Nerlove's partial adjustment model to the analysis of supply and demand for agricultural products, (2) determine the model's short- and long-term elasticities, and (3) identify the appropriate forms of elasticities. in the prediction of rice supply and demand.

According to mainstream economic theory, "offer" is defined as a functional relationship that shows how much of a given good is being offered (to sell) at various locations and times while other factors are left unaffected (Tomek & Kaiser, 2014). The curve of offers demonstrates a positive relationship between the quantity of goods for sale and their price range (Lantican, 1990). The above supply curve is based on the hypothesis that producers act rationally, that is, they continually seek to increase their profit. According to these hypotheses, the level of output is theoretically tracked up to the ideal state, which is the situation when the marginal product value and the initial investment price are equal.

The production decisions made at time t based on the current price (P t) are not carried out at time t but at time t+1. As a result, the function of offer includes a delayed variable as an explicative variable. However, there is a high possibility of double collinearity between the grace period variables as described previously. Thus, it is necessary to modify the production response model. However, for seasonal crops such as rice, the use of product prices in the same year is still quite relevant (Adnyana & Maulana, 1988).

METHODOLOGY

According to the assumptions built in Nerlove's partial adjustment model, the planned response area (A) can be formulated as follows.

$$A_{t*} = a_0 + a_1P_t + a_2Z_t \quad (1)$$
$$A_t - A_{t+1} = (A_t \times A_{t+1}) \quad (2)$$

When the partial adjustment coefficient is present, Pt is the producer's price and Zt is the other relevant explanatory variable. Le coefficient is of 01 is a measure of the rate of adjustment of the actual surface in response to factors affecting the surface of planned cultures (Siregar. 2009).

If equation (1) is substituted into equation (2) then the result becomes:

$$A_t = a_0+a_1 P_t + a_2 Z_t + (1 -) A_t . 1 \quad (3)$$

to simplify the estimation equation (3) is simplified to:

$$A_t = b_0 + b_1P_t + b_2Z_t + b_3A_{t-1} + t \quad (4)$$

where A_t is harvested area of a commodity at time t, P_t is the price of the commodity concemned at time t.

Estimated productivity (Y_t) response using the Nerlove model approach, with the variable of harvested surface area included as one of the relevant explanatory variables. The harvested surface area was used by Nainggolan and Suprapto in 1987 to estimate the response of productivity as a measure of the effectiveness of the system of production of an agricultural commodity. The following can be written as the productivity response model for Nerlove's adaption strategy:

$$Y_t^* = C_0 + C_1P_1 + C_2A_t + C_3Z_t \quad (6)$$
$$Y_t - Y_{t-1} = (Y_t \times Y_{t-1}) \quad (7)$$

where is the partial adjustment coefficient of the productivity response.

The result of substituting equation (0) into equation (7) is:

$$Y_t = C_0 + C_1P_t + C_2A_t + C_3Z_t + (1-) Y_{t-1} \quad (8)$$

In order to facilitate the estimation of each parameter, the equation (8) can be simplifted to:

$$Y_t = d_0 + d_1P_t + d_2A_t + d_3Z_t + d_4Y_{t-1} + t \quad (9)$$

where Y_t is commodity productivity per unit area at time t, P_t is the price of the commodity concerned at time t, A_t is harvest area of the commodity concerned at time t, Z_t is other relevant explanatory variables at time t, especially the factor production and Y_{t-1} is productivity lag variable at time $t-1$.
t is stochastic confounding factor, and = $(1-d_4)$; d_0 $C_0/$; $d_1 = c_1/$;$d_2 = C_2/$;$d_3 = c_3/$
Thus, the short-un elasticity of productivity with respect to output prices (YP (3r)) and area (YA (3r)) are:

$(YP\ (3r)) = d_1(P/Y)$ and $(YES/3r)) = d_2(A/Y)$ (10)

Meanwhile, the long-term elasticity of productivity to output prices and harvested are is

$(YP(lr)) = (YP\ (sr))\ (1- d_4)$ and $(YES(lr)) = (YES\ (sr))\ (1 - d_4)$ (11)

Using the above Nerlove adjustment model approach, it is clear that the production total of an agricultural commodity is calculated or calculated based on the product of the harvested area and its productivity.

$$Q_t = A_t \times Y_t \quad (12)$$

Also, the elasticity of the offer by product reflects how the whole production supply has responded to price changes. Three methods are frequently used to determine the elasticity of the supply: (1) directly from the offer function; (2) indirectly through a decline in the elasticity of the demand for inputs and the elasticity of production; and (3) indirectly through the elasticity of the production's component parts. in (Nainggolan & Suprapto, 1987). Following the indirect approach used by, the assumptions are: area (A) and productivity (Y) are responsive to price changes (P), on the other hand, productivity is also assumed to be responsive to changes in harvested area. Thus, the elasticity of supply for the production of an agricultural commodity is:

$QP = YP + AP\ (1+ YES)$ (13)

where QP is elasticity of supply of production to its price, YP is elasticity of productivity with respect to price, AP is $_{area}$ elasticity to price, and YES is $_{elasticity}$ of productivity to harvested area.

The elasticity value of each endogenous variable to the various explanatory variables in the model is used in making projections for each endogenous variable in the response model of harvested area, productivity, and production.

Nerlove's partial adjustment model was also applied to analyze dynamic demand behavior. This approach can explain differences in demand behavior in the short and long term. The basic assumption in Nerlove's partial adjustment model is that demand in a certain period (t) adjusts partially to the expected demand.

The long-run balance of demand can be formulated as follows.

$C^* = a_0 + a_1I_t + a_2P_t$ (14)

where C^* reflects the long-run balance of demand. However equation (14) cannot be predicted directly because the value of C^* cannot be observed. The hypothesis is then, that changes in current consumption will vary in proportion to the difference in the balance of long-term consumption and consumption in the past period, so that:

$C_t - C_{t+1} = (C_t^*- C_{t-1})$ (15)

where is the coefficient of the partial adjustment rate whose value is 0-1.The influence of other determinants on equation (15) can be added as explanatory variables so that it becomes:

$C_t^*= a_0 + a_1I_t + a_2P_t + a_3Ps_t + a_4Pop_t + a_5 Z_t$ (16)

where

C_t^* is demand for consumption in the long run equilibrium time t, I_t is population income per capita time t, P_t is price of product consumption time t, Ps_t is price of alternative product at time t, Pop_t is total population at time t.

Substitute equation (15) into equation (16) so that it becomes:

$C_t = a_0 + a_1 I_t + a_2 P_t + a_4 Pop_t + a_5 Z_t + (1\text{-}) C_{t+1}$ (17)

or in a simpler composite form with a stochastic confounding variable can be formulated as follows:

$C_t = b_0 + b_1 I_t + b_3 ps_t + b_4 Pop_t + b_5 Z_t + b_6 C_{t-1} + t$ (18)

Where $1\text{-} b\,6\,;\ a\,0 = b\,0\,/\,;\ a\,1 = b\,1\,/\,;\ a\,2 = b\,2\,/;\ a\,3 = b\,3\,/;\ a\,4 = b\,4\,/;\ a\,5 = b\,5\,/;\ a\,6 = b\,6\,/$.

The short-run elasticity of demand with respect to own price (Ep (sr)) and to income (Ei (sr)) can be formulated as follows:

$Ep\ (sr) = b_2(P/C)$ and $(Ei\ (sr)\ ) = b_1(I/C)$ (19)

Meanwhile, the long-term elasticity to own price (Ep (lr)) and to income (Ei (lr)) can be formulated as follows:

$(Ep\ (lr)) = Ep\ (sr)\ /$ and $(Ei\ (lr)) = (Ei\ (sr))$ (20)

or

$(Ep\ (lr)) = Ep\ (sr))/\ (1\text{-}b\ 2\ )$ and $(Ei\ (sr))/\ (1\text{-}b1)$ (21)

Application in Rice Production and Consumption ResponseMany studies on the supply and demand for agricultural products have been carried out using various analytical models, including trend analysis models and economic model (Simatupang et al., 2022). Nerlove's model of adequacy is tested by applying it to the equilibrium between the supply and demand for rice as a staple food product. Yes, this model can also be used with other food-producing plants. Given that the primary goal of this article is to explain how to apply the Nerlove adaption model approach rather than to analyze a particular product, the rice-based product is used as an example in this work.

The majority of the country's first rice supply is provided by domestic production, with only a little amount coming from imports and stockpiling changes. (Balqis,2020) With the use of the direct production function, which links the total output to the amount of harvested land, the cost of the raw material in question, the cost of the raw material of the competitor, the cost of inputs, and the cost of technology. However, (Gemill, 2013) asserts that the direct function of production has flaws, such as (a) the presence of too many variables, which frequently results in double collinearity, (b) the function of the harvest zone (zone of reaction), and the function of productivity (Réponse de rendement). despite the price influencing both, they are two distinct characteristics.

Since the price responses for the two functions differ, they must be estimated separately. Hence, the indirect approach using the function of cultivable surface area, the function of productivity, and the Nerlove approach is more representative of actual situations. Another benefit of using the indirect function is that it is more effective than the direct approach in parameter estimation.

In addition to the price of the raw materials, other factors such as irrigation and technology, particularly in the systems of vivrified agriculture in Asia, affect the variances in the area and productivity of rice. Further to being more accurate, this would prevent underestimating the impact of price on supply by excluding these factors.

The factors that can theoretically affect the harvested area other than the price of grain (Pg) are the price of alternative commodities (Pc), the input price (W), the area of land conversion (KL), for areas experiencing conversion of paddy fields, the area of irrigation (Irg), rainfall (Ch), and the area harvested in the previous period (A_{t-1}).

Thus the response of the rice harvested area is:

$A_t = f\ (Pg_t,\ pc_t,\ W_t,\ Pm_t,\ Kl_t,\ lrg_t,\ Ch_t,\ Y_{t-1},\ A_{t-1})$ (14)

where A_t is the area of the harvested commodity concerned at time t, A_{t-1} is the area of the harvested commodity concerned at time t-1, Y_{t-1} is productivity of the commodity concerned at time t-1, Pg_t is The price of the commodity concerned at time t, Pc_t is price of competitor's commodity at time t, Kl_{t-1} is land conversion at time t-1, W_t is price of input (fertilizer and or labor) in time period t, lrg_t is Irrigation facilities (% irrigation of total planted area) in time period t, Ch_t is rainfall in year t.

Based on the hypothesis that an increase in productivity from the previous year will have a positive impact on the amount of rice harvested the following year, the productivity of a period is included in the function of surface.

Meanwhile, the price of cereals (Pg), the use of seeds (F), the form quadratically using seeds (F^2), the intensification surface (Int), the surface from the previous year (A_{t-1}), and the productivity from the previous year are the factors affecting rice production (Y_{t-1}). The primary driver of productivity changes in agriculture is thought to be the use of technology, which is seen in the use of tractors and the intensification of soils. On the other hand, the productivity response to the use of inputs (fertilizers) within a certain period of time is quadratic, especially at stage II and stage III of the production function of a food crop commodity ((Mulyana, 1988); (Tomek & Kaiser, 2014). Thus the response to rice productivity is:

$$Y_t = = f\,(Pg_t,\ lnt_t\ ,F_t\ ,F_t^2,\ W_t,\ A_{t-1},\ Y_{t-1}) \qquad (15)$$

where

Y_t is Productivity of the commodity concerned at time t, Y_{t-1} is Productivity of the commodity concerned at time t-1, F_t is Use of fertilizer at time t, lnt_t is Actual area of intensification in time period t, F_t^2 is Square of fertilizer use at time t.

Therefore, the production of rice (grain) can be formulated as follows.

$$Qgt = A_t\ x\ Y_t \qquad (16)$$

where Qgt is total production in time period t, rice production (Qi) is the result of grain processing (milling), namely grain production multiplied by a conversion factor (k), whose value ranges from 0.60 - 0.65. In other words, rice production can be formulated as follows.

$$Qbt = k_t\ x\ Qgt \qquad (17)$$

Furthermore, for the purposes of projection, the elasticity parameter obtained from the estimation of the area function and the productivity function is used. Thus the projection of area, productivity and production of a commodity can be formulated as in equation (18), (19), and (20).

The quantity of a good that consumers can and want to buy at a specific location and time at various price points, with other factors remaining constant, is the fundamental notion behind consumer demand. The total of each consumer's individual demands makes up market demand. The demand can be expressed as a curve showing a negative relationship between the quantity of a good demanded and various price levels. Similar to the offer, the demand can be expressed mathematically when it is dependent on a number of factors, such as B. The product's price (Pi), as well as the prices of related goods (Ps), income per capita (In), population (Pop), demand the previous year (Q_{dt-1}). Incorporating the previous year's demand volume into the demand response model is based on an assumption that the previous year's demand affects this year's demand as a result of habits formation (Wohlgenant, 1982). The demand model for a commodity can be formulated as in equation (21).

$$Qd_t = g(Pi_t\,,\ Ps_t\,,\ In_t,\ Pop_t\,,\ Qd_{t-1}\,) \quad (21)$$

where Qd_t is quantity of commodity demanded at time t, Qd_{t-1} is quantity of commodity demanded at time t-1, Pi_t is commodity price at time t, Ps_t is price of substitute commodity (substitution) at time t, In_t is income per capita at time t, Pop_t is total population at time t.

If the market is assumed to be in a balanced condition (clear market condition), then the market price will be formed when supply equals demand ($Qs_t = Qd_t = Q_t$). The estimation of the demand function uses a standard approach which consists of two components, namely consumption per capita and total population. The total demand in a given year is the sum of the two demand segments.

Meanwhile, per capita consumption of a commodity (for food) is a function of: the price of the commodity, the price of substitute commodities, per capita income, and consumption of the previous period. Consumption per capita can be formulated as follows:

$$Ci_t = g(Pi_t, Ps_t, In_t, Ci_{t-1}) \qquad (22)$$

where Ci_t is per capita consumption of commodity i at time t, Ci_{t-1} is consumption per capita of commodity i at time t-1, Pi_t is price of commodity i at time t, Ps_t is price of substitute commodity (substitution) at time t, In_t is Income per capita at time t.

As in the case of production, the projection of per capita demand is carried out using price elasticity and income elasticity. The demand projection model can be formulated as follows:

$$Ci_t = Ci_{t-1} (1+ ii+ i) \qquad (24)$$
$$Pop_t = Pop_{t-1} (1+ r) \qquad (25)$$

where Ci_t is per capita consumption of commodity i for food at time t, Ci_{t-1} is per capita consumption of commodity i for food at time t-1.

The data collected is from secondary sources, both at the national and regional levels, which are time series data . The types of secondary data that will be collected include: 1. raw land area (000 ha); 2. harvested area (000 ha); 3. productivity (t/ha); 4. the price of the commodity under study (Rp/kg); 5. price of fertilizer (Urea, TSP/SP36, KCl, and ZA) (Rp/kg); 6. Labor wages (Rp/HOK); 7. area of harvested area irrigated (000 ha); 8. development of intensification program (000 ha); 9. fertilizer use (kg/ha); 10. rice consumption per capita (kg/year); 11. income per capita (Rp/year); 12. population (000 people); 13. consumer, wholesaler and producer price index.

All secondary data collected is at the national and provincial levels. The following data sources and respondents were used: BPS central and provincial, Directorate general of vivrified cultures, Ministry of Agriculture for vivrified cultures and horticulture, Bulog, and other sources.

RESULTS AND DISCUSSION

In general, the empirical results of the estimation of the zone response model, productivity, production, and rice consumption are reasonably good. After attempting several economic equations for each of these models, the parameters estimated for each response model in this study are better suited. Thus, the following discussion is the optimal result that can be presented in this paper.

The area response model and rice productivity are very good at explaining the existing factual conditions, it can be seen from $R^2 > 0.96$. In other words, the model's explicative variables have the ability to collectively explain the actual situation on the ground. In general, the outcomes of the parameters estimated for the variables in the empirical consumption model can also well explain the actual situations. From the sign and magnitude of the predicted parameters, it seems that they are in line with expectations so that the calculation of elasticity and projection of each endogenous variable can give quite rational results.

Production Response

The following discusses the influence of each variable or factor on the performance of the harvest area, the productivity of rice plants as outlined in the production response model. The sign and magnitude of each estimated parameter and the magnitude of its elasticity are the focus of the discussion in line with the existing economic theory considerations.

The estimation results of the harvest area response model based on the Nerlove adjustment model for each region and nationally are presented in Table 1 and Table 2. In general, the sign and magnitude of the estimated parameters of each explanatory variable in the model are in line with expectations, especially the economic implications. In the following, A discussion of the findings from the estimation of the riceicole surface response model is presented.

The response of harvested area and rice productivity is grouped into four regions, namely Sumatra, Java and Bali, Sulawesi, the rest of Indonesia, and nationally. As an illustration of the gap between domestic production and consumption, only a nationwide analysis of the rice demand is done. Despite the fact that the price of cereals is typically not significant at the agricultural level, it has a positive impact on the development of riceoclastic zones in four regions (Sumatra, Java and Bali, Sulawesi, and the rest of Indonesia), as well as at the national level. Corn is a competitor to rice farming in land use throughout the region, although the estimated parameters are not real. Other factors such as irrigated surface area, precipitation, productivity slowdown, and cultivated surface area all have a positive impact on the growth of cultivated surface area.

Each of these factors in Sumatra has a significant score of 0.17, 0.21, and 0.001 and has an impact on the performance of riceicle surfaces. These factors are pluviometry, productivity lag, and underbrush. Yet, the surface that was harvested is not elastic to changes in the model's explanatory factors. In other words, farmers don't appear to be impacted by changes in the price of grains or milk as competitors and grow rice on their land both in the short and long term, with short-term elasticities ranging from 0.0164 to 0.0456 and long-term elasticities between -0.0007 and -0.0019.

Specifically in Java and Bali, the area of agricultural land conversion was included as one of the explanatory factors in the area response model and turned out to have a negative effect on the rice harvested area and was significant at the 0.06 level. This reflects that as a substitute for the declining harvest area due to land conversion in Java and Bali, extensification must be carried out through expansion of the standard area outside Java and increasing the cropping index in Java and Bali as well as outside Java and Bali.

In addition to the factors already mentioned, precipitation, productivity, and crop area delay all have significant positive effects on crop area development, with respective significance values of 0,002, 0,18, and 0.02 respectively. Similar to Sumatra, the growth of riceicole zones in Java and Bali is not sensitive to price changes, but is slightly more sensitive to irrigated land, with short- and long-term price elasticities of 0.298 and 0.498 respectively.

Although the surface of the irrigated riceières has a positive impact on the harvested surface, it is not statistically significant. According to parameter estimates, which are located at a real-world level of 0,05, the maze is the main competitor of rice cultivation in the Sulawesi region. The area of irrigated rice fields and the delay in the harvest zone are two more factors with positive impacts and statistical significance, with significative values of 0.02 and 0.001, respectively.

Table 1.
Parameter Estimation Results for Rice Harvested Areas in Sumatra, Java and Bali, and Sulawesi

Sumatra						
Variable	Estimate Parameters	Prob> T	Term Elasticity		Change Elas/yt	Variable Label
			Short	Long		
Intercep	-122005	0.557				Intercept
Hgabah	9.1085	0.5808	0.0164	0.0456	0.0029	Price of grain
Corn	-0.4816	0.9924	-0.0007	-0.0019	-0.0001	Com Price
Luirig	0.1131	0.6376	0.0498	0.1383	0.0089	Inigation area
Chujan	0.0346*	0.1782				Rainfall
Lpdvt	161.4816*	0.2143				Productiv ity Lag
Lgluas	0.6403***	0.0039				Lagharve st area
Years	16063	0,5583				Trend
R- square		0.9887				
Dw		2,384				

Sulawesi						
Variable	Estimate Parameters	Prob> T	Term Elasticity		Change Elas/yt	Variable Label
			Short	Long		
Intercep	39.3873	0.7448				Intercept
Hgabah	6.0117	0.6552	0.0216	0.0775	0.0056	Price of grain
Corn	-52. 6798**	0.0474	-0.1465	-0.5261	-0.0380	Com Price
Luirig	0.3696	0.2978	0.1822	0.6541	0.0472	Inigation area
Chujan	0.0334**	0.0164				Rainfall
Lpdvt	20.8664	0.6417				Productiv ity Lag
Lgluas	0.7214***	0.0001				Lagharve st area
R- square		0.9642				
Dw		1,871				

Note *= significant at 20% level; ** = real at level 10*;*** = real at 1% level

Source: Processed Data

Except for the red chili per capita consumption response model, the response model used for rice consumption is quite good in explaining the factual conditions in the field. Simultaneously the explanatory variable used in the model is able to explain the development of the harvested area of this commodity with R2 of around 0.90. The results of the estimated consumption model parameters for each commodity are presented in Table 2.

Nationally, it seems that income, The two main factors influencing the evolution of per-person rice consumption in Indonesia are population and consumption arriérés, each with a significance threshold of 0.202, 0.063, and 0.006 respectively. Although the price of rice has a negative impact on the amount of rice consumed per person, it is not significantly so. Corn seems to still be a complementary product to rice even though the effect is not real on rice consumption. In general, the consumption of rice per person does not change in response to changes in internal prices, the prices of ancillary goods, and per-person income, both temporarily and over the long term. However the elasticity of rice consumption relative to per-capita income is negative, namely –0.148 and –0.287. In other words, both in the short and long term, rice consumption per capita tends to decrease when the income per capita of the population increases (Table 2).

As a result, the consumption of rice per person generally does not respond to changes in price, including those of its competitors' and complementary products' prices as well as changes in per-person income. These findings are consistent with those of several earlier studies.

The price of basic meat as determined by the analysis of the market's response demonstrates that Indonesian meat producers react to changes in price. Their findings show that in comparison to the elastic values of the other factors, surface elasticity and offer elasticity price are the most elastic. Because the price is a significant variable in the response or reaction to the productivity of the maze surface, the government must have a base price policy in order to encourage farmers to grow maze. Yet, if the price-based policy guidelines need to be revised, these guidelines must be effectively implemented. This will incentivize farmers to increase their production at prices that the government will guarantee.

Table 2.
Results of parameter estimation of rice consumption

Variable	Estimate Parameters	Prob> T	Term Elasticity		Change Elas/yt	Variable Label
			Short	Long		
Intercep	-17.80138	0.663				Intercept
Hberas	-0. 85610	0.8833	-0.0132	-0.0012	0.0012	Rice price
Jagkon	3.851906	0.3776	0.0762	0.0072	0. 0072	Com Price
Income	-0.0028*	0.1201	-0.1479	-0.0139	-0.0139	Income
Pendd	0.0006**	0.0627				Jl. population
Lgkonber	0. 4848***	0.0255				Lag con. rice
R- square		0.8981				
Dw		2,127				

Source: Processed Data

According to the ECM's analysis, the ma's internal prices have a real impact up to a certain point. The positive indication of the price of the crop suggests that if prices rise by 10%, farmers will respond by increasing the crop's surface area. The value of the elasticity of the surface area offer in relation to the mortgage rate is positive and elastic, although it is more elastic in comparison to other factors. The value of the offer's price-elasticity demonstrates how strongly manufacturers react to price changes.

Increasing the ma's productivity (intensification). The analysis of the research's findings demonstrates that, in addition to the use of the base price-rendement policy, there is positive short- and long-term elasticity of responses to the productivity of the maze price. So, it stands to reason that when the price of the commodity rises, efforts to increase the supply (production) of the commodity are better directed toward increasing the productivity (intensification of the commodity).

The region's maze production can

be increased (extensified) in response to the positive short- and long-term elasticities of the maze surface. This can satiate the objectives of increasing maze output. The government has the option to increase the area under the marsh to achieve self-sufficiency, particularly for the mars (extensification). The goal of factory expansion is to increase production by enlarging or adding factory space. The expansion of the maze surface can be accomplished by making the most of large uncultivated areas and by adding arable areas both in Java and outside. Also, in the domanial forest zones (Perhutani), the expansion of the surface can be accomplished by planting additional trees among the main crop types, and the expansion can be accomplished by using less-than-ideal land (tourbes and marécages) as well as other unproductive land.(Lantican, 1990).

CONCLUSIONS

The yields of cultures and the productivity of raw materials clearly benefit from the maas price. The price of the maze may be used as a guide by farmers when assigning surfaces. As the price of the crop rises, farmers are encouraged to expand their land, which ultimately increases the amount of harvested area. In addition, farmers are encouraged to increase their maze production as maze prices rise. Farmers generally want to manage their maze farm as best they can when the price of maze is relatively high since they have a possibility to make a better income.

The cost of raw materials for soy also influences the surface of the meal. Despite being very small, the reduction in ma's surface area will result from the increase in soya prices. The price of the imported ma's is well understood by farmers. Farmers will increase the area planted in maze if the price of maze rises. Since the majority of the maze product is used as feed for the livestock during this time, the cost of avian food is also a factor in determining the maze's surface area. Other factors that affect the productivity of the maze include the cost of the semences, urea, engrais, and labor costs in addition to the maze's purchase price. The price of seeds and engraves based on urea has changed negatively from the perspective of farmers. Increased prices for menstrual suppliesand urine will cause people to use less of these supplies, which will have an effect on the labyrinth's productivity. The farmers have reacted favorably to wage increases because the maze culture does not require a lot of labor, and even while labor costs are rising, maze productivity can increase through the use of labor. The price of fourrage has a favorable impact on Indonesia's provisioning of maize. Even though the effect of animal food price increases is not particularly elastic, farmers will increase the supply of meat as a result of price increases. Moreover, the precipitation variable has a negative and significant coefficient, indicating that heavy precipitation decreases the supply of maize because more maize is planted during light precipitation.Based on the estimation's findings, the base price policy can be reinstated to increase farmers' incentives to cultivate the crop because it has a significant impact on the amount of land that can be farmed and the productivity of the crop Government's attempt to increase the minimum.

The partial adjustment model used in this analysis is quite good for the purposes of projecting a land-based agricultural commodity. This condition can be seen from the efficiency of the estimated parameters of each explanatory variable simultaneously very well, which is indicated by the termination coefficient above 95%. For the purposes of empirical analysis, this model is very suitable.

The implications of the empirical results of this study include the need for a review of the elimination of subsidies, import tariffs and protections which resulted in the supply of domestic production components continuing to decline, while demand increased more rapidly, resulting in a larger supply deficit.

The development of technology with high domestic components should receive greater attention. Utilization of internal inputs on land conditions that are already poor in nutrients is an alternative that is quite sustainable. Integration of various commodities in a production system by utilizing synergistic relationships between components can reduce excessive dependence on external inputs. Such a system is suitable for farmers with narrow land holdings in the perspective of small and medium scale agribusiness.

Providing protection for domestic rice through the imposition of import tariffs as has been taken by the government recently accompanied by improvements to the marketing system for products and rural infrastructure development. However, the level of ad-valorem tariff imposed needs to take into account the price of rice on the world market and the exchange rate of the rupiah against the US dollar.

To maintain the stability of food supply, especially rice, domestic production activities still need to be protected, either in the form of input price subsidies or the imposition of tariffs on imported food products.

Take advantage of the sources of agricultural production growth driven by market demand through: (1) expansion of planting area (extensification and improvement of cropping index), (2) increase in productivity with the application of site-specific technology, (3) increase yield stability with early warning systems, (4) reducing yield gaps between research results and farmer level as well as between regions through more accurate charactericeation and zoning of resources, and (5) reducing yield and post-harvest losses through participatory development of agricultural tools and machinery.

REFERENCE

Adnyana, & Maulana, M. (1988). Farm business land size and farmers' welfare: smallholders' existence and agrarian reform urgency. *Analisis Kebijakan Pertanian*, 10(1).

Directed-Seeded, D. (n.d.). *Rice Culture*. Rice Research Studies 2011. https://scholarworks.uark.edu/cgi/viewcontent.cgi?article=1052&context=aaesser#page=251

FS da Mota. (1980). *Meteorological aspects of rice production in Central and South America—current and future*. In L. R. Cowell (Ed.), Agrometeorology of the Rice Crop (pp. 9–17). The International Rice Research Institute. https://books.google.com/books?hl=en&lr=&id=BVVkIDX981MC&oi=fnd&pg=PA9&dq=%22rice+production%22&ots=I_biCpI43W&sig=rPfQY_5iZwdDCO6xI5RVmxx0nk

Gemill. (2013). The response of maize production in Kenya to economic incentives. *Agricultural Economics*, 16(1).

Handbook, L. R. P. (1999). *Louisiana Cooperative Extension Service*. Louisiana Agriculture Experiment Station. LSU

Handbook, R. P. (2001). *University of Arkansas Division of Agriculture Cooperative Extension Service Handbook* MP192: University of Arkansas. Fayetteville.

Isvilanonda, S., & Zimmer, Y. (2014). *Agri Benchmark report 2014/1 on "Economics of Southeast Asian Rice Production*." https://www.researchgate.net/publication/274065751

John, S. (1991). The Role of Government and Other Institutions in The Development of Rice-Fish Culture in Thailand. *Agricultural Administration (Research And Extension) Network*, 28(1). http://ageconsearch.umn.edu

Lantican, F. A. (1990). *Present and Future*

Market Supply and Demand for Diversified Crops. Training Course on Diversified Crops. Irrigation Engineering Held at DCIEC Building, NIA Compound, EDSA. Queson City.

Moldenhauer, J. A. K. (2012). B.R. Wells Rice Research Studies. In *Arkansas Agricultural Experiment Station Research Series*.

Mulyana. (1988). The Impact of Prices and Macroeconomic Policies on Agricultural Supply: A Synthesis of Available Result. *Agricultural Economics*, 16(1).

Nainggolan, & Suprapto. (1987). Effects of agricultural policy change on maize supply in developing countries. *International Journal of Agricultural and Food Research*, 2(3), 50–61.

Abueva, J. V. & G. R. W., & ... (1973). A Comparative Study of Administrative Perceptions: Rice Administration in Indonesia, Korea, the Philippines, and Thailand: a Terminal Report to the …. *Technology and Development Institute, East-West Center & Institute of Governmental Affair*.

Pavithran, K., & under Geographical, B. (2014). Indication Protection: The Attitude of Farmers. *Journal of Intellectual Property Rights*.

Production, P. R. (1966). Extension Project in Baliwag, Bulacan: A Joint Report Submitted by the Chinese Agricultural Technical Team and Its Philippine Counterpart. No publisher listed),(Manila: 1966).

Pusdatin. (2022). *Corn Commodity Outlook 2016*.

Quartina Pudjiastuti, A., Mekse Korri Arisena, G., & Keswari Krisnandika, A. A. (2021). Rice Import Development in Indonesia. *SOCA: Jurnal Sosial, Ekonomi Pertanian*, 15(2), 390. https://doi.org/10.24843/soca.2021.v15.i02.p14

Silalahi, N. H., Yudha, R. O., Dwiyanti, E. I., Zulvianita, D., Feranti, S. N., & Yustiana, Y. (2019). Government policy statements related to rice problems in Indonesia: Review. *Journal of Biological Science* (Vol. 3).

Simatupang, I. M., Suryadi, S., & Adhiana, A. (2022). Analysis Of Factors Affecting The Demand For Soybean in North Sumatra Province. *Jurnal Mahasiswa Agribisnis*, 1(1).

Balqis S.A. (2020). PENGARUH KAPASITAS PENGOLAHAN PENGGILINGAN PADI TERHADAP JUMLAH PASOKAN BERAS DAN PENDAPATAN USAHA PENGGILING PADI DI … [UNIVERSITAS SRIWIJAYA]. In repository.unsri.ac.id. https://repository.unsri.ac.id/29841/57/RAMA_54201_05011281621054_0002126001_0023047909_01_front_ref.pdf

Suryadharma. (2010). Estimation of Elasticity of Output Supply and Input Demand in Rice and Corn Farming: Multiinput-Multioutput Approach. *Journal of Agroeconomics*, 32(2).

Tomek, W. G., & Kaiser, H. M. (2014). *Agricultural product prices*. Cornell University Press.

TRENDS, R. P. (n.d.). *Dampak Alih Fungsi Lahan Sawah Terhadap Tren Produksi Padi Dan Pendapatan Petani Di Desa Cahaya Negeri Kecamatan*. repository.unsri.ac.id. https://repository.unsri.ac.id/8125/2/RAMA_54201_05011181419051_0010076406_0003096601_01_front_ref.pdf

Wohlgenant, M. and W. H. (1982). Dynamic Adjustment in Monthly Consumer Demand for Meats. *American Journal of Agricultural Economics* (AJAE).

Yusuf, M. A., Sundari, S., Purwanto, I. D., & Kurnia, R. R. (2024). Rice Production, Policies, and Their Implications on Food

Security Indonesia - Thailand Perspective. *Jurnal Multidisiplin Madani*, 4(1), 174–179. https://doi.org/10.55927/mudima.v4i1.7927