

**RELATIONSHIPS BETWEEN SOCIO-ECONOMIC CHARACTERISTICS
OF FARMERS AND THEIR PRODUCTIVITY: A STUDY ON PADDY
FARMERS IN SUB DISTRICT KELAWAT, KOTA BELUD, SABAH**

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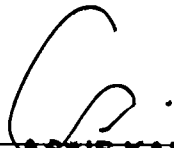
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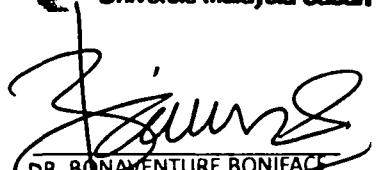
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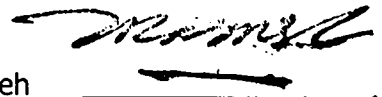
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ABSTRACT

Rice has been always been the staple food of the nation. There have been many factors affecting the paddy yield of farmers, as well as their productivity. One of the factors is socio-economic factors of paddy farmers such as age, marital status, educational level, number of family members, main occupation, main source of income, etc. This cross sectional study was conducted with the main objective to analyse the relationship between the selected socio-economic characteristics of paddy farmers and their productivity. A total of 60 paddy farmers in sub district Kelawat, Kota Belud were selected as respondents by using multistage sampling technique. The relationships were analysed using multiple linear regression model and Ordinary Least Square (OLS) method as the model estimation method. The perceptions of paddy farmers on factors which could affect their productivity were also included and analysed in this study by using factor analysis and Mann-Whitney U test. The regression analysis revealed that only marital status had a significant effect on the paddy farmers' productivity. Based on the factor analysis, there were two main factors identified as the factors that affecting the paddy farmers' productivity which were environmental and human factor, as well as, input factor. The paddy farmers interviewed were then divided into two groups based on their productivity. But Mann-Whitney U test revealed that there were no significant differences between these two groups of respondents in terms of their perceptions on the environmental and human factor and also the input factor. The study successfully proved that socio-economic factors, based on the perceptions of the paddy farmers interviewed, would affect the productivity of paddy farmers. Therefore, the relevant parties, such as the Government should introduce a good strategy or program which could improve the socio-economics, as well as, the productivity of paddy farmers in the studied area.

**HUBUNGAN ANTARA CIRI SOSIOEKONOMI PETANI DAN PRODUKTIVITI
MEREKA: SATU KAJIAN KE ATAS PENANAM PADI DI MUKIM KELAWAT,
KOTA BELUD, SABAH**

ABSTRAK

Beras merupakan makanan ruji Negara. Terdapat banyak faktor yang mempengaruhi hasil padi petani serta produktiviti mereka. Salah satu faktor adalah faktor sosio-ekonomi penanam padi seperti umur, status perkahwinan, tahap pendidikan, bilangan ahli keluarga, pekerjaan utama, sumber utama pendapatan, dan lain-lain. Kajian keratin rentas telah dijalankan dengan objektif utama untuk menganalisis hubungan antara ciri-ciri sosio-ekonomi terpilih penanam padi dan produktiviti mereka. Seramai 60 penanam padi di Mukim Kelawat, Kota Belud telah dipilih sebagai responden melalui kaedah persampelan pelbagai peringkat. Hubungan ini dianggar dengan membangunkan satu model ekonometrik dengan menggunakan kaedah kuasa dua terkecil (OLS). Persepsi petani padi kepada faktor-faktor yang boleh member kesan terhadap produktiviti mereka juga telah dimasukkan dan dianalisis dalam kajian ini dengan menggunakan analisis faktor dan ujian Mann-Whitney U. Analisis regresi menunjukkan bahawa hanya status perkahwinan mempunyai kesan yang besar ke atas produktiviti penanam padi. Berdasarkan analisis faktor, terdapat dua faktor utama yang dikenal pasti sebagai faktor-faktor yang mempengaruhi produktiviti penanam padi iaitu faktor alam sekitar dan manusia serta faktor input. Penanam padi kemudiannya dibahagikan kepada dua kumpulan berdasarkan produktiviti mereka. Walau bagaimanapun, ujian Mann-Whitney U menunjukkan bahawa tidak terdapat perbezaan antara kedua-dua kumpulan responden dari segi persepsi mereka kepada faktor alam sekitar dan manusia serta faktor input. Kajian ini telah berjaya membuktikan bahawa faktor-faktor sosio-ekonomi, berdasarkan persepsi pesawah ditemuramah, member kesan terhadap masih menjejaskan produktiviti penanam padi. Oleh itu, pihak-pihak berkaitan terutama kerajaan perlu memperkenalkan satu strategi atau program yang baik yang boleh meningkatkan tahap sosio-ekonomi serta produktiviti petani padi terutama dalam kawasan kajian.

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LIST OF SYMBOLS, UNITS AND ABBREVIATIONS

%	Percentage
ha	Hectares
kg	Kilogram
t ⁻¹ ha	Metric tonne per hectare
AERDRI	Agricultural Extension and Rural Development Research Institute
BERNAS	Padiberas Nasional Berhad
CGIAR	Consultative Group on International Agricultural Research
CIAP	Cambodia IRRI Australia Project
DSM	Department of Statistics Malaysia
FAO	Food and Agriculture Organisation
FMP	Fifth Malaysian Plan
GAIN	Global Agricultural Information Network
GDP	Gross Domestic Product
IFPRI	International Food Policy Research Institute
IPM	Integrated Pest Management
IRRI	International Rice Research Institute
ITES	Institute for Techno Economics Studies
JPM	<i>Jabatan Pertanian Malaysia</i>
JPS	<i>Jabatan Pertanian Sabah</i>
K	Potassium
KADA	Kemubu Agriculture Developments Authority
MADA	Muda Agriculture Development Authority
MARDI	Malaysia Agriculture Research and Development Institute
MOA	Ministry of Agriculture
MPOB	Malaysian Palm Oil Board
MR	Malaysian Rice
MT	Metric Tonnes
N	Nitrogen
NAP	National Agriculture Plan
NMP	Ninth Malaysian Plan
NRC	National Research Council
NS-SC	National Statistic Socio Class
NS-SEC	National Statistic Socio Economic Class
NS-SEG	National Statistic Socio Economic Group
OAGC	Office of the Auditor General of Canada
OLS	Ordinary Least Square
P/ P ² O ⁵	Phosphorus
PBLS	<i>Projek Lembaga Laut Selangor</i>
PEMANDU	Performance Management and Delivery Unit
RM	<i>Ringgit Malaysia</i>
SPSS	Statistical Package for the Social Sciences
SRI	System of Rice Intensification
SSL	Self Sufficient Level
TAMRC	Texas Agribusiness Market Research Centre
TCTC	Tropic of Capricorn
TMP	Tenth Malaysian Plan
UK	United Kingdom
USA	United State of America
USDA	United States Department of Agriculture
VFA	Vietnam Food Association

CHAPTER 1

INTRODUCTION

1.1 Introduction

Rice is the country's staple food ever since it was first cultivated in the country. The word "paddy" means cultivated rice in irrigated lands. Malaysia is the first country in Asia to have an irrigation paddy cultivation system. Basically, the producers of paddy consist of small scale holders with ownership of an average farm size of 1.06 hectares (ha) (FAO, 2000a). According to the Department of Agriculture Malaysia, in 2010 the total of paddy cultivated land was 677,884 ha, 387,160 ha within the eight granary areas, a total of 512,610 ha covering West Malaysia, 43,353 ha in Sabah, and 121,921 ha in Sarawak. The country's average rice production in the year 2010 was 2,464,830 metric tonnes (MT), with an average of 2,102,644 MT in West Malaysia, 147,531 MT in Sabah and 214,655 MT in Sarawak, East Malaysia. In the year 2009, there were about 296,000 paddy farmers in Malaysia, whereby 116,000 of them depended on paddy cultivation for income therefore working as full time farmers (Man and Sadiya, 2009). A study done by the World Bank had shown that, among the total paddy farmers in Malaysia, only 65% had their own farm which was less than 1 ha, while only 4% owned more than 3 ha. This shows that Malaysia is producing an inefficient total amount of rice (Pio Lopez, 2007).

As the industrialization sector of Malaysia has been growing, the share of the agricultural sector in the country's gross domestic product (GDP) has been decreasing since 1975. During 1970, the agricultural sector contributed 30.8% to the country GDP, which stood the highest, compared to the other sectors. Then in 1975, it fell to 22.7 %, hardly increasing to 22.9% in 1980 and then declining to a 20.8% in 1985 but still remaining as the top contributor. In 1990, the contribution continued to decline to 13.5% towards the national GDP; however, it was the second largest sector in the

economy. In 2000, the sector contributed 8.9% and declined in 2005 with a contribution of 8.2%. The service and manufacturing sectors soon caught up and became the first and second highest contributing sectors as the agricultural sector declined, losing its importance in contributing to the national GDP. Today, the agricultural sector sits at third place of the economic growth of Malaysia (Alam *et al.*, 2011; FAO, 2004).

Many agricultural lands are declining in Malaysia since the country's economy was rapidly developing. Many of these agricultural land areas were being developed for housing, business and industrial purposes. The land used for industrial crops had been increasing from 1960 up to 2010, while many lands used for food crop were declining. This proves that more agricultural lands were cultivated for the purpose of growing industrial crops, thus the importance of producing food crop is decreasing. Among the industrial crops, palm oil had been the largest industrial crops to utilize the land area. Agricultural land used by the palm oil sector had increased significantly as seen during 1960 with 2.1% to the total amount of 63.4% in 2005. By 2010, the total of oil palm area in Malaysia increased to 3.4% or 4.85 million ha. Sarawak had the largest expansion in oil palm area with an increase of 79,670 ha or 9.5% and a 3.5% increase in Sabah making it 48,078 ha. West Malaysia recorded an increase by 1.4% or 34,858 ha. Sabah found to be the largest oil palm planted state with 1.4 million ha or 29% of the total planted area in Malaysia, followed by Sarawak with 0.9 million ha with 19%. This proves the palm oil production had been gaining in importance and significantly contributing its share to the country's economy. In Malaysia, the agricultural sector had been characterized as a dual structure whereby the large plantation companies contribute to professionally managing perennial crops like palm oil, rubber and cocoa, while the small scale farmers, which are left to manage independently concentrating on their own activities in cultivating food crops (Yamada, 2003).

Recent record showed a negative trend of land used for paddy cultivation with only 426,260 ha of paddy planted area and an average yield of 3.5 t ha⁻¹ per season (MOA, 2008). The actual yield of a paddy field could produce up to 3 to 5 t ha⁻¹ however the potential yield is 7.2 tonne (Singh *et al.*, 1996). According to Pio Lopez (2007), rice production in Malaysia would continue to decline due to decrease in the cultivated area, negligible gains in productivity, continued increases in the cost of production and decreasing profitability. A study conducted by Jayawardane (1996)

found that 90 % of the total paddy productivity was contributed by labour, farm power, fertilizer, and agro chemicals, where 45% was labour.

The Government had also offered support by investing into research and development, production and marketing in the sub sector through credit facilities, fertilizer subsidies, irrigation investment, guaranteed minimum price, income support programmes, subsidized retail price and also extension support (training and advisory services). However, despite all that the Government have done, the rice production still remains insignificantly insufficient with regards to meeting the market demand.

Malaysia needed to aim for a 90% rice sufficiency after the government made it a policy goal under the Ninth Malaysia Plan (NMP, 2006-2010). It was planned that Malaysia achieved 80-85 % of self sufficiency when the nation was still under the Fifth Malaysia Plan (1986-90) which involved the eight paddy granary areas covering 220,000 ha of land. The plan also stated that by 2010, West Malaysia was to achieve 70% to 90%, 30% to 70% in Sabah and from 50% to 70% in Sarawak. The current nation self sufficiency level (SSL) is at 86% (NMP, 2006-2010). According to FAO (2008) about 10% of production increase come from area expansion therefore 20% will come from intensification and another 70% through research and development (R&D), innovation and policies (Chee, 2009).

The Government of Malaysia, with the influence of the new food security policy, was determined to ensure availability, accessibility and affordability of food, particularly rice for the general population. The Government had identified few strategies in order ensure sufficient supply of rice, namely, maintaining the nation rice stockpile at 292,000 MT or sustained consumption for 45 days (if in a normal year, the country's total stock is about 720,000 tonne) carry out long term contract agreements to import rice, and upgrade infrastructure in existing paddy areas which would increase the production yield. It had been agreed that opening of new land area for rice cultivation would be put on hold to concentrate on improving paddy yield thus achieving the 70% SSL.

The country's consumption of rice had increased by 3.8% to 2.7 million tonne in 2011 and it is predicted that by 2012 there would be an increase about 4 % in 2012, as there would be a high demand due to the in-flow of foreign workers and tourists. The rice consumption per capita increased from 81.6 kg to 95 kg in 2010. However, the

figure did not include for foreign workers and tourists. In reality, the domestic consumption per capita was only 72kg to 75kg (GAIN, 2011).

Malaysia is still importing rice from neighbouring countries and it is expected to continue increasing in 2012. Since 2009 Vietnam has been the top rice supplier for Malaysia approximately 55% of Malaysia's import market came from this country. Other countries that supply rice to Malaysia are Pakistan, Cambodia and India. A memorandum of understanding was signed between Padiberas National Berhad (BERNAS) and the Vietnam Government for a guarantee annual supply of 800,000 tonne of rice to Malaysia. BERNAS was granted another extension to be the sole importer of rice for another 10 years until 2021 (Wong, 2011).

The country's paddy productions were mainly related to land and labour. However, researchers had linked other factors that affected the production of paddy yield. A recent study done on the relationships between the socio-economic profile of farmers and paddy productivity in North West Selangor, Malaysia, showed that there were few socio-economic factors that significantly impacted paddy productivity (Ibrahim and Low, 2008).

There were several socio-economic variables of the paddy farmers that had statistically significant relationships with paddy yield, either it increased or decreased the paddy production. Some common socio-economic factors that were found to affect paddy production were gender, age, education level, years of experience, non-agriculture to agriculture income ratio, family size, availability of machines, labour, price, fertilizer and land area (Alam *et al.*, 2011; Ibrahim and Low, 2008).

1.2 Problem Statement

Malaysia's paddy productivity lacks behind other countries with 3.7 t ha⁻¹ per season. This poor level of productivity resulted in low incomes for paddy farmers with an average of RM1, 400 per month (PEMANDU, 2010). Rice is the staple food crop of Sabah, especially for the rural population as it serves as a source of food and an important economic crop. Rice cultivation had been practiced traditionally and was cultivated in a small scale. As the population of Sabah grew and the State began developing, rice begun to be cultivated in a large scale. Potential areas, such as, Kota

Belud and Kota Marudu were identified for rice cultivation thus irrigation systems and modern rice farming practices were implemented to boost the rice production. However, the total land area dedicated to rice production began to decline from 53,000 ha in 1990 to 41,000 ha in 2004 and finally in 2009 it was 34,594 ha. Approximately, 50% of Sabah rice production came from these two districts which could only contribute 70 % of the total State rice production. The government only provided less than 50% of irrigation facilities to assist the rice production and 40% of the paddy farmers harvest twice a year (Department Statistic of Malaysia, 2005).

At the moment, the rice production in Sabah only could supply only between 30%- 40% of the population needs due to high demand from a large population and a rapid population growth (Ubong and Ibrahim, 2010). Therefore, it was crucial that the state increase the rice productions if Sabah aims to achieve at least 60 % of rice self sufficiency level (SSL). Records from the Sabah Agriculture Department showed a decline in the rice production per ha from 2004 until 2009. In 2004, the rice production was 40,882 ha, 39,631 ha in 2005, 39,571 ha in 2006 and 36,334.4 ha in 2007. Then the state saw an increase in 2008 with 38,935.6 ha and late in 2009, a high record of 43,563 ha. However, in 2010 the rice productions drop to 43,168 ha (Department of Agriculture Sabah, 2010a; 2009; 2008; 2007; 2006; 2005 and 2004).

Several socio-economic aspects of farmers had significant impacts on paddy productivity. According to Alam *et al.* (2011), education level, secondary occupation, off farm-on farm income ratio and physical farm characteristics had significantly affected the paddy yields of farmers studied study. Another study done by Ibrahim and Low (2008) proved that gender, age and also experience of farmers had significant relationships with their paddy production.

MARDI carried out a survey on the socioeconomic factors influencing the total productivity of paddy. The socioeconomic factors were age, race, area of paddy field, planting technique (broadcasting or transplanting), area status (in the granary or outside of the granary) and location of survey (MADA, KADA and PBLs). Results from the survey showed that the technique of planting (broadcasting) and the location of the survey correlates and were significant to the total productivity of the paddy. Other factors, such as, the variety of the paddy seeds (MR219) increases the total productivity

in KADA area. However, the areas of the paddy field in MADA showed a negative significant correlation towards the total productivity (MARDI, 2010).

These studies had shown that socio-economic characteristics of paddy farmers could affect their paddy production as well as their productivity. Identification of these socio-economic factors was very crucial because it could help and guide the government or other related parties in identifying alternative effective programs or activities that need to be implemented in order to increase the production of paddy by local farmers.

Besides socio economic characteristics of the paddy farmers, other factors such as environmental and input factor also play an important role in affecting the paddy farmers' productivity. Agriculture production depends heavily on environmental conditions (Rahman and Hasan, 2008 and Sherlund *et al.*, 2002). According to Sherlund *et al.* (2002), environmental factors which might affect rice production include carrying rainfall, pest and weed infestation, and other environmental conditions. Input factors, such as fertilizers (Chaudhry *et al.*, 1990; Chaudhry and Rafique, 1990 and Iqbal *et al.*, 1987), plant density optimum farm management (Kahlowan *et al.*, 1997), timely availability of agricultural inputs (Ali *et al.*, 1994), resource conservation (Raza *et al.*, 2001), and farmers inputs (Junejo *et al.*, 2001) were found to affect the productivity of paddy farmers.

Based on these findings, the government could further improve and initiate policies which would help those target groups specifically who really were in need of assistance in their paddy production to improve their productivity. From these findings, we could suggest that the Government should initiate more policies that aim to help paddy farmers to boost their productivity by conducting specific training or education programmes, awareness creation programmers or additional incentive programmes. Policy implications improving environmental conditions may lead to higher rice yield. Therefore, there is a need to conduct a study to identify which socio-economic characteristics of paddy farmers affecting their production and also their productivity. Also perceptions of the paddy farmers on the socioeconomic factors need to be identify to further understand how these paddy farmers feel on these factors affecting their productivity.

1.3 Objectives

The primary aim of this study was to investigate the relationships between socio-economic characteristics of paddy farmers and their paddy productivity in the sub district Kelawat, Kota Belud. Specifically this study attempted to accomplish the following objectives:

- i. To identify the socio-economic characteristics of paddy farmers in sub district Kelawat, Kota Belud, Sabah;
- ii. To identify the productivity of paddy farmers selected in the study;
- iii. To determine the relationship between socio-economic characteristics of paddy farmers and their paddy productivity in the district of sub district Kelawat, Kota Belud, Sabah; and
- iv. To identify the paddy farmers perceptions on factors affecting their paddy productivity.

1.4 Terminologies

In this study, socioeconomic, productivity and production terms were frequently used. In order to fully understand the meaning of these terms, this section would explain each individual term in both conceptual definition and operational definition.

1.4.1 Socio-economic

1.4.1a Conceptual Definition

Oxford Dictionary of Economics defined socioeconomic as socioeconomic class (National Statistic Socio Economic Class, NS-SEC). The UK National Statistics classification that groups together people with similar social and economic status. The version used for most analyses has eight classes with the first one subdivided. These classes are as follows: 1 Higher managerial and professional occupations: 1.1 Large employers and higher managerial occupations; 1.2 Higher professional occupations; 2 Lower managerial and professional occupations; 3 Intermediate occupations; 4 Small employers and own account workers; 5 Lower supervisory and technical occupations; 6 Semi-routine occupations; 7 Routine occupations; 8 Never worked and long term

unemployed; and Not Classified. This classification replaced the previously used classification of socio-economic groups (National Statistic Socio Economic Group, NS-SEG), along with the classification of social class (National Statistic Socio Class, NS-SC) (Black, 2003).

Socioeconomics have been defined as socioeconomic characteristics. Socioeconomic characteristics include income, occupation and education can be used to derive segments that are easy to reach. Such segments are indicators (although not perfect) of behaviour such as lifestyle, price sensitivity and brand preference (Gaur and Singh, 2012). Furthermore, the American Heritage® Dictionary of the English Language defines socioeconomics as of or involving both social and economic factors (Pickett, 2000).

1.4.1b Operational Definition

In this study, the socio-economic characteristics of paddy farmers were identified according to the previous similar studies under taken. The socio-economic characteristics used in this study were the paddy farmers' marital status, age, main occupation, education, number of household members, years of experience in cultivating paddy, main source of income, land status, input subsidy received in the last season, number of seed varieties used in the last season, sowing method used in the last season and visit from extension worker in the last season.

1.4.2 Productivity

1.4.2a Conceptual Definition

Eatwell and Newman (1991) defined productivity as a ratio of some measure of output to some index of input use. Samuelson and Nordhaus (1995) supported this concept which implied that productivity was indeed perceived as the output per unit input or the efficiency with which resources were utilized.

The Oxford Dictionary of Economics defines productivity as the amount of output per unit of input achieved by a firm, industry, or country. This can be per unit of a particular factor of production, for example labour employed, or per unit of land in

agriculture, or 'total factor productivity' may be measured, which involves aggregating the different factors. Productivity would be determined by the level of output if returns to scale were constant (Black, 2003).

1.4.2b Operational Definition

In this study, productivity was referred to as productivity of paddy farmers. The productivity of paddy farmers was measured in terms of the total production of the paddy obtained last season divided by the total land area used to cultivate the paddy.

The productivity of paddy farmers was calculated based on Formula 1.1 which was the following formula used by MARDI (MARDI, 2010).

$$PP = \frac{\text{Output}}{\text{Input}} = \frac{Q_i}{q_i} \quad (1.1)$$

Where, PP denotes the productivity of paddy farmers (kg per acre), Q_i denotes the paddy yield quantity produced in the last season (kg) and q_i denotes the quantity of input which is the total land area of cultivation (acre).

CHAPTER 2

LITERATURE REVIEW

2.1 Paddy Production and Productivity in Malaysia

Malaysia has been an inefficient producer of rice ever since the World Bank has carried out a study which was systematically recorded as early as 1988. It was found that the producer price was twice higher than imported rice. The World Bank study revealed that 74% of paddy producer's source of monthly income came from income support measures. In conclusion, Malaysian paddy sub-sector was non-viable and non-sustainable. Although the Government have supported through research and development (R&D), production and marketing in the form of credit facilities, fertiliser subsidies, irrigation investment, guaranteed minimum price, income support programme, subsidised retail price and research and extension support (training, advisory), despite all this, rice production was still persistently inefficient (Pio Lopez, 2007).

The contribution of the paddy sector was 0.9% of GDP and 4.7% of agriculture value-added in the year 1985. In 1995, the paddy sector's contribution declined to 0.1% of GDP and 4.1% of agriculture value-added. In 1998, the Third National Agriculture Plan predicted that the paddy sector would contribute further less than 4% of agriculture value. Furthermore, rice was not identified in the Balance of Trade Plan of the Ministry of Agriculture to achieve surplus trade in the agriculture and food sector until 2010. Continued decline in cultivated area, negligible gains in productivity, continued increase in the cost of production and decreasing profitability ensured that rice production in Malaysia was a sunset industry (Pio Lopez, 2007).

The trend of paddy planted area could be clearly seen after the independence of the country in 1957, the acreage of rice had steadily increased up to its peak of 766,



000 ha in 1972 and in 1981 it began to gradually decrease to 711,000 ha. It then had been stable within the range of 640,000 ha to 700,000 ha (IRRI, 2008). Some economists suggested that this was a result of land competition for production of more profitable commodities, mainly oil palm and rubber. However, given that there was no direct competition for land as soil requirements for paddy and other major commodities are different, it was rather a diversion of investment for more profitable crops.

Alam *et al.* (2011) stated that the usage of land for agriculture continued to decrease due to the country's rapid economic development with more agricultural land are developed for housing, business and industrial purposes. Land use for industrial crops had been increasing from 1960 to 2005 while food crop had been decreasing. This proved that industrial crops were taking up the agriculture land and the importance of food crop is slowly decreasing. Though there was significant increase in the agricultural land used by the palm oil sector since the last five decades from 2.1% in 1960 to 63.4% in 2005.

The total oil palm planted area in 2011 reached to 5 million ha, which showed a 3.0% increase compared to previous year 4.95 million ha. Sarawak had increase its planted area to 102,169 ha or 11.0%. However, Sabah was still the largest state with planted oil palm with a 28.6% or 1.43 million ha of the total oil palm planted area followed by Sarawak with 20.4% or 1.02 million ha (MPOB, 2011).

The total acreage of paddy land in Malaysia was 676,034 ha in 2006. In 2007, the land area increased to 676,111 ha, however in 2008 the land area decreased to 656,602 ha and in 2009 it increased back up to 674,928 ha and finally in 2010 the total acreage of paddy is 677,885 ha (JPM, 2012). The paddy growing area is expected to decline with time as a result of conversion of paddy land for other land use including urbanisation. In Peninsular Malaysia, the total paddy planted area was 510,289 ha in 2006, 511,489 ha in 2007, and in 2008, a decline to 503,290 ha. In 2009, it increased to 515,657 ha and in 2010 it again decrease to 512, 610 ha (JPM, 2012).

For Sabah, there was a remarkable increase in the total paddy planted area from 2006 to 2010. In 2006 the area was 38,498 ha, 41,443 ha in 2007, 37,447 ha in 2008, 40,352 ha in 2009 and lastly 43,535 ha in 2010 (JPM, 2012). In 2006, the total paddy planted area in Sarawak was 127,247 ha, increased to 123,179 ha in 2007 and

then it dropped in 2008 to 115,865 ha. The area increased in 2009 with a the total acreage of 118,929 ha and in 2010, 121,921 ha (JPM, 2012).

Meanwhile, paddy production in Sabah was 2,187,519 metric ton (MT) hiking up to 2,375,604 MT in 2006. In 2008, the paddy production decreased to 2,353,032 MT and in 2009 increased to 2,511,043 MT. The year 2010 showed a drop from the previous year with 2,464,830 MY (JPM, 2012). The paddy production experienced an influx with 1,813,867 MT in 2006, increased to with 2,031,542 MT in 2007, followed by a drop in 2008 to 2,013,142 MT, and then increased to 2,193,640 MT in 2009. In 2010, the production again dropped to 2,102,644 MT (JPM, 2012).

In Sarawak, paddy production was 239,794 MT in 2006, and dropped to 209,679 MT in 2007, further decreased in 2008 to 206,753 MT and dropped further in 2009 to 185,693 MT. The year 2010 saw an improvement with an increase to 214,655 MT. For Sabah, the paddy production was 133,858 MT in 2006, and increased to 134,384 MT in 2007 but decreased in 2008 to 133,138 MT. In 2009, paddy production further decreased to 131,710 MT and in 2010 the paddy production increased up to 147,531 MT (JPM, 2012).

In Malaysia, rice is the third most important crop after palm oil and rubber, respectively. In Peninsular Malaysia, rice was mainly grown in the eight granary areas covering an area of about 209,300 ha (Azmi and Mashhor, 1995). In 2006, the total rice production in Malaysia was 2,154,000 tonnes and the total growing area was 635,000 ha (USDA, 2008). Muda Agriculture Development Authority (MADA) and Kemubu Agriculture Developments Authority (KADA) were the two main paddy production areas which were only able to produce 230,000 tonnes of paddy, and in 2010 it was expected to increase to 260,000 tonnes.

IRRI (2008) cited that Malaysia was expected to achieve 85% self-sufficiency level (SSL) by 2010 and at the same time able to put aside stockpile to maintain food security. Currently, Malaysia consumes about 2.75 million tonnes annually and in order to achieve the 80% SSL, Malaysia has to produce at least 2.2 million tonnes of rice which is about 600,000 tonnes more than the current production of 1.6 million tonnes (Oryza News, 2012). Furthermore, IRRI (2008) stated that new paddy areas would

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