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Projection of Paddy Production in Kedah Malaysia: A Case Study

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Authors' contributions

This work was carried out in collaboration among all authors. Authors ZMY, NFB and HBS designed the study, managed methodology and performed the statistical analysis, authors MFY and NABAA wrote the first draft of the manuscript. Author MM managed the literature searches and discussion. All authors read and approved the final manuscript.

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ABSTRACT

Rice is a staple food for Malaysian. Malaysian paddy farmers contributed up to 70% of the country's needs. However, climate change impact to the agriculture activities. The aim of this study is to forecast the paddy production for four years in Kedah, Malaysia. Naïve forecasting method was used in this study. The forecasted results for the paddy production values from 2013 to 2016 are considered in this study. The finding shows that the decrease of paddy production in the year of 2013 but the paddy production increased from year 2014 until 2016. Overall, this research work forecasted gradual increments for the projection of four years rice's production in Kedah.

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1. INTRODUCTION

The rice from paddy field is crucial in Malaysian diet. The paddy production by Malaysian farmer contributed to 70% of country's consumption needs [1], of which half of the supply comes from the state of Kedah, known as the rice bowl of Malaysia. The cultivation of paddy is an important food source for Malaysia as its per capita consumption accounted for 500 to 799 of calorie intake per day. This activity provides major source of income for small-scale farmers in Kedah that depend solely on paddy cultivation. The importance of rice industry in Malaysia can be seen from the early years, where the Rice Commission has been established in 1937. Its major task to oversee the rice industry in Malaysia was improved by the establishment of Federation of Rice Malay Commission in 1956 [2].

The role of rice industry is not only to contribute to Malaysia economy [3,4], it can also be seen as providing food security for the country [5, 6, 7]. However, climate change has adversely affected the overall activities or agricultural activities. Climate changes causes crop damages, low productivity and contributes to high production cost leading to loss of income, increase in poverty level, and increase in seasonal unemployment rates [8]. The reduction of 10% of profit in the rice production was caused by climate change in Malaysia [9]. Such vulnerabilities can be seen through some research works in Malaysia in particular [10,11, 12] and throughout other region such as Indonesia, Vietnam and Thailand [13, 14, 15]. A scientific assessment indicates that the coastlines areas of Southeast Asia including Malaysia are highly vulnerable to the effects of climate change. A more detailed research work at the North West Selangor [16, 17] suggested that the decline in productivity and profitability of paddy cultivation were due to this climate change in the recent years.

The growth of paddy is heavily affected by natural factors such as temperature and rainfall in the paddy field area. The critically low and high temperature range influences the rate of development of paddy leaves and panicles and the rate of their ripening [18]. As such the fixing of the duration for growth for paddy variety under a given environment should be done. Eventually the suitability of this variety to the environment can be determined [18].

The effects of natural disasters, namely drought have affected rice cultivation schedule in the area and the flood has caused severe damage to the rice crop. Such disaster reduces rice production and simultaneously affecting rice farmer's income. Some other effects include the shortage of water and other long-term resources, worsening soil condition, disease and pest outbreaks on crops and livestock and the rise of sea level. As Kedah is the major state that produces rice in Malaysia, this article aims to see the correlation between rainfall rates and total paddy production in Kedah and further forecasts paddy production for the next 4 years.

2. METHODOLOGY

This study is focus on selected area in Kedah. A secondary data from Muda Agricultural Development Authority (MADA) is considered. MADA is a department that oversees paddy production in Kedah. The paddy plantation area under MADA's surveillance is divided into four regions including Perlis (Region I), Jitra (Region II), Pendang (Region III) and Kota Sarang Semut (Region IV). In this study, we will focus on Jitra region (Region II), which covers nine districts, namely Kodiang, Sanglang, Kerpan, Tunjang, Kubang Sepat, Jerlun, Jitra, Kepala Batas and Kuala Sungai due to limitation of study. In total, the area of selected region covers 31,616 hectares of paddy planted area.

The data is focused on granary level data and paddy production data in metric tons per hectare. These data are seasonal, which involve data from the year 2005 to 2012. The data are in the form of seasonal granary level data (main season and off-season), in which farmers' activities from the early stage of preparation of land until harvesting are considered. The main season begins in August and ends in February the following year, while off-season begins in March and ends in July the same year. The seasonal data of rainfall rates were obtained from Malaysian Meteorological Department, where the observed result for selected area was identified. The location of weather stations, which is surrounded by paddy fields and strategically, located amidst the northern planting area is able to correctly reflect the weather trend at these granaries. We also categorized rainfall rates data according to harvesting months to capture both the main and off-season. Forecasting technique is used to the data for forecasting future paddy production. We used the naive forecasting

method with trend model for both main and off-season. Naive forecasting method with trend model is used when time series data tends to exhibit the trend component, and it can also be used even with fairly short time series.

3. DATA ANALYSIS AND DISCUSSION

3.1 Forecasting

Forecasting is a process of predicting future events or trends. In this study, forecasting method will be adopted.

Fig. 1 displays scatter plots for paddy production for main season and off-season. The graphs in Fig. 1 indicate that only 17.6% of the variation in average paddy production main season is explained by variation in rainfall rates main season. For off-season, the graph indicates that only 24.5% of the variation in average paddy production off-season is explained by variation in rainfall rates off season.

Figs. 2 and 3 show the trend line during main season for the paddy production. Fig. 2 illustrates the trend line for paddy production data from year 2005 until 2012 (indicated by blue line). A linear equation forecasts the average paddy production for the next consecutive years is shown in Fig. 3 (indicated by red line). A slight increase in 2013 is observed and maintained for the next three years.

An average paddy production for the next consecutive four-year period for the off-season data is also forecasted. Both figures show the trend line during off-season for the paddy production. Fig. 4 shows the trend line for paddy production data from year 2005 until 2012 (indicated by blue line). From the linear equation in this figure, the average paddy production for the next consecutive four-year period is forecasted, as shown in Fig. 5 (indicated by red line). This figure suggests the decrease of production in the year of 2013, but the production will increase in 2014 until 2016.

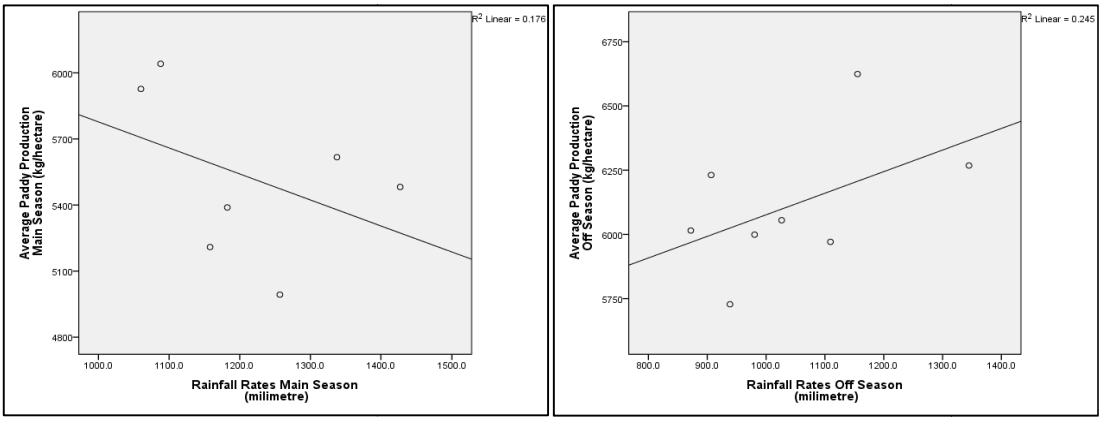

Fig. 1. Scatter plot paddy production for main season and off-season

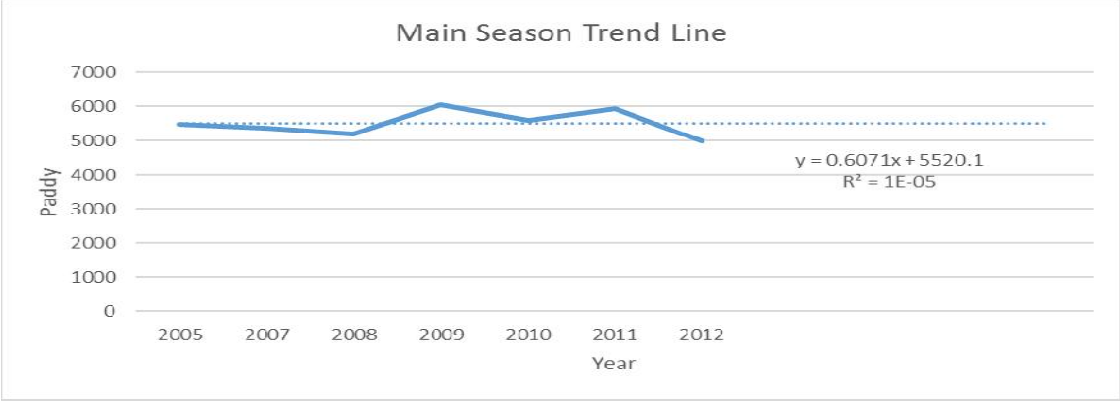

Fig. 2. Trendline for main season

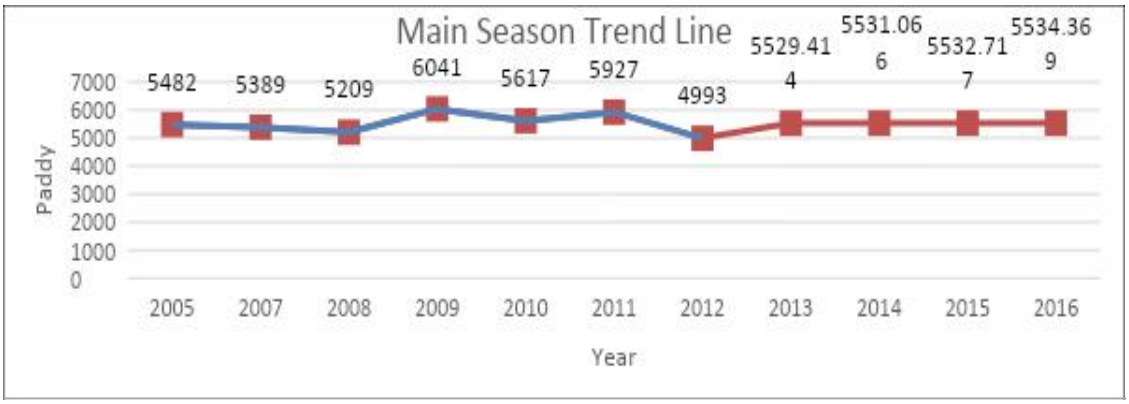

Fig. 3. Forecasting for main season

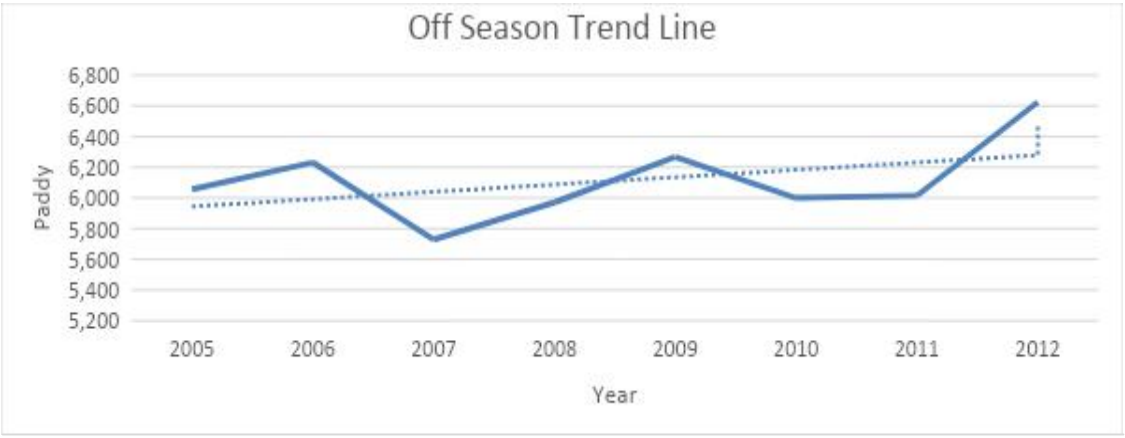

Fig. 4. Trend line for off season

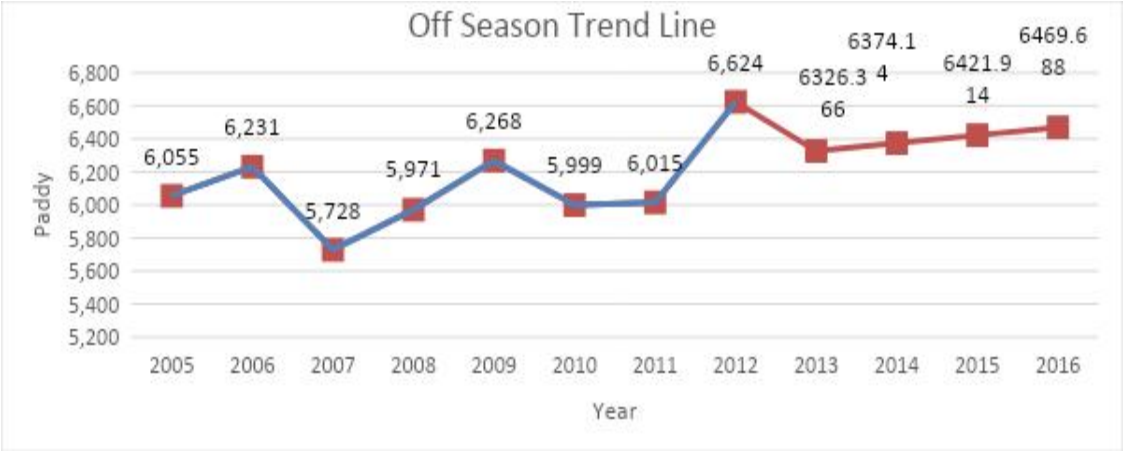

Fig. 5. Forecasting for off season

4. CONCLUSION

This research work forecasted gradual increments for the projection of four years rice's production in Kedah The finding suggested that the rainfall rate does not have direct affect on the paddy production. From the literature, other reasons should be considered to identify causes

of which may have affecting paddy production. Such factors include the temperature behavior, pests control and farmer's practices. A lean and efficient production of the rice can eliminate the dependency to the imported rice in particular from the bordering countries. Reluctant to the shifting paradigm from the conventional practice to modern practice may also affect paddy production, as time factor and human capital are underutilized. We suggest a thorough research on the contributing factors that may affect rice's production in Kedah.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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