Input – Productivity Analysis in Paddy Production: A Case Study in Pasir Mas, Kelantan, Malaysia

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Abstract
The entire paddy industry in Malaysia, has been contributed to GDP for RM 2.44 billion in 2020. Roughly about 2.34 million metric tons of paddy were produced annually in 2022 (Statista, 2022). In sustaining a good production of paddy, the inputs of production need to be consistently maintained. There are several commercial inputs in paddy production such as labours, machinery, fertilizer, fuel and biocides. This study was aiming to study and measure the level of inputs in paddy production. Additionally, the second objective is to carry out the input productivity analysis in paddy production. Other than that, the other objective is to investigatethe relationship between different levels of inputs with paddy production. The location for this study was be conducted at Pasir Mas, Kelantan. The area of cultivating paddy is under KemubuAgriculture Development Authorities (KADA). The sample was taken by questionnaire as a primary data collection. The data was distributed to 292 sample of respondents from total 1205of farmers populations in Pasir Mas, Kelantan. The data were analysed using Statistical Package for the Social Sciences (SPSS). The analysis used were descriptive analysis, statistical analysis using correlation and regression and input–productivity analysis. Based on the result,the data shown that all the factor were significantly affecting the paddy production with the significance value of p-value less than 0.01. As a conclusion, all the 5 factors labours, machinery, fertilizer, fuel and biocides were confirmed as 92% affecting the paddy productionmeanwhile the most dominant factor was the fertilizer. The government needs to work and proactively improve the productivity of the country rice and paddy industry by introducing thelatest technology. In addition, the Ministry of Agriculture and Food Industry must provide services for the expansion and development of agriculture through the transfer of technology based on the production for input using Good Agricultural Practices along through including fertilizer to increase production and income of paddy production and to ensure the sustainableproduction of food especially paddy production.
Keywords: Paddy, Input in Paddy Production, Labours, Machinery, Fertilizer, Fuel, Biocides.

Introduction

Paddy is Malaysia's main crop as domestic rice, a cereal grain, is the primary diet for more than half the world's population, especially in Asia and Africa. Rice provides 20% of the world's calories. Rice comes in many forms, and regional cuisines vary (Hill, R.D., 2012). Rice is the most widely consumed staple food for more than half the world's human population. It is a monocot plant, normally grown as an annual crop. In tropical regions, it can survive as a perennial and in many traditional rice habitats of Asia and Africa this property is exploited by the native farmers. The plant can perennate through ratoon production. Some cultivars produce ratoon crop for several years (Pawar, S.Y et al, 2015). According to Shah, S.A. (2020), The Malaysian Agriculture and Food Industries Ministry (MAFI) is raising its self-sufficient level (SSL) target for local rice production to 75% by 2025. Despite producers' perspectives being mostly positive about paddy production, there are some obstacles that prevent the extension of paddy production areas. Such obstacles are; an increase in input prices in recent years, insufficient capital, and a low amount of subsidy payments (Semerci, A. 2020). Rice growing is labor-intensive and water-intensive, making it appropriate for countries with low labours costs and copious rainfall. But, this research study was focusing more on the inputs such as labor, machinery, fertilizer, fuel, and biocide relationship with the production. Since Malaysia is importing high number of its staple food, which is paddy, thus, Malaysia must always prepare for the worst in case of paddy inventories as to enhance the food security and boycotts issue. Consequently, this research is needed to help in enhancing national paddy output and efficiency. Increased fertilizer prices limit domestic production.

Research Methodology

Location of Study

Based on the study, it was conducted at Pasir Mas, Kelantan, as one of the rice field in Malaysia. The area of cultivated paddy is under Kemubu Agriculture Development Authorities (KADA). Location is a key component in facilitating data gathered in field investigated.

Population and Sample

This case study focused on Pasir Mas, Kelantan farmers for population and sample. Pasir Mas, Kelantan has 5669 hectares of paddy, organized into three Area Plantation Organization (PPK): Kubang Sepat, Kubang Bunut, and Alor Mas. 1205 farmers grew paddy here. 292 farmers comprise the population sample. Hence, 292 farmers were sampled for input-productivity study in paddy cultivation by using convenience sampling method.

Data Collection Method

Interview and Questionnaire

All of the information and data for the input-productivity analysis of paddy production came from in- depth, one-on-one interviews. Unstructured interviews were used because they provided greater room for in-depth discussions and allowed the interviewer to probe a broader range of topics. The framework for interview protocol refinement (IPR) was applied in this investigation. The process consisted of four distinct steps: ensuring that interview questions align with research topics; constructing an inquiry- based conversation; soliciting feedback on interview protocols; and last, piloting the protocol. The questionnaires has been divided into three parts; Part A (Demographic Information), Part B (Inputs Data Information) and Part C (Paddy Productivity Data).

At the same time, interview was also conducted to gain some additional information regarding the inputs-productivity of the paddy.

Conceptual Framework of Research Study
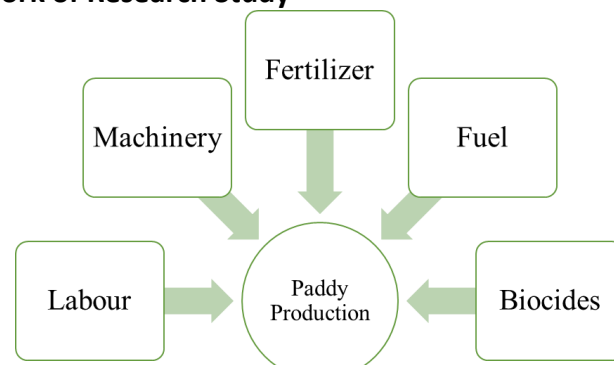

Figure 1: Conceptual Framework of Research Study

Data Analysis
The goal of data analysis is to extract meaningful insights from data by means of examination, cleaning, manipulation, and modelling to help draw conclusions and make decisions.There were several types of data analyses used to discuss the results from this research including descriptive analysis, statistical analysis including correlation, regression and benefit-cost ratio analysis.

Reliability Analysis
Measurement scales and the components that make them up can be analyzed for their qualities using reliability analysis. The Dependability Analysis process determines several standard metrics of scale reliabilities and reveals insights into the connections between the scale's components. Estimates of the consistency between ratters can be calculated using intra- class correlation coefficients.

Descriptive Analysis
Descriptive analysis the process of using statistical techniques to describe or summarize a set of data. As one of the major types of data analysis, descriptive analysis is popular for its ability to generate accessible insights from otherwise uninterpreted data.

Statistical Analysis
Correlation Analysis
Whether or not there is a causal relationship between two random variables, a correlation or dependence can be defined as the presence of any association between them. The term "correlation" is often used in statistical analysis to refer to the linear relationship between two variables, but it can be used to represent any type of link between two items.

Regression Analysis
Regression analysis is a collection of statistical techniques used to estimate the relationship between a dependent variable and one or more independent variables. It can be used to evaluate the strength of the relationship between variables as well as to model their future relationship (CFI, 2022).

Benefit-Cost Ratio Analysis
Productivity or can be considered as benefit is often evaluated by comparing the quantity of output to the quantity of input. An economy's output is directly proportional to the efficiency with which it utilizes its production inputs, such as labours and capital. Productivity data is essential for many international comparisons and country performance evaluations. Productivity data can be used to analyses the impact of product and labours market regulations on economic growth. At the same time, the cost for the inputs would be compared with the productivity data and the results showed the productivity level that can be obtained from the investment of RM1 in the input.

Results and Discussions
Reliability Analysis

Reliability Statistics		
Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.256	.855	27

It can be seen from the table that Cronbach's Alpha is quite high, above the threshold of 0.069 that is acceptable. The value of 0.855 that I obtained for Cronbach's alpha indicates that the survey questionsdesigned for this study are consistent with the features of the data that will be analysed. A popular measure of internal consistency is Cronbach's alpha. Most commonly, it is used to test the reliability ofa survey or questionnaire's Likert scale, which is formed from a large number of individual questions.

Descriptive Analysis
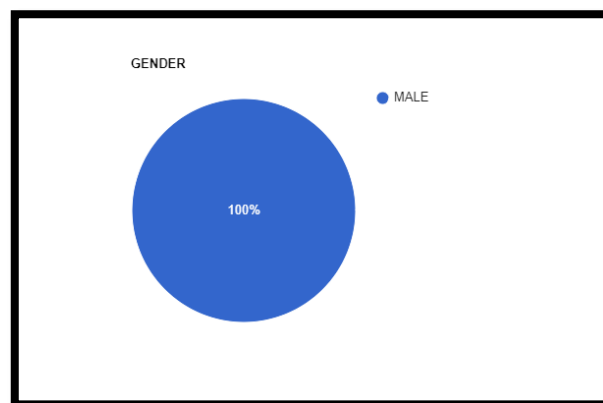*Demographic Information*
Gender

Figure 2 of Gender

Based on the pie chart above, the data results show that most of the data is 100% all from men. It is because the average landlord in Pasir Mas Kelantan is a man who is still active in this agricultural activity.
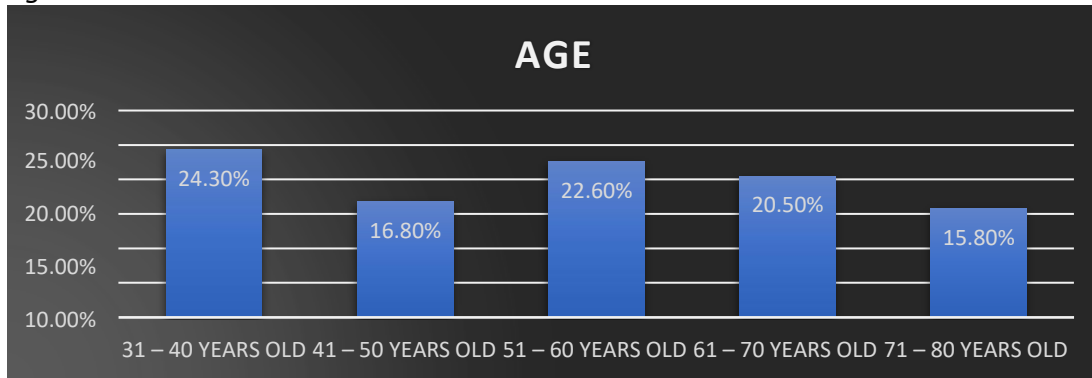
Age

Figure 3of Age

Based on the bar chart above, it shows that there are five age scopes that have been recorded. From the292 respondents that have been taken, the bar chart shows that the scope of age between 31 - 40 years has a high percentage of 24.30%. While the second highest percentage is held by the scope of age 51 -60 years with a percentage of 22.60%. In addition, the age scope of 61 - 70 years shows the third highestpercentage of the 5 age scopes that have been taken. Among the low age percentage is 71 - 80 years with only 15.80%.

Race
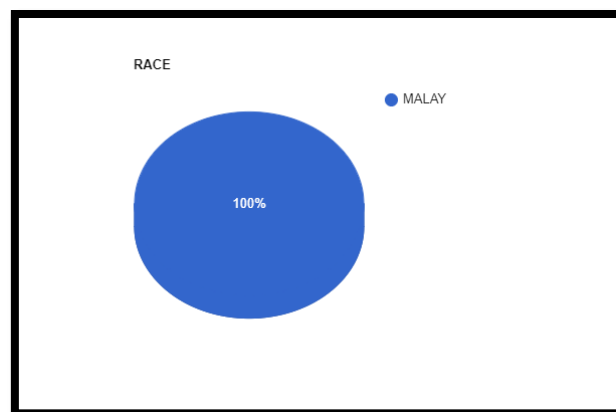

Figure 4 of Race

Based on the pie chart above, it shows that in the Pasir Mas area of Kelantan, on average, the landlordsare Malays who live in the area. The main reason why the percentage of Malays is so high is because in Pasir Mas, Kelantan, the majority of the residents are Malays and there are no or very few other races.
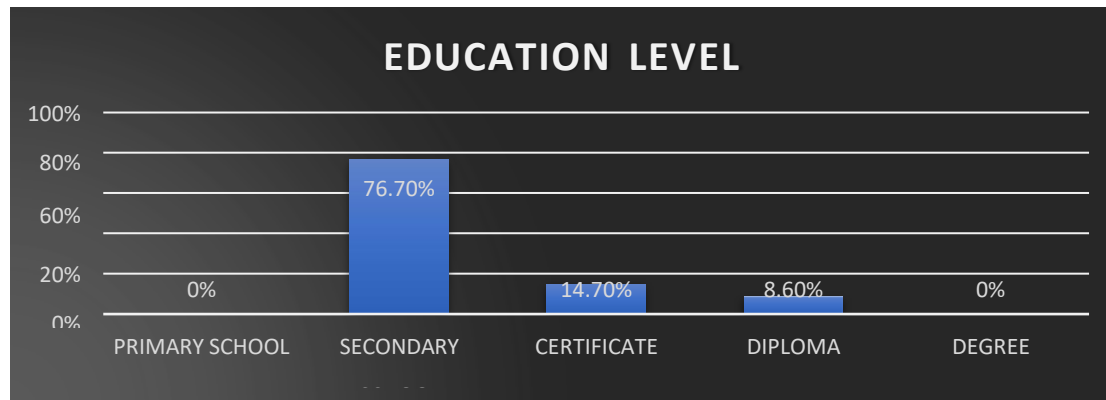
Education Level

Figure 5 of Educational level

Based on the bar chart above, it shows a record level of education for farmers. Among the highest recorded are secondary schools. It is because the standard of living is simple or less able to prevent theinterest or dream of the farmers to improve their level of education. In addition, the percentage of education level that has been recorded is 76.70% which is the highest that has been recorded. Besides that, the lowest level of education recorded is diploma which is 8.60%. It happens because the level ofeducation for a diploma is the lowest because of the high cost that needs to be invested to study at university. Because that is the reason for the lowest percentage of diplomas recorded.
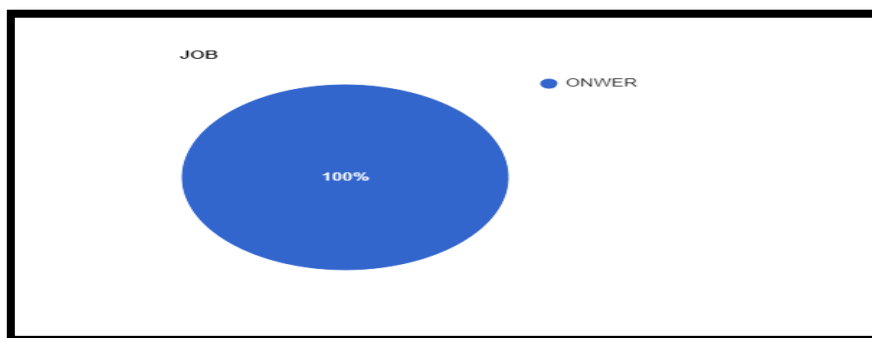
Job of Respondents

Figure 6 of Job

Based on the pie chart above, it shows the occupation of the farmers. Almost all the 292 respondents who were interviewed on average are the owners of their rice crops. In addition, threshing rice is their main job to find a source of income.

Paddy Field Area

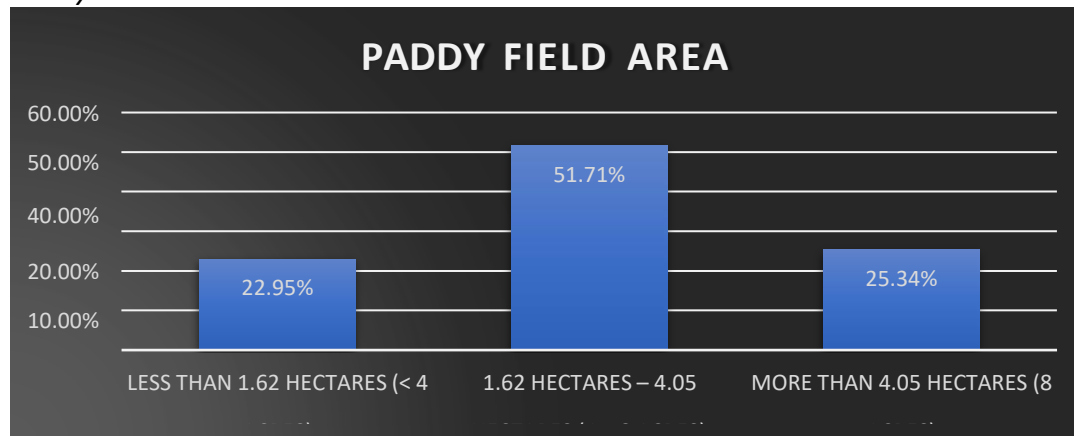
Figure 8 of Paddy Field Area

Based on the bar chart above, it shows data on the area of rice land owned by farmers. Among the areasmost owned by farmers is 1.62 - 4.05 hectares which is equivalent to 4 - 8 acres which is 51.71%. In addition, among the paddy area the lowest percentage is less than 1.62 hectares which is eqivalent to less than 4 acres which is 22.95%

Benefits and Cost Ratio (B/C ratio) Analysis
Benefits and Cost Ratio for 292 farmers at Pasir Mas, Kelantan

Income paddy production		RM	
Total Acres	2988.5238		
Total income for paddy production 1 acres	1 ton = RM1650		
Total acres for paddy production (acres)	2988.5238		
Total production (ton)	6191665		
Total production (ton) x Average selling price/ton	6191665 x 1650		
Total income for paddy production		10216230750	
Total income/acres	÷ 2988.5238	3418487.33	
Total income/acres/farmers	÷ 292	11707.15	
Cost			
Labours	21620 ÷ 249		
			86.83
Machinery			
tractor		745068 ÷ 291	0.26
mist blower		1025 ÷ 2	512.5
lorry		289856 ÷ 291	996.07
paddy harvester machine		582712 ÷ 292	1995.59
Fuel			
Petrol		47673 ÷ 290	164.39
Diesel		5210 ÷ 16	325.63

Fertilizer		
NPK + Urea + Compound	456375	
Foliar	456375	
	912750 ÷ 292	3125.86
Biocide		
Insecticides	1435000	
Herbicides	245700	
Fungicides	245700	
	1926400 ÷ 292	6597.26
Total cost of paddy production		13804.39
Total cost of paddy production/acres	÷ 2988.5238	4.62
Total cost of paddy production x 12 factors that affect cost	4.62 x 12	55.44
Benefits/Cost	11707.15 ÷ 54.44	
		215.05

Based on the Benefits and Cost Ratio table above, what we can conclude is that we can know that whenthe farmers invest RM1 for planting rice, the farmers would get a return of 215.05. However, the value will always change from time to time through price changes for each item and the rent charged. The Benefit and Cost ratio table shows that the cost of fertilizer and biocides is very high with a value of RM912750 and RM1926400. It shows that fertilizer and biocides greatly affect paddy production because every value invested in fertilizer and biocides will bring good results if the correct guidelines are followed.

Correlation Analysis

LABOUR			**MACHINERY**	**FERTILIZER**	**FUEL**	**BIOCIDES**
INPUT PRODUCTIVITY	Pearson Correlation	.611**	.412**	.956**	.813**	.893**
	Sig. (2-tailed)	<.001	<.001	<.001	<.001	<.001
	N	292	292	292	292	292

Based on the table 25, the all independent variable shows the relationship between dependent variable.Labours was moderate positive relationship and it will reject the H null. For machinery was the weal positive relationship and it will reject the H null. Fertilizer was the strong positive relationship and it will reject the H null. Fuel was the strong positive relationship and it will reject H null. For the last,biocides were the strong positive relationship and it will reject the H null.

Regression Analysis

Model Summary				
Model	R	R Square	Adjusted RSquare	Std. Error of the Estimate
1	.960a	.921	.920	5110.364

Predictors: (Constant), Biocides, Machinery, Labours, Fuel, Fertilizer

Based on the model summary table above, what we can see for R square is 0.921 which is equal to92%. It means that 92% of independent variables greatly affect paddy production.

NSTANDARDIZED COEFFICIENTS			TANDARDIZED COFFICIENTS		
Model	B	Std. Error	Beta	t	Sig.
(Constant)	-33465.090	11204.086		-2.987	.003
Labour	476.213	159.927	.062	2.978	.003
Machinery	2786.327	1623.763	.038	1.716	.087
Fertilizer	2257.366	147.178	.889	15.338	<.001
Fuel	341.777	150.620	.080	2.269	.024
Biocides	-207.162	194.697	-.053	-1.064	.288

Based on the table coefficients above, it can be seen that there are 3 factors that have significant relationship with the p value is below 0.05 which are labours, fuel and fertilizer. Which means a p-value less than 0.05 is typically consideredto be statistically significant, in which case the null hypothesis should be rejected. But among the mostinfluencing factors is fertilizer with significant <.001 and got the highest Beta value with 0.889.

Conclusion

In conclusion, all factors of production affect rice input-productivity analysis. 92% also boost rice production, according to research. Fertilizer affects rice output most, according to the research. This rice crop alsooffers rice growers enormous prospects and earnings. Farmers' money always has a positive worth, although it changes with the times. The government should boost Malaysian rice production. It meansthat subsidies should emphasise farmer welfare. This attracts farmers to increase paddy farming. Givingfarmers a chance to earn more, even if it's just enough to survive. The Department of Agriculture, MARDI, BERNAS, LPP, AgroBank, BPSP (Drainage and Rice Drainage Division), and several Integrated Agriculture Projects should also guide farmers in rice cultivation (Integrated Agriculture Development Authority - IADA). Agencies must guide farmers to maximise time and money. To ensurethat farmers don't miss out on rice farming information, these agencies must identify which areas require their guidance. These agencies help farmers plant rice. Introduce young people to rice cultivation using a knowledge programme. According to the data, most farmers are over 40. Government and agencies must help raise young farmers. For instance, implementing a plantation or agriculture course in our education system to show young people that farming can be successful. Theycan also give simple folks greater opportunity to work in plantations. Next, a work-based salary structure will enhance employment demand and reduce Malaysian

labour recruiting. I hope this may be highlighted so Malaysia doesn't fall behind and can compete with the biggest producers. As for the contribution, the outcomes or results obtained from this research article was showing that all of the inputs studied would likely to give some significant impact towards the production of paddy in Malaysia. Thus, the outcomes would likely to be as a guidance in terms of theoretical and contextual contribution in improving and sustaining the paddy industry in Malaysia.ACKNOWLEDGEMENT

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