UNIVERSITI PUTRA MALAYSIA

WELFARE IMPLICATION OF LIBERALIZATION POLICY OPTION FOR RICE SECTOR IN MALAYSIA

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By

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Thesis Submitted to the School of Graduate Studies, Universiti Putra Malaysia, in Fulfillment of the Requirements for the Degree of Doctor of Philosophy.

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Abstract of the thesis presented to School of Graduate Studies, Universiti Putra Malaysia, in fulfilment of the requirements for the degree of Doctor of Philosophy

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April 2015

Chairman: Assoc. Professor Amin Mahir Abdullah, PhD
Faculty: Agriculture

Rice sector in Malaysia is heavily supported and protected because of its socio-political and economic importance. These supports provided in form of production subsidy and import restriction intended to improve farmers' income through cut in production cost, attaining self-sufficiency level and rice-food security. However, the country membership in the World Trade Organization (WTO) and ASEAN Free Trade Area (AFTA) makes it mandatory to open up the sector in terms of adopting market-driven policy and by extension exit all forms of supports enjoy in the sector. The government efforts to have a trade-off between the two opposing policies depend on the knowledge of welfare impact of such policy option on the society at large. Hence, the study is designed to estimate welfare implications of complete liberalization policy in the rice sector. Specifically, the study is designed to achieve the following objectives: (i) estimate supply and demand models for Malaysian rice market; (ii) simulate the effects of alternative rice sector policy on the national output, paddy producer price, rice retail price, rice consumption level and import quantity; and, (iii) determine welfare implications of the policy options. Time series data (1980-2012) were collected and analyzed using appropriate time series econometric models: ARDL, ECM and OLS Multiple Regression. This estimation preceded the specification of structural equations by disaggregation of the supply-side of the sector into All-season, Main-season and Off-season paddy productions; while demand side is represented by aggregated single demand equation. Estimated coefficients were subjected to and pass the relevant diagnostic tests. The estimated elasticities were used for scenarios simulation and forecast. The results generated were further used in estimating the society welfare changed through appropriate estimation techniques. The results show that paddy area planted did not respond significantly to an increase in paddy producer price. Yield response significantly to technological trend but insignificantly to fertilizer subsidy. Rice consumption per capita is unresponsive to retail price movement. Rice consumption in relation to an increase in income signifies inferior good in the long-run but normal good in the short-run basis. Wheat is a substitute to rice in consumption. The complete liberalization of rice sector would witness the following situations by the year 2020: rice domestic production would decline by 9.7%; paddy Farm price would decrease by 2%; rice retail price decrease by 7.6%, rice total consumption increase by 0.1% and rice import would rise by 19.4%. The policy would result in paddy producer welfare loss of RM87M, consumer welfare gain of RM 829M while the sum of RM1B would be saved as revenue. Societal welfare gain is about RM 950M. These results would serve as empirical guide in aiding policy makers toward decision to adopt

market driven policy since society as a whole would be better-off as net gain far outweigh the welfare loss. This would lead ultimately to general welfare improvement in the society at large.

Abstrak tesis yang dikemukakan kepada Sekolah Pengajian Siswazah, Universiti Putra Malaysia, Sebagai memenuhi keperluan untuk ijazah Doktor Falsafah

IMPLIKASI KEBAJIKAN ATAS PEMILIHAN DASAR LIBERALISASI SEKTOR BERAS DI MALAYSIA

Oleh

HARUNA SULEIMAN UMAR

April 2015

Pengerusi: Profesor Madya Amin Mahir Abdullah, PhD
Fakulti: Pertanian

Sektor padi/beras di Malaysia menerima sokongan dan perlindungan kerana kepentingan sosio-politik dan ekonomi Negara. Sokongan yang diberikan adalah dalam bentuk subsidi pengeluaran dan halangan import bagi maksud meningkatkan pendapatan petani melalui pengurangan kos pengeluaran, mencapai tahap sara-diri dan sekuriti makanan. Namun begitu, keahlian Malaysia di dalam Pertubuhan Perdagangan Dunia (WTO) dan Kawasan Perdagangan Bebas ASEAN mewajibkan sektor ini lebih terbuka dengan mengamalkan dasar berpacukan pasaran serta mengurangkan lebih banyak sokongan yang dinikmati oleh sektor ini. Usaha kerajaan untuk mendapatkan keseimbangan di antara dua polisi bertentangan bergantung kepada pengetahuan tentang kesan kebajikan dari pelaksanaan polisi dipilih keatas masyarakat keseluruhannya. Oleh itu kajian ini dibuat untuk menganggarkan implikasi kebajikan dari pelaksanaan dasar liberalisasi menyeluruh sektor padi/beras. Khususnya, kajian ini dijalankan untuk mencapai objektif berikut: (i) menganggarkan model penawaran dan permintaan beras bagi pasaran Malaysia; (ii) membuat simulasi kesan dari pelaksanaan polisi alternatif keatas output nasional, harga pengeluar padi, harga runcit beras, tahap pengunaan beras dan kuatiti import; dan (iii) menentukan implikasi kebajikan dari pelaksanaan dasar pilihan. Data siri masa (1980-2012) telah dikumpul dan dianalisis dengan menggunakan model ekonometrik siri masa: ARDL, ECM dan OLS -Regresi berganda. Spesifikasi struktur persamaan dijalankan terlebih dahulu dengan memisahkan bahagian penawaran kepada beberapa bahagian iaitu keseluruhan musim, musim utama dan diluar musim pengeluaran padi; manakala di bahagian permintaan diwakili persaamaan permintaan tunggal. Anggaran pekali tertakluk kepada dan melepasi ujian diagnostik yang relevan. Keanjalan yang dianggarkan digunakan untuk simulasi senario dan keputusan yang dihasilkan seterusnya digunakan untuk menganggar kesan kebajikan masyarakat yang berubah dengan menggunakan teknik anggaran yang sesuai. Keputusan analisis menunjukkan kawasan penanaman padi tidak bertindak balas dengan ketara terhadap peningkatan harga pengeluar padi. Hasil menunjukkan reaksi positif kepada perubahan arus teknologi tetapi sebaliknya bagi subsidi baja. Manakala penggunaan beras per kapita tidak responsif kepada perubahan harga runcit. Penggunaan beras meningkat dengan peningkatan pendapatan untuk jangkamasa pendek, permintaan beras adalah selari dengan peningkatan pendapatan, namun untuk jangkamasa panjang, permintaannya akan menurun apabila pendapatan meningkat. Gandum adalah makanan penganti kepada beras. Liberalisasi menyeluruh sektor beras akan menunjukkan situasi berikut pada tahun 2020: pengeluaran domestik beras akan merosot sebanyak 9.7%; harga pengeluar padi akan berkurangan sebanyak 2%; penurunan harga runcit beras sebanyak 7.6%, jumlah penggunaan beras meningkat

sebanyak 0.1% dan import beras akan meningkat sebanyak 19.4%. Dasar ini mengakibatkan kerugian kebajikan pengeluar padi sebanyak RM87 juta, kebajikan pengguna memperoleh sejumlah RM829 juta, manakala RM1 bilion dapat dijimatkan sebagai hasil. Keuntungan yang diperoleh masyarakat pula adalah berjumlah RM950 juta. Penemuan kajian ini akan menjadi panduan empirikal kepada pembuat dasar di dalam membuat keputusan untuk menerimapakai dasar perpacukan pasaran kerana secara keseluruhannya masyarakat akan lebih baik memandangkan keuntungan sosial bersih jauh melebihi kerugian sosial. Hal ini secara umumnya akan membawa kepada penambahbaikan kebajikan dalam masyarakat

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I certify that a Thesis Examination Committee has met on 27th[th] of May, 2015, to conduct the final examination of Haruna Suleiman Umar on his thesis entitled "Welfare Implication Of Liberalization Policy Option For Rice Sector In Malaysia" in accordance with the Universities and University Colleges Act 1971 and the Constitution of the Universiti Putra Malaysia [P.U.(A) 106] 15 March 1998. The Committee recommends that the student be awarded the Doctor of Philosophy.

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This thesis was submitted to the Senate of Universiti Putra Malaysia and has been accepted as fulfilment of the requirement for the degree of Doctor of Philosophy

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This is to confirm that:

- the research conducted and the writing of this thesis was under our supervision;
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Supervisory
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CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Malaysia is endowed with agricultural resources as it has an estimated 14.2 million hectares of arable land of which about 7.6 million hectares are under cultivation; about 76% of the cultivable land (5.8 million hectares) are planted with permanent crops, while 24% (1.8 million hectares) is under annual cereal crops mainly rice by 2009 period (Chee-wan and Meng-chang, 2012). Apart from abundance arable land resource, the tropical climate and suitable soil conditions favour cultivation of the tropical crops. These features make agriculture a key sector of Malaysia's economy as it provides food for the nation and employment for about 12% of the total workforce of about 11.6 million, though its contribution to the national GDP is about 7.7% in 2009 period. The sector is also a source of high quality raw materials to the industrial sector under the agro- and resource-based industrial development strategies of the government (Dano and Samonte, 2005). Based on the Economic Transformation Programme reports for 2011, agriculture sector contribution to national GDP has reduced to 7.3% in 2011.

The sector is also considered by the government as a vital for the sustenance of national unity as efforts are been made to enhance income of the farmers in order to reduce the poverty incidence and improve inter-sectoral disparity as well as inequality between agrarian community and non- agricultural sector. Generally, there as has been an increased income generation in the major subsectors of Malaysian agriculture namely palm oil, rubber, paddy and livestock in some years ago. Table 1 show that the country palm oil industry generated an income of about RM 10,086 billion in 2010. This represents an increase of about 27% when compare to RM7, 915 billion income earned in the subsector in 2005; and about 72% increase over RM5, 860 billion in 2000. Similarly, in rubber subsector, a total income of RM2, 554 billion was generated in 2010 which was an improvement over RM 2,264 billion realized in 2005 by 12%. This also represents an increase of about 37% over RM1, 868 billion generated in 2000. Paddy subsector of the nation agriculture shows tremendous increase in income generation for the country. For instance, a total of RM998 million was earned as income in 2010. This represent about 56% increased compare to RM632 million generated in 2005; and 67% increase over RM590 million realized as income in 2000. Another subsector that made remarkable progress in terms of income generation for the country is the livestock industry dominated by poultry. For example, a total of RM2, 483 billion was realized as an income from livestock industry in 2010 alone. This represents about 19% increases over RM2, 089 billion generated in 2005; and 63% over RM 1,520 billion in 2000. However, income generated from cocoa is showing a decreasing trend since 2000. In 2000, RM250 million was generated as income and later decline drastically, by 67%, to RM 83 million in 2005. In 2010, the income from cocoa commodity increased modestly, by 66%, to RM 138 million. But on comparison with 2000 value, the RM 138 million realized in 2010 is still lower than the amount earned in 2000 by 45% (Table 1).

Table 1: Income generated by agricultural based industry by commodity between 2000 to 2010 (RM Million)

Year	2000	2005	2010
Palm oil	5860	7915	10,068
Fisheries	2493	2839	3875
Forestry	3055	3016	2761
Rubber	1868	2264	2554
Livestock	1520	2089	2483
Paddy	590	632	988
Cocoa	250	83	138

Source: Department of Statistics, MOA & AI, Malaysia (2012)

The Malaysian agricultural sector can be grouped into three sub-sectors namely the agro-industrial sub-sector consisting of oil palm, rubber, cocoa and timber industries, which majorly serves the export market; the food sub-sector comprising of rice, fruits and vegetables, livestock and fisheries, this group mainly serves domestic market; and the third sub-sector, often described as miscellaneous group, includes tobacco, pepper, coconut, sugarcane, cassava, sweet potato, maize, tea and coffee, serves both the domestic and export markets (Dano and Samonte, 2005).

Rice is the most important cultivated crops, besides oil palm and rubber in the country, covering a total land area of about 684,545 ha in 2012 (MOA & AI, 2014). About 76% of the rice farm land (515,657 hectares) is located in Peninsular Malaysia while Sabah and Sarawak constitute 6% (40,352 hectares) and 18% (118,919 hectares) respectively. It is a main staple crop which account for about 86% of the country's food grain production and is considered strategically important crop for food security in the country. Paddy/rice is mostly cultivated in the designated eight major producing areas called Granary Areas. The granary areas which cover over 200,000 hectares of the irrigated paddy land are found in Peninsular Malaysia. The mini granary areas with irrigation facilities totally about 28,000 hectares are also found all over the country. These granary areas are Muda Agricultural Development Authority, (MADA); Kemubu Agricultural Development Authority, (KADA); Barat Laut Selangor Integrated Agricultural Development Authority, (IADA Barat Laut Selangor); North Terengganu Integrated Agricultural Development Authority, (IADA Ketara); Krian/Sg. Manik Integrated Agricultural Development Authority, (IADA Kerian Sg. Manik); Seberang Perak Integrated Development Authority (IADA Seberang Perak); Pulau Pinang Integrated Development Authority (IADA Pulau Pinang); and, Kemasin/ Semerak Integrated Agricultural Development Authority, (IADA Kemansin Semarak) (Figure 1). The Granary Areas, which support both main-season and off-season paddy productions, provide about 72% of the rice production in the country (Najim, Haque and Eshan, 2007).

Distribution of paddy land areas among eight Granaries (Table 2) shows that MADA has the highest allocation (96,558 hectares) which constitute 47% of the total Granary Areas (204,578 hectares) in the country. The paddy land allocated to other Granary Areas and their proportions of the total areas are: KADA, 32,167 hectares (16%); IADA Kerian Sg. Manik, 27,829 hectares (14%); IADA Barat Laut Selangor, 18,814 hectares (9%); IADA Seberang Perak, 8,529 hectares (4%); IADA Ketara, 5,156

hectares (2%); IADA Kemasin/Semerak, 5,220 hectares (3%); and, IADA P. Pinang, 10,305 hectares (5%) (Figure1).

Table 2: Distribution of paddy land areas in hectares among granaries in peninsular Malaysia in 2010

Granary	Cultivated Areas (Ha)	% of Total Cultivated Areas
MADA	96,558	47
KADA	32,167	16
IADA Kemubu	27,829	14
AIDA P. Pinang	10,305	5
AIDA Barat L. Selangor	18,814	9
AIDA Seberang Perak	8,529	4
AIDA Ketara	5,156	2
IADA Kemasin Semarak	5,220	3
Total	204,578	100

(Adopted from Chee-wan and Meng-chang, 2012)

Granary Areas:

1. Muda Agricultural Development Authority
2. IADA Pulau Pinang
3. IADA Kerian Sg. Manik
4. IADA Seberang Perak
5. IADA Barat Laut Selangor
6. Kemubu Agricultural Development Authority
7. IADA Kemasin Semarak
8. IADA Ketara

Figure 1: Eight Major Rice Growing Areas in Malaysia- Granary Areas
(Adopted from Chee-wan and Meng-chang, 2012)

The mini Granary Areas are characterized by small and medium scale irrigation infrastructure with different capacities for double cropping as their paddy land area differs. About 80% of the mini Granary Areas is also found in the Peninsular Malaysia, and together with major ones, they constitute about 85% of total paddy cultivated areas. The non-Granary Areas are the non-irrigated rice areas which depend mostly on precipitation include rain fed paddy Sabah and Sarawak (Ahmad and Tawang, 1999). In these areas, singled-cropped paddy cultivation is commonly practiced and with low productivity.

There are more than 200,000 rice farmers who rely on rice production as the main source of income. The number of rice farmers is on decrease because of ageing and lack of fresh hands to take over from aged farmers. There are mostly small holder

farmers with an average farm size of about 1.5 hectares, and they dominate rice production sector which is highly regulated and subsidized.

The areas under rice production have witnessed an average annual growth rate of 2.6 percent from 680,647 hectares in 1990 to 698,702 hectares in 2000 (Figure 2). This later declined by 3% to 677,884 hectares in 2012 for all-season paddy production (Statistical Unit, MOA & AI, 2013). Much of the land area reduction under paddy rice production happened in Peninsular Malaysia under main-season production. A total of 430,182 hectares (that is 63% of total land area under paddy production in the country) were planted for paddy in the main season as against 254,363 hectares planted in the off-season in 2012. Both main and off seasons' rice paddy are planted in the eight designated Granary Areas which depends largely on irrigation. However, main season paddy is also cultivated in non-Granary Areas under rainfall.

According to Malaysian Ministry of Agriculture and Agro-based Industry, Agriculture Statistical Handbook, (2006), main-season paddy production has a commencement month of planting between August to February of the following year, while the off-season paddy cultivation fall between April and June of the same year. All-season paddy refers to yearly summation of data reported in the man-season and off-season paddy production in terms of area planted, area harvested, and average yield.

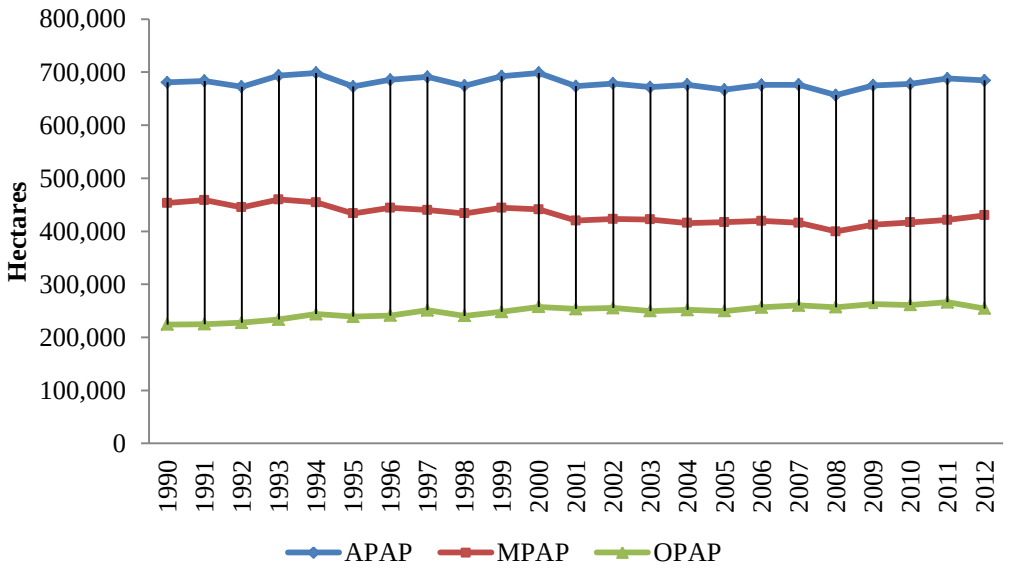

Figure 2: Total Planted Area (ha) for Rice Paddy by Season in Malaysia (1990-2012)

Note: APAP (All-season Paddy Area Planted); MPAP (Main-season Paddy Area Planted); and, ORP (off-season Paddy Area Planted).

Sources: Paddy Statistics Unit, Malaysian MOA& AI., (2013).

Malaysia's rice production has witnessed an increasing trend in the last two decades (Figure 3). There was 14% increase in rice national output from 1.2 million tonnes in 1990 to 1.4 million tonnes in 2000 and further increased by 20% to 1.7 million tonnes

in 2012 for all-season. The off season rice production has shown a steady increase in output (34%) over the years from 506,681 million tonnes in 1990 to 680,359 million tonnes in 2012. Within the same period, main season rice production also witnessed an irregular increase of 15% from 793,256 million tonnes in 1990 to 908, 930 million tonnes in 2012.

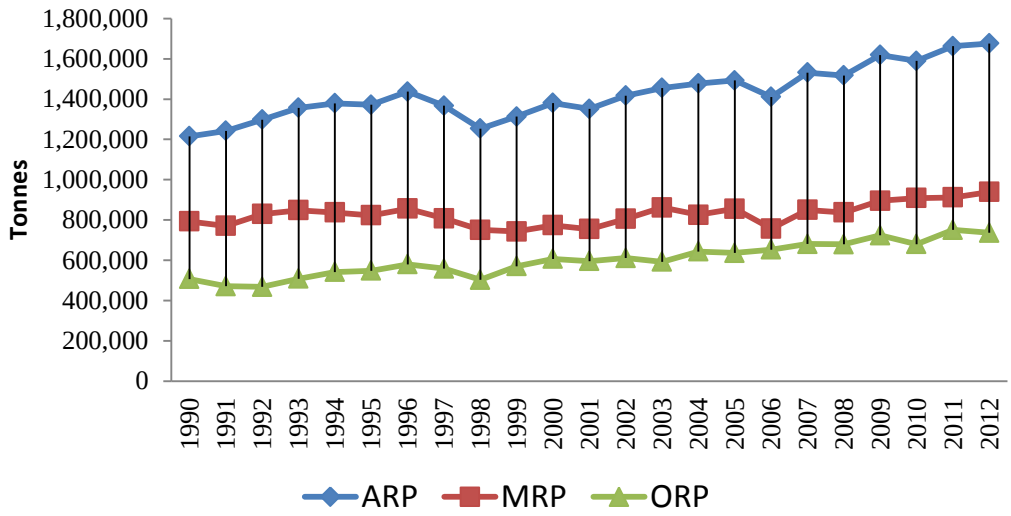

Figure 3: Rice Grain Production (Tonnes) by Season in Malaysia (1990-2012)
Note: ARP (All-season Rice); MRP (Main-season Rice Production); and, ORP (Off-season Rice Production).
Sources: Paddy Statistics Unit, Malaysian MOA & AI., (2013).

Rice yield recorded an increase on the average from 2.7 tonnes / ha to 3.8 tonnes / ha within 1990- 2012 period (Figure 4). The off-season paddy recorded an increased in yield from 3.5 tonnes / ha to 4.5 tonnes / ha within 1990-2012. The main-season yield increased from 2.7 tonnes / ha to 3.4 tonnes / ha within the same period. The national average yield is lower at about 3.642 tonnes / ha in the main season compare to 4.065 tonnes / ha in the off season.

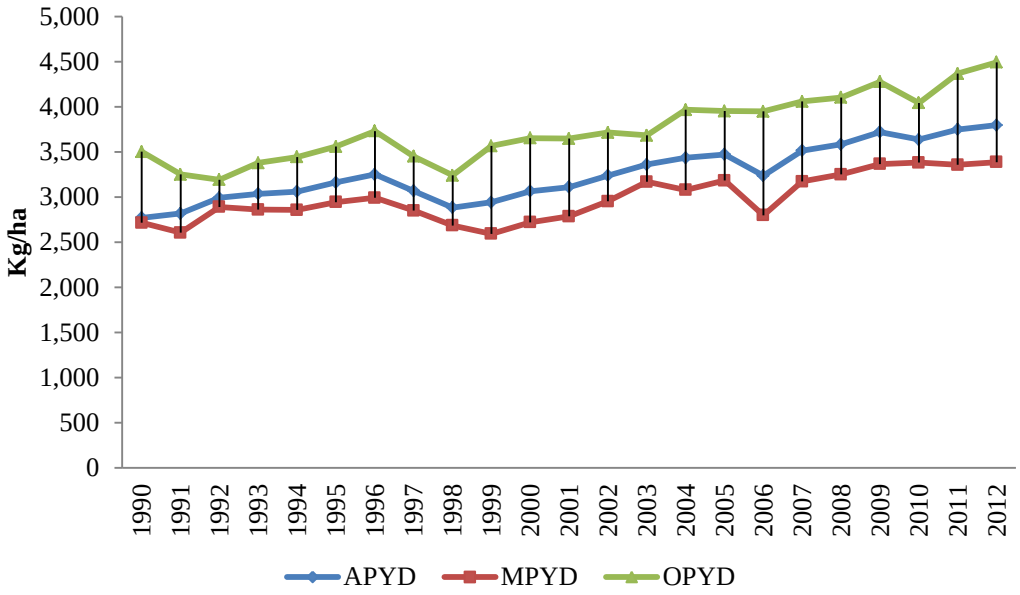

Figure 4: Average Yield (kg/ha) of Paddy Rice in Malaysia (1990-2012)
Note: APYD (All-season Paddy Yield); MPYD (Main-season Paddy Yield); and, OPYD (Off-season Paddy Yield).
Sources: Paddy Statistics Unit, Malaysian MOA & AI., (2013).

The total rice consumption in the country shows an increase of 45% from 1.6 million tonnes in 1990 to 2.4 million tonnes in 2012 (Figure 5). Within a decade of 1990 and 2000, the national rice consumption increased from 1.6 million tonnes to 1.97 million tonnes (representing an increase of 20%). There is further increase of total consumption by 21% between 2000 and 2012. However, rice consumption per capita is showing a downward trend from about 90 kg in 1990 to about 82 kg in 2012 (Figure 6). This implies a reduction in consumption per capita of about 8%. The reduction of rice consumption per capita is attributed to changes in dietary habit, income level and population increase (Fatimah, *et al*; 2012). Even though the domestic rice production increase by 38% from 1.2 million tonnes in 1990 to 1.7 million tonnes in 2012, such increment still creates a deficit of 42% of the national rice consumption by 2012 (Figure 5). As a result of shortfall in meeting the national rice consumption, rice importation has increased by over 200% from 330,336 thousand tonnes in 1990 to 1.05 million tonnes in 2012 as depicted in Figure 5. The rice importation is necessary to bridge supply-demand gap.

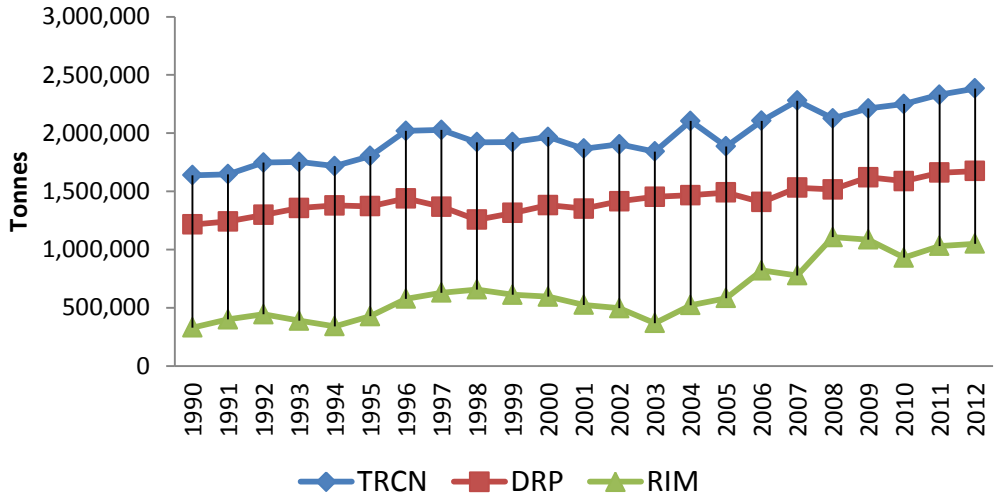

Figure 5: Rice Consumption, Domestic Rice Production and Rice Net Import (Tonnes) (1990-2012)
Note: TRCN (Total Rice Consumption); DRP (Domestic Rice Production); and, RIM (Rice Net Import).
Sources: Paddy Statistics Unit, Malaysian MOA & AI., (2013).

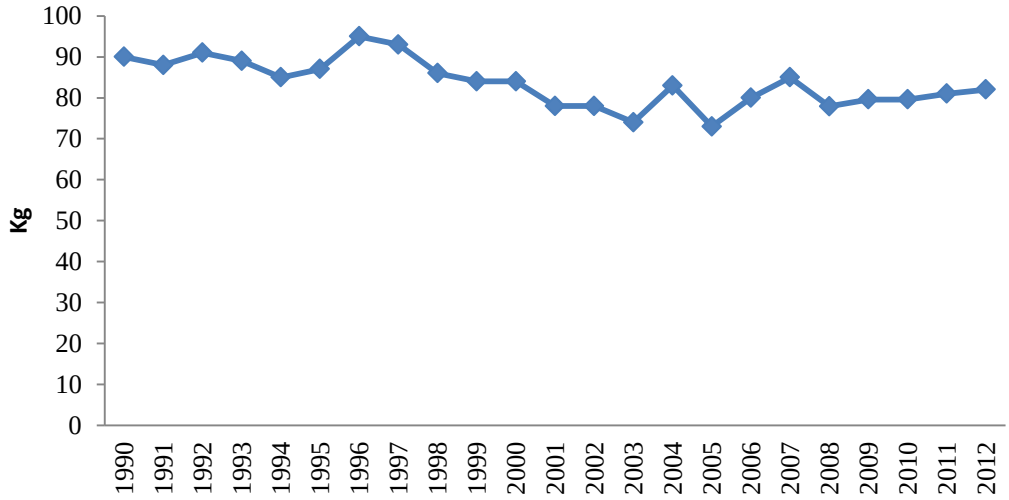

Figure 6: Rice Consumption per Capita (RPCN) in kg (1990-2012)
Sources: Paddy Statistics Unit, Malaysian MOA & AI., (2013).

The rice import bill has increased astronomically over the last two decades in the country (Figure 7). The value of rice import increase by over 500% from US$99,737,000 in 1990 to $606,222,000 in 2012. There was increased of about 82% from 1990's value to US$181, 585,000 in 2000. Between 2000 and 2012, the value of rice import into the country increased by over 200%. The highest import value incurred

by the country was US$813,305,000 recorded in 2008 period of global shock in rice supply.

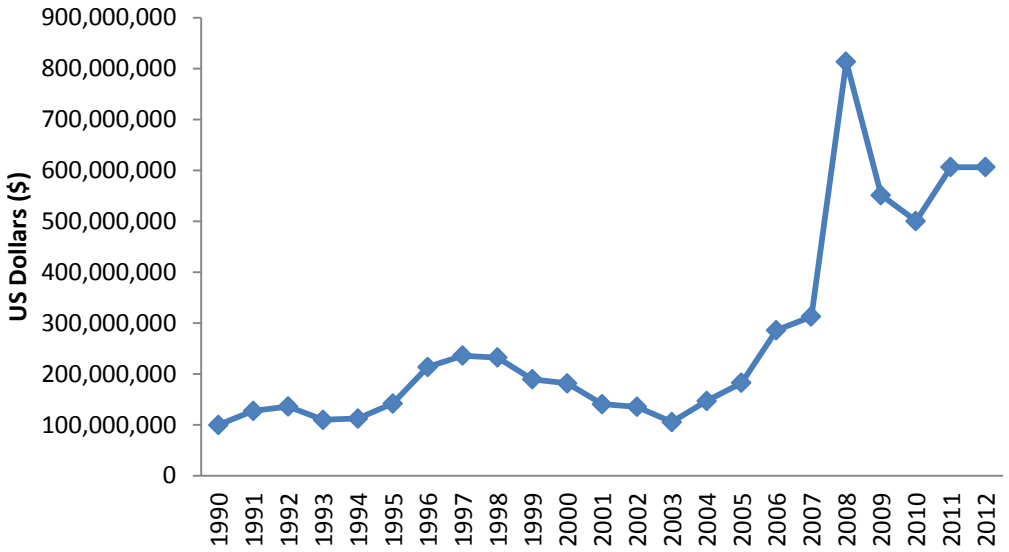

Figure 7: Value of Rice Net Import ($) (1990-2012)
Sources: Food and Agricultural Organization's website: www.fao.stat, (2013).

Vietnam has been the first major rice exporter to Malaysia since 2009. In 2011, Vietnam had about 55% of the Malaysian import Market (Global Agricultural Information Network (GAIN) Report, 2012). Thailand which has been the first major rice exporter before taken over by Vietnam, is now ranked as the second major rice exporter to Malaysia. The other significant supplier is Pakistan, followed by Cambodia and India. Malaysian rice import from U.S. was about 9,400 tonnes in 2012, which is mainly short-grain rice variety consumed by Japanese and Korean expatriates (GAIN Report, 2013). In 2011, given the policy of import quota, *Padiberas Nasional Bhd (BERNAS)*, a state owned company with the sole right of rice import, was given a 10-year extended mandate of sole importer of rice until 2021. The government has also granted an import duty exemption to *BERNAS*, which allows the imported rice price to be marginally above the local rice price (Deviga, 2013). In an attempt to protect the local rice farmers and in line with the import quota policy, *BERNAS* merely import rice just to cover the shortfalls of demand after ensuring the local rice production finds its way to the market.

Malaysia has a long history of government intervention in rice sector. The global instability in rice prices experienced in early 1970, middle of 1980 and recently in 2008 reinforced the necessity for the state intervention. Three main objectives for the formulation and implementation of various policies on rice through the decades by the government included: (i) ensuring food security; (ii) raising farm income and productivity; and, (iii) ensuring food supply to consumers at reasonable cost. The government supports for the rice sector has been consistently maintained and reflected in both National Agricultural Policy (NAPs) and Malaysia Plans. In 1980s, the government intervention in rice market was reinvigorated through different policies like monopoly on imports, Guaranteed Minimum Price (GMP) for paddy, fertilizer

subsidy, and controlled price at milling. The government also provides investments in building drainage and irrigation facilities and funded research and development in rice. The identification of suitable areas in the states of Sabah and Sarawak for large scale commercial paddy production by the private sector is another strategy adopted by government to ensure rice food security and sufficiency.

The fertilizer subsidy scheme of the government involves granting 240 kg/ha of compound fertilizer (that is 12 bags of 20 kg compound fertilizer per ha) and 100 kg/ha of urea fertilizer (that is 5 bags of 20 kg of urea fertilizer per ha). The aggregate amount of fertilizer subsidy per annum has been hovering unsteadily around RM 140 million and RM146 million between 1990 and 2000 (Figure 8). This amount later decreased by about 3% (compare to 2000 value) to about RM 141 million between 2003 and 2009. In 2010, the total amount of fertilizer subsidy increased by 13% to RM 165 million over 2009 amount. It further increased by 6% to about RM 175 million in 2012.

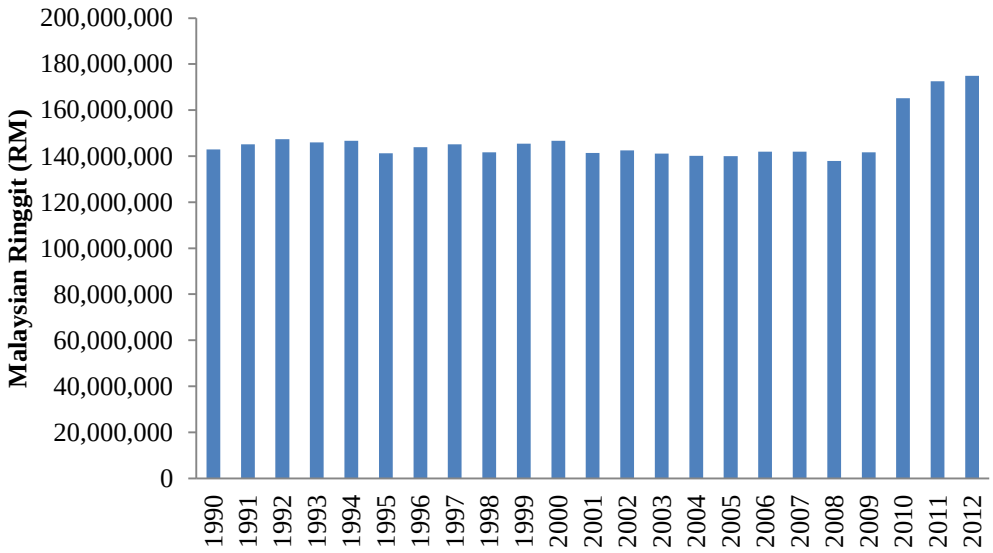

Figure 8: Amount of Fertilizer Subsidy (RM) (1990-2012)
Sources: Paddy Statistics Unit, Malaysian MOA & AI., (2013).

Another paddy production support is the Guaranteed Minimum Price (GMP) and paddy price support. The GMP was first introduced in 1949 to protect the paddy farmers' income. As a price floor policy, however, the GMP is no longer effective because since 1990, the paddy farm price has remained above the GMP at RM700 per tonnes. Similarly, in early 1980s, the price subsidy was introduced by providing paddy farmers with subsidy of RM33 per tonnes of paddy produced. The rate was later increased to RM167 per tonnes in 1982 (Ahmad and Tawang, 1999). In 1990, a further increased in the paddy price support was recorded to the current amount of RM248.10 per tonnes of paddy produced. The aggregate cost of paddy support price incurred by government is shown in Figure 9. The aggregate amount increased unsteadily from about RM468 million in 1990 to about RM531 million in 2000. The amount further increased to about RM 645 million in 2012. In addition, all paddy farmers enjoy a subsidy of RM25

per 100 kg of paddy delivered to a licensed mill or drying facility (GAIN Report, 2013).

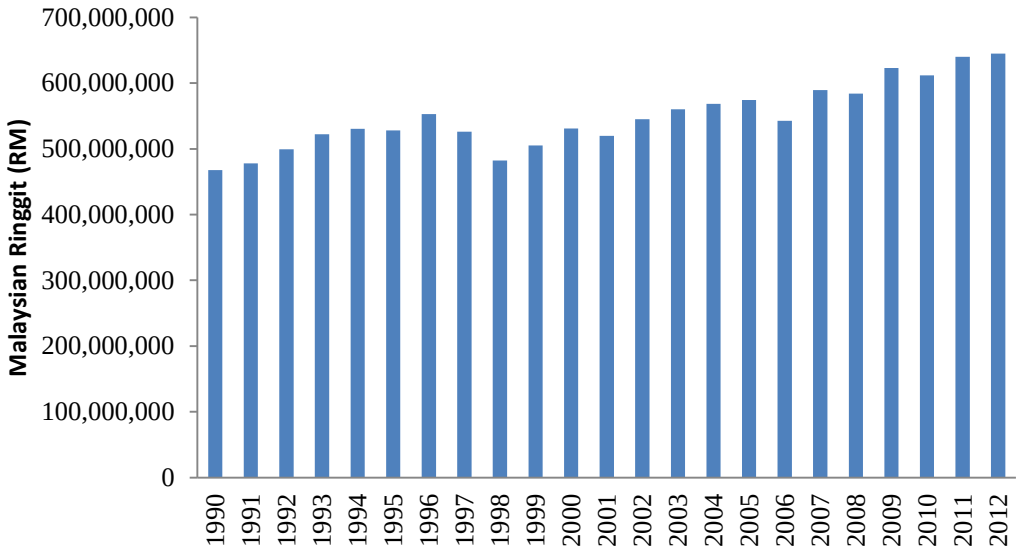

Figure 9: Aggregate Paddy Support Price per annum (RM) (1990-2012)
Sources: Paddy Statistics Unit, Malaysian MOA & AI., (2013).

According to Deviga (2013), in addition to paddy price support, Malaysian government also imposed rice consumer price ceiling to avoid arbitrary rise in local prices since the rice commodity remains a staple food. The price regulations cover three different types of locally produced rice namely, ST5 (5% broken rice), ST10 (10% broken rice) and ST15 (15 % broken rice). Recently, government restricts its price ceiling to ST15 because the type is consumed generally by the lower income population. The controlled retail prices for ST 15 ranges between RM1.65 to RM 1.80 per kg (Deviga, 2013).

The government has also invested heavily in paddy farm infrastructure in the form of irrigation canals, farm roads and other on-farm infrastructures. According to Fatimah, *et al*; (2012), the on-paddy farm infrastructural investment has enabled the farmers to do doubled cropping and enhance cropping intensity in the major granary areas. Table 3 shows that in the 1st Malaysian Plan, 30.8% of total national budget for agricultural sector was invested in the construction and maintenance of largest irrigation scheme in the country (MADA). The irrigation facility shared of agricultural sector budgetary allocation however decreased to less than 4% in the following 2nd Malaysia Plan. The allocation for irrigation/ drainage facilities and maintenance shared of agricultural sector budget has been more than 10% since 6th Malaysia Plan, with the second highest allocation of RM2.17 billion or 27.8 % of agriculture sector budget made in the 8th Malaysia plan. Within a short term perspective (2008-2010), the government allocated additional RM876 million as management expenditure for irrigation and drainage in both existing and new paddy areas in the country (Fatimah, *et al*; 2012). In the long term scheme, a sum of RM6 billion was allocated for construction of irrigation and drainage facilities in both existing and new paddy areas.

Table 3 : Budgetary allocation for drainage and irrigation development in RM between 1966- 2010

Malaysian Plan	Period	Total Agriculture Budget (RM million)	Drainage and Irrigation Amount (RM millon)	% Share of Agriculture Budget
1st Malaysia Plan	1966-1970	1,114.4	342.6	30.8
2nd Malaysia Plan	1971-1975	7,100.3	271.1	3.8
3rd Malaysia Plan	1976-1980	4,666.2	554.8	11.9
4th Malaysia Plan	1981-1985	7,671.3	396.6	5.2
5th Malaysia Plan	1986-1990	7,325.0	200.3	2.7
6th Malaysia Plan	1991-1995	8,215.2	844.6	10.3
7th Malaysia Plan	1996-2000	8,139.3	1,929.9	23.7
8th Malaysia Plan	2001-2005	7,860	2,170.2	27.6
9th Malaysia Plan	2006-2010	11,435	1,458.1	12.8

(Adapted from Fatimah, *et al*; 2012)

Over the years, the public interventions in rice industry have earned different levels of self-sufficiency in rice production (Table 4). Since 1966, the highest self-sufficiency level (SSL) achieved in rice production was 92%. This feat was achieved during the implementation of 3rd Malaysia Plan of 1976-1980. The period was characterized by rehabilitation of idle land for agricultural purpose and developing drainage for agriculture and food crops including rice production. The next highest level of self-sufficiency achieved was in the period of implementation of 4th Malaysia Plan (1981-1985). In this period, 76.5% SSL was achieved only next to 92% earlier mentioned. The period also witnessed the implementation first National Agricultural Policy. Food import substitution policy was emphasized during the period aimed at reducing high import bill of about RM4-5 billion annually (Dano and Salmonte, 2005). Since 1985, the country self- sufficiency levels in rice production has been fluctuating between 75% and 72% and in all cases overshot the projected level in the master plan.

The Ministry of Agriculture and Agro-based Industry, in an attempt to achieve higher self-sufficiency level and food security, adopted 4th National Agricultural Policy, which is now called the National Agro-food Policy 2011-2020 (Table 4). This policy is targeting at making the country to attain 85% self –sufficiency level in rice production by developing large scale rice farming in Sabah and Sarawak through private sector investment and sector modernization. The country usually resorts to importation of rice to augment deficit in demand-supply gap.

Table 4: National self-sufficiency level for paddy production in percentage within 1966 -2010 in Malaysia

Malaysian Plan/ National Agri. Plan (NAP)	Period	Self Sufficiency Level (SSL) Targeted (%)	Self Sufficiency Level (SSL) Achieved (%)
1st Malaysia Plan	1966-1970	na	80
2nd Malaysia Plan	1971-1975	na	87
3rd Malaysia Plan	1976-1980	90	92
NAP 1	1984-1991	65	75.9
4th Malaysia Plan	1981-1985	65	76.5
5th Malaysia Plan	1986-1990	65	75
6th Malaysia Plan	1991-1995	65	76.3
NAP 2	1992-2010	65	65
7th Malaysia Plan	1996-2000	65	71
NAP 3	1998-2010	65	71
8th Malaysia Plan	2001-2005	65	71
9th Malaysia Plan	2006-2010	65	72
National Food Security Policy	2008	80 by 2010	72
New Economic Model	2010	85 by 2020	na
National Agro-Food Policy (or NAP 4)	2011-2020	70 by 2012	na

Source: Fatimah, Emmy, Kusairi and Muhammed, (2011). **Note**: na (Not available)

Malaysia entered agreements with multi-lateral bodies namely, the World Trade Organization (WTO) and ASEAN Free Trade Area (AFTA). The most relevant of these agreements and with direct impact on rice sector are the "Agreement on Agriculture" (AoA) of WTO and the "Common Effective Preferential Tariff" (CEPT) of AFTA. These agreements called for the liberalization of agricultural sector by removing all forms of trade barriers including import quota and production subsidy by all member countries. Though at the moment there had been different levels of compliance to the agreement's obligations among member countries, some major changes in rice production and market have been witnessed by some member countries as a result of enforcement of the agreements. For instance, market-driven rice production in Vietnam has resulted in surplus production and making the country to be the second largest rice producer in the world. The country large rural population is involved in rice production, so the positive impacts of increased exports were largely dispersed. According to Minot and Gulotti (2000), overall poverty incidence of Vietnam has decreased significantly following liberalization policy of rice sector. International Support Group (ISG) (2002) observed that simulation based on spatial equilibrium approach confirms that trade liberalization would create substantial impact on Vietnam's agriculture like rice in promotion and efficiency improvement. In China, market-orientation has induced a shift towards production of high quality rice. However, the US and Japan have made little change in effective protection.

Gulati and Narayanan (2002) observed that liberalization of the rice trade would increase exports by rice producing Asian countries with beneficial effects for societal welfare following initial price increases for producers and secondly, round effects including increased in wages, employment and investment in these countries. This would contribute to welfare improvement and poverty alleviation, and at the same time, importing countries would have welfare improved through increased in food security. According to Mitra and Josling (2009) all agricultural trade restrictions, in long run and short run, lead to a deterioration of welfare in both the country imposing such measures and the rest of the world.

Dano and Samonte (2005) observed that Malaysia has made clear adjustments in its agricultural trade policies to conform with its obligation to the WTO agreements immediately upon accession. This was further demonstrated in the Seventh Malaysia Plan adopted in 1996, which further intensified Malaysia's thrust towards more competitive agricultural economy and free market trade, while focusing on top export earners. As a result, rice imports rose and self-sufficiency level declined below 65%. According to Ariff (1998), the major gains for Malaysia from liberalization policy would be seen from the exports of palm-oil and wood products. Other export crops namely cocoa, rubber, and pepper witnessed modest gains since Malaysia's competitiveness in exporting these products is uncertain.

In contrast with inherent societal benefits of liberalization policy in agricultural sector as mentioned above, some findings have shown the importance of production subsidies in raising farm income and output in Malaysian rice sector. For instance, Fatimah, Shamsudin and Rosli (2005) observed that the price support scheme of Malaysian rice sector was able to increase output by 65.8% and contribute to a 38.6% change in income while fertilizer and price support components of production subsidy constitute 58% of total farm income. According to Ahmed and Tawang (1999), Malaysian paddy rice subsidy alone constituted almost 50% of the farm income, and that a situation where all subsidies were to be withdrawn, the farm profitability would decline by 57%.

From foregoing, it is understandable that implementation of either of the policy, namely liberalization or maintaining the status quo (paddy production support and rice import restriction) would have effect on the entire society. This is because of inherent price and quantity changes from the implementation of such policy. Hence, it is possible to use price and quantity changes to find out the gainers and the losers and also estimate approximately the amounts of gains and losses as the consequences of the implementation of policy interventions. Welfare analysis through consumer and producer surpluses measure provides the opportunity of estimating the amount of gains and losses from implementation of the particular policy intervention.

Studies on producer and consumer surplus evolved from supply and demand theory, the theory that remains the basic foundation of economic theory. After Marshall had developed its application, the consumer and producer surplus concepts have been widely used in the empirical analysis. The analysis involves the estimation of consumer surplus, producer surplus and government cost or revenue saved. The estimate of consumer surplus, producer surplus (economic rent) and government cost are used to assess the welfare economic impact arising from government policy (Mustapha, 1998). The welfare economic approach to the analysis of the impact of policy interventions derive it validity from generalized recommendations of the aggregated nature of the policy outcome.

1.2 Policy Environment

Malaysia government intervention in rice market could be traced back to pre-independence era when the Guaranteed Minimum Price (GMP) was introduced in 1949 to protect the paddy price (Deviga, Harris and Macaulay, 2011). The policy thrust since then was to pursue food self-sufficiency and increasing farmers' income and maintaining stable rice supplies for the consumers. The policy intervention in rice sector is often embedded in the country's Development Plan (MP) and National Agricultural Policy (NAP), which is now called National Agro-food Policy.

The First Malaysia Plan of 1966-70 witnessed completion of the two biggest irrigation projects construction namely the Muda irrigation scheme in Kedah and Kemubu in Kelantan (Fatimah, *et al*; 2012). As result of these irrigation facilities, double cropping of paddy was achievable and hence contributed to the national output and enhances the income of paddy farmers in the country. This facilitated the attainment of 80% self-sufficiency level in rice production in 1970s. In addition to irrigation infrastructures, government introduced credit facility to help farmers coped with paddy production cost and to finance the double cropping scheme. The credit facility scheme was reinforced in the Second Malaysia Plan of 1971-1975 as credit was given at subsidized interest rate of 4.5% per season in 1973 by the Bank Pertanian Malaysia (BPM).

The Third Malaysian Plan (1976-1980) gave priority to agricultural sector with launching of New Economic Policy (NEP). A total sum of RM 2,744.65 billion was devoted to agriculture far higher than the previous allocations of RM375.9 million and RM88.18 million in the First and Second Malaysian Plans (Dano and Salmonte, 2005). The period was characterized by rehabilitation of idle land for agricultural purpose and developing drainage for agriculture and food crops including rice production. Within this period, a major paddy production intervention took place with the implementation of the fertilizer subsidy scheme in 1978. Based on this fertilizer subsidy scheme, free chemical fertilizers were given to smallholder paddy farmers with less than 2.4 ha (Amin, 2007). It was during this period, 3MP, that the highest self-sufficiency level (92%) of rice production was achieved compared to 78% in 1970.

The Fourth Malaysia Plan (1981-1985) elevated the status of agriculture as a precious sector in the Malaysian economy following the establishment of first National Agricultural Policy (NAP 1). The NAP 1, which was executed in 1984, provided short term and long term policy focus towards the development of agricultural sector until 2000. The policy placed much emphasis on new land development and consolidation of uneconomic sized land for paddy production. The period also witnessed the increased in the Paddy Price Support to RM167 per tonnes in 1982. Food import substitution policy was emphasized during the implementation of the scheme aimed at reducing high import bill of about RM4-5 billion annually. Rice self-sufficiency of 76.5% was actually attained from projected level of 80-85% (Dano and Salmonte, 2005).

The Fifth and the Sixth Malaysian Plans, (1986-1990; 1991-1995), were characterized by major policy thrust of modernizing and commercializing the small holder sector and lobbied for increasing participation of the private sector in the development of agro-based industry. The major policy concern under the two plans was to ensure that agriculture remained competitive in the international market. This resulted in the open up of more agricultural land and about 85% of the total land was undertaken by private sector (Dano and Salmonte, 2005). It was also during this period that the Second

National Agricultural Policy, NAP 2 (1992-1998) was launched and implemented, which culminated in Malaysia's shift towards industrialization and the promotion export crops like palm oil and cocoa. In this period, Paddy Price Support recorded upward adjustment as RM248.10 per tonnes was introduced and implemented. The efforts in this period led to the attainment of 76% self-sufficiency level in rice production; which was above projected value of 65% SSL.

The Seventh Malaysian Plan (1996–2000) reinvigorated efforts towards more competitive agricultural economy and free market trade as a result of Malaysia's accession to the WTO (Dano and Salmonte, 2005). It encouraged participation in large-scale agricultural production particularly food commodities and high-value products. As a result of implementation of the new policy shift towards the production of high valued crops and industrialization to meet WTO agreements, rice production witnessed a declining trend between 1996 and 1998. As a result, the rice import bill increased substantially from RM527.52 million in 1996 to RM 701.31 in 1997. It further increased to RM 910.52 in 1998. So, Malaysia's rice imports increased by almost 50% from 1995 to 1997 because of shift in policy towards market driven strategy (Dano and Samonte, 2005). The Third National Agricultural Policy, NAP3, (1998-2010) was introduced during this period which further emphasized increased in production of high-market-value crops, the involvement of the private sector in large scale rice paddy farming and, investments in research and development of commercial value crops. Also, the during the implementation of the NAP3 that eight Granary Areas were designated as permanent paddy producing areas so as to realize a minimum self-sufficiency level of 65%.

The efforts of expanding the sufficiency level in rice production was pursued in Eight (2001-2005) and Ninth (2006-2010) Malaysian Plans. The policy to increase the current 65% self –sufficiency level to 90% in rice production was the main issued in 9MP. Given the lack of land availability for production and the current cultivation practices on small holding land area, not much has been achieved to date (GAIN, 2010).

As result of failure to realize 90% self-sufficiency level in rice production from the implementation of the Ninth Malaysia Plan, the Tenth Malaysia Plan (2011-2015) was introduced and implemented. The 10th Malaysia plan has identified the need for scaling up of small paddy fields into large scale farms in order to increase productivity for enhancing the national self-sufficiency level. Efforts are geared towards ensuring the availability, accessibility and affordability of food particularly rice to general public (GAIN Report, 2013). Under the plan, enabling environment has been created for *BERNAS* to develop new paddy fields in East Malaysia and integration of small paddy farms into large size in Peninsular Malaysia. Strategies to ensure sufficient supply of rice include maintaining rice stockpile at 292,000 tonnes that can sustain consumption for 45 days, entering long-term contract agreement to import rice in exchange for palm oil, and increasing the productivity of existing granary and non-granary areas through upgrading of infrastructure (GAIN Report, 2011). Within the Tenth National Plan, National Agro-Food Policy (NAFP) 2011-2020 was introduced in 2011. The National Agro-Food Policy, which attempts to address food security and production of food commodities, is placed under the jurisdiction of Ministry of Agriculture and Agro-based Industry. The NAFP was also meant to focus on high-value agricultural development, strengthening supply chain, adoption of sustainable agricultural practices,

human capital development, private sector investment and sector modernization. This is meant to achieving self-sufficiency in rice production to about 85% level.

1.3 Problem Statement

From foregoing, it is obvious that rice sector in Malaysia is, at the moment, heavily supported and protected because of its socio-political and economic importance, and national drive towards achieving self -sufficiency in rice production. For instance, in 2012 alone, the total cost of paddy production subsidy incurred by the government was about RM820 million comprising RM 645 million as paddy price support and RM175million as fertilizer subsidy. However, the national rice self-sufficiency goal is still far from realization as SSL is about 70%, which necessitated the annual rice importation through import quota, thus, boosting the import bill to billions of Malaysian Ringgit (RM) every year. For example, in the year 2012 alone, the total value of rice import was estimated at RM1.9 billion.

Contrary to the support and protection of rice sector by Malaysian government, the country membership in the WTO and AFTA makes it mandatory to open up agricultural sector in terms of adopting liberalization and market-driven policy option. The full implementation of the agreements connotes removal of trade barriers like import quota and production subsidy such as price support and fertilizer subsidy. While some economist analysts believe that adopting such policy option would make the country agricultural sector more competitive and enhance the welfare of both consumers and producers in the long-run citing the case of Vietnam and China as an example. However, studies have shown that if all subsidies are withdrawn from Malaysian rice farmers, the farm income would decline by 57%. This significant decline in income is believed to have an economic injury on the welfare of small size farmers who constitute the majority of rice farmers in the country and would also serves as incentive for abandonment of the paddy/rice production in the country; a situation that can negates the efforts of achieving self-sufficiency level in rice production and, improved income and welfare among the farming households.

Hence, the government's efforts to have the potential trade-off between the goal of protecting smallholder paddy producers and pursuing self-sufficiency for the nation on the one hand, and the need to honour her multilateral agreements by making agricultural sector a market driven on the other hand, certainly depend on knowledge gainer from empirical analysis of welfare implications, for rice producers and consumers as well as Malaysian nation as whole.

Previous studies analyzed impact of different policies as well as welfare implications on the rice sector by disregarding seasonal disparity, such as main-season paddy production and off-season paddy production, on the supply side of the sector. Hence, by aggregating the supply information (that is all-season paddy) in the analysis, opportunity of having a comprehensive insight into the policy impact of main-season and off season rice productions in the country would be denied. Similarly apart from basing analysis on up-to-date data (1980-2012), as most previous studies on the subject matter are becoming out-dated, efforts have been made to subject all the models built to satisfy classical linear regression assumptions and thereby making the results more applicable. It is as a result of missing knowledge in the previous studies as highlighted above that informed the need for this study. The study is aimed at finding answers to the following research questions:-

(i) What is the nature of structural relationships exist among the major variables (or players) in both supply and demand sides of the rice sector?
(ii) What is the impact of partial and complete liberalization of rice sector on rice production, consumption and regulatory body?
(iii) What is the welfare implication of partial and complete liberalization of rice sector?

1.4 Objectives of the Study

The general objective of the study is to determine welfare implication of liberalization policy option in Malaysian rice sector. Specifically, the study is intended to:
(i) estimate supply and demand models for Malaysian rice market;
(ii) simulate the effects of alternative rice sector policies (that is partial and complete liberalization) on the national output, consumption level and import quantity; and,
(iii) determine welfare implication of liberalization policy option (that is complete removal of paddy price support and fertilizer subsidy, as well as free import).

1.5 Significance of the Study

The implementation of trade policy instruments such as liberalization or changes in import quotas, tariffs, production supports, and exchange rates often exert complex impacts on production and welfare of the citizens (Shamsudin, 2007). This necessitates the need for analysis of policy alternatives and weighs their impacts on the economy and people's welfare. The choice of optimal policy instrument requires both *ex post* and *ex ante* evaluation of all possible alternative courses of actions. Hence, the results of quantitative welfare analysis (using historical data) of all possible policy options of partial or complete liberalization in the rice sector would serve as reference tool to the Malaysia government in an efforts to establish trade-off between the goal of sustaining trade and production supports policies on the one hand, and discharging her bilateral agreements by making the rice sector a market driven on the other hand.

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