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TREND AND SWOT ANALYSIS OF RICE PRODUCTION, DEMAND IN KUTAI KARTANEGARA REGENCY, INDONESIA

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ABSTRACT

The demand for rice is increasing along with consumer preferences and population growth. Therefore, the availability and sufficiency of rice is one of the most crucial challenges because rice is a staple food, the scarcity of which will affect the social life of the community. The demand for rice in Kutai Kartanegara Regency continues to increase, for this reason it is necessary to study in more depth the projected production and demand for rice as well as what strategies must be implemented in developing rice farming. The purpose of this study was to analyse the projection of rice production, the rice demand projections, and analyze rice farming development strategies. The research was conducted in Kutai Kartanegara Regency, East Kalimantan Province, Indonesia. There were seven sample sub-districts that became rice production centers, namely: Samboja, Muara Jawa, Loa Janan, Sebulu, Tenggarong Seberang, Muara Kaman, and Loa Kulu. Data were collected through key persons. This research utilised both primary and secondary data sources, employing data collection methods such as in-depth interviews, observation, and documentation. The acquired primary data was utilised in a Strengths, Weaknesses, Opportunities, and Threats (SWOT) analysis. A total of 73 key informants were questioned, including 2 agricultural service officials, 7 sub-district heads, 28 village heads, 14 officials from the technical implementation section of the Agricultural Extension Centre, and 22 leaders of farmer groups. Secondary data was processed with double exponential smoothing for projection analysis. This investigation utilised secondary data spanning from 2015 to 2023. The results of the research showed that the increasing population growth was not in line with the demand for rice food in Kutai Kartanegara Regency. Rice production growth fluctuated and tended to decline in the period 2017 to 2021. Furthermore, for the period 2021 to 2023 there had been an increase. The difference between supply and demand for rice in the period 2015 to 2020 experienced a surplus and tended to decrease, even experienced a deficit starting in 2021 and is projected to continue experiencing a deficit until 2030. The result of the SWOT analysis of rice farming development applied an aggressive strategy. Based on the analysis of production projections, projections of rice demand for Kutai Kartanegara Regency, as well as obtaining various rice commodity development strategies, it can be recommended that the government adopt policies to maximize support for rice farming. It is hoped that the results of this research can be used as a reference for other researchers.

Key words: rice production, rice demand, projections, development strategies, rice farming

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INTRODUCTION

The development of rice farming in Kutai Kartanegara Regency, East Kalimantan Province is based on the increasing demand for rice. Food needs increase along with the increase in population. In 2010, the population of Kutai Kartanegara Regency amounted to 626,680 people compared to 786,123 people in 2019 [1,2]. The existence of the National Capital City located in Kutai Kartanegara Regency and North Penajam Paser Regency of East Kalimantan Province triggers food demand. As the population increases, followed by an increase in consumer preferences, the demand for rice will also increase. Therefore, the availability and sufficiency of rice as a staple food are important. The population, rice demand and rice supply are presented in Table 1. As rice is a staple food commodity, it has an impact on people's social life if the supply of rice is insufficient.

Kutai Kartanegara Regency is required to immediately prepare itself so that it can take action to increase the supply of rice. Kutai Kartanegara Regency as one of the Capital of the Nusantara (*IKN*) areas should also be able to develop the rice commodity. The rice commodity is one of the commodities that has potential and is a superior commodity for this district. This is in line with the statement that rice is the superior commodity of the Kutai Kartanegara Regency area [3].

It is hoped that this potential can make an important contribution, namely making a significant contribution to the demand for rice in the National Capital City (*IKN*). The development of sub-district-based rice farming has a strategic role and is important in supporting regional economic growth and job creation which has implications for increasing people's income and increasing the level of community welfare.

In line with the relocation of the National Capital to North Penajam Paser Regency and Kutai Kartanegara Regency, the orientation of agricultural development, especially in food supply, has become a priority. Agriculture is a business that is managed profitably and sustainably, which is an agribusiness paradigm that should be developed. Therefore, it is appropriate to determine the development of rice farming. This is also supported by research findings that the capacity to provide rice food in East Kalimantan Province is still lacking [4]. For this reason, it is necessary to carry out an in-depth study of rice production projections, rice food needs and the development of rice farming in Kutai Kartanegara Regency, East Kalimantan Province, Indonesia.

LITERATURE REVIEW

Development is a process of deliberate change to meet the needs of society. The implementation of development is greatly influenced by the physical and non-physical conditions of a society so the acceleration of development in each country

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is not the same. Development is a process that has multiple dimensions, including changes in the orientation and organization of social, economic, political and cultural systems. Development that is oriented towards the human element also means preparing people to actively participate in the sustainable development process. The development efforts undertaken so far, with various forms and variations, are carried out to improve the level of community welfare [5]. One of the efforts made is the development of rice farming with the aim of increasing production.

Production is the use or utilization of resources that transforms one commodity into another, completely different commodity [6]. In summary, production is a process of changing input into output [7]. The relationship between input and output is seen as a production function. The production function determines the maximum output that can be produced from a certain amount of input, under certain conditions of expertise and technical knowledge [8]. Rice commodity production varies quite widely from one period to the next. The factors that cause variations in production include rainfall levels, outbreaks of plant-destroying insect pests, changing weather, and the farming methods used. On the other hand, human food consumption, by itself, does not vary. People need a more or less constant level of food supply based on regular consumption of the required amount of food. The relationship between food production and food needs can be used as a basis for discussing that the required food production is not in line with population growth/food needs. This is as stated by Thomas Robert Malthus, that the population will exceed the amount of food supplies needed [9].

Domestic rice production is very important to avoid the high risk of price volatility and rice availability on the world market. Rice production is the process of changing production inputs into rice that is ready for consumer use. The amount of rice production in Indonesia is greatly influenced by the amount of harvested area and the level of productivity. Even though there is a trend of increasing production and productivity, Indonesia is not yet able to meet its own domestic food needs (self-sufficiency). This is because the growth in national rice consumption has not been able to be balanced by the growth in production. Indonesia is also a net importer of rice in the world even though it is the third largest rice producer in the world after India [10]. In certain areas in Indonesia, rice production has exceeded need/demand. For example, research results in North Sumatra Province stated that rice production was greater than rice consumption in North Sumatra Province [11]. Fluctuations in rice production in North Sumatra Province with an increasing trend. This indicates the potential for higher production growth in the future. Even though there has been an increase in production, dependence on rice imports is still quite significant, indicating that the efficiency of rice production in North Sumatra is not yet optimal [12]. Rice production has fluctuated and increased, exceeding the

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demand/consumption of rice in the country. Even though there is a rice surplus, Indonesia still imports rice from other countries [13]. The same thing is happening in other areas, namely the trend of rice production in the Sipilu Center area (Sidrap, Pinrang, Luwu) is experiencing an increase in production [14]. Projections for rice production and rice consumption in Bondowoso Regency are expected to increase [15]. Different results occurred in East Java Province, namely that rice production experienced a decline [16].

The need for rice in general is an activity aimed at reducing or depleting the usability of an object, whether in the form of goods or services, to meet immediate needs and satisfaction. Consumption is a number of goods that are used directly by society to meet their needs [17]. Demand for rice tends to increase from year to year along with population growth. On the supply side, rice production fluctuates from season to season, so that at certain times there is excess supply (harvest season) and excess demand (famine). As Sukirno said, this condition often causes market instability [18]. Along with the increase in population, demand for rice increases. As research results state, every year there is an increase in demand for rice and consumption of rice [19]. This is the result of research which states that consumption tends to increase [18]. If there is a supply of rice, the demand will be satisfied [20]. The rice import policy is no longer appropriate if it is taken as an alternative food supply for the Indonesian population. Other policy strategies that can be offered are a) diversifying people's food consumption patterns; b) increasing farmer partnerships; and (c) socialization of food consumption development plans from the center to the field unit level [10]. Based on the theoretical and empirical studies above, it can be said that meeting rice food needs in the future will be met if rice production is available.

Providing rice food for the population can be done with efforts to develop rice farming. The development of a farming business including rice farming cannot be separated from the strategy that is being utilized. Strategy is a tool to achieve goals. Strategy has two concepts, namely: distinctive competence and competitive adventive. One of the analytical tools often used to analyse development strategies is SWOT analysis. This analysis is based on logic that can maximize strengths and opportunities but can simultaneously minimize weaknesses and threats [21]. Furthermore, it is said that organizational performance is determined by a combination of internal factors or Internal Strategic Factor Analysis Summary (IFAS) and external factors or External Strategic Analysis Summary (EFAS). Various studies have been conducted by various researchers related to the problem of determining strategy, both in the business, government, organizational, social and cultural sectors, as well as in the context of making other policy strategies. This research has been conducted by Fahmi RR and M Hayati, Hoesain *et al.*,

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Puspanegara *et al.,* Sakina, Zuhri and Sofianto, Gumilar *et al.,* Erlina et al., Malia *et al.,* Saleh *et al.,* Uria, Wardani and Widyatami, Marciatie *et al.,* Soegoto *et al.,* Tyas *et al.,* Sahara *et al.* and Rahmawati *et al.* [22 – 37]. Based on theoretical studies and previous researches, the objectives of this research were to analyse the projection of rice production, rice demand projections, and analyze rice farming development strategies. This research is useful as a reference for the Government of Kutai Kartanegara Regency in developing rice farming.

RESEARCH METHOD

This research used a quantitative research design with a quantitative descriptive model. Descriptive research format aims to explain, summarise various conditions, various situations, or various variables that arise in the community that is the object of research based on what happens [38]. This research was conducted in Kutai Kartanegara Regency, East Kalimantan Province, Indonesia. There were seven sample sub-districts that became rice production centers, namely: Samboja, Muara Jawa, Loa Janan, Sebulu, Tenggarong Seberang, Muara Kaman, and Loa Kulu sub-districts. The reason the purposive method was used to select this sub-district was because this sub-district is a rice production center in Kutai Kartanegara district. According to research findings, Loa Kulu, Tenggarong Seberang, Anggana, Sebulu, and Muara Kaman are basic sub-districts that produce rice [39]. The data sources used in this research were primary and secondary data. The data collection techniques in this research include in-depth interviews, observation, and documentation.

Primary data collected was used in a SWOT analysis. Primary data was collected through in-depth interviews with government officials and farmers (key informants) to find out the internal and external factors that are owned in the context of developing rice farming in Kutai Kartanegara Regency. Key informants interviewed totalled 73 people, with details are Officials of the Agriculture and Livestock Service Office of Kutai Kartanegara Regency of 2 people, Sub-District Heads of 7 people, Village Heads of 28 people, Officials of the Technical Implementation Unit of the Agricultural Extension Centre of 14 people, and Heads of Farmer Groups of 22 people.

For analysis of projection production, projection of the population, and projection of rice demand, secondary data source from the Central Statistics Agency of Kutai Kartanegara Regency was used [1, 2, 40]. The secondary data for this analysis used data range from 2015 to 2023.

The analytical method used for forecasting/projection is a forecasting analysis technique using the double exponential smoothing method with the following formula [41]:

1) Single exponential smoothing:

$$\hat{y}t = yt + (1 -)\hat{y}t - 1 \; \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \quad (1)$$

2) Double exponential smoothing:

$$Lt = \hat{y}t + (1 -)(Lt - 1 + Tt - 1) \; \dots \dots \dots \dots \dots \dots \dots \dots \dots . \; . (2)$$

$$Tt = \beta \, (Lt - Lt - 1) + (1 - \beta)Tt - 1 \; \dots \dots \dots \dots \dots \dots \dots \dots \dots (3)$$

$$\hat{y}t + p = Lt + pTt \; \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots (4)$$

Information:
ŷt = single exponential smoothing value
yt = actual data at time t, t=1..., n
Lt = double exponential smoothing value
α, β = smoothing constant
L, T = Estimated Level and Trend at time t
$\hat{y}_{t+p}$ = Time series prediction value at t+p

The accuracy of the forecasting method is seen from the forecasting error. This research used Mean Absolute Percentage Error (MAPE) to select the best method and determine forecasting accuracy. Mean Absolute Percentage Error assessment criteria are presented in Table 2. Forecasting ability is said to be good if it has a MAPE value below 10%. The MAPE value can be calculated with the following equation [41]:

$$MAPE = \left(\frac{100\%}{n}\right)\sum_{t=1}^{n} \frac{|\, Xt - Ft \,|}{Xt} \; \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots . . (5)$$

The calculation of rice production is by converting milled dry grain (*GKG*) using data released from *BPS* with the criteria for converting milled dry grain (*GKG*) into rice of 64%. Next, to calculate the amount of demand for rice, it is calculated based on rice consumption with reference to the Food Security Agency of the Ministry of Agriculture, amounting to 94.9 kg/capita/year.

Analysis of rice commodity development strategies using SWOT analysis. SWOT is an abbreviation, S is Strength, W is Weakness, O is Opportunity, and T is Threats. SWOT is usually used to analyse a condition where a plan will be made to do something. SWOT is a systematic identity of various factors to formulate a strategy [21]. An overview of the internal and external factors of farming can be outlined in the SWOT matrix. The SWOT matrix can be used to explain how to deal with opportunity and threat factors by adjusting the elements of your strengths and weaknesses. Through this matrix, four possible strategic alternatives are obtained, namely: 1) SO Strategy, farming develops alternative strategies using optimal capabilities that utilize strengths in order to win opportunities; 2) ST Strategy, an

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alternative strategy through optimizing existing forces to reduce threats; 3) WO Strategy, farming uses strategies by optimizing opportunities and minimizing weaknesses; and 4) WT strategy, every farming business must be faced with threats, and also has weaknesses. For this reason, strategies are developed to the extent possible that threats can be avoided, and weaknesses can be minimized. The SWOT indicators used in this research are: a) Strength (S) with indicators availability of farmer labor, availability of land, existence of farmer institutions, availability of economic institutions, and availability of agricultural machine tools; b) Weakness (W) with Indicator decreasing number of farmers, limited production/farming access, decreasing level of land fertility, limited development of agricultural irrigation, and the lack of farming partnerships; c) Opportunities (O) with indictor Kutai Kartanegara as a part of Capital of The Nusantara (*IKN*), the support of the local government for agricultural development, the availability of market opportunities for agricultural commodities, the availability of appropriate technology, and the availability of agricultural extension officers, and d) Threats (T) with Indicator instability of climatic conditions, free market competition, limited accessibility of agricultural production distribution, pest and disease attacks of agricultural commodities, and agricultural land conversion.

RESULTS AND DISCUSSION

Rice production projection for Kutai Kartanegara Regency

Rice is the staple food of the people of Kutai Kartanegara Regency. Rice comes from paddy (Grain). Calculating rice production, milled dry unhulled grain (*GKG*) must be converted first. The conversion of grain to rice used data released from Central Bureau of Statistics (*BPS)*, the conversion of milled dry grain (*GKG*) to rice was 64% [42]. In the period 2015 to 2023 rice production of Kutai Kartanegara Regency along with the production of milled dry unhulled rice fluctuated. From figure 1, it can be said that rice production data from 2015 to 2023 depicts rice production as a trend data pattern.

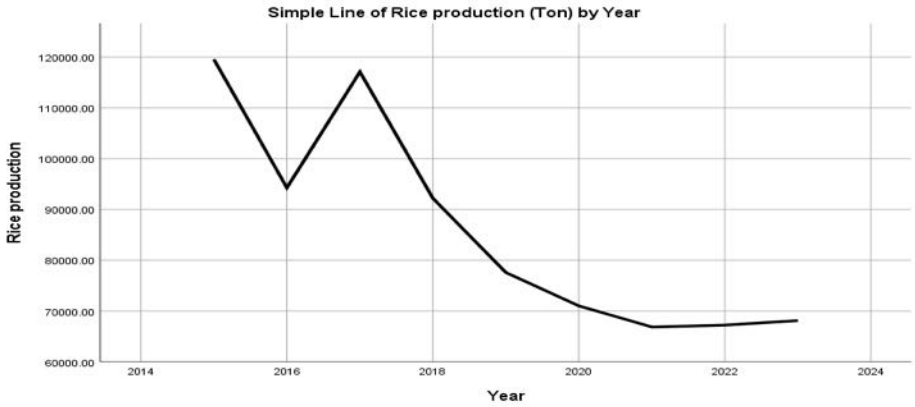

Figure 1: Rice production, 2015 -- 2023
Source: Data Analysis, 2024

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To determine rice projections, the double exponential smoothing method was used with the help of the SPSS Version 26 computer program, Brown's linear trend criteria. The results were as follows: The results of projections for rice production in Kutai Kartanegara Regency from 2024 to 2030 using the double exponential Brown's linear trend method are shown in Table 4. Based on this table, it can be stated that the rice projections for Kutai Kartanegara Regency for the period 2024 to 2030 have decreased. Figure 2 explains that the forecast results for rice production in Kutai Kartanegara Regency, East Kalimantan Province, Indonesia for the period 2024-2030 were still between Upper Control Limit (UCL) and Lower Control Limit (LCL). This meant that rice production was at the Upper Control Limit (UCL). Upper Control Limit (UCL) is the line that shows the highest deviation from the standard value or is also called the line above the center line which shows the Upper Control Limit. Furthermore, Lower Control Limit (LCL) is the line that shows the lowest deviation. In this figure, it can be seen that all forecasting values were still within the Upper Control Limit and Lower Control Limit hence Brown's double exponential smoothing one parameter forecasting method is suitable for use to predict rice production in the future period in Kutai Kartanegara Regency.

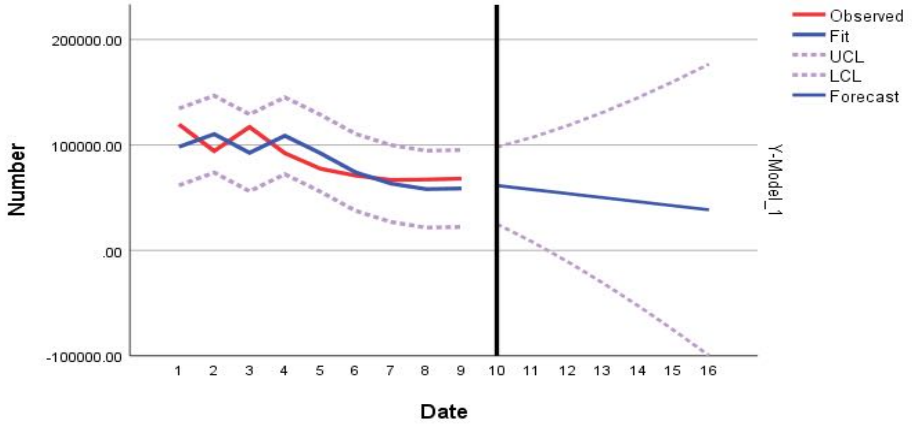

Figure 2: Rice projections, 2024 -- 2030
Source: Data Analysis, 2024

Projection of the population of Kutai Kartanegara Regency

Population figures forecasting was carried out using double exponential smoothing Brown's linear trend criteria, starting with determining the time series pattern of population data for Kutai Kartanegara Regency from 2015-2023. The population of this district has fluctuated and starting in 2020 experienced an increasing trend again (Figure 3). Figure 3 shows data with a trend pattern. The next stage was to calculate the accuracy value of the forecasting model used. For population projections, the MAPE assessment was used (Table 5).

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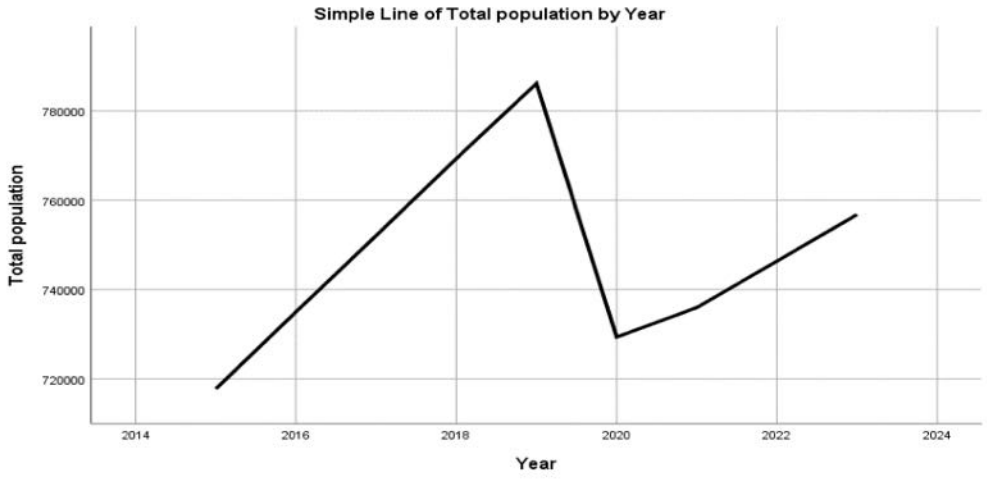

Figure 3: Graphic plot of population data, 2015--2023
Source: Data Analysis, 2024

Based on Table 5, it can be seen that the MAPE value was 2.675%, which meant that the error rate of this forecasting method had a very small value. Thus the method used in this forecasting was very good. The relocation of the Indonesian Capital City (*IKN*) will have an impact on population growth. The population of Kutai Kartanegara Regency has increased. The results of forecasting population using the Brown's linear trend double exponential smoothing method using IBM SPSS version 26 software showed that the projected population in Kutai Kartanegara Regency from 2024 to 2030 showed a tendency to increase (Table 6).

Figure 4 shows the forecast results for the population of Kutai Kartanegara Regency in 2023-2030 which was between the UCL and LCL values. This meant that all forecast values were still within the Upper Control Limit and Lower Control Limit, and hence exponential smoothing forecasting method with Brown's linear trend criteria is suitable to be used to predict the population in the future period in Kutai Kartanegara Regency.

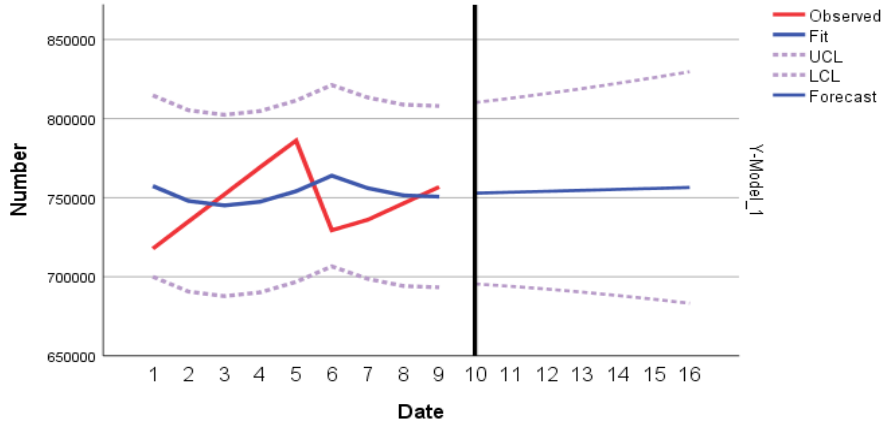

Figure 4: Population projection, 2024—2030
Source: Data Analysis, 2024

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Projection of rice demand

The need for rice was calculated based on rice consumption with reference to the Food Security Agency of the Ministry of Agriculture, that was 94.9 kg/capita/year [43]. In the period 2015 to 2023, the demand for rice in Kutai Kartanegara Regency fluctuated. From 2015 to 2019 there was an increase and from 2019 to 2020 it decreased, and then increased until 2023. Based on Figure 5, it can be said that the rice demand data from 2015 to 2023 depicted a seasonal data pattern. Seasonal data patterns are data fluctuations that occur every certain period.

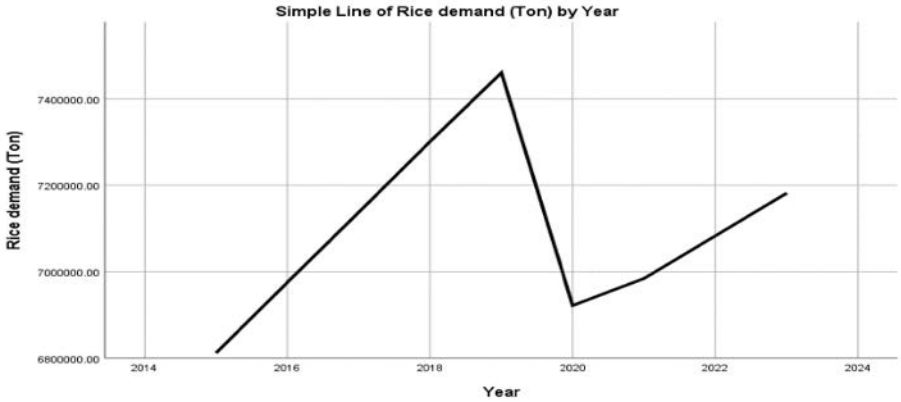

Figure 5: Rice demand in Kutai Kartanegara Regency, 2015--2023

Source: Data Analysis, 2024

To determine the projected demand for rice, the double exponential smoothing method was used with the help of the SPSS Version 26 computer program, Brown's linear trend criteria. The results of forecasting accuracy tests using MAPE are presented in Table 7. The results of forecasting the rice demand for Kutai Kartanegara Regency from 2024 to 2030 using the double exponential Brown's linear trend method are shown in Table 8. Based on this table, it can be stated that the projected rice demand for Kutai Kartanegara Regency for the period 2024 to 2030 has decreased.

Figure 6 explains that the forecast results for rice needs for Kutai Kartanegara Regency, East Kalimantan Province, Indonesia for the period 2024-2030 are still between UCL and LCL. This meant that the need for rice was at the control limit. In this figure, it can be seen that all forecasting values were still within the Upper Control Limit and Lower Control Limit, so, it can be said that Brown's double exponential smoothing one parameter forecasting method is suitable for use to predict rice production in the future period in Kutai Kartanegara Regency.

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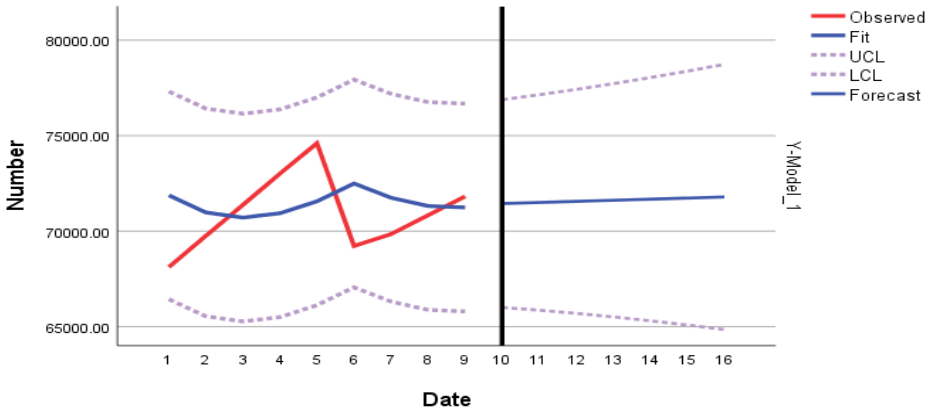

Figure 6: Projection of rice demand for Kutai Kartanegara Regency, 2015--2030
Source: Data Analysis, 2024

Kutai Katanegara Regency's rice production fluctuated and tended to decline from 2017 to 2020. This decline in rice production was caused by, among other things, the COVID 19 outbreak. The COVID 19 outbreak greatly affected rice farming production activities. As research results stated that there was a decline in rice production during the Covid-19 pandemic [44]. Demand for rice food in Kutai Kartanegara Regency tends to increase along with population growth. The comparison between supply and demand for rice in Kutai Kartanegara Regency is in a surplus condition from 2015 to 2020. However, there is a downward trend from 2021 until it is projected that in 2030 it will experience a deficit. (Table 9). Various efforts have been made to increase rice production by the government so that rice production begins to increase from 2021 to 2023, even though conditions are still in deficit. For this reason, a rice farming development strategy is needed so that deficit conditions can be avoided.

Development of rice commodities

Rice is a rice-producing crop whose production is strived to be available throughout the year because it is needed as a staple food for 90% of Indonesia's population. Based on the strength elements of the IFAS component in rice development in Kutai Kartanegara Regency, land availability has the highest score while the lowest score is the existence of farmer institutions. In the weakness element, the highest score is limited production lines/farming businesses and the lowest score is weak farming business partnerships. In the EFAS component, based on the opportunity element, the highest score is the availability of market opportunities for agricultural commodities and the lowest score is Kutai Kartanegara as part of the National Capital City (*IKN*). The highest score for the threat element is agricultural land conversion, while the lowest score is free market competition (Table 10).

The results of the internal factor analysis (Table 10) showed that the strength factor was 1.83. Conversely, based on the weakness factor of 1.51. Weakness factors are

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limitations or obstacles that must be overcome in developing rice farming, where based on the results of the analysis, the limitations of production roads/farm roads were the main obstacles faced by rice farmers. The difference in the total value of internal factors (strengths-weaknesses) based on the results of the analysis was 0.32.

Based on the results of the analysis of external factors (Table 10) obtained, the number of opportunity factors amounted to 2.04. Opportunities are external environmental situations that can affect the development of rice commodities, including the availability of market opportunities for agricultural commodities, the availability of agricultural extension workers who are able to provide appropriate technology counseling and assistance to farmers in managing their farming businesses. The results of the analysis of external factors, the magnitude of the threat factor was 1.44. Threat factors are environmental factors that are less favorable in developing rice commodities, where the biggest threat is the conversion of agricultural land. The difference in total external factors (opportunities - threats) obtained a result of 0.60. The difference in the total value of internal and total external factors is then compiled in the SWOT diagram presented in Figure 7.

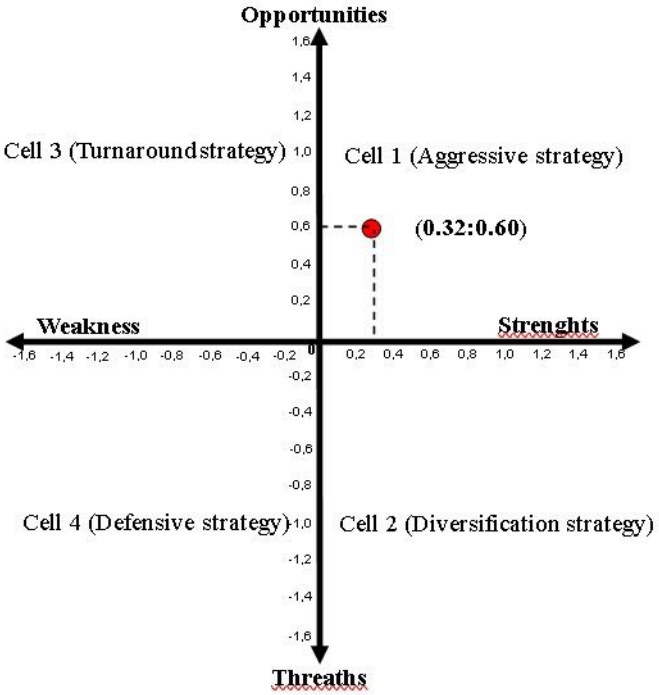

Figure 7: SWOT analysis chart of rice development in Kutai Kartanegara Regency
Source: Data Analysis, 2024

The SWOT diagram showed that the development of rice in Kutai Kartanegara Regency was in cell 1 (one) which supports an aggressive strategy (SO) in

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accordance with the opinion of Rangkuti and Siagian [21, 45]. This strategy meant that Kutai Kartanegara Regency in developing rice commodities used a strategy by optimizing strengths and opportunities. The findings of this study were in favour of aggressive strategies in line with the results of the study [22, 46]. The finding of this study that the government conducted training to increase farm productivity was different from the results of research [34]. Strategies that need to be done in developing rice commodities in Kutai Kartanegara Regency are made in a grand strategy, then determined the preferred strategy to be used, as described in Table 11.

Based on the issue of rice commodity development strategy in Kutai Kartanegara Regency (Table 11), strategy recommendations were prepared based on the results of the analysis, namely; aggressive strategy (cell 1), namely: optimizing the availability of land to increase production, strengthening farmer institutions, to optimize the existence of *IKN*, increasing the role and function of economic institutions through optimizing extension institutions, increasing the competency of farmer workers in using appropriate agricultural technology, and optimize the availability of agricultural markets.

CONCLUSION AND RECOMMENDATIONS FOR DEVELOPMENT

Based on the analysis of research results and discussions that have been carried out, the research conclusions were stated as follows: Rice production and growth were also projected to decline. Demand for rice in Kutai Kartanegara Regency has increased along with population growth. The difference between supply growth and rice demand growth in Kutai Kartanegara Regency was a surplus for the period 2015 to 2020. Furthermore, for the period 2021 to 2023 there was a deficit. In fact, based on the projection results, this deficit condition will continue until 2030.

The strategy for developing rice farming in Kutai Kartanegara Regency based on SWOT analysis is to use an aggressive strategy. The proposed strategy options are optimizing the availability of land to increase production, strengthening farmer institutions, optimizing the existence of *IKN*, increasing the role and function of economic institutions through optimizing extension institutions, increasing the competency of farmer workers in using appropriate agricultural technology, and optimizing the availability of agricultural markets.

Based on the analyses of projected rice production (rice supply) and rice food needs (rice demand) for Kutai Kartanegara Regency, various strategies for developing the rice commodity were obtained. It is hoped that this research can contribute to policy makers (especially the government) in their efforts to achieve food security through strengthening rice farming. It is also hoped that the results of this research can be used as a reference for other researchers.

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CONFLICT OF INTEREST

The authors declare no conflict of interest

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Table 1: Population and demand for rice in Kutai Kartanegara Regency, 20215-2023

Year	Total population	Rice demand (Ton)	Rice production (Ton)	Production - Demand difference
2015	717788	68118,08	119570,56	51452,48
2016	735016	69753,02	94261,76	24508,74
2017	752091	71373,44	117088,00	45714,56
2018	769337	73010,08	92190,72	19180,64
2019	786123	74603,07	77569,92	2966,85
2020	729382	69218,35	71001,60	1783,25
2021	735970	69843,55	66842,77	-3000,78
2022	746370	70830,51	67216,45	-3614,07
2023	756790	71819,37	68103,10	-3716,27

Source: BPS Kutai Kartanegara Regency [1, 2, 40]

Table 2: MAPE value criteria

MAPE value	Criteria
MAPE < 10%	The forecasting model's capabilities are very good
10% ≤ MAPE < 20%	The forecasting ability of the model is good
20% ≤ MAPE < 50%	The forecasting capability of the model is decent
MAPE ≥ 50%	The forecasting ability of the model is poor

Source: [44]

Table 3: Accuracy of the rice production forecasting model

Model	MAPE	Decision
Rice production	14.395	The forecasting ability of the model is good

Source: Data analysis, 2024

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Table 4: Results of projected rice production for Kutai Kartanegara Regency for 2024 – 2030

Year	Forecast (Ton)	UCL	LCL
2024	61531.30	97998.12	25064.48
2025	57693.23	107227.87	8158.58
2026	53855.15	118302.58	-10592.28
2027	50017.08	130936.32	-30902.15
2028	46179.01	144950.25	-52592.23
2029	42340.94	160220.96	-75539.08
2030	38502.87	176656.65	-99650.91

Source: Data analysis, 2024

Table 5: Accuracy of population forecasting models

Model	MAPE	Decision
Total population	2.675	The forecasting model's capabilities are very good

Source: Data analysis, 2024

Table 6: Results of projections for the population of Kutai Kartanegara Regency for 2024 – 2030

Year	Forecast (jiwa)	UCL	LCL
2024	752831	695503	810159
2025	753435	693976	812895
2026	754040	692235	815844
2027	754644	690286	819002
2028	755248	688134	822362
2029	755852	685788	825917
2030	756456	683253	829660

Source: Data analysis, 2024

Table 7: Accuracy of the rice production demand forecasting model

Model	MAPE	Decision
Rice production	2.674	The forecasting model's capabilities are very good

Source: Data analysis, 2024

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Table 8: Results of projected rice demand for Kutai Kartanegara Regency for 2024 – 2030

Year	Forecast (Ton)	UCL	LCL
2024	71443.69	76883.94	66003.44
2025	71501.04	77143.55	65858.52
2026	71558.38	77423.41	65693.34
2027	71615.72	77723.06	65508.38
2028	71673.06	78041.90	65304.23
2029	71730.41	78379.27	65081.55
2030	71787.75	78734.44	64841.06

Source: Data analysis, 2024

Table 9: Supply-Demand for rice in Kutai Kartanegara Regency, 2015 –2030

Year (1)	Rice Supply (Ton) (2)	Growth supply (3)	Rice demand (Ton) (4)	Growth demand (5)	Supply-demand (6=2-4)	Growth production-Growth demand (6=3-5)	Decision
2015	119570,56	0,000	68118,08	0,0000	51452,48	0,0000	Surplus
2016	94261,76	-0,212	69753,02	0,0240	24508,74	-0,2357	Surplus
2017	117088,00	0,242	71373,44	0,0232	45714,56	0,2189	Surplus
2018	92190,72	-0,213	73010,08	0,0229	19180,64	-0,2356	Surplus
2019	77569,92	-0,159	74603,07	0,0218	2966,85	-0,1804	Surplus
2020	71001,60	-0,085	69218,35	-0,0722	1783,25	-0,0125	Surplus
2021	66842,77	-0,059	69843,55	0,0090	-3000,78	-0,0676	deficit
2022	67216,45	0,006	70830,51	0,0141	-3614,06	-0,0085	deficit
2023	68103,10	0,013	71819,37	0,0140	-3716,27	-0,0008	deficit
2024	61531,30	-0,096	71443,69	-0,0052	-9912,39	-0,0913	deficit
2025	57693,23	-0,062	71501,04	0,0008	-13807,81	-0,0632	deficit
2026	53855,15	-0,067	71558,38	0,0008	-17703,23	-0,0673	deficit
2027	50017,08	-0,071	71615,72	0,0008	-21598,64	-0,0721	deficit
2028	46179,01	-0,077	71673,06	0,0008	-25494,05	-0,0775	deficit
2029	42340,94	-0,083	71730,41	0,0008	-29389,47	-0,0839	deficit
2030	38502,87	-0,091	71787,75	0,0008	-33284,88	-0,0914	deficit

Source: Data analysis, 2024

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Table 10: Rice commodity development score in Kutai Kartanegara Regency, Indonesia

No.	SWOT Factors Description	Value	Rating	Score
	Strenght			
	Availability of farmer labor	0,13	3,58	0,47
	Availability of land	0,14	3,64	0,52
A	Existence of farmer institutions	0,08	3,54	0,29
	Availability of economic institutions	0,07	3,19	0,23
	Availability of agricultural machine tools	0,08	3,83	0,32
	Total of Strength			**1,83**
	Weakness			
	Decreasing number of farmers	0,10	3,11	0,33
	Limited production/farming access	0,12	3,01	0,37
B	Decreasing level of land fertility	0,10	3,28	0,33
	Limited development of agricultural irrigation	0,08	3,31	0,28
	The lack of farming partnerships	0,07	3,21	0,21
	Total of Weakness			**1,51**
	Total Score of Strength-Weakness			**0,32**
	Opportunities			
	Kutai Kartanegara as a part of Capital of The Nusantara (*IKN*)	0,06	3,79	0,24
C	The support of the local government for agricultural development	0,10	3,98	0,39
	The availability of market opportunities for agricultural commodities	0,13	3,86	0,51
	The availability of appropriate technology	0,11	3,52	0,39
	The availability of agricultural extension officers	0,13	3,93	0,50
	Total of Opportunies			**2,04**
	Threats			
	Instability of climatic conditions	0,09	3,12	0,29
	Free market competition	0,04	3,23	0,13
D	Limited accessibility of agricultural production distribution	0,09	3,07	0,27
	Pest and disease attacks of agricultural commodities	0,11	3,01	0,34
	Agricultural land conversion	0,13	3,19	0,41
	Total of Threats			**1,44**
	Total Score Opportunities – Threats			**0,60**

Source: Primary data processed by researchers

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Table 11: Formulation of the rice development design in Kutai Kartanegara Regency, East Kalimantan, Indonesia by SWOT Matric

Internal Factors (IFAS)	**Strengths (S)**	**Weaknesses (W)**
	S1: Availability of Farmer Workers S2: The availability of land S3: The existence of Farmer Institutions S4: The existence of Economic Institutions S5: The availability of agricultural machine tools	W1: Decreasing number of farmers W2: Restriction of production/ farming access W3: Decreasing land fertility W4: Restriction of agricultural irrigation development W5: The lack of farming partnerships
External Factors (EFAS)		
Opportunities (O)	**S – O Strategy**	**W-O Strategy**
O1: Kutai Kartanegara as part of the Ibu Kota Nusantara (IKN) O2: Local government support for agricultural development O3: The availability of market opportunities for agricultural commodities O4: The availability of appropriate technology O5: The availability of agricultural extension officers	1. Optimize land availability to increase production 2. Strengthen farmer institutions 3. Increasing the role and function of economic institutions through optimizing extension institutions 4. Increase the competency of farmer workers in using appropriate agricultural technology 5. Optimize the availability of agricultural markets	1. Increase the quantity and quality of production/farming roads 2. Maximize the performance of agricultural extension workers to encourage partnerships 3. Optimizing opportunities for Kutai Kartanegara Regency as an IKN area 4. Maximize government support to address infrastructure 5. Encourage the cadre formation of young farmers and women farmer groups
Threats(T)	**S – T Strategy**	**W – T Strategy**
T1: The unstable climate conditions T2: Free market competition T3: Restricted accessibility of agricultural production distribution T5: Pest and disease attacks on agricultural commodities T6: Agricultural land conversion	1. Minimize land conversion 2. Improving institutions in the context of free competition 3. Increase the availability of facilities to deal with pest and disease attacks 4. Increasing the competency of the farmer workforce to win global competition	1. Increasing farmer partnership cooperation 2. Increasing technology mastery by farmers in anticipating climate change 3. Increase the quantity and quality of farming roads in order to optimize the distribution of agricultural production

Source: Primary data processed by researchers

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