UNIVERSITI PUTRA MALAYSIA

ADOPTION ON NEW PADDY SEED VARIETIES AMONG FARMERS IN MUDA AGRICULTURAL DEVELOPMENT AUTHORITY, MALAYSIA

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FP 2017 49

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By

NUR SHUHAMIN BINTI NAZURI

Thesis Submitted to the School of Graduate Studies, Universiti Putra Malaysia, in Fulfilment of the Requirements for the Degree of Master of Science

April 2017

DEDICATION

I dedicate this precious gift to my parents Nazuri bin Kamis and Zainab binti Husin. Thanks to both of my sister who always support my study journey. Indeed, it is not the knowledge, which should come to you, it is you who should come to the knowledge. Always keep your dream alive.

Abstract of thesis presented to the Senate of Universiti Putra Malaysia in fulfillment of the requirement for the degree of Master of Science

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Chairman :Associate Professor Norsida Man, PhD
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Malaysia's economic report stated that the rice production is expected to achieve 86% self-sufficiency level by 2010. Currently, Malaysia has reached self-sufficiency's level for rice at 73% (9th Malaysia Plan). The contribution in an agricultural sector especially rice production is very important for generating self-sufficient rice, reducing imported rice and increasing food security. Agriculture sector is also important to provide income, increase the rate of employment and escalate investment especially in rural areas. Malaysian Agricultural Research and Development Institute (MARDI) is a research institute that is involves in supplying quality seeds and planting materials to the farmers. Meanwhile, government agency such as MADA provides support services for farmers' development programs such as producing high quality of paddy seeds to enhance socio-economic of the farmers (Fauzi and Wahab, 2013). However, farmers encountered many problems due to lack of knowledge and practices on new paddy seed varieties. The yield performances are different according to areas and farmers although they are using the same seed variety. Farmers' knowledge and skill are the main factors contributing to the yield performance.

Current studies have been conducted to identify the knowledge, attitude and skill that affect the adoption on new seed varieties. The research also determines the contribution of age, gender, education level, size of farm, and years of involvement in paddy experience. The primary data has been obtained from a questionnaire filled by 250 respondents of the farmers in Muda area in Kedah and Perlis. The respondents have been selected through random sampling technique. Descriptive Analysis, Chi-Square and Correlation analysis techniques are used to analyze the data. The analysis showed that the average age of farmers was 48 years old and majority of the participants have paddy farming experiences for more than 16 years. Most of them attended secondary school level of education and the average farm size was 2.01 hectares. The

results showed that the level of respondents towards adoption of new seed varieties was in a high level with the value of 3.71. This level of adoption towards new seed varieties were driven by high level of farmers' attitude, knowledge and skills with respective value of 3.90, 4.01 and 3.91. For the socio-demographic factors, only age and years of involvement had significant relationships with adoption on new paddy seed varieties. Meanwhile, the adoption on new seed was highly correlated with knowledge, but not to the attitude and skills of farmers. These results indicate that the knowledge plays an important role in affecting the farmers' adoption towards new seed varieties. An Authority, which is the MADA agency should strive to maintain and further enhance the adoption on new seed varieties among farmers by providing training and guidance for them.

Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk Ijazah Master Sains

PENERIMAAN PETANI TERHADAP VARIETI PADI BARU DI LEMBAGA KEMAJUAN PERTANIAN MUDA (MADA), MALAYSIA

Oleh

NUR SHUHAMIN BINTI NAZURI

April 2017

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Laporan ekonomi Malaysia menyatakan bahawa pengeluaran beras dijangka mencapai tahap kecukupan 86% menjelang tahun 2010. Pada masa ini, Malaysia telah mencapai tahap sara diri bagi pengeluaran beras sebanyak 73% (Rancangan Malaysia ke-9). Sumbangan pengeluaran beras dalam sektor pertanian khususnya adalah sangat penting bagi penghasilan beras yang secukupnya, mengurangkan kadar beras import dan dapat meningkatkan kadar keselamatan makanan. Sektor pertanian juga penting bagi menyediakan pendapatan, pekerjaan dan pelaburan terutamanya di kawasan luar bandar. MARDI merupakan sebuah pusat penyelidikan yang terlibat dalam membekalkan benih berkualiti dan bahan tanaman kepada petani. Sementara itu juga, agensi kerajaan seperti MADA juga ada menyediakan perkhidmatan sokongan bagi program pembangunan petani termasuk dalam menghasilkan benih padi yang berkualiti tinggi untuk meningkatkan sosio-ekonomi petani (Fauzi and Wahab, 2013). Walaubagaimanapun, terdapat banyak masalah yang dihadapi oleh petani kerana kurang pengetahuan dan amalan dalam mengendalikan banih padi baru. Hasil tanaman yang dikeluarkan berbeza mengikut kawasan dan petani. walaupun telah menggunakan benih padi yang sama.

Kajian semasa dijalankan untuk mengenal pasti pengetahuan, sikap dan kemahiran yang mempengaruhi penggunaan varieti benih baru. Data primer diperoleh daripada soal selidik yang diisi oleh 250 responden petani di kawasan Muda di Kedah dan Perlis. Responden dipilih melalui teknik persampelan rawak. Analisis Deskriptif, teknik Analisis Korelasi dan Chi-Square digunakan untuk menganalisis data. Analisis menunjukkan bahawa purata umur petani berusia 48 tahun dan kebanyakannya mempunyai pengalaman dalam tanaman padi sekitar 16 tahun dan ke atas. Kebanyakan mereka mempunyai pendidikan di tahap sekolah menengah dan purata saiz ladang adalah 2.01 hektar. Hasil kajian menunjukkan bahawa tahap responden

terhadap penerimaan benih padi baru berada pada paras yang tinggi dengan nilai 3.71.

Tahap penerimaan yang tinggi terhadap varieti baru ini didorong oleh sikap, pengetahuan dan kemahiran petani yang tinggi dengan nilai 3.90, 4.01 dan 3.91. Bagi faktor sosio-demografi, hanya penglibatan umur dan tahun yang mempunyai hubungan yang signifikan dengan penggunaan varieti benih padi baru. Sementara itu, penggunaan benih baru sangat berkaitanrapat dengan pengetahuan, tetapi bukan kepada sikap dan kemahiran petani. Kesimpulannya, keputusan dari kajian ini menunjukkan bahawa pengetahuan memainkan peranan penting dalam mempengaruhi penerapan petani terhadap varieti benih baru. Pihak berkuasa seperti agensi MADA harus berusaha dalam mempertahankan dan meningkatkan lagi penerimaan petani terhadap varieti benih baru dengan menyediakan latihan dan bimbingan kepada mereka.

ACKNOWLEDGEMENTS

Praise be to ALLAH for his majesty, uncountable blessings and helping me to take on this wonderful journey as another chapter in my life. The strength has made me able to complete my master study successfully.

I would like to express my deepest gratitude and thanks to my supervisor, Associate Professor Dr. Norsida Man to be my best teacher. I have learn so much from you. To my supervisory committee Associate Professor Dr. Nitty Hirawaty Kamarulzaman for her constant support, persistent guidance and advice throughout my study. Thank you to Associate Professor Dr. Nolila Mohd Nawi for his assistance, expertise and suggestion to improve the research. This work would not be possible without their help.

I deeply acknowledge a bunch of my friends, Nur Mardhiati Afifa Abd Samad, Nur Izzati binti Ibrahim, Syakirah binti Mohd Ariffin, Wisam Yako, Mellisa Alina Yusoff, Hidayah Hassim and Fateen Noorasyikin Sarkowi for their understanding, advice and encouragement throughout my study journey.

And last but not least, there is no words can be expressing my deepest gratitude to my beloved parents Nazuri bin Kamis and Zainab binti Husin ; my sisters Siti Nur Shuhada and Nur Sharmiza who has been very supportive and loving throughout my journey searching for knowledge. They all kept me going and this thesis would not have been possible without them.

This thesis submitted to the Senate of Universiti Putra Malaysia has been accepted as fulfillment for the Master of Science. The members of the Supervisory Committee are as follows:

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Declaration by Members of Supervisory Committee

This is to confirm that:

- the research conducted and the writing of this thesis was under our supervision;
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LIST OF ABBREVIATIONS

GDP	Gross Domestic Product
MARDI	Malaysian Agriculture Research and Development Institute
DOA	Department of Agriculture
MADA	Muda Agricultural Development Authority
FAO	Food and Agricultural Organization of the United Nations
FAOSTAT	Food and Agricultural Organization Statistic
R&D	Research and Development
NAP1	National Agricultural Policy 1
GTP	Government Transformation Program
NKEA	National Key Economic Area
ETP	Economic Transformation Program
EPP	Entry Point Project
KADA	Kemubu Agricultural Development Authority
IADA	Integrated Agriculture Development Area
KETARA	Northern Terengganu Integrated Agriculture Development Area
FELCRA	Federal Land Consolidation and Rehabilitation Authority
PPK	Pertubuhan Peladang Kawasan
BERNAS	Padiberas National BERHAD
SPPM	Syarikat Perniagaan Peladang MADA
HYV	High Yielding Varieties
GM	Genetically Modified

CHAPTER 1

INTRODUCTION

1.1 Introduction

This chapter discussed the introduction of the study and consisted of Agriculture Sector in Malaysia, National Agro Food Policy on Paddy and Rice, Paddy Production and Granary Area, Technology Innovation and Green Revolution, Rice and Paddy Varieties, Muda Agricultural Development Authority (MADA) and Muda Area, Problem Statement, Objective Study, Significance of the Study and Thesis Organization

1.2 Agriculture Sector in Malaysia

Agriculture sector is one of the most vital sectors in Malaysia economic development. Several commercial crops such as cocoa, palm oil and rubber were introduced during British administration in Malaya. These commodities have contributed to Malaysia economic growth due to highly exports earning in the few decades after independence of Malaysia. However, the government have changed their focus into industrial sector such as electrical, automobile, electronics and others in early 90's (Istikoma et al., 2015). In 1997, Malaysia financial crisis occurred due to a global economic problem, which declined our industrial sector. Therefore, government have shifted their economic strategies towards agriculture sector since this sector was able to act as a savior of the Malaysian economic through their contribution towards Gross Domestic Product (GDP) inclined (8^{th} Malaysia Plan).

Recently, agriculture sector was identified as the third engine of economic growth after manufacturing and service sector. Based on statistics, Malaysia agriculture sector contributes 7.3% in GDP compare to manufacturing and services sector, which contribute 48% and 40% respectively (Malaysian Investment Development Authority, 2011). Agriculture plays an important role as the nation food provider and sources of employments in a rural area. Biotechnology, agricultural sciences and agribusiness are agricultural relate courses that deserve massive attention in order to produce specialist and researchers in agricultural fields.

Generally, the agriculture sector in Malaysia is categorized into two (2) groups, which are industrial sub sector and food sub sector. Industrial sub sector including oil palm, rubber and timber industries are highly commercialized, which mainly serves the export market. Meanwhile food sub sector such as vegetables, fruit and paddy are managed by smallholders' subsector, less

commercialize and largely serves for domestic consumption only (9th Malaysia Plan).

Paddy is an important source of food and farm income for smallholders in Malaysia. Apart from being a staple diet for Malaysian, paddy also consider as a strategic crop since it has been listed as the most vital food security crop. The paddy planted area in Malaysia is about 672,000 ha and 3.6 metric tons per hectares for the average of national paddy production (Dano and Samonte, 2002). Malaysian Agriculture Research and Development Institute (MARDI), Department of Agriculture (DOA) and Muda Agricultural Development Authority (MADA) are research institutes and government agencies that has been involved in developing many programs to increase paddy production. DOA is the main producer of rice variety and there are about 32% of the total production produce in our country (Wan Mahmood, 2006). DOA is the government agency functions to increase the production of rice by evaluating, modifying and recommending technology for rice and paddy seed production. Besides, they also produce, monitor and supply of quality seeds and the rice industry development programs in the states.

MARDI as a statutory body is responsible to carry out extensive research programs by producing the new paddy seed varieties with a high yield potential and resistance towards disease. There are several rice varieties has produced by MARDI such as MR220-CL1, MR220-CL2, MR253 MR263 and MR269. Meanwhile, MADA also provides support services to farmer development programs including produces a high-quality paddy seeds that have implemented to enhance socio-economic of farmers (Hussin and Mat, 2013). It was a good program and effort from government agencies and research institutes in developing the new paddy seed varieties and evaluation to strengthen the yield.

However, the production of paddy in the country still insufficient and remain low. Malaysia self-sufficiency level for rice is at 73% (MARDI, 2016). Currently, most of our import rice stocks are from foreign country such as Thailand, Vietnam and Pakistan. The contribution in agricultural sector especially rice production is very important for generating self-sufficient, reducing imported rice and increasing food security. It is also important to provide income, employment and investment especially in rural area.

Table1.1 shows the production of import rice in Malaysia in 2015. Thailand and Vietnam controlled more than 70% of rice imported into Malaysia. Other exporters of rice to Malaysia in 2015 were Pakistan, Cambodia, India and others with the percentage 19%, 5%, 2% and 1% respectively.

Table 1.1: Import Rice, Malaysia 2014

Country	Percentage (%)
Vietnam	32%
Thailand	41%
Pakistan	19%
Cambodia	5%
India	2%
Others	1%

Source: DOA (2014)

Table 1.2 shows the data of import and export paddy in Malaysia from 2006 until 2011. There were fluctuation trend showed for import and export quantity from 2010 until 2013.

Table 1.2: Import and Export Data of Paddy in Malaysia from 2010-2013

Year	Import quantity (tonnes)	Export quantity (tonnes)
2010	930,583	413,000
2011	1,031,033	661,000
2012	1,005,416	923,000
2013	889, 820	1,076,200

Source: Food and Agricultural Organization Statistic, 2013

1.3 National Agro Food Policy on Paddy and Rice

The Food and Agricultural Organization (FAO, 1997) defines food security as a situation where all household have physically and economically ability to access adequate food for all members continuously. World Food Summit (1996) defines food security in a different way, which is when all people at all the times have access to sufficient, safe, nutritious food to maintain their health and active life. There are three (3) pillars on food security concept which are food availability, food access and food use. Food availability describes the sufficient quantity on food consistently. Meanwhile, food use and food access explains an appropriate use based on their knowledge of nutrition value and having sufficient resources to acquire appropriate foods for a nutritious diet (Siwar et al., 2014).

In national perspective, food security is an ability of a country to produce an adequate food for their domestic consumption. In Malaysia, government gives a massive attentions and involvement in food security to ensure a sufficient food supply especially in rice sector. Malaysian government has spent billion-ringgit Malaysia for the past fifty years on subsidies, Research and Development (R&D), irrigation system, extension support and policies in order to increase and strengthening the production.

In 1984, the First National Agricultural Policy (NAP1) has been introduced by Malaysia government. This policy objective towards development of the sector covered long-term target until year 2000. Government invested heavily in modernizing and commercializing the smallholder sub sector and developing of agro-based industry. Besides, government has made efforts to regenerate, develop the agricultural sector and to modernize the rural areas. These efforts to ensure that agriculture remains competitive in international market

Government implemented NAP 2 (1992-1996) by shifting towards industrialization and focusing on high value and export orientation crops such as oil palm and cocoa. Thus, it encouraged involvement of government and private sector in large-scale agricultural production on food commodities and high value of product. During NAP3 (1998-2010) was introduced, government emphasized the improvement on production of high market value crops. Even though NAP3 focused on agro-based agriculture and high-value crops, it would still maintain the production of paddy. The private sector also involves in large-scale rice paddy farming. This policy implemented to reverse the previous trend by increasing in rice production and decreasing in rice importation (9th Malaysia Plan).

The success of the NAP1, NAP2 and NAP3 had led the government to launch the New Agro Food Policy (NAFP) approved by Cabinet of Malaysia on 28 September 2011. Malaysian Prime Minister Dato' Seri Mohd Najib Tun Abdul Razak had raised the issue of NAFP and about RM1.1 billion had been allocated for this agro sector.

The policy emphasizes on strengthening the effectiveness of agro food industry to be more productive and competitive. This new approach consists of eight primary ideas that have been recognized to support the transformation process of agro food industry such as (1) food security, availability and sufficiency of food access, (2) development of high-value agriculture; (3) sustainable agricultural development; (4) private sector investment of modern agriculture (5) modernization of agriculture driven by R & D , technology and innovation; (6) knowledge- information-based human capital; (7) dynamic agriculture with maximization of income generation (8) prime agricultural support services.

The implementation of National Agro-Food Policy (2011-2020) has been put in place to address the issue of food supply in Malaysia. The objectives of the policy are to increase the food security and safety in order to ensure the food availability and prevent poverty. Government also concentrated on food production through sustainability and optimization of land use. For instance, intensive farming, integrated farming and mini-estate program in granary area. Thus, we can support the food consumption for our nation. There will be 16 Entry Points Projects (EPP) identified under National Key Economic Area that will be implented to spur growth in this sector. Entry Point Project 10 focusing on strengthening the productivity of paddy farming in MADA. Government sets the target on self-sufficiency level (SLL) of 70% for the production of rice in the country for 2011-2020 by taking into account the food security. This EPP objective is to establish Malaysia's long term food security and increase the income of paddy farmer. The introduction of new paddy seed varieties is one of adoption technology that have been introduce to intensify across the production chain of the paddy and rice industry. This purpose is to raise the paddy yield production from 5 MT per ha to 8 MT per ha by 2020 (NKEA, 2014).

1.4 Paddy Production and Granary Area

Paddy regard as a vital crop in food sub sector in Malaysia. Therefore, Malaysian paddy and rice industry receive massive more attention by government. The annual paddy production is 2.6 million metric tons (FAOSTAT, 2013). There are 300,000 farmers depend on rice farming as the main sources of income and the average age of farmers are more than 60 years (Norsida, 2009). Paddy farming in Malaysia required large and suitable area for farm practices. The area of paddy planted throughout the year 2005 to 2014 in Malaysia is fluctuating every year. Therefore, the production of rice also affected whereas an increase and decrease quite significantly occurred from year to year (Refer to Table 1.3).

Table 1.3: Area of Farming and Production of Yield

Year	Area Of Paddy Farming (Hectare)	Paddy Production ('000 Metric Tonnes)	Average Yield of Paddy (Kg/Ha)	Rice Production ('000 Tan Metrik)
2005	666,823	2, 314	3,471	1,490,015
2006	676,034	2, 187	3,236	1,407,221
2007	676,111	2, 375	3,514	1,530,971
2008	656,602	2, 353	3,584	1,516,474
2009	674, 928	2, 511	3,720	1,620,256
2010	677,884	2, 464	3,782	1,588,456
2011	687, 940	2, 575	3,748	1,661,260
2012	684, 545	2, 599	3,797	1,674,981
2013	671, 679	2, 603	3,876	1,677,367
2014	679, 239	2, 848	4,194	1,834,831

Source: Department of Agriculture (2014)

Table 1.4 shows self-sufficiency level of food commodities in Malaysia from 2010, 2015 and 2020. The rice crops are target to achieve the self-sufficiency 100% to support the needs of an increasing and affluent population.

Table 1.4: Self-Sufficiency Level of Food Commodities, 2010-2020 (%)

Commodities	2010	2015	2020
Crops			
Rice	63.1	71.4	100
Fruits	103.3	101. 6	106.5
Vegetables	89.8	91.8	95.1
Livestocks			
Beef	30.1	27.2	50
Mutton/Lamb	12.2	17.3	24.6
Poultry	105.6	104.6	103.7
Pork	94.7	88.7	83.1
Eggs	114.6	122.1	130
Milk	8.5	13	13.6
Fish	93.9	92.6	95.8

Source: 11th Malaysia Plan, 2010-2020

Therefore, government has done many programs in order to strengthen the paddy production and improve farmer's living standard. The Prime Minister, Dato' Seri Mohd Najib bin Tun Haji Abdul Razak had announce the implementation of Government Transformation Programme (GTP) in order to put the country stronger in facing many challenges to achieve Vision 2020. The National Key Economic Area (NKEA) under Economic Transformation Programme (ETP) had been introduced by government and one of the ETP is focus in agriculture.

The program has been identified to increase job opportunities, increase national self-sufficiency and ensure food security. Two Entry Point Project (EPP10) and (EPP11) in NKEA are focusing on rice cultivation in granary area. Rice area covered about 11% of total agricultural lands. Rice remains as the country most vital cultivation since it is the staple food for most of people.

Therefore, the government has designed eight granary areas as the permanent rice-producing areas in the country. Granary areas defined as major irrigation and main paddy producing areas identified by government in the National Agricultural Policy. The size of granary area is greater than 4,000 hectares. There are 8 granary areas in Malaysia which are: 1) Muda Agricultural Development Authority (MADA); 2) Kemubu Agricultural Development Authority (KADA); 3) Kerian-Sungai Manik Integrated Agriculture Development Area (IADA); 4) Barat Laut Selangor Integrated Agriculture Development Area (IADA); 5) Seberang Perak Integrated Agriculture Development Area (IADA); 6) Penang Integrated Agriculture Development Area (IADA);7) Northern Terengganu Integrated Agriculture Development Area (KETARA) ; 8) and Integrated Agriculture Development Kemasin Semerak. Table 1.5 shows the average yield of major granaries area in Malaysia. Among eight granary areas, MADA is among the highest on average yield of paddy production and it is known as paddy bowl of Malaysia.

Table 1.5: Average Paddy Yield of Major Granaries in Malaysia (metric tons per hectare)

Granaries	2006	2007	2008	2009	2010	2011	2012	2013	2014
IADA Barat Laut Selangor	4.557	5.042	4.761	5.493	5.612	5.908	5.989	6.280	6.403
IADA Pulau Pinang	4.555	4.854	4.776	5.206	5.589	5.728	5.621	5.841	5.872
KETARA	4.020	4.337	4.682	4.985	5.354	5.834	5.604	5.549	5.738
MADA	3.893	4.532	4.598	5.055	4.725	4.955	4.843	5.026	5.539
IADA Seberang Perak	2.987	2.972	4.268	4.618	4.375	4.592	4.948	4.552	4.484
KADA	3.519	3.599	3.586	3.754	3.974	4.096	4.196	4.136	4.297
IADA Kerian Sg.Manik	3.046	3.320	3.148	3.483	3.280	3.686	4.380	4.495	4.514
IADA Kemasin Semerak	2.731	2.489	2.639	2.831	3.347	2.938	3.905	3.495	3.715

Source: DOA (2014)

1.5 Green Revolution and Technology Innovation

Green revolution term refers to the revolution occurred that are dramatically change the agricultural practices as a result increase the productivity. The revolution occurred between 1940's and the late 1960's where a series of research, development and technology transfer were applied in agriculture field. This idea created by Norman Borlaug, the "Father of the Green Revolution" an American Scientist who interested in agriculture. During this time, a new technology such as chemical fertilizers, synthetic herbicides and pesticides had created. He started conduct research in Mexico and involved in development of high yield variety of cereal grains, modernization of management techniques, infrastructure in irrigation, distribution of synthetic fertilizers, pesticides and hybrid seeds to farmers. The usages of synthetic fertilizers function to supply extra nutrients and increase yield (Evenson and Gollin, 2003). Meanwhile, herbicides and pesticides are possible to control weeds or kill pests and prevent from diseases that result in increase the productivity. In addition, new and high yield varieties were developed and utilized to produce high yield. Besides, irrigation infrastructure also plays an important role in Green Revolution where water can be stored and sent to driers area – thus increase yield production worldwide. This increase in productivity and make it possible to save over a billion people from starvation.
Due to the success in producing more agricultural products in Mexico, Green Revolution technologies had spread worldwide in the 1950s and 1960s. For an example, India is one of the country bring of mass famine in the early 1960s because of its rapidly growing population. Borlaug and the Ford Foundation had conduct research there to develop new variety of rice IR8 that produced more grain per panicle with the irrigation and fertilizers application. Scientists need to develop plants bred that respond to plant nutrient, had shorter straw to support the weight of heavier and produce an increase amount of grain per acre planted. Besides, they also involved in contributed to the new variety that could mature faster and grow at any time of the year.

Therefore, researchers were able to double the crop's production each year on the same land. Besides, new varieties also need to be resisting to pests and disease, which flourish under intensive farming conditions. Nowadays, India is one of the countries that lead for rice produces and the use of IR8 are spreading throughout Asia. There were 30,000 rice varieties had been introduced prior to the Green Revolution (Evenson and Gollin, 2003). The uses of high and new varieties as well to increase the quality of rice production in order to achieve food security target (Evenson and Gollin, 2003). However, the productivity of rice still beset low in Malaysia and cannot in any way guarantee self-sufficiency in rice production. More new varieties with high-yielding potentials and resistance to pest and diseases have been developed due to the fact that the variety produced are susceptible towards pest and diseases. These varieties have a shorter maturity days, good grain quality, higher yield potentials, resistance to pest and diseases and tolerance to soil problems and helps particularly to use the land for double cropping and multiple cropping, etc., resulting in high

productivity and land saving. The seeds are developed to get higher yielding and improved quality yielding compared to the yield of traditional seeds.

1.6 Rice and Paddy Varieties

In early stage, DOA took a responsibility to produce the rice varieties. In 1971, MARDI was established to take over the production of new paddy seed varieties. Until the year 2013, MARDI and DOA had been declare almost 41 rice varieties for farmers to use. All varieties produced through rice breeding program and the varieties were stored in the rice gene bank of the genetic resources to be used for the next generation.

The example of pioneer rice varieties such as Malinja, Mahsuri, Ria, Murni, Sri Malaysia, Kadaria, MR84 and so on. Malinja variety was one of the popular rice variety produced by DOA and has been announced in 1965. The maturity period for this variety was between 137 to 147 days. Besides, the other popular variety, Mahsuri have been produced by DOA in 1965 had the maturity period between 134 to 138 days. There are several rice varieties such as Masria, Jaya, Sri Malaysia 1, Setanjung and MR47 produced by MARDI and DOA between the year 1966 to 1985.

All varieties had the different characteristics and benefit. MR84 variety was one of the best variety ever produced and have been declared in 1986. This variety was preferred to be plant almost 17th season and covered 70% area of paddy cultivation in Malaysia (MARDI, 2016). The high yielding varieties have been developed based on their potential and resistance towards pest and diseases. The seeds were developed to produce higher yield and good quality as characterized to have a good grain quality, shorter maturity days, tolerance to soil problem and resistance to pests and disease. The variety also helped to maximize the usage of land (double cropping) in order to produce a higher yield compared to traditional seeds.

The average yield of high-yielding varieties has been reported to increase yield from 2 to 3 and 5 to 6 tons per hectare in last 25 to 50 years and maximize the crop duration from 110 days to 140 days (Bouman and Tuong, 2001). Hitertho, MARDI have been declared 35 rice varieties that had the special characteristics such as good yield performance as well as resistant towards pest and disease. Among the popular rice varieties nowadays are MR220-CL1, MR220-CL2, MR253, MR263, and the latest one is MR269. MR220-CL2 was a popular variety that has been identified as a high variety and has been declared on May 2010. This breed have been grown in the field area that with weedy rice problem. Most of farmers who had problem regarding on weedy rice were preferred to use this breed. Besides, MR253 variety that is resistance against leaf blast diseases, suitable for an organic and high acidity of paddy

area. Based on the high yield results, MR253 has been declared on November 2010 (MARDI, 2016).

MR263 has been declared in November 2010 and was first cultivated in FELCRA Seberang Perak, MADA and KADA. The latest one is MR269 which has a maturity stage between 104 to 113 days after sowing and has been declared on November 2012. The height of the plant around 97 to 108 cm and has a high resistance against blast leaf disease. All these new varieties has been introduced via development of varieties and research program to ensure the rice consumption are sufficient. In Peninsular Malaysia, at least forty cultivars have been recorded thus far by MARDI (MARDI 2011) as listed Table 1.6 below. At present, majority of Peninsular Malaysia rice farmers are encouraged to use seeds of rice cultivars recommended by MARDI.

Table 1.6: List of Seed Varieties in Malaysia

No.	Varieties	Year Released	No.	Varieties	Year Released
1.	Malinja	1964	22.	Pulut Hitam 9 PH9	1990
2.	Mahsuri	1965	23.	MR103	1990
3.	Ria (IR8)	1966	24.	MR106	1990
4.	Bahagia	1968	25.	MR123	1991
5.	Murni	1972	26.	MR127	1991
6.	Masria Pulut	1972	27.	MR159	1995
7.	Jaya (C4-63)	1973	28.	MR167	1995
8.	Sri Malaysia I	1974	29.	MR185	1997
9.	Pulut Malaysia I	1974	30.	MRQ50	1999
10.	Sri Malaysia II	1974	31.	MR211	1999
11.	Sekencang	1979	32.	M219	2001
12.	Setanjung	1979	33.	MR 220	2003
13.	Sekembang	1979	34.	Maswangi MRQ74	2005
14.	Kadaria	1981	35.	MR232	2006
15.	Pulut Siding	1981	36.	MRM16	2010
16.	Seberang	1984	37.	MR220-CL1	2010
17.	Manik	1984	38.	MR220-CL2	2010
18.	Muda	1984	39.	MR253	2010
19.	Makmur	1985	40.	MR263	2010
20.	MR84	1986	41.	MR269	2012
21.	MR81	1988			

(Source: Salmah, 2014)

1.7 Muda Agricultural Development Authority (MADA) and Muda Area

Muda Agricultural Development Authority (MADA) was established on under the original name of the Emergency Decree is Party Muda Agricultural Development Authority. Then, the agency later had changed to the Muda Agricultural Development Authority (MADA) after approved by Parliament under Act 70, the Muda Agricultural Development Authority Act, 1972. Under this act, MADA had been entrust to support tasks such as to develop, assist, plan, manage and enhance economic and social development in the Muda area. The two main goals of MADA are to increase the people standard of living in rural area and improve the production to meet the high demand. Besides, to ensure the goal successfully achieved, MADA has set up several functions to be carry out efficiently and effectively by providing agricultural and irrigation infrastructure, managing water resources effectively and ensuring economic and social development of farming communities (MADA, 2015).

There are about 55,130 farmers in MADA that involved in paddy farming. Kedah and Perlis are two states that involved in Muda Irrigation Scheme, with an area of 105.851 hectares in Kedah and 20.304 hectares in Perlis. The total of Muda area that covered two states in Peninsular Malaysia are 126.155 hectares. The total rice cultivation area in MADA is 96,558 acres, where 77,882 acres in the state of Kedah equivalent to 80.66% meanwhile the remaining area of 18.676 hectares, equivalent to 19.34% located in the state of Perlis (MADA, 2015). MADA's function is to ensure sufficient water supply for irrigation cultivation area. MADA is continuously searching for the best method and technologies for irrigation technique so that the water supply is always at the optimum level. Through establishment of MADA, paddy was successfully cultivated two times a year. First season or off season begins in March to August of the current year. The second season or main season begins in September of the current year to February next year. (MADA,2015).

To facilitate and completing the administration of MADA, four regional offices have been established, namely Region I (Kangar, Perlis), Region II (Jitra, Kedah), Region III (Yan, Kedah) and Region IV (Kota Sarang Semut). The area covered by Region 1 is 18,676 ha, Region II is 31,616 ha, Region III is 21,376 ha and Region IV is 24,890 ha. There are 27 centers Districts Farmers' Organization (PPK) in MADA area that offer various type of services such as farm infrastructure services, farm goods suppliers, development and consultation, marketing and others (MADA, 2015). The objectives establishments of the PPK are to increase economy and social standard, to enhance skills and knowledge, to incline revenue and income and improve living standards. MADA also provide farmers' development programs in implementing high quality of paddy seed that have been introduce by MARDI to enhance farmers' economic. Figure 1.1 shows the map of MADA paddy farming area covered from Region 1 to Region IV. The regions were dividing into 27 small areas of irrigation (A1-E1, A2-H2, A3-F3 and A4-F4).

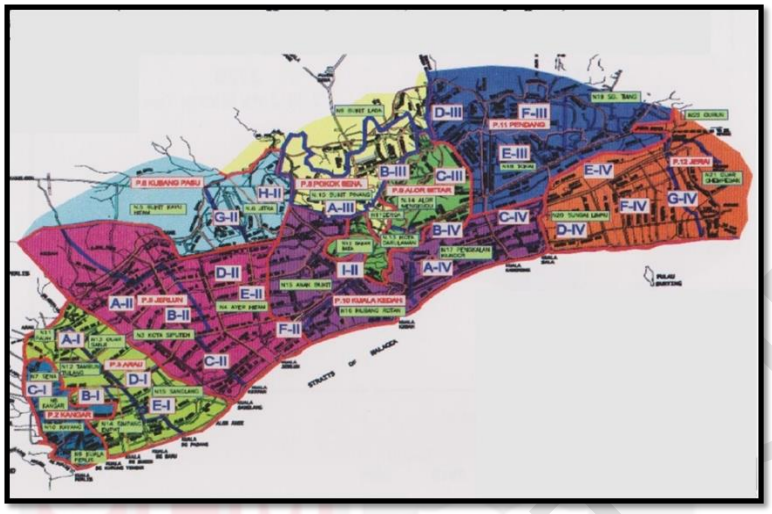

Figure 1.1: Map of Muda Paddy Farming Area
Source: MADA (2015)

1.8 Problem Statement

Based on data in statistics from DOA (2011), the total population of people in Malaysia is 29.7 million people and consumption of rice per capita is around 94 kg per person. The production of rice only 2.6 metric tons meanwhile the rice for domestic consumption amount needed is 2.8 metric tons thousand tons (Ricepedia, 2011). Government seriously emphasizes and gives a massive attention via research institutes and government agencies towards increasing paddy production and rice industry. High yielding varieties have been developed based on their potential and resistance towards pest and diseases. MARDI has launched several new paddy seed varieties such as MR220-CL1, MR220-CL2, MR253, MR263 and MR269. The uses on new seed varieties are important and beneficial for the productivity of rice.

However, there was no significant improvement in yield as the average farm yields varies from 3-5 tons per hectare. There are many problems facing by rural farmers due to their lack of knowledge and skill on using the new seed varieties on their farm. Some of them experienced the differences of yield production according to the area even though they have applied the same new seed varieties. Farmers should have the right knowledge, attitude, and skill on adopting new varieties to make sure the potential of the seed contribute to their productivity. The strategies for rice technology transfer to farmers also should be specially packaged in order to enhance the yield production. To date there have been little if any on adoption of farmers towards new paddy seed varieties research. Therefore, this research has been conducted to find out to what extent of knowledge, attitude and skill on the adoption on new paddy varieties among farmers.

1.9 Research Question

1) What is the level of adoption on new paddy seed varieties among respondents in Muda area?

2) What are level of knowledge, attitude and skills on new paddy seed varieties?

3) Does the socio-demographic factors will affect the level of adoption on new paddy seed varieties?

4) Does the level of knowledge, attitudes and skills will affect the level of adoption on new paddy seed varieties?

1.10 Objective of the study

1.10.1 General Objective

The general objective of this study is to determine adoption on new paddy seed varieties among farmers in Muda area.

1.10.2 Specific Objectives

Specific objectives of this study are:

1) To identify the level of respondent's adoption towards new paddy seed varieties in Muda area.

2) To identify the level of respondent's knowledge, attitude and skills towards new paddy seed varieties.

3) To determine the association between socio-demographic factors and level of adoption on new paddy seed varieties.

4) To determine the relationship between the level of knowledge, attitudes, skills and level of adoption on new paddy seed varieties.

1.11 Significance of the Study

This study will provide useful information to understand factors that influence the respondents' adoption on new paddy seed varieties in terms of attitude, skill, and knowledge. This study can help farmers to improve their farm productivity and increase their incomes. Policy makers and agricultural agencies can use the results to formulate plans and strategies to ensure development of rice farmers in this particular Muda area.

This objective agreed the government's desire to increase food production in order to meet country rice self-sufficiency 90% in 2010. The study provided information about the development of agriculture especially in rice production. Besides, it gives a clear picture on level of farmers' adoption towards new varieties of rice among community on that study area. The results of this study may help departments and agencies in planning and implementing activities in a joint development program with farmers.

This study was very significant to economic development in paddy farming. From this study, we described the socio-economic development of farmers towards adoption on new paddy seed varieties. In fact, this is the best solution to improve the uses of new paddy seed varieties and yield production for the future.

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BIODATA OF STUDENT

Nur Shuhamin binti Nazuri was born on 10 January, 1991 in Kuching, an urban districts in Sarawak. Growing up as the second children with an eldest sister and younger sister, she spent most of her childhood with her family in Kem Batu 10, Kuantan Pahang.

She obtained her primary education in Sekolah Kebangsaan Pengkalan Tentera in Kuantan and then entered a boarding school Sekolah Tun Fatimah in Johor Bharu to continue her secondary education. She finished her Sijil Penilaian Menengah (SPM) on 2008.

Afterwards, she continued her education in Penang Matriculation College in 2009 until 2010. Later in 2011, she furthers her study in Bachelor Science of Agriculture at the Faculty of Agriculture and obtained her Bachelor's Degree in November, 2014.

Her interest for agriculture extension field starts when she first entered Agriculture Extension class for her subject at the faculty. Her interest for agriculture extension field continues as she began studying in Master of Science Agricultural Extension at the Faculty of Agriculture, Universiti Putra Malaysia. During her Masters', she had an opportunity to work on a project with the title "Adoption on New Paddy Seed Varieties among Farmers in Muda Agricultural Development Authority (MADA) carries out by her respected lecturer Associate Professor Dr. Norsida Man and experienced lecturer Associate Professor Dr. Nitty Hirawaty binti Kamarulzaman.

PUBLICATION

Submitted

Nazuri, N. S. and Norsida, M. (2016). Acceptance and Practices on New Paddy Seed Variety Among Farmers in MADA Granary Area. *Academic Journal of Interdisciplinary Studies,* 5(2): 105-110.

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