UNIVERSITI PUTRA MALAYSIA

SOCIAL ADAPTATION TOWARDS UNSTABLE RUBBER PRICE AMONG SMALLHOLDERS

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By

NUR AQILAH BINTI SAUFE

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

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

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April 2018

Chairman : Norsida Man, PhD
Faculty : Agriculture

National Key Economic Area (NKEA) for rubber involves three (3) Entry Point Projects (EPPs) and one of the targets is to ensure sustainability of the upstream rubber industry in Malaysia. This EPP aims to increase the area of replanting and new planting of rubber by independent smallholders to 24,000 hectares. More replanting exercises can also be expected following the government's rubber incentive to aid rubber smallholders suffering from weak commodity prices. Rubber smallholders produce 92.4% of the Malaysian rubber production. Nowadays, rubber smallholders need to face many challenges especially in rubber price fluctuation. The unstable prices of natural rubber could affect the income and socio-economics of the rubber smallholders. Thus, this research is focused on experienced of Malaysian smallholders with the aim to identify smallholders' social adaptation level towards unstable rubber price. Studying these conditions is a basic necessity to identify areas, which need to be supported to increase productivity through appropriate planning and proper extension services.

This study was conducted in four (4) districts area (Baling and Kulim, Kedah; Gua Musang and Kuala Krai, Kelantan) where most people are from rubber community and also the main occupation and income are from rubber with a total of 400 respondents. The primary data collected directly from the study of materials such as using questionnaire filled by the rubber smallholders as a respondent. The survey questions design according to the objectives of the study. Interviews for this surveys consisted of several structured questions such as demographic characteristic, respondents' farm profile, impact of unstable rubber price, social adaptation toward the unstable rubber price, agricultural extension services and others.

The data collected was analysed using descriptive analysis, chi-square analysis, factor analysis and multiple regression analysis. First, descriptive analysis was used to analyze the data which including the percentage and frequency. Chi-square analysis was used to test the association between selected socio-demographic factors and the level of respondents' social adaptation towards unstable rubber price. Lastly, multiple regression analysis was applied to investigate the most influential factors of impact level of unstable rubber price towards social adaptation.

The findings of descriptive analysis showed that 76.5% of respondents are male and the rest of 23.5% are female. The most predominant age group of the respondents is more 56 years old which are 42.0%. For the marital status of the respondents, there were 90.0% are married, 1.5% are single and 8.5% are widow and widower. 35.0% respondents went to primary schools while about 38.5% went to secondary schools. Meanwhile, only 4.0% had college/university education and 22.5% did not get any formal education. In general, the income level of smallholders is still low (68.5% less than RM1000). The main factors affecting the income of the smallholders are the current rubber price and the old age of the trees.

The overall mean for social adaptation level of smallholders towards the impact of unstable rubber price is 3.65 considered as a moderate level of perception. The result showed that the impacts level of unstable rubber price of smallholders was very high. Moreover, the level of agricultural extension agencies' roles to undertake impact of unstable rubber price toward respondents was very high. This study indicated that agricultural extension services have played a role in providing knowledge and information to improve smallholders' social adaptation.

The results of chi-square analysis showed that smallholders' age, gender, marital status, years of involvement, number of household, age of rubber tree, yield per month and rubber price per kilogram had significant association with their level of respondents' social adaptation towards unstable rubber price. Since the smallholders' majority is more than 56 years old age, it shows the significant effect on social adaptation towards unstable rubber price. Meanwhile for education level, farm operation system, places that are yield delivered, gross income per month show no significant difference at all. Further, results of multiple regression analysis revealed that socio demographic factors (education level, years of involvement, yield and income) and impact factors (environment, socio economic, and psychology and emotion) were the most influential factors in respondents' social adaptation towards unstable rubber price.

In conclusion, this study impacts gave a clear picture and better insight in smallholders' social adaptation towards unstable rubber price. The result showed the impact of unstable rubber price to smallholders was very high. Moreover, the level of social adaptation towards unstable rubber price was moderate. Assessing their levels of adaptation will assist the relevant agencies in understanding the readiness

of the community to be transferred and to learn new knowledge and skills about rubber production and off-farm activities. An agricultural extension service has played a role in providing knowledge and information to improve smallholders' yield and income to increase the level of smallholders' social adaptation. Besides, extension services should give more intention to smallholders' impact of unstable rubber price which are socio economy, environment and also psychology and emotion for increases of social adaptation level among smallholders. Thus, government subsidies should be continue to help farmers adapt with unstable rubber price. Government must be continuing support and should formulate new policies to increase social adaptation level among smallholders towards unstable rubber price.

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

ADAPTASI SOSIAL TERHADAP KETIDAKSTABILAN HARGA GETAH DALAM KALANGAN PEKEBUN KECIL

Oleh

NUR AQILAH BINTI SAUFE

April 2018

Pengerusi : Norsida Man, PhD
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Bidang Ekonomi Utama Negara (NKEA) bagi getah melibatkan tiga (3) Projek Permulaan (EPP) dan salah satu sasaran adalah untuk memastikan kemampanan industri getah huluan di Malaysia. EPP ini bertujuan untuk meningkatkan kawasan penanaman semula dan penanaman baharu getah oleh pekebun kecil persendirian kepada 24,000 hektar. Projek penanaman semula getah juga akan dijalankan sebagai insentif pihak kerajaan untuk membantu pekebun kecil getah berikutan harga komoditi yang lemah. Pekebun kecil getah menghasilkan 94% daripada pengeluaran getah di Malaysia. Pada masa kini, pekebun kecil getah perlu menghadapi pelbagai cabaran terutamanya dalam turun naik harga getah. Harga getah asli yang tidak stabil boleh memberi kesan kepada pendapatan dan sosio-ekonomi pekebun kecil getah. Oleh itu, kajian ini memberi tumpuan kepada pekebun kecil Malaysia dengan tujuan untuk mengenal pasti tahap penyesuaian sosial pekebun kecil terhadap harga getah yang tidak stabil. Mengkaji masalah ini adalah satu keperluan asas untuk mengenal pasti bidang yang perlu disokong bagi meningkatkan produktiviti melalui perancangan yang sesuai dan perkhidmatan lanjutan yang betul.

Kajian ini dijalankan dalam empat (4) kawasan daerah (Baling dan Kulim, Kedah; Gua Musang dan Kuala Krai, Kelantan) di mana kebanyakan penduduk adalah dari komuniti getah dan juga pekerjaan utama dan pendapatan mereka adalah dari getah dengan sejumlah 400 responden. Data primer yang dikumpul secara langsung daripada kajian bahan-bahan seperti menggunakan soal selidik diisi oleh pekebun kecil getah sebagai responden. Soalan-soalan kajian direka bentuk mengikut objektif kajian. Temubual untuk kaji selidik ini terdiri daripada beberapa soalan struktur seperti ciri-ciri demografik, profil ladang responden, kesan kenaikan harga getah tidak stabil, penyesuaian sosial terhadap harga getah yang tidak stabil, khidmat pengembangan pertanian dan lain-lain.

Data yang dikumpul dianalisis menggunakan analisis deskriptif, analisis khi-kuasa dua, faktor analisis dan analisis regresi berganda. Pertama, analisis deskriptif digunakan untuk menganalisis data peratusan dan kekerapan. Analisis khi-kuasa dua digunakan untuk menguji hubungan antara faktor-faktor sosio-demografi terpilih dan tahap penyesuaian sosial responden terhadap harga getah yang tidak stabil. Akhir sekali, analisis regresi berganda telah digunakan untuk mengkaji faktor-faktor yang paling berpengaruh di tahap kesan harga getah tidak stabil ke arah penyesuaian sosial.

Hasil analisis deskriptif menunjukkan bahawa 76.5% daripada responden adalah lelaki dan selebihnya 23.5% adalah wanita. Kumpulan umur yang paling utama daripada responden yang berusia lebih 56 tahun iaitu 42.0%. Untuk status perkahwinan responden, terdapat 90.0% telah berkahwin, 1.5% adalah penjaga tunggal dan 8.5% adalah janda dan duda. 35.0% responden mendapat pendidikan sekolah rendah manakala kira-kira 38.5% mendapat pendidikan sekolah menengah. Sementara itu, hanya 4.0% mempunyai pendidikan di kolej/ universiti dan 22.5% tidak mendapat apa-apa pendidikan formal. Secara umum, tahap pendapatan pekebun kecil masih rendah (68.5% kurang daripada RM1000). Faktor-faktor utama yang menjejaskan pendapatan pekebun kecil adalah harga getah semasa dan usia pokok getah yang tua.

Min keseluruhan bagi tahap penyesuaian sosial pekebun kecil ke arah kesan harga getah yang tidak stabil adalah 3.65 dan dianggap sebagai tahap sederhana. Hasil kajian menunjukkan bahawa tahap kesan daripada harga getah yang tidak stabil terhadap pekebun kecil adalah sangat tinggi. Selain itu, tahap peranan agensi pengembangan pertanian untuk mengatasi kesan harga getah tidak stabil terhadap responden adalah tinggi. Kajian ini menunjukkan bahawa perkhidmatan pengembangan pertanian telah memainkan peranan dalam menyediakan pengetahuan dan maklumat untuk meningkatkan penyesuaian sosial pekebun kecil.

Keputusan analisis khi-kuasa dua menunjukkan bahawa umur, jantina, status perkahwinan, tahun penglibatan, bilangan isi rumah, umur pokok getah, hasil bulanan dan harga getah bagi setiap kilogram mempunyai hubungan yang signifikan dengan tahap adaptasi sosial pekebun kecil terhadap harga getah tidak stabil. Hal ini kerana, majoriti pekebun kecil adalah berusia lebih daripada 56 tahun, ia menunjukkan kesan yang besar ke atas penyesuaian sosial terhadap harga getah yang tidak stabil. Sementara itu, bagi tahap pendidikan menunjukkan signifikan yang berbeza sama sekali. Di samping itu, keputusan analisis regresi berganda menunjukkan bahawa faktor demografi sosioekonomi (tahap pendidikan, tahun penglibatan, hasil dan pendapatan) dan faktor kesan (persekitaran, sosio ekonomi dan juga psikologi dan emosi) adalah faktor yang paling berpengaruh dalam penyesuaian sosial responden terhadap ketidakstabilan harga getah.

Kesimpulannya, kesan kajian memberi gambaran yang jelas dan wawasan yang lebih baik dalam penyesuaian sosial pekebun kecil terhadap harga getah yang tidak stabil. Hasil kajian menunjukkan bahawa kesan daripada harga getah yang tidak stabil kepada pekebun kecil adalah sangat tinggi. Selain itu, tahap penyesuaian sosial terhadap harga getah tidak stabil adalah sederhana. Menilai tahap adaptasi mereka, agensi-agensi berkaitan akan membantu dalam memahami kesediaan masyarakat untuk disampaikan dan belajar kemahiran baru mengenai pengeluaran getah dan aktiviti luar ladang. Perkhidmatan pengembangan pertanian telah memainkan peranan dalam menyediakan pengetahuan dan maklumat untuk menambah hasil dan pendapatan bagi meningkatkan tahap penyesuaian sosial pekebun kecil. Selain itu, perkhidmatan pengembangan juga perlu memberi perhatian kepada kesan ketidaksatbilan harga getah terutamanya pada persekitaran, sosio ekonomi dan juga psikologi dan emosi bagi meningkatkan tahap penyesuaian sosial pekebun kecil. Oleh itu, subsidi kerajaan perlu diteruskan bagi membantu pekebun kecil menyesuaikan diri dengan harga getah yang tidak stabil. Pihak kerajaan perlu sentiasa menyokong dan merumuskan dasar-dasar baru untuk meningkatkan tahap penyesuaian sosial di kalangan pekebun kecil terhadap harga getah yang tidak stabil.

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I certify that a Thesis Examination Committee has met on 13 April 2018 to conduct the final examination of Nur Aqilah binti Saufe on her thesis entitled "Social Adaptation Towards Unstable Rubber Price among Smallholders" 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 Master of Science.

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

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This is to confirm that:

- the research conducted and the writing of this thesis was under our supervision;
- supervision responsibilities as stated in the Universiti Putra Malaysia (Graduate Studies) Rules 2003 (Revision 2012-2013) were adhered to.

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Name of Chairman of Supervisory Committee: Associate Professor Dr. Norsida Binti Man

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Name of Member of Supervisory Committee: Associate Professor Dr. Ismail Bin Abd. Latif

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Name of Member of Supervisory Committee: Associate Professor Dr. Zulkefly Bin Sulaiman

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ANRFC	Association of Natural Rubber Producing Countries
BO	Business Opportunities
EPP	Entry Point Project
ETP	Economic Transformation Program
FELCRA	Federal Land Consolidation and Rehabilitation Authority
FELDA	Federal Land Development Authority
GDI	Gross Domestic Income
GDP	Gross Domestic Product
GNI	Gross National Income
ICT	Information and Communications Technology
INRO	International Natural Rubber Organization
IPCC	The Intergovernmental Panel on Climate Change
IRSG	International Rubber Study Group
ITRC	International Tripartite Rubber Corporation
JPS	Sarawak Agriculture Department
LIGS	Sabah Rubber Industry Board
MARDEC	Malaysia Rubber Development Council
MOA	Ministry of Agriculture and Agro-based Industries
MOSTI	Ministry of Science, Technology and Innovation
MPIC	Ministry of Plantation Industries and Commodities
MRB	Malaysian Rubber Board
MRRD	Ministry of Rural and Regional Development
NEP	New Economic Policy

NKEA	National Key Economic Areas
NR	Natural Rubber
PMD	Prime Ministers Department
RISDA	Rubber Industry Smallholders Development Authority
RRI	Rubber Research Center
SMR	Standard Malaysian Rubber
UNCTD	United Nations Commission for Trade and Development
WRI	World Resources Institute

CHAPTER 1

INTRODUCTION

1.1 Introduction

This chapter introduces agriculture in Malaysia, Malaysian rubber industry, policies and national agenda focusing on rubber, problem statement, research questions and objectives of the study. Factors influencing prices in current world natural rubber industry, social adaptation and the role of agriculture extension in Malaysia are briefly discussed in this section. Furthermore, problems facing the rubber industry have been clarified in the problem statement. The research questions and objectives of the study are described. Finally, organisation of this thesis is discussed in detail at the last part of this chapter.

1.2 Agriculture Sector in Malaysia

Agriculture remains an important sector of the Malaysian economy and further development in the agriculture contributes significantly to the economic growth of the country. The Malaysian government has taken agriculture as a serious issue and made several policies starting with the National Agriculture Policy and the Agro-Food Policy. Agriculture is the third engine of Malaysian economy after service and manufacturing sectors (Austin and Baharuddin, 2012).

The agriculture sector is one of the major contributors to the national income, export earnings and has significantly contributed since before independence until now to the national growth. Malaysia was once known as a developed country with a variety of agricultural products especially palms oil and rubber. Increasing in the production of livestock, fisheries and other miscellaneous crops could enhance the income of farmers, fishermen, ranchers and other agriculture related industrial players and confirmed the national food resources that could sufficiently sustain the population. The industry of processed food and beverages had become a significant element in the agro-based industry after government's emphasis on the agricultural sector (Department of Statistics Malaysia, 2017).

In addition, agriculture contributes 8.1 % of Gross Domestic Income (GDI) in 2016 and it has contributed about RM89.5 billion in GDI of Malaysia. Plantation crop which is oil palm was a major contributor to the Gross Domestic Product (GDP) of agriculture sector at 43.1 % followed by other agriculture (19.5%), livestock (11.6%), fishing (11.5%), forestry & logging (7.2%) and rubber (7.1 %) (Department of Statistics Malaysia, 2017).

Abdullah *et al*. (2015) describes that agriculture sector contributed close to 50% of the country's GDP in 1950s and reduce year by year until reduced to below 10% by 2009. The major contribution of agriculture sector to gross domestic income in 2009 was industrial crops which were oil palm and rubber about RM20.2 billion (4%) with a composite annual growth rate of 10.7%. Increasing in population and food demand has grown expected to expand fast every year. In 2015, agriculture industry creates about 12% to the national GDP and provides employment to the population.

Government continues to focus on transforming agriculture sector in National Key Economic Areas (NKEA) plan especially traditionally small-scale and production-based sector. This sector has planned to transform small-scale into a large-scale agribusiness which contributes to economic development and its sustainability. There are four (4) key themes being used in this transformation plan based on an integrated and market-centric model that includes capitalizing on competitive advantages, tapping premium markets, aligning food security objectives with increasing Gross National Income and participating in the regional agricultural value chain. Based on the four (4) themes in NKEA in 2010, the government have mapped out 16 Entry Point Projects (EPPs) and 11 Business Opportunities (BOs). These initiatives are expected to generate more than RM 28.9 billion income and 74,600 jobs from the agriculture sector by 2020 (Performance Management and Delivery Unit, 2014).

The share of the agriculture to GDP increased slightly from 8.7% in 2000 to 11.2% in 2014. However, total agricultural value added increased from 1.0% in 2012 to 2.1% in 2013. Rest of the other agricultural commodities contains of vegetables, fruits and rice, prolonged to 7.4% whereas, livestock was the highest with 10.4% in final quarter of 2013. In contrast growth of oil palm, fishing and forestry remained low in the same period (Department of Statistics Malaysia, 2015).

Furthermore, government has allocated RM 6.5 billion for the agriculture sector in 2017 which were RM 1.2 billion more than the 2016 budget. The budget was provided for the agricultural sector is expected to increase the farmers' income and smallholders included for the implementation of increasing in value-added and commercially viable agricultural programs. The government allocated about RM2.3 billion for subsidies as incentives for higher production of paddy including fertilizers, seeds, price of paddy and price of rice. At the same time, RM500 million will be used to improve irrigation infrastructure for the paddy farms and upgradation of tree plantation at the road sides of the country. Moreover, another RM200 million will be reserved for replanting rubber trees and provide infrastructures to boost rubber production. The government under National Key Economic Area program had also assigned RM634 million to improve productivity and production of highly demanded agro-products (Ministry of Finance, 2016).

1.3 Malaysian Rubber Industry

Rubber *(Hevea brasiliensis)* belongs to *Euphorbiaceae* family. It is one of the most important plantation crops in Malaysia. It originated from the Amazonian rain forest of South America including Brazil, Venezuela, Ecuador, Colombia, Peru and also Bolivia. Moreover, rubber also is the world's number one source of natural rubber (Malaysian Rubber Board, 2009).

Henry Wickham has been recognised to be responsible for the introduction of rubber from Brazil to South Asia. It started in 1876 when Henry Wickham brought some 70,000 rubber seeds (later known as the Wickham's Collection) from Amazon forest, Brazil. The rubber seeds collected from Brazil were shipped to the Royal Botanical Garden at Kew, England. From 70,000 seeds, only 2,700 seeds were successfully germinated at Kew Garden (Malaysian Rubber Board, 2009). In the same year, some of these seedlings were sent to the Botanical Garden in Ceylon (now Sri Lanka), thirteen to Singapore Botanical Garden and nine seeds were transported to Kuala Kangsar, Perak. The seedlings sent to Malaya were successfully raised and distributed (Webster, 1989).

A long time ago, there was not even a single rubber tree in Malaysia. The first rubber tree in Malaysia was planted in 1877 at Bukit Residency, Kuala Kangsar. This gave rise to the 500 million rubber trees currently growing in Malaysia (Noordin *et al*., 1984). In Malaysia, the rubber industry consists to main sectors which are plantation or estate and smallholder. The plantation or estate sector refers to a single legal ownership for all areas planted with rubber aggregating more than 100 acres (40.47 hectares). While, a rubber smallholding refer to a single legal ownership for all area planted with rubber aggregating less than 100 acres (40.47 hectares) (Department of Statistic, 2015).

The smallholder sector in rubber was approximately 1.176 million hectares (95.6%) comprising of the total 1.229 million hectares with the total numbers of 209,247 smallholders in the country during 2007. The smallholder is separated into two (2) categories which are individual smallholders and grouped or organised smallholders. The individual smallholders refer to smallholder who operate and manage their rubber by their own and without supervision or direct monitoring by a government agency. Grouped or organized smallholders are organized under Rubber Schemes/Programmes by FELDA, RISDA and FELCRA. Hence, the presence of government agencies such as FELDA, FELCRA and RISDA can be assumed that the development of smallholders' socio economy is well managed and taken care by the government. In contrast, the development of rubber areas of individual smallholders is not directly managed by any agency. However, government still develops these smallholders under the supervision of RISDA. (Osman and Vanaja, 2008).

The importance of the rubber industry for Malaysia is at the large scale and it significantly contributes to the income of the nation. For example, products of rubber include industrial and general products such as tyre and tyre-related products; latex products which are rubber cloves, catheters, latex thread and foam products. Next, the gloves account for 80% of the Malaysian export of the latex product. The supply of materials is one of the crucial factors to sustain in the market as a top ten producer in the world and employment creator for the country. Therefore, government has been targeted to boost up the natural rubber industry from 62 % in 2011 to 75 % by 2020 with increase of 13% per year to global market. In line, rubber industry also can create more than 29,000 jobs (Abdullah *et al*., 2015).

1.3.1 Economic Contributions

The agriculture sector is an important sector for the economic development of the country. It is one of the key economic sectors which contributions made to a nation's well-being having a great importance. The transformation programs under NKEA program in agriculture sector has shown positive achievements. The production is basically the term to explain the conversion of input into output. According to Fried *et al*. (2008), the production can be considered as a process of transforming of two (2) economical inputs to the most useful can be considered as a production. The maximum output that can be produced from different combinations of inputs with high technology used (Miller, 2008).

Rubber industry's contribution to the economy is enormous in terms of its export value of RM19.55 billion, consisting of raw rubber, rubber products and rubber wood (RISDA, 2006). Rubber prices soar up to RM14.13 per kg, the highest in the history of the rubber shortages due to climate change in key producing countries where the latest prices are also the highest in history over the last five years. However, the average market prices are remained around RM4 per kg and increase the indirect benefit over 350,000 small holders' families across the country and with the price now, smallholders can now earn between RM1500 to RM2000 per hectare per month (Razak, 2010).

Rubber production increases due to many factors, especially high demand from rubber producing countries such as China and India. They require high rubber from Malaysia because Malaysia is one of the top producers for high quality natural rubber and is able to maintain continuous export. It also leads to robust economic growth of the country through the production and export. Smallholder sector plays a significant role in the Malaysia upstream rubber industry. Malaysian total rubber production was about 1,072,365 tonnes, 94.4% of which is produced by smallholders (Amran, 2009). Therefore, much attention has been given to develop this important sector.

1.3.2 Natural Rubber (NR) Production

Malaysia is the fifth significant maker of natural rubber after Thailand, Indonesia, Vietnam and China in the world. The Malaysian rubber industry had created negative net trade flows, provided inconsistent income for the government. Figure 1.1 and Figure 1.2, shows that natural rubber production decreased drastically by 32.9% from 996, 880 tonnes in 2011 to 668,613 tonnes in 2014. However, production was showed fluctuation from 2014 until 2016 where it increase by 8% from 2014 to 722,122 tonnes in 2015 and decrease 6.6% from 2015 to 673, 513 tonnes in 2016. In line, exports of natural rubber declined from 1.1 million tonnes in 2015 to 1.0 million tonnes in 2016. Nevertheless, Malaysia is still remaining major exporter of natural rubber (Malaysian Rubber Board, 2016).

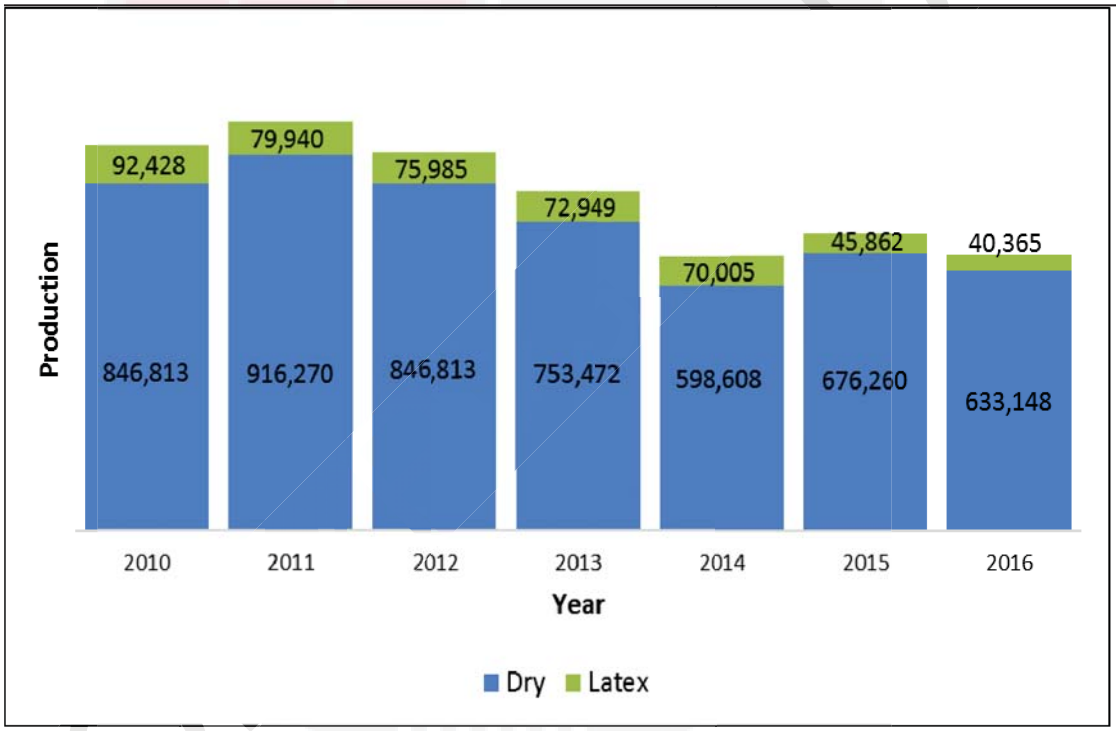


Figure 1.1 : Malaysia's Natural Rubber Production
Source: Department of Statistics Malaysia (2016)

In 2015, consumption of natural rubber tends to increase by 4% from 474.7 million tonnes to 493.5 million tonnes in 2016. It has shown that Malaysia is one of the supply sources for quality raw rubber of Standard Malaysian Rubber (SMR) grades and latex concentrates including Low Protein Latex (Malaysian Rubber Board, 2016).

Based from Figure 1.2, Malaysian accounted for about 75,132 tonnes of the natural rubber production in January 2016, increased by 1,548 tonnes (+2.1%) when compared to the previous month. Production of natural rubber in February 2016 was recorded at 54,564 tonnes, dropped by 20,884 tonnes (-27.7%) as compared to January 2016. Year-on-year also showed a decrease in rubber production by 19,905 tonnes (-26.7%). Production of natural rubber by the smallholdings sector contributes 92.9 while the remaining 7.7% is from the estate sector. However, both smallholding and estate sectors decreased in production at 27.6 and 28.4% respectively (Department of Statistics Malaysia, 2016).

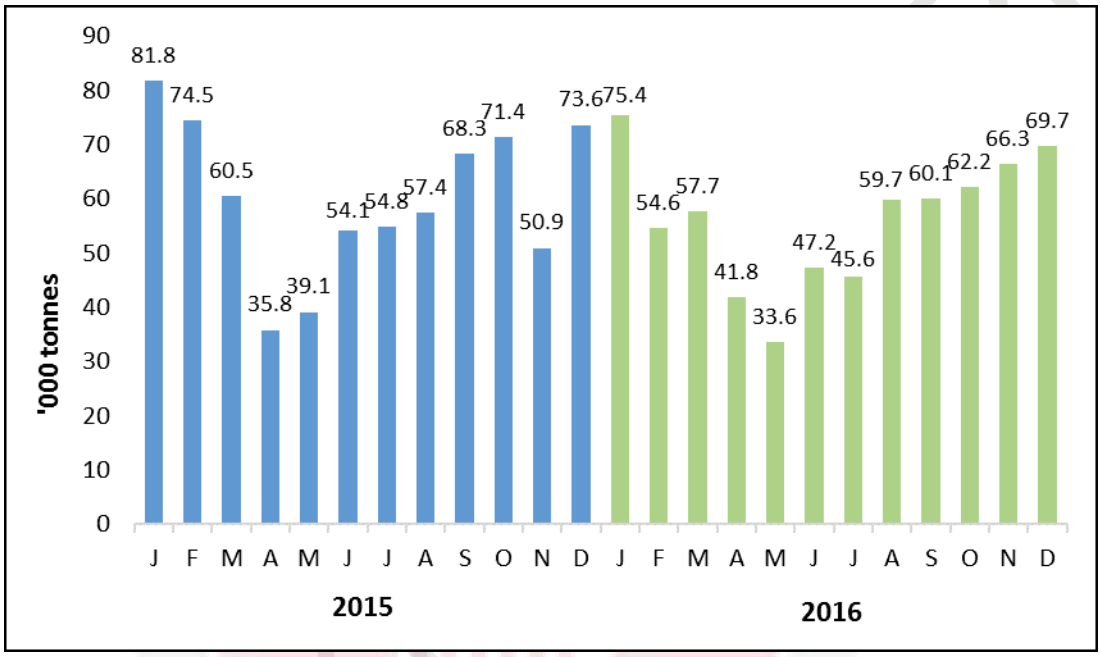


Figure 1.2 : Monthly Rubber Production from Estates and Smallholdings
Source: Department of Statistics Malaysia (2016)

1.3.3 Natural Rubber (NR) Import

In December 2016, statistic shows the total imports of natural rubber to Malaysia were recorded at 103,125 tonnes. The imports volume of natural rubber in Malaysia has increased when compared to November 2016 but reduced by 5.1 % from December 2015. According to Figure 1.3, the main type of natural rubber imported were Standard Rubber and latex concentrate natural rubber at 34.8 % and 25.7 % respectively (Department of Statistics Malaysia, 2016).

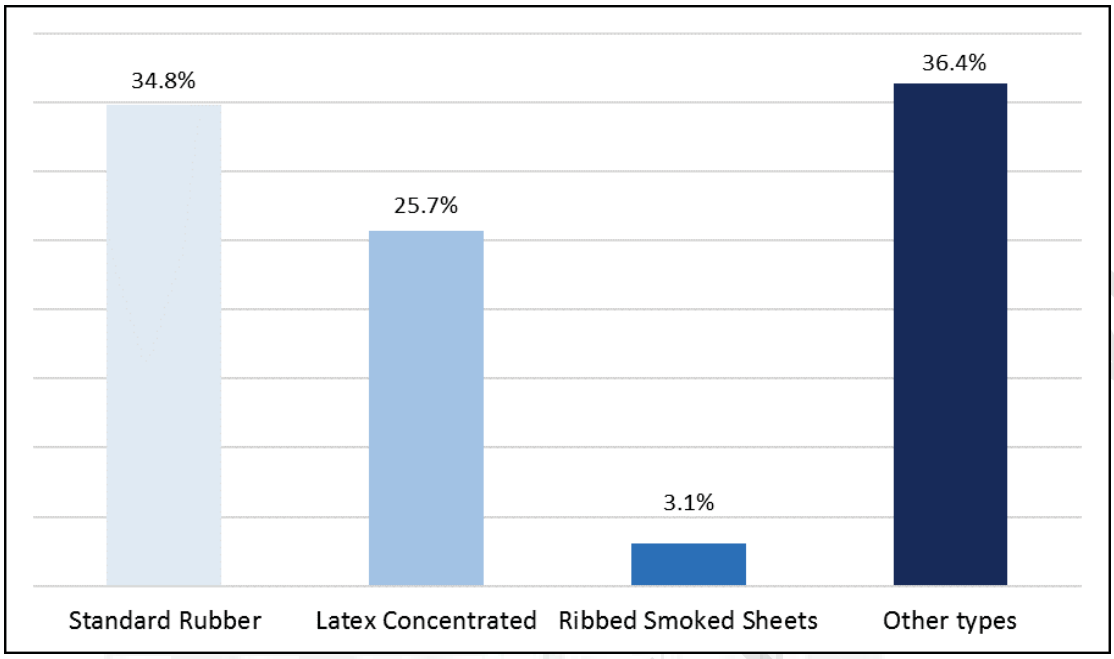


Figure 1.3 : Imports of Natural Rubber by Type
Source: Department of Statistics Malaysia (2016)

According to Figure 1.4, natural rubber was imported mostly from Thailand (42.5%) and Viet Nam (12.2%).

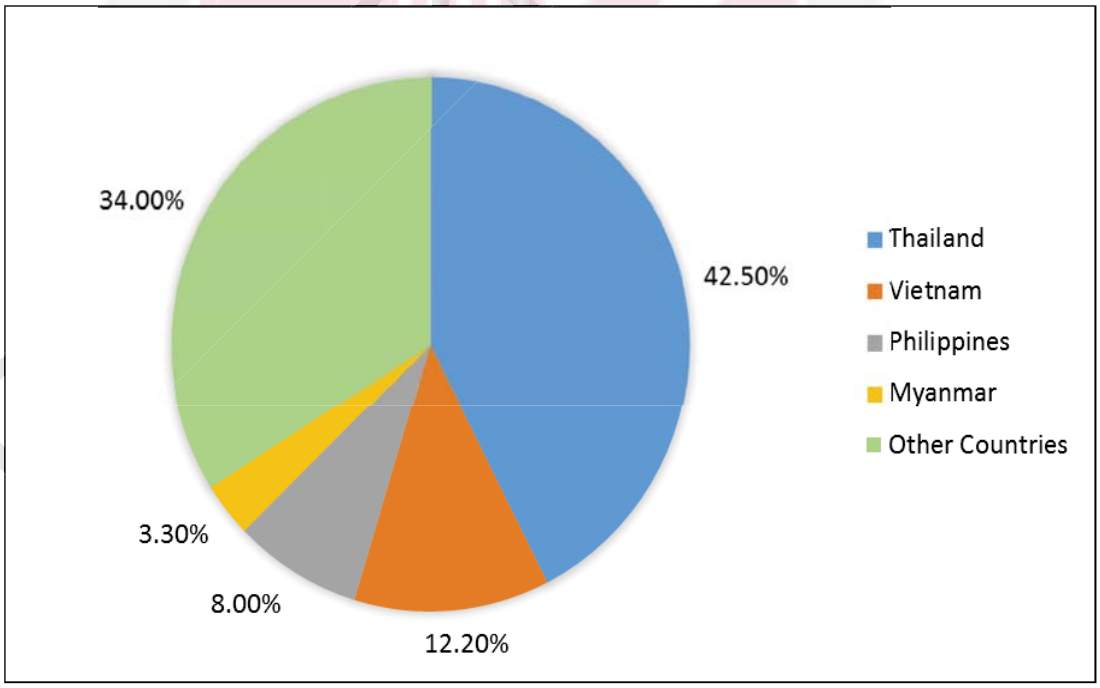


Figure 1.4 : Imports of Natural Rubber from Major Countries
Source: Department of Statistics Malaysia (2016)

1.3.4 Natural Rubber (NR) Export

Malaysia is universal well-known for high quality and competitively priced of rubber products. Malaysia has mutual ventures with various countries which are the USA, Europe and Japan as well as locally-owned enterprises. These partnerships supply each level of rubber items such as medical gloves, hoses, automotive components and structural bearings (Department of Statistics Malaysia, 2016).

Malaysia is top supplier in the world for medical gloves (examination and surgical gloves), catheters, condoms and latex threads. In the other hand, Malaysia also produced various products form latex include teats, hoses, beltings, seals, wires and cables for the worldwide market (Department of Statistics Malaysia, 2016).

A total of 61,380 tonnes of natural rubber from Malaysia was exported in December 2016, increased by 6,756 tonnes (+12.4%) and 7,226 tonnes (+13.3%) respectively as compared to month by month and year-on-year. Standard Malaysian Rubber (SMR) contributes 95.1 % from the total natural rubber exports whereby 62.9 % was solely contributed by SMR 20 (Figure 1.5).

According to Figure 1.6, the main destination for exports of natural rubber was China 31, 350 (51.1%). Second destination is Germany 8, 298 (13.5%), followed by Iran 4, 342 (7.1%), U.S.A 1, 995 (3.3%), Finland 1, 714 (2.8%), Turkey 1, 319 (2.1%), Taiwan 1, 297 (2.1%), Korea 1, 271 (2.1%) and Brazil 1, 265 (2.1%) (Department of Statistics Malaysia, 2016).

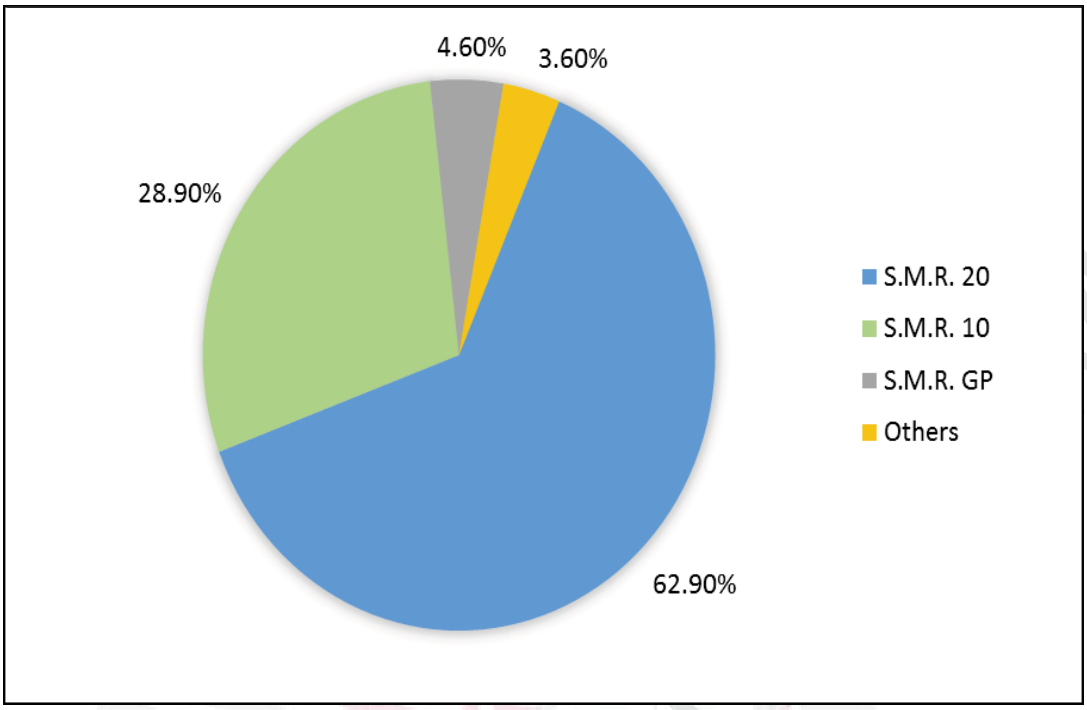


Figure 1.5 : Exports of Standard Malaysian Rubber (S.M.R.) by Grade
Source: Department of Statistics Malaysia (2016)

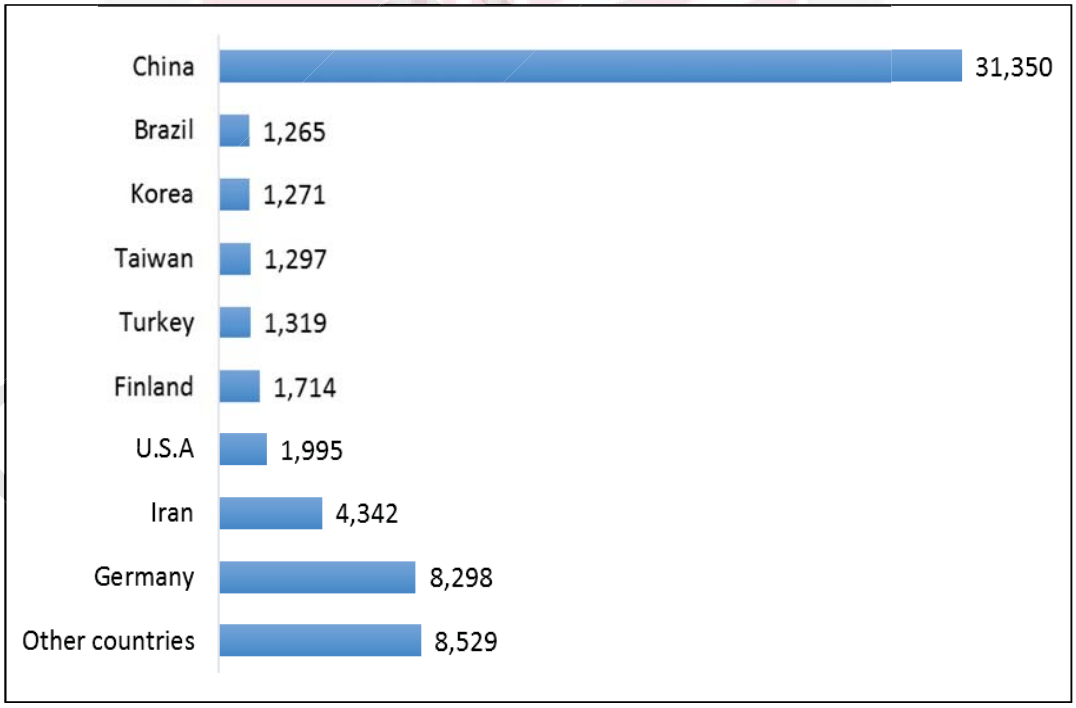


Figure 1.6 : Exports of Natural Rubber to Major Countries, December 2016
Source: Department of Statistics Malaysia (2016)

1.3.5 Natural Rubber (NR) Consumption

In 2016, China becomes the largest consumer in the world for rubber, followed by India, USA, Japan, Thailand and Indonesia. In addition, Malaysia becomes eight largest consumers in the world. Malaysia is one of the global greatest producers for various rubber products due to political stability, accessibility of quality raw materials and modern infrastructure as well as research and development (R&D) support (Malaysian Rubber Export Promotion Council, 2017).

The total consumption of natural rubber in 2015 was recorded at 474,773 tonnes, increased by 26,289 tonnes as compared to 2014. Rubber gloves industry is the largest natural rubber consumer at 30,575 tonnes (74.9%) (Department of Statistics Malaysia, 2016).

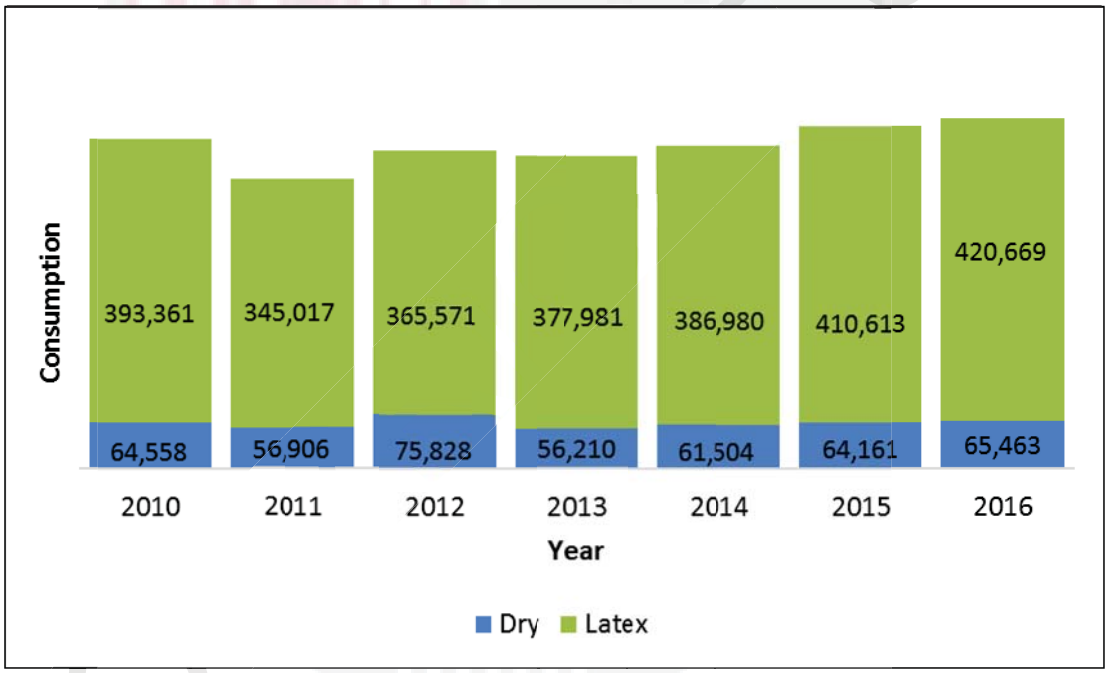


Figure 1.7 : Malaysia's Natural Rubber Consumption (tonnes)
Source: Department of Statistics Malaysia (2016)

1.3.6 Trends in Natural Rubber Prices

Natural rubber is one of the dynamic commodities for extensive production a variety of rubber-base products. The pattern of price movement from the previous year trend, SMR 20 price in Malaysia rubber market was recorded as a lowest level in the Year 2015. Generally, decreasing on demand in the period of and addition of downtrend in the regional rubber stocks market coupled with strengthening of ringgit against US dollar (Malaysian Rubber Board, 2016).

Table 1.1 : Yearly Average of Natural Rubber Price by Grades (sen/kg) FOB

Year	SMR CV	SMR L	SMR 5	SMR GP	SMR 10	SMR 20	Bulk Latex (dry)
2007	857.30	792.17	748.06	745.06	736.06	734.06	854.18
2008	958.75	935.20	845.37	842.37	833.37	831.37	951.51
2009	707.09	677.28	655.72	652.71	639.36	637.36	745.86
2010	1,206.88	1,157.62	1,080.70	1,077.70	1,060.08	1,058.08	1,238.93
2011	1,492.75	1,437.63	1,373.83	1,370.83	1,350.33	1,348.33	1,482.42
2012	1,087.98	1,045.54	974.05	971.05	954.50	952.50	1,099.43
2013	919.07	831.66	794.47	791.47	776.68	774.68	934.13
2014	730.01	675.07	565.14	562.14	555.14	553.14	728.18
2015	691.57	653.40	533.90	530.90	523.90	521.90	688.13
2016	716.59	679.63	580.45	577.45	570.45	568.45	765.10

Source: Malaysian Rubber Board, 2016

1.3.7 Rubber Smallholders

In Malaysia, a rubber smallholder may be defined as an agricultural land owner which is under a single legal ownership with aggregating less than 40.47 hectares (100 acres) and planted with rubber. In the real life most of the smallholders only own less than two (2) hectares of the land. With the limited acreage of land, the question is to be asked that the small rubber farm generate sufficient and consistent incomes to ensure the smallholder's family with reasonable standard of living (Ali, 1982). Smallholdings can be organized or unorganized, but usually organized by various government agencies such as FELDA, RISDA, FELCRA, other Federal Government land schemes and State Government land schemes (Department of Statistics Malaysia, 2016).

Rubber smallholdings sector contributes up to 92.9% of nation's rubber production in 2016 while the rest from the estate sectors. Productions of estates and smallholding sectors for month-on-month were increased by 10.8 and 4.8% respectively. Whereas, the rubber smallholding sectors comprise a total of 992.51 ha planted area (Department of Statistics Malaysia, 2016).

Although Malaysia is developing as a whole, the rubber smallholders are still in poverty. Furthermore, there is still high incident of (41.3%) of poverty among smallholders in 1980. Even with government support through research, replanting and development programs the rubber smallholders still stuck in the poverty cycle and in 2008 there are still 38,555 of rubber smallholders that can be classified as hard-core poor in Malaysia (Shamsudin and Raja, 1985).

The rubber smallholders are scattered and live in non-contiguous form and most of the time far from the main transportation routes. Thus, the technology and research are hardly implemented in those remote areas. RISDA has become the savior of this group of smallholders when this government agency operates central smoking of USS collected from widely scattered group processing centers (Barlow, 1983).

Besides, Malaysia as one of the tropical country is exposed to large amount of rain per year. In rainy season, it rains almost every day. This will affect latex production as the rainfall will prevent latex from continuously flowing to the container. The rubber smallholders will stop the tapping activities for days and sometimes for weeks. This situation will affect the smallholder's income and they couldn't rely on the rubber plantation alone as their source of income (Verheye, 2010).

1.4 Policies and National Agenda focusing on Rubber

In Malaysia, rubber (*Hevea brasiliensis*) is the second most important plantation crop after oil palm. It contributes more in terms of employment opportunities for smallholders' families, downstream activities and export earnings. Moreover, rubber is one of the first commodity crop planted in Malaysia before palm oil, cocoa and tobacco since 1877. Number of rubber plantation increases year by year around Malaysia (Chandrasekhar *et al*., 2005).

Malaysia's rubber industries are the main providers to GNI and continuous boost the industry's value to Malaysia's economy since before independence. Under the Rubber National Key Economic Area (NKEA), three (3) has been implemented such are maintaining rubber area of 1.2 million hectare and produced 2 million metric tonnes of rubber. The framework of this project covers for downstream activities and commercialising new rubber products by improving product for exports (Performance Management and Delivery Unit, 2014).

The twelve (12)-NKEA have been selected as various sectors to enhance economic which can derive Malaysia towards high income country and competitive in global market. Malaysia has a competitive advantage and potential in several sectors. Therefore, the NKEA is one of the approach to achieve the sustainable economic growth (Economic Transformation Programme Annual Report, 2014).

Government gives more emphasis on NKEA sector to enhance GNI. Besides, government still remain committed to develop non-NKEA sectors. It is important because NKEA was driven the country's economic growth, while non-NKEA will continue to contribute a vital share in Malaysia's transformation. In line, the non-NKEA is benefited from multiplier effects through the implementation of the NKEA, signifying the catalytic nature of the NKEA (Economic Transformation Programme Annual Report, 2014).

Entry Point Project (EPP) is implemented under NKEA is maintaining one million ha of the production area by increasing the average yield for domestic supply to develop higher-valued rubber products. Malaysia's rubber sector is targeted to enhance the total GNI from RM18.5 billion (2012) to RM52.9 billion in year 2020 (Economic Transformation Programme Annual Report, 2014).

Three (3) EPPs were recognized under the NKEA to drive the rubber sector's growth. Three EPPs are clustered such as; 1) EPP 1 ensuring sustainability of the upstream rubber industry; 2) EPP 2 increase world market share of latex gloves to 65% by 2020 and 3) EPP 3 commercialising epoxidised natural rubber (Ekoprena) and deproteinised natural rubber (Pureprena) (Performance Management and Delivery Unit, 2014).

The first rubber EPPs is to ensure the sustainability of the upstream rubber industry by maintaining rubber areas at 1.2 million hectares with 1 million hectares harvested. This EPP will be maintaining to give impact for smallholders in rural areas and future upstream productivity (Performance Management and Delivery Unit, 2014).

Second EPPs under NKEA is aim to increase world market share of latex gloves especially in natural rubber by 2020 (65%) with growing rate of 13% annually to maintain dominance as the world's leading rubber gloves producer (Performance Management and Delivery Unit, 2014).

The last EPPs under NKEA are to commercialise ekoprena and pureprena. This EPP led by the MRB aim to stay ahead of regional competition and pioneered the production of specialty rubber such as epoxidised natural rubber (Ekoprena) and deproteinised natural rubber (Pureprena) to increase consumer preference for natural materials over synthetics (Performance Management and Delivery Unit, 2014).

1.5 Rubber Price Volatility

Natural rubber price tends to be unstable and have an impact on the incomes of many producers. It also gives impact on production plan for coming year especially for long terms. Volatility can give impact more to agricultural producers, supplier of input, consumers, agencies and country income (Anthony and Blanford, 1989). It has been claimed that agricultural commodity prices are unpredictable because of the short run supply and low demand elasticity (Ardeni and Wright, 1990).

In world market, fluctuation price of natural rubber prices depend on international trade policies, political changes, fluctuations in demand and supply of natural rubber and fluctuations in oil prices. In line, the price of rubber are depending on the production of rubber, demand for the end products and the price of substitutes for natural rubber However, there is no suitable instrument to reduce or manage risk

among producing countries including Malaysia, Indonesia, Thailand and India. Natural rubber gives a significant impact especially for world economy since the beginning of industrial revolution. It is a strategic raw material which supplies to manufacturing industries with a variety of products. (Dowling, 1979).

1.5.1 Factors Influencing Prices in Current World Natural Rubber Industry

1) World Supply-Demand of Natural Rubber

Natural rubber supply depending on numerous factors which are the size of mature rubber, tapping days, productivity of clones planted and rubber prices in the market. Demand and supply in the market also one of the factor influencing in rubber price. When demand increase and shortage in supply then price will be increased. This situation will encourage smallholders to tap more than usual at incorrect time. Furthermore, a rubber plantation which formerly derelict back laboured thus increases the supply of natural rubber in the market. Nevertheless, if the price of rubber is not favourable in the market, it also affects the day-tapping and rubber supply in untapped areas (Malaysian Rubber Board, 2014).

Manufacturing industry needs nearly 70% of the world's rubber production. China is one of the major import countries, consumed about 40% of the total natural rubber supply and a major tyre manufacturer which contribute almost 30% of global tyre production. Therefore, growth of automotive industry gave positive effect to world economic growths particularly among Europe Country and United States of America. These countries have high use of car and related transport. Thus, the world rubber market trends are depending significantly by the demand of rubber products including tyres and automotive components (Malaysian Rubber Board, 2014).

The world natural rubber supply-demand relationships in 2008 shows a deficit condition in the world at - 0.54 million tonnes. Although world natural rubber production increased over the period 2004 until 2008, the natural rubber global demand also increased. Therefore, unstable rubber price was occurred. This situation become worst after 2008, when rubber planted area was declined, labour shortage, socio-economic smallholders, uneconomic size holdings, low productivity, diversification away from the rubber and inadequate resources (Kamarul, 2009). World total rubber consumption in 2020 is predicted to reach 31.3 million MT. Forecasts for world natural rubber production is predicted to increase. However, forecast for world synthetic rubber production will be decreased in 2020 (International Rubber Study Group, 2007).

2) orld Natural Rubber Stocks

Stocks of natural rubber is a guideline to guarantee manufacturer always have adequate raw materials for the operations and contrariwise. Generally the quantity or amount of rubber stocks stored is proportional for two months of operation. Same as another product, surplus stocks of natural rubber will prompt oversupply of natural rubber. Hence, it might influence the price of rubber in the worldwide market. Referring to the IRSG stock quantity of natural rubber in 2013 remained at two (2) million tonnes. International rubber data on production, demand and stocks of rubber for the period 2000 to 2013 released by the Association of Natural Rubber Producing Countries (ANRFC) to ensure sufficient rubber stock in the world market (Malaysian Rubber Board, 2014).

The stock of world natural rubber was declined to 2.0 million MT in 2008 and it was the lowest level since 2004 (2.3 million MT). Moreover, the stock of natural rubber was decrease about 0.038 million MT in 2008 (1.8%) as compared with 2007. Change in the world stock situation affected the price, supply and demand of world natural rubber. In 2004 to 2008, price of natural rubber and stock levels is implied because prices tend to peak during low levels of stock and vice versa (Malaysian Rubber Board, 2014).

3) Trend of Crude Petroleum Oil, Natural Rubber and Synthetic Rubber Price

The price of most agricultural commodities such as the price of rubber fluctuates greatly. From the invention of the tyre to competition from synthetic rubber, many events have affected prices. In 1979, the United Nations Commission for Trade and Development (UNCTD) brought into being the International Rubber Agreement in order to stabilize natural rubber prices and to achieve a steady growth in natural rubber revenues. In late 1980s, price escalated because of the AIDS scare. In 1980, the associated International Natural Rubber Organization (INRO) was established to implement the Agreement (Malaysian Rubber Board, 2007).

Malaysia withdrew from the Agreement in October 1998 in response to prevailing low rubber prices. The agreement was terminated in September 1999. In 2001, Malaysia, Thailand and Indonesia formed the International Tripartite Rubber Corporation (ITRC) with the aim of increasing rubber prices. Vietnam became a signatory in 2003 and ITRC is known as the International Rubber Corporation (Malaysian Rubber Board, 2007).

Fluctuating prices have affected industry performance on a short-terms basis, while over the years longer-lasting challenges have emerged. Between 1990 and 2003, the total planted area for rubber declined by 28.4 % due to global decrease in demand. The reduction in acreage was more strongly felt in Malaysia. Malaysian rubber began to lose its primary both globally and domestically. Internationally, synthetic

rubber had started and successfully competes with natural rubber in the elastomer market (Malaysian Rubber Board, 2007).

Labor had become increasingly scarce. Thailand and Indonesia, with large pools of cheap labour, began producing more natural rubber than Malaysia. Rubber declined in importance in the world market, it eventually ceased to be Malaysia's star export, with palm oil replacing it as the country's biggest crop export earner in 1984. By the middle of 1990, the profit per hectare of oil palm averaged 2.5 times that of rubber. In the face of these challenges, the rubber industry has evolved considerably as a result of local research and development (Malaysian Rubber Board, 2007).

Price fluctuation and uncertainty are the risk in the natural rubber industry as well as have a negative impact especially on the rubber smallholders' income. Moreover, price fluctuation mainly responded by supply and demand factors. Lower natural rubber prices could trigger higher demand and affect in a supply. It also affects a price and creates a new equilibrium. The less natural rubber prices due to oversupply normally have a negative impact on production and encourage farmers to change their crop. Thus, this factor can cause world natural rubber prices rises. Consequently, the world natural rubber price would increase in the future, it would likely lead to higher natural rubber production (Malaysian Rubber Board, 2014).

On the other hand synthetic rubber is a substitute product for natural rubber. Natural and synthetic rubbers have a significant difference of price where the manufacturers encourage using of cheapest materials to retain market competitiveness and gain more profit. Producers of rubber products will use more competitive raw materials to increase profit margins without reducing product quality. This factor will increase the demand for natural rubber and affecting the natural rubber prices in the market (Malaysian Rubber Board, 2014).

Butadiene is the main raw material for synthetic rubber production and produced during the crude oil refining process. Price of synthetic rubber and others commodities are very much related to the natural rubber prices trend. The synthetic rubber (Butadiene) materials less competitive as compared to natural rubber when the price of synthetic rubber and other commodities in the market increases. Therefore, natural rubber demand was increased and will shoot up the price of natural rubber in the global market (Malaysian Rubber Board, 2014).

4) Exchange Rate

Foreign currency exchange rates especially the depreciation of the USD currency have a great contribution to the world rubber prices because this commodity traded in dollars (Tyner *et al*., 2008). The Economic Report also predicted that the USD would continue to depreciate against major currencies. If the price is expected to have negative relationship with the exchange rate for Malaysia Ringgit would be

paid for 1USD, the natural Rubber price would be decreased as experienced during the forecasting period. If the exchange rate of the currency issuing country experienced a decline compared to the USD, the price of natural rubber in the global market will be affected in long run (Malaysian Rubber Board, 2014).

1.6 Social Adaptation

Agriculture in Malaysia is vulnerable towards the human adaptation to boost up the economy of the country. This sector is threatened by various factors coming from human and surrounding environment. In case of human factor such as declining numbers of smallholders' community and the young generation made this sector fragile. Furthermore, agriculture sector is exposed towards environmental factors that depict it towards natural disaster due to climate change consequences especially floods disaster in Malaysia. The social adaptation of community in agriculture sector is important for the survival of this sector.

Social adaptation sometimes can be defined as an adaptive capacity a community goes through in a good condition rather than after being affected by external stress. The element of social adaptation exists as a normal response of human behaviour to minimize the impact when stress happen. The social adaptation also can come about accordance to interpersonal with the society, their social behaviour and the cultural norms that usually had in the community (Peleg, 2012).

In aspect of psychological perspective, social adaptation also correlated with the on-going process of individuals that are attached to the emotions and intellect. The on-going process is subsequent of human to balance their mental and their emotional states to interact with their social and cultural environments. The individuals are restricted to express and live in accordance with their environments and local culture. While, the psychologist defines that social adaptation is a state of adjustment in the middle of an organism or a social group with their environment to favour their existence and growth (Peleg, 2012).

The best application of risk management practice can be identify by the perception of risk (Meuwissen *et al*., 2001). The factors that affect perception of risks included geographic areas, farm types, institutional and environment (Patrick and Musser, 1997). The risk management plans have to implement by assessing the information of limited resource from the farmers.

A study in Mississippi showed that the farmers of the area practiced the use of low input and output in production for adapting the production risks due to limited resources. Income constraint also motivates them to do the off-farm job and other government funds. The farm diversification activities are not a best solution for reduced farm risk. The improvement of quality production would be the alternatives for reducing farm risk. Farmers also chose the incentives rather than take crop

insurance programs with low production and low income. The transfer knowledge and training program by extension agent trough farm management practice also help farmers to increase their farm activities (Coble *et al*., 2001).

Adaptation is comprised of the adjusting practices steps, processes and capital reaction to the current changes. The decisions in adaptation for environment are include social, institutional structures and modification of technical options that can affect the capacity for realization of adaptation. The knowledge in adaptation will help farmers to be effectively handled climate risk and delivering the feedbacks from the related agents and policy makers in making the decision of adaptation for short term and long-term duration. In line, it also gives clear relationship between the short term and long term alternatives. Therefore, management and policy maker will be able to prepare for any consequences of future risk (Howden *et al*., 2007).

1.7 Agriculture Extension in Malaysia

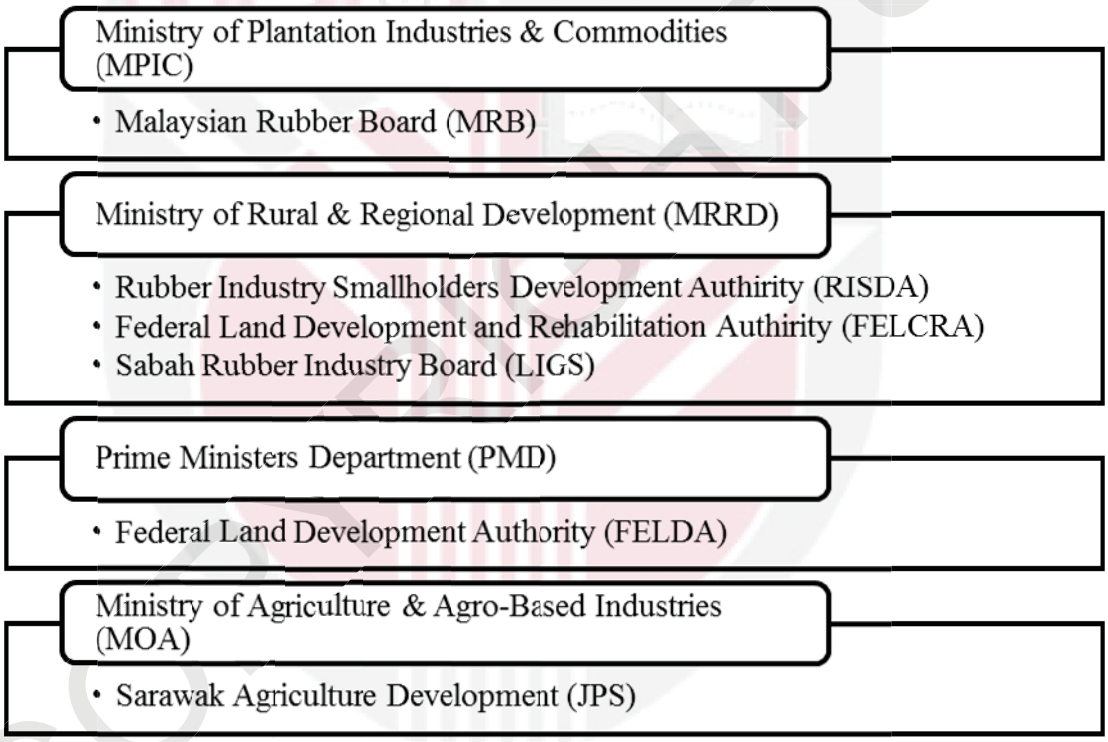
Extension education is an important component to enable the smallholder to gain knowledge of the latest technologies in improving their socio-economic status and incomes (Osman and Vanaja, 2008). Agricultural extension services involved several key factors such as the public sector (represented by ministries/departments of agriculture NGOs), non-profit organizations such as universities and commodity foundations, international research centres and other private sectors (Shah *et al*., 2013).

The Malaysian rubber industry is conquered by the smallholders' farmers. Statistics indicates that in 2007 about 1.176 million hectares area was planted by smallholder and comprising of the total rubber area about 1,229 million hectares (95.6%). Thus, several government agencies such as FELDA, FELCRA and RISDA have been established to monitor and manage the development of the industry. RISDA is one of the agencies responsible for the individual smallholders while the FELDA, FELCRA and several other regional development agencies manage the organised smallholders. Hence with the existence of these relevant government agencies it can be helpful farmers develop their socio-economic status (Osman and Vanaja, 2008).

Since 1890s the rubber has been planted in Malaysia. It is one of the first commodity crop planted as a plantation crop and industrialized in Malaysia. Numerous ministries has been support the rubber industry which are Ministry of Plantation Industries and Commodities (MPIC), Ministry of Rural and Regional Development (MRRD), Prime Ministers Department (PMD) and Ministry of Agriculture and Agro-based Industries (MOA) to ensure the rubber industry grow and develop well in Malaysia. Rubber was once the most profitable plant commodity in Malaysia. Thus, the Malaysian government takes part in order to improve and later modernize

smallholder's rubber plantation industry. With the foundation of RISDA, the first organization which specialized in rubber agriculture extension in all aspect of rubber production and later marketing the end product, the government mission in strengthening the natural rubber industry will hopefully succeed (RISDA, 2017).

This institution will help embedding the modernization willingness among the small holders which later will benefits them by the increasing of yield, quality and systematic rubber production. In order to provide better marketing strategy for rubber based product RISDA collaborate with Malaysia Rubber Development Council (MARDEC) to compensate with current global market (RISDA, 2017). Figure 1.8 shows the relevant agencies under the various ministries involved in the development of rubber in Malaysia.



Note: * - Only main agencies are listed

Figure 1.8 : Ministries and Government Agencies Involved in the Rubber Industry
Source: Malaysian Rubber Board, 2016

RISDA is a legal institution under the Act of Parliament and was founded on 1st January 1973. The foundation of RISDA indicates the awareness of the government of the smallholders' part in the national economic development. RISDA was

officially launched on 8th February 1973 by our late prime minister The Honourable Tun Hj. Abd. Razak Bin Datuk Hussein Onn (RISDA, 2017).

The "Integrated Approach" implemented by RISDA will help to centralize the rubber institution in Malaysia. The "Integrated Approach" lubricates and initiates rubber production in Malaysia and later improves socio economic level of rubber smallholders especially in rural part of Malaysia. In conjunction with the New Economic Policy (NEP), RISDA will play its parts especially in the rearrangements of Malaysian and equal distribution of wealth to all sectors among all races by developing rubber plantation industry and later improve the rubber smallholder's standard of living (RISDA, 2017).

1.8 Problem Statement

Malaysia exports about RM17 million in 2015and reached almost RM18 millions of rubber products in 2016, is one of the most important exported commodities in Malaysia. However, rubber markets are uncertain with the major external factors especially market price (Malaysian Rubber Board, 2017). In Malaysia, smallholders are the backbone of the natural rubber production. Therefore, serious attention should be given to all aspects of smallholders' in rubber production activities.

Currently, rubber smallholders have faced too many issues and challenges including rubber price problems. The market is expected to decline by the world economic condition and currency exchange. Moreover, many supporting schemes have been implemented for rubber development. Malaysian government involvement in the development of rubber smallholders is higher than in Indonesia, while in Thailand the government had fully supported the rubber smallholders (Manivong *et al*., 2008). The major limitations in rubber production comprised shortage and high cost of labour, low rubber prices, inadequate credit offer and storage facilities (Giroh *et al*., 2012).

In addition, excessive rubber production from the producing countries over the demand of rubber consumer countries is also the cause of the fall in rubber prices. Monetary policy states of the main importers such as China, European countries and Japan are also affecting rubber price fall. The unstable prices of natural rubber could affect the income and lead to poverty among smallholders in the rural areas (Malaysian Rubber Board, 2016).

Moreover, the decline in the world rubber economy has extremely affected the price of the natural rubber. Thus, this condition affected smallholders' income and their socio economic status (Anishkumar, 2014). In line, recent study by Husin and Abdullah (2012) stated that the prices of commodities such as palm oil and rubber are always volatile due to the unstable agriculture sector.

Rubber price is also affected by the quality and purity of scrap. There are a lot of cases where pollutants and unwanted substances such as plastic, stones and leaves were trapped in the scrap. This problem might occur unintentionally or intentionally by the rubber smallholders to increase the weight of scrap sold. This unwise act negatively affects the rubber processing company and later reducing rubber price offered by buyers (Verheye, 2010).

The trends of unstable rubber price can also be countered by using some steps of social adaptation by accepting practices to improve yields and quality of the rubber in the future. Other than that, rubber smallholders could diversify their income sources through off-farm employment. These would directly improve returns for family simultaneously increase household incomes. To increase the yield and productivity of the smallholders, who need an effective mechanism and a more proactive guidance from the agencies (Verheye, 2010).

Extension agency is one of the bodies that can transfer the new information to farmers. Farmers' productivity level can be enhanced by educating them with new techniques and technologies (Rosegrant and Cline, 2003). RISDA is an agency that is responsible for the development of smallholders and develops activities and programs that are effective for smallholders.

However, a grounded understanding of the smallholders' social adaptation is required for government's intervention to produce profitable outcomes. Thus, this is an important to conduct a research on the social adaptation of determinants regarding unstable rubber price. Bahinipati and Venkatachalam (2015) stated that adaptation has abundance of literature review. To date, no study has investigated smallholders' adaptive behaviour and the factors influencing their social adaptation towards unstable rubber price. A lot of studies have been undertaken on social adaptation specifically, but the abundant literature on social adaptation to climate change can be used to fill knowledge gaps.

However, uncertainties and knowledge gaps remain, particularly for social adaptation of rubber smallholders' towards unstable rubber price. Related research for community development needed to analyse the impact of unstable rubber price, the socio-economic characteristics of the rubber smallholders and social adaptation of smallholders. This study is a basic in order to identify areas, issues, challenges and problems occur in production area. Therefore, appropriate planning by policies makers and proper extension services will be given by extension agencies.

The research questions in this study are:

1) What is the level of respondents' social adaptation towards unstable rubber price?
2) What is the impacts level of unstable rubber price?
3) What are the roles of agricultural extension agencies to undertake impact of unstable rubber price?
4) How will be relationship between selected socio-demographic factors and their level of social adaptation towards unstable rubber price?
5) What are the significant factors affecting on the unstable rubber price and can lead respondents' to social adaptation?

1.9 Study Objectives

1.9.1 General Objective

The general objective of this study is to identify the social adaptation level of respondents towards unstable rubber price.

1.9.2 Specific Objectives

The specific objectives are:

1) To study the level of respondents' social adaptation towards unstable rubber price.
2) To study the impacts level of unstable rubber price.
3) To evaluate the roles of agricultural extension agencies to undertake impact of unstable rubber price.
4) To examine the association between selected socio-demographic factors and their level of social adaptation towards unstable rubber price.
5) To investigate the most influential factors of unstable rubber price towards respondents' social adaptation.

1.10 Significance of the Study

Rubber may be considered as a strategic plantation crop based on its role in developing socio-economic aspects in Malaysia. Smallholding sector contributes 92.8% to the total national rubber production while the remaining is from the estate sector. Currently, rubber smallholders have been facing many challenges especially in rubber price. Hence, it is important to identify the status and characteristics of respondents' socio-economic profile, the impacts level of unstable rubber price and the level of respondents' social adaptation towards unstable rubber price in Malaysia.

Moreover, the study focused on the association between selected socio-demographic factors of respondents and the level of respondents' social adaptation towards unstable rubber price. This study will hopefully help the rubber smallholders to make necessary adjustment to increase their living status of their household members and it will also help other researchers who will be conducting studies on the same field. The result of this study will help the agricultural extension agents, policy makers, researchers and other players in this industry to build a plan and decision regarding the current practice of rubber smallholders in Malaysia.

The finding of the study will help agricultural extension agencies in planning new strategic policies and programs that will contribute to rubber smallholders and improve the rubber industry. With this information it can be a guideline to the agricultural extension agencies in order to plan a suitable program with a right focus group to make sure the information success reached to the target group and to maximize production of rubber among smallholders. Therefore, they can boost up and maximize their rubber production among smallholders.

1.11 Thesis Organization

This study contains of five (5) chapters covering different areas of the study. The introduction in Chapter 1, gives broad information on agriculture sector in Malaysia, policies and national agenda focusing on rubber, rubber price volatility, social adaptation and agriculture extension. It contains the problems statement, objectives of the study, research questions and significance of the study.

Chapter 2, reviews of previous literatures and findings related to the definition, concept and theoretical framework. Related literatures with rubber sectors were reviewed in this chapter. The purpose of a literature review is to review the work that has been done in a subject or field. It helps to fill the gap in this research and generates rationale or justification for the study. In addition, methods used in previous studies related with this study were discussed.

Chapter 3 discusses the methodology adopted in this study. It is presented in details about the research design including questionnaire as the instrument of study, sampling frame, sampling size and sampling method in this study. This chapter also briefs about the details of analysis and how it will be conducted. .

Chapter 4, elaborate the results and analysis of this study. The last part of the research is Chapter 5, which concludes the research findings and provides recommendations for future study in this field. Questionnaire used was attached as appendix.

REFERENCES

Abdolmaleky, M. (2012). Predictions of small-farmers' empowerment to success in farm operations in Lorestan Province, Iran. World Applied Sciences Journal, 20 (10), 1416-1422.

Abdullah, I., Dahlan, A., & Rahman, A. (2015). The transformation of an agriculture to an industrial-based economy through crowd sourcing in Malaysia. International Journal of Computer Science and Information Technology Research 3(1), 34-41.

Abraham, T. (2013). Value chain analysis of vegetables: The case of Habro and Kombolcha Woredas in Oromia Regions, Ethiopia. Master Science Haramaya University.

Adger, W. N. (2006). Vulnerability. Global Environmental Change, 16, 268-281.

Agwu, A. E. (2006). Intra-household roles and constraints in rice cropping systems in Aninri local government area of Enugu state, Nigeria. International Journal of Agriculture and Rural Development, 7, (1).

Ahuya, C. O., Okeyo, A. M., and Mwangi-Njuru Peacock, C. (2005). Developmental challenges and opportunities in the goat industry: The Kenyan experience. Small Ruminant Research, 60, 197–206.

Aidenvironment (2011). Low prices drive natural rubber producers into poverty: An overview of sustainability issues and solutions in the rubber sector. Amsterdam: Netherlands.

Alam, M., Siwar, C., Talib, B., & Jaafar, A. H. (2013). Climatic change and the socioeconomic sustainability of the paddy farmers in Malaysia.

Albrecht, T. L., & Adelman, M. B. (1987). Communicating social support. Sage Publications, Inc.

Allahyari, M. S., Chizari, M. and Homaee, M. (2008). Perceptions of Iranian agricultural extension professionals toward sustainable agriculture concepts. Journal of Agriculture and Social Sciences, 4(3), 101-106.

Allen, K. (2003). Vulnerability reduction and the community-based approach, in Pelling (ed.), Natural Disasters and Development in a Globalising World, 170-184.

Allison, E. H. and Ellis, F. (2001). The livelihoods approach and management of small-scale fisheries. Marine Policy, 25(5), 377-388.

Allison, H., & Hobbs, R. (2004). Resilience, adaptive capacity, and the "Lock-in Trap" of the Western Australian agricultural region. Ecology and society, 9(1).

Amran, A., Sobhani, F. A., & Zainuddin, Y. (2009). Revisiting the practices of corporate social and environmental disclosure in Bangladesh. Corporate Social Responsibility and Environmental Management, 16(3), 167-183.

Anaeto, F. C., Asiabaka C. C., Nnadi F. N., Ajaero J. O., Ugwoke F. O., Ukpongson M. U., & Onweagba, A. E. (2012). The role of extension officers and extension services in the development of agriculture in Nigeria. Wudpecker. Journal of Agriculture Research, 1(6), 180-185.

Anderson, J. R. (2003) Risk in rural development: challenges for managers and policy makers. Agricultural Systems, 75, 161-197.

Andi and Minato, T. (2003). Design documents quality in the Japanese construction industry: factors influencing and impacts on construction process. International Journal of Project Management, 21 (7), 537-546.

Andy, F. (2009). Discovering statistics using SPSS. Third edition. Dubai: SAGE Publication.

Anishkumar, P. T. (2014). Optimization of school tardiness and absenteeism through motivation and strategic school policy. International Journal of Social Science and Humanities Research, 2, (2).

Anishkumar, P. T. (2014). Socio-economic profile of rubber tappers in the small holding sector: A study at Wardvi of Thevazhoorgrama Anchayath, Kottayam, Kerala. Indian Streams Research Journal, 4 (4).

Anthony, C. Z. and Blanford, D. (1989). Market Intervention and International Price Stability. American Journal of Agricultural Economics, 71(2), 379-388.

Ardeni, P. G., & Wright, B. (1990). The long-term behavior of commodity prices (Vol. 358). World Bank Publications.

Armitage, D. (2005). Adaptive Capacity, Social Capital and Co-Management. In 'Adaptive Co-Management Symposium'. Waterloo, Ontariop. Online at: http://www.omrn.ca/documents/Armitage.pdf.(draft paper).

Ashford, S. J. (1986). The role of feedback seeking in individual adaptation: A resource perspective. Academy of Management Journal, 29: 465-487.

Ashford, S. J., & Taylor, M. S. (1990). Adaptation to work transitions: An integrative approach. Greenwich, Conn.: JAI Press.

Astewel, T. (2010). Analysis of rice profitability and marketing chain: The case of Fogera Woreda, South Gondar Zone, Amhara national regional State. Master Thesis, Haramaya University.

Austin, O. C., and Baharuddin, A.H. (2012). Risk in Malaysian agriculture: The need for a strategic approach and a policy refocus. Kajian Malaysia 30(1), 21-50.

Ayelech, T. (2011). Market chain analysis of fruits for Gomma Woreda, Jimma Zone, Oromia National Regional State. Master Science Haramaya University.

Ayob, A. M. (1978). The Agricultural development: economics, policy and empirical evidence. Kuala Lumpur: Dewan Bahasa dan Pustaka.

Badjeck, M. C., Mendo, J., Wolff, M., & Lange, H. (2009). Climate variability and the Peruvian scallop fishery: the role of formal institutions in resilience building. Climatic Change, 94(1), 211-232.

Bahinipati, C. S., and Venkatachalam, L. (2015). What drives farmers to adopt farm-level adaptation practices to climate extremes: Empirical evidence from Odisha, India. International Journal of Disaster Risk Reduction, 14, 347-356.

Barlow (1983). Institutional And Policy Implications Of Economics Change In Agriculture: The Case Of Malaysian Rubber ,Canberra, Department Of Economics, Research School Of Pacific Studies, Australian National University.

Barlow, C., & Jayasuriya, S. K. (1987). Structural change and its impact on traditional agricultural sectors of rapidly developing countries: The case of natural rubber. Agricultural Economics, 1(2), 159-174.

Barnes, C. (1999). A working social model. Disability and Work in the 21st Century.

Barrett, C., Reardon, T., & Webb, P. (2001). Nonfarm income diversification and household livelihood strategies in rural Africa: Concepts, dynamics, and policy implications. Food Policy, 26(4), 315-331.

Bass, R. (1998). Evaluating environmental justice under the national environmental policy act. Environmental Impact Assessment Review, 18(1), 83-92.

Baum, J. R., Locke, E. A., & Kirkpatrick, S. A. (1998). A longitudinal study of the relation of vision and vision communication to venture growth in entrepreneurial firms. Journal of Applied Psychology, 83, 43–54.

Becker, H. S., & Carper, J. W. (1956). The development of identification with an occupation. American Journal of Sociology, 61(4), 289-298.

Bennett, C. (2001). Genres of research in multicultural education. Review of educational research, 71(2), 171-217.

Berry, J. W. (1992). Acculturation and adaptation in a new society. International Migration, 30(1), 69–85.

Bilkey, W. J., & Nes, E. (1982). Country-of-origin effects on product evaluations. Journal of international business studies, 13(1), 89-100.

Bliss, J. C., Sisock, M. L. and Birch T. W. (1998). Ownership matters: Forestland concentration in rural Alabama. Social Nature Resources, 11 (4), 401-410.

Bohensky, E., Stone-Jovicich, S., & Larson, S. (2009) Adaptive capacity in theory and reality: implications for governance in the Great Barrier Reef region In 'Adaptive Capacity: Building Environmental Governance in an Age of Uncertainty.' (Eds D Armitage, R Plummer). (Springer, Heidelberg, Germany).

Brooks, N., Adger, W. N., & Kelly, P. M. (2005). The determinants of vulnerability and adaptive capacity at the national level and the implications for adaptation. Global environmental change, 15(2), 151-163.

Brooks, N. (2003). Vulnerability, Risk and Adaptation: A Conceptual Framework. Working Paper 38, Tyndall Centre for Climate Change Research, University of East Anglia, Norwich.

Brunckhorst, D. J. (2002). Institutions to sustain ecological and social systems. Ecological Management & Restoration, 3(2) 108–116.

Bryan (2013). Adapting agriculture to climate change in Kenya: Household strategies and determinants. Journal of Environmental Management, 114, 26-35.

Burger, K., & Smit, H. P. (1989). Long-term and short-term analysis of the natural rubber market. Review of World Economics, 125(4), 718-747.

Burton, I. (1996). The growth of adaptation capacity: practice and policy. Adapting to climate change: An international perspective, 55-67.

Burton, M., Rigby, D., & Trevor, Y. (2003). Modelling the adoption of organic horticultural technology in the UK using duration Analysis. The Australian Journal of Agricultural and Resources Economic, 47, 29-54.

Calvo, S. G. (2010). The Global Financial Crisis of 2008-10: A View from the Social Sectors.

Caprio, G., & Klingebiel, D. (2005). Appendix: Banking Crisis Database, in Patrick Honahan and Luc Laeven (eds.), Systemic Financial Crises: Containment and Resolution. Cambridge, UK, Cambridge University Press.

Carter, T. P., Parry, M. L., Harasawa, H., & Nishioka, N. (1994). IPCC Technical Guidelines for Assessing Climate Change Impacts and Adaptations. London: University College London.

Carter, W. B., Andresen, E. M., Malmgren, J. A., & Patrick, D. L. (1994). Screening for Depression in Well Older Adults: Evaluation of. Prev Med, 10, 77-84.

Cavane, E. (2007). Farmers' attitude and adoption of improved maize varieties and chemical fertilizers in Mozambique. Indian Research Journal Extension Education, 11(1).

Cernea, M. M. (1993). Culture and organization: The social sustainability of induced development. Sustainable Development, 1 (2), 18–29.

Chah, J. M., Obi, U. P., & Ndofor-Foleng, H. M. (2013). Management practices and perceived training needs of small ruminant farmers in Anambra State, Nigeria. African Journal of Agricultural Research, 8(22), 2713-2721.

Chakravarthy, B. S. (1982). Adaptation: A promising metaphor for strategic management. Academy of management review, 7(1), 35-44.

Chamhuri, S., Mahmudul, A., Wahid, M., & Al-Amin. (2009). Climate change, agricultural sustainability, food security and poverty in Malaysia. International Review of Business Review Paper Journal, 5(6), 309-321.

Chan, C.C., Chan, Y.C., Au, A., & Cheung, G. O. C. (2010). Reliability and validity of the "Extended - Hurt, Insult, Threaten, Scream" (E-HITS) screening tool in detecting intimate partner violence in hospital emergency departments in Hong Kong. Journal of Emergency Medicine, 17(2), 109-117.

Chandrasekhar, T. R., Alice, J., Varghese, Y. A., Saraswathyamma, C. K., & Vijayakumar, K. R. (2005). Girth growth of rubber (Hevea brasiliensis) trees during the immature phase. Journal of Tropical Forest Science, 17(3), 399-415.

Christoplos, I. (2010). Mobilizing the potential of rural and agricultural extension. Retrieved from http:// gris.fao.org/agris-search/search.do?recordID=XF2016015170

Cinner, J. E., Marnane, M. J., Mcclanahan, T. R. Clark, T. H., & Ben, J. (2005). Trade, tenure, and tradition: influence of sociocultural factors on resource use in Melanesia. Conservation Biology, 19(5), 1469–1477

Coble, K. H., Vergara, O., Patrick, G. F., Knight, T. O., & Baquet, A. E. (2001). Understanding Limited Resource Farmers' Risk Management Decision Making: Summary and Preliminary Analysis. Department of Agricultural Economics, Mississippi State University.

Cochrane, J. H., & Saa-Requejo, J. (2000). Beyond arbitrage: Good-deal asset price bounds in incomplete markets. Journal of Political Economy, 108(1), 79-119.

Cohen, S., & Wills, T. A. (1985). Stress, social support, and the buffering hypothesis. Psychological bulletin, 98(2), 310.

Colding, J., Elmqvist, T., Barthel, S., Borgström, S., Duit, A., Lundberg, J., & Bengtsson, J. (2004). The dynamics of Social- Ecological systems in urban landscapes: Stockholm and the national urban park, sweden. Annals of the New York Academy of Sciences, 1023(1), 308-322.

Contado, C., Dondi, F., Beckett, R., & Giddings, J. C. (1997). Separation of particulate environmental samples by SPLITT fractionation using different operating modes. Analytica Chimica Acta, 345(1), 99-110.

Cook, T. D., Campbell, D. T., & Day, A. (2008). Quasi-experimentation: Design & analysis issues for field settings (Vol. 351). Boston: Houghton Mifflin.

Dang, L. H, Li, E., Nuberg, I., & Bruwer, J. (2014). Understanding farmers' adaptation intention to climate change: a structural equation modelling study in the Mekong Delta, Vietnam. Environmental Science & Policy, 41, 11-22.

Dasgupta, P., & Maler, K. (2001). Wealth as a Criterion for Sustainable Development pp. online at: http://www.beijer.kva.se/ publications/pdf-archive/Disc139.pdf. (Beijer International Institute of Ecological Economics: Stockholm).

Dawit, G. (2010). Market Chain Analysis of Poultry. The Case of Alamata and Atsbi-Wemberta woredas of Tigray Region. Master Thesis, Haramaya University.

Department of Statistics Malaysia (2010). Selected Indicators for Agriculture, Crops and Livestock, Malaysia, Retrieved from https://www.statistics.gov.my/images/stories/files/LatestReleases/indicator/Summary_Indikator_Terpilih_Pertanian_Tanaman_dan_Ternakan2006-10.pdf

Department of Statistics Malaysia (2015). Rubber. Retrieved from https://www.statistics.gov.my/dosm/uploads/files/3_Time%20Series/Malaysia_Time_Series_2015/10Getah.pdf

Department of Statistics Malaysia. (2015). The source of Malaysia's Official Statistics. Retrieved from http://www.statistics.gov.my/index.php

Department of Statistics Malaysia. (2016). Monthly Rubber Statistics. Retrieved from https://www.statistics.gov.my/

Department of Statistics Malaysia. (2017). Monthly Rubber Statistics. Retrieved from https://www.dosm.gov.my/v1/index.php?r=column/pdfPrev&id=RllJZWxFTUV3VE9LUlErUnZKTCtnUT09

Dilmaghani, M. (2011). Religiosity, human capital return and earnings in Canada. International Journal of Social Economics, 39(1/2), 55-80.

Disssanayake, D. M. A. P., Wasana, W., Herath, H. M. L. K., and Gunaratne, P. K. K. S. (2009). Socio-economic status of smallholder rubber farmers in the Moneragala District. Journal of Food and Agriculture, 03, (1), 41-49.

Dorward, A., & Omamo, W. (2007). A framework for analysing institutions. In Kirsten J. (ed) The Economics of Institutions: Theory and Applications to African Agricultural Development.

Dorward, A., Kydd, J., Morrison, J., & Poulton, C. (2005). Institutions, markets and economic co-ordination: Linking development policy to theory and praxis. Development and Change, 36(1), 1–25.

Dowling, J. M. (1979). The supply response of rubber in Thailand. Southern Economic Journal, 795-805.

Easterby-Smith, M. (2008). Research methods for organizational learning: the transatlantic gap management learning (pp: 439–447), Lancaster University: UK.

Economic Transformation Programme Annual Report (2014). Palm oil and rubber. Putrajaya. Retrieved from http://etp.pemandu.gov.my/annualreport2014/National_Key_Economic_Areas_(NKEAs)-@-Palm_Oil_and_Rubber.aspx

Ellis, F. (1998). Household strategies and rural livelihood diversification. Journal of Development Studies, 35(1), 1-38.

Ellis, F. (2000). The determinants of rural livelihood diversification in developing countries. Journal of Agricultural Economics, 51(2), 289-302.

Eriksen, S., O'Brien. K., & Rosentrater, L. (2007). Climate Change in Eastern and Southern Africa - Impacts, Vulnerability and Adaptation. (GECHS, Department of Sociology and Human Geography (ISS) University of Oslo and NORAD).

Fafchamps, M., & Quisumbing, A. R. (1999). Human capital, productivity, and labor allocation in rural Pakistan. Journal of Human Resources, 369-406.

Fankhauser, S., Smith, J. B., & Tol, R. S. (1999). Weathering climate change: some simple rules to guide adaptation decisions. Ecological economics, 30(1), 67-78.

Fenton, W., & Marder, S. R., (2004). Measurement and Treatment Research to Improve Cognition in Schizophrenia: NIMH MATRICS initiative to support the development of agents for improving cognition in schizophrenia. Schizophrenia research, 72(1), 5-9.

Field, A. P. (2009). Discovering statistics using SPSS, 2nd Ed., Sage, London.

Fischer, T. B. (2002). Strategic environmental assessment performance criteria the same requirements for every assessment? Journal of Environmental Assessment Policy and Management, 4(01), 83-99.

Fisher, W. (2001). Theories of intellectual property. New essays in the legal and political theory of property, 168(1).

Flora, J. L. (1998). Social capital and communities of place. Rural sociology, 63(4), 481-506.

Fried, C. (1963). Two Concepts of Interests: Some Reflections on the Supreme Court's Balancing Test. Harvard Law Review, 755-778.

Fried, H. O., Lovell, C. K., & Schmidt, S. S. (Eds.). (2008). The measurement of productive efficiency and productivity growth. Oxford University Press.

Friedman, J.F., Phillips-Howard, P.A., Mirel, L. B., Terlouw, D. J., Okello, N., & Vulule, J. M. (2005). Progression of stunting and its predictors among school-aged children in western Kenya. Europe Journal Clinical Nutrition, 59(8), 914-22.

Friedman, M. (2005). The optimum quantity of money. Transaction Publishers.

Fry, H., Ketteridge, S., & Marshall, S. (2008). A handbook for teaching and learning in higher education: Enhancing academic practice. Routledge.

Fussel, H. M. (2007). Vulnerability: A generally applicable conceptual framework for climate change research. Global environmental change, 17(2), 155-167.

Garson, D. (2002). Differential Bias in Representing Model Parameters. Multivariate Behavior Research, 28(3), 263-311.

George, K. T. (1987). International Commodity Agreements: The Case of Natural Rubber. Social Scientist, 15, (4), 77-86.

Getachew, Z. (2005). Determinants of sustainable rural water supply system in Ethiopia: The case of two rural water supply systems. Master Thesis, A.A.U. Ethiopia.

Giroh, D. Y., & Adebayo, E. F. (2012). Analysis of the technical in efficiency of rubber tapping in Rubber Research Institute of Nigeria. Journal Human Ecology, 27,171–174.

Gizachew, G. (2005). Dairy marketing patterns and efficiency: A case study of Ada'a Liben district of Oromia Region, Ethiopia. Master Science, Harmaya University.

Gonzalez, J. J., & Benito, C. G. (2001). Profession and Identity. The Case of Family Farming in Spain. Sociologia Ruralis 41, 343-356.

Griffin, B., & Hesketh, B. (2003). Adaptable behaviours for successful work and career adjustment. Australian Journal Psychology. 55 (1), 65–73.

Grusec, J. E., & Lytton, H. (1998). Social Development: History, Theory and Research. New York: SpringerVerlag.

Gulati, A., Mehta, R., & Narayanan, S. (1999). From Marrakesh to Seattle: Indian agriculture in a globalising world. Economic and Political Weekly, 2931-2942.

Gunderson, L. (2000) Ecological Resilience - In Theory and Application. Annual Review of Ecological Systems, 31, 425-439.

Gustafson, P. (2001). Meanings of place: Everyday experience and theoretical conceptualizations. Journal of environmental psychology, 21(1), 5-16.

Hair, J. F., Jr., Anderson, R. E., Tatham, R. L., & Black, W. C. (1995). Multivariate data analysis. New York: Macmillan Publishing Company

Halac, M., Schmukler, S. L., Fernández-Arias, E., & Panizza, U. (2004). Distributional effects of crises: the financial channel. Economia, 5(1), 1-67.

Haller, W. J, Portes, A., & Guarnizo, L. E. (2002). Transnational entrepreneurs: An alternative form of immigrant economic adaptation. American sociological review, 278-298.

Hardaker, J., Huirne, R., Anderson, J., & Lien, G. (2004). Coping with risk in agriculture. Cambridge: CABI.

Harris, M. I., Flegal, K. M., Cowie, C. C., Eberhardt, M. S., Goldstein, D. E., Little, R. R., & Byrd-Holt, D. D. (1998). Prevalence of diabetes, impaired fasting glucose, and impaired glucose tolerance in US adults: the Third National Health and Nutrition Examination Survey, 1988–1994. Diabetes care, 21(4), 518-524.

Harrison, S., Safford, H. D. & Wakabayashi, J. (2004). Does the age of exposure of serpentine explain variation in endemic plant diversity in California? International Geology Review, 46, 235–242.

Hashemi, S. M., Schuler, S. R., & Riley, A. P. (1996). Rural credit programs and women's empowerment in Bangladesh. World development, 24(4), 635-653.

Hazell, P., and Norton, R. (1986). Mathematical programming for economic analysis in agriculture. New York: Macmillan.

Herath, K., Wijesuriya, W., Puhambugoda, R., & Abeywardene, V. (2005). Income status of rubber smallholders in the Moneragala district: Reporting from participatory rural appraisals done in four villages. Bulletin of the Rubber Research Institute of Sri Lanka, 46, 52-61.

Hidalgo, M. C., & Hernandez, B. (2001). Place attachment: Conceptual and empirical questions. Journal of environmental psychology, 21(3), 273-281.

Hinkin, T. R. (1995). A review of scale development practices in the study of organizations. Journal of Management, 21, (5), 967-988.

Hofferth, S. L. and Icelan, J. (1998). Social Capital in Rural and Urban Communities. Rural Sociology. 63(4), 574–598.

Howden, S.M., Soussana, J.F., Tubiello, F.N., Chhetri, N., Dunlop, M., & H. Meinke. (2007). Adapting agriculture to climate change. Proceedings of the National Academy of Sciences. 104, 19691–19696.

Huka, H., Ruoja. C., & Mchopa. A. (2014). Price fluctuation of agricultural products and its impact on small scale farmers' development: Case analysis from Kilimanjaro Tanzania. European Journal of Business and Management, 6(36), 155-160.

Humphrey, C. R. (1994) Introduction: Natural Resource-Dependent Communities and Persistent Rural Poverty in the U.S. - Part II. Society and Natural Resources 7, 201-203.

Humphrey, D. G., Kramer, A. F., Larish, J. F., & Logan, G. D. (1994). Aging and inhibition: beyond a unitary view of inhibitory processing in attention. Psychology and aging, 9(4), 491.

Husin, F., & Abdullah, H. (2012). The role of FELDA and KESEDAR in the development of land in the district of Gua Musang: A comparison the socio-economic level of the settlers. Sustainable Agriculture Research, 1(2), 285-291.

Idaszak, J. R., & Drasgow, F. (1987). A revision of the job diagnostic survey: Elimination of a measurement artefact. Journal of Applied Psychology, 72, (1), 6. Implications of moderate altitude training for sea-level endurance in elite distance runners.

Intergovernmental Panel on Climate Change (2007), Climate Change, available at http://www.ipcc.ch/ (accessed 28 August 2017).

International Rubber Study Group (IRSG). (2007). International Rubber Statistic and Rubber Statistical Bulletin. www.rubberstudy.com/newsarticle.aspx?id=100

IPCC (2007). In: Solomon, S., Qin, D., Manning, M., Chen, Z., Marquis, M., Averyt, K.B., Tignor, M., Miller, H.L. (Eds.), Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, 996 pp.

Ipe, V. C. (1990). An Analysis of Indian NR Market. Journal of Plantation Crops, 20, 414 - 416.

Irwan, A. (1996). Business networks and the regional economy of East and Southeast Asia in the late twentieth century.

Ismail, M. (1996). Gender needs analysis of women entrepreneurs. Pertanika Journal of Social Sciences & Humanities, 4(1), 1-9.

IUCN (2009), A Framework for Social Adaptation to Climate Change; Sustaining Tropical Coastal Communities and Industries, International Union for Conservation of Nature and Natural Resources, Gland.

Jensen, A. (2011). Educational differences (Vol. 182). Routledge.

Job, E., & Mukundan, K. (1984). Economics of rubber cultivation by small holders in Kottayam district. Indian Journal of Agricultural Economics, 39(1), 99.

Twingg, J. (2004). Disaster Risk Reduction Mitigation and Preparedness in Development and Emergency Programming. Oversea Development Institute. London.

Kamarul, B. B. (2009). Sustainability and Competitiveness of the Malaysia NR Industry, National Rubber Economic Conference 2009, Malaysia Rubber Board.

Kibett, J. K., Omunyin, M. E., & Muchiri, J. (2005). Elements of agricultural extension policy in Kenya: Challenges and opportunities. In African Crop Science Conference Proceedings (Vol. 7, No. pt. 03 of 03, pp. 1491-1494).

King, L. A., & Hood, V. L. (1999). Ecosystem health and sustainable communities: North and south. Ecosystem Health, 5(1), 49-57.

Kirsten, J. F., Karaan, A. S. M., & Dorward, A. R. (2009). Introduction to the Economics of Institutions. In Institutional Economics Perspectives on African Agricultural Development: Africa

Klein, R. J., & Maciver, D. C. (1999). Adaptation to climate variability and change: methodological issues. Mitigation and Adaptation Strategies for Global Change, 4(3), 189-198.

Kolb, A. Y., & Kolb, D. A. (1984). Experiential learning theory. In Encyclopedia of the Sciences of Learning (pp. 1215-1219). Springer US.

Kosgey, I. S., Rowlands, G. J., Van Arendonk, J. A. M., & Baker, R. L. (2008). Small ruminant production in smallholder and pastoral/extensive farming systems in Kenya. Small Ruminant Research, 77(1), 11-24.

Kozlowski. (2001). Effects of training goals and goal orientation traits on multidimensional training outcomes and performance adaptability. Organizational Behavior and Human Decision Processes. 85(1), 1-31.

Kraimer, M. L., & Wayne, S. J. (2004). An examination of perceived organizational support as a multidimensional construct in the context of an expatriate assignment. Journal of Management, 30(2), 209-237.

Kraimer, M. L., Wayne, S. J., & Jaworski, R.A. (2001). Sources of support and expatriate performance: The mediating role of expatriate adjustment. Personnel Psychology. 54, 71-99.

Lay Y.F. & Khoo C.H. (2009). Pengenalan Kepada Analisis Data Komputer dengan SPSS 16.0 for windows, Selangor: Venton Publishing (M) Sdn. Bhd. Malaysia.

Lemmen, D. S., Warren, F. J., Lacroix, J., & Bush, E. (2008). From impacts to adaptation: Canada in a changing climate. Government of Canada, Ottawa.

LePine. (2005). Hindrance stressor framework: An explanation for inconsistent relationships among stressors and performance. The Academy of Management Journal, 48(5), 764-775.

Lu, C., Fenske, R. A., & Barr, D. B. (2006). OP Pesticides, Organic Diets, and Children's Health. Environment Health Perspective, 114(10), 572–573.

Kissel, J.M. & Krauter, S.C.W. (2006). Adaptations of renewable energy policies to unstable macroeconomic situations – case study: wind power in Brazil Energy Policy, 34 (18), pp. 3591-3598

Maalouf, W. D., Contado, T. E., & Adhikarya, R. (1991). Extension coverage and resource problems: The need for public-private cooperation. Agricultural Extension: Worldwide Institutional Evolution and Forces for Change. Amsterdam: Elsevier Science Publishers.

Malaysia Rubber Board (2014). Smallholders in rubber industry. Putrajaya. Retrieved from http://www.lgm.gov.my/Smallholders/SmallHolder.aspx

Malaysia Rubber Board (2017). Natural Rubber Statistic 2017. Putrajaya. Retrieved from http://www.lgm.gov.my/nrstat/nrstats2017_(Jan-Mar)_pword.pdf

Malaysia Rubber Export Promotion Council (2017). Malaysia's Production, Consumption and Trade of Rubber. Kuala Lumpur. Retrieved from http://www.mrepc.com/industry/malaysia_production.php

Malaysian Rubber Board (2007). Quarterly natural rubber statistical Bulletin. Retrieved from http://www.lgm.my.com

Malaysian Rubber Board (2009). Rubber plantation and processing technologies. Malaysian Rubber Board. Kuala Lumpur, Malaysia.

Malaysian Rubber Board. (2016). Monthly Report 2016. Retrieved from http://www.lgm.gov.my/

Malhotra, N. K. (2006). Questionnaire design and scale development. The handbook of marketing research: Uses, misuses, and future advances, 176-202.

Manivong, V., & Cramb, R. A. (2008). Economics of smallholder rubber expansion in Northern Laos. Agroforestry Systems, 74(2), 113.

Marshall, A. (2009). Principles of economics: unabridged eighth edition. Cosimo, Inc.

Marshall, L. A., & Mclean, N., (2010). A front line police perspective of mental health issues and services. Criminal behaviour and mental health, 20(1), 62-71.

Marshall, N. A., & Marshall, P. A. (2007). Conceptualizing and operationalizing social resilience within commercial fisheries in Northern Australia. Ecology and society, 2 (6): 23-27.

Marshall, N. A., Marshall, P. A., Tamelander, J., Obura, D., Malleret-King, D., & Cinner, J. E. (2010). A framework for social adaptation to climate change: sustaining tropical coastal communitites [sic] and industries. IUCN.

Marshall, N., Marshall, P., & Abdulla, A. (2009). Using social resilience and resource dependency to increase the effectiveness of marine conservation initiatives in Salum, Egypt. Journal of Environmental Planning and Management, 52(7), 901-918.

Marx, S. M., Weber, E. U., Orlove, B. S., Leiserowitz, A., Krantz, D. H., Roncoli, C., & Matsuoka, Y., & Kai, K. (1994). An estimation of climatic change effects on malaria. National Institute for Environmental Studies, Tsukuba.

McDonald, T. (2006). The Impact of Global Warming on Sustainable Development Mitigating the Impact: Natural Hazards Mitigation. In 2nd International Solar Cities Congress (Vol. 4).

McQueen, R.A. and C. Knussen. (2002). Research Methods for Social Science: A Practical Introduction. Prentice Hall, US.

Meuwissen M. P. M., Huirne, R. B. M. and Hardaker, J. B. (2001). Risk and risk management: An empirical analysis of dutch livestock farmers. Livestock Production Science, 69, 43-53.

Milbrath, L. W. (1995). Psychological, cultural, and informational barriers to sustainability. Journal of Social Issues, 51(4), 101-120.

Miller, E. (2008). An assessment of CES and Cobb-Douglas production functions. Retrieved from https://www.cbo.gov/

Ministry of Finance (2016). Ecoomic Report. Kuala Lumpur Retrieved from http://www.treasury.gov.my/index.php/en/economy/economic-data.html

Ministry of Finance Malaysia (2013). Malaysia Budget. Retrieved from: http://www.treasury.gov.my/pdf/budget/speech/ bs13.pdf.

Ministry of Science, Technology and Innovation (2007). Report on National Seminar on Socio- economic Impacts of Extreme Weather and Climate Change, available at: www.met.gov.my/files/ClimateChange2007/SumRep06Aug07.pdf (accessed 18 October 2017).

Minnegal, M., and Dwyer, D. (2004). The good, the bad and the ugly: risk, uncertainty and decision-making by Victorian fishers. Journal of Political Ecology.13.

Minnegal, M., King, T. J., Just, R., & Dwyer, P. D. (2003). Deep identity, shallow time: sustaining a future in Victorian fishing communities. The Australian Journal of Anthropology, 14(1), 53-71.

Mishra, A.K., and Morehart, M. (2001). Off-farm investment of farm households: A logit analysis. Agricultural Finance Review, 87-101.

Mitchell, O. S. & Macleod. (2006). Planning and financial literacy: How do women fare? (No. w13750). National Bureau of Economic Research.

Mitchell, T., Sabates-Wheeler, R., Devereux, S., Tanner, T., Davies, M., & Leavy, J. (2008). Rural disaster risk—poverty interfaces. Report prepared for global assessment report on disaster reduction, University of Sussex, Institute of Development Studies.

Mohd, M. K. (1990). Kaedah penyelidikan pendidikan. Kuala Lumpur: Dewan Bahasa Dan Pustaka.

Mokhtar, N. H., Abdul, H. F., and Syed, K. S. Z. (2011). The effectiveness of storytelling in enhancing communicative skills. Social and Behavioral Sciences, 18, 163-169.

Morris, D., & Walls, M. A. (2009). Climate change and outdoor recreation resources. Washington, DC: Resources for the Future.

Nasliya, A. M. F., Herath, H. M. L. K., & Balasooriya, B. M. D. C. (2013). Assessment of socio economic status and awarenesses of smallholder rubber farmers in Kurunegala district. Proceedings of 12th agricultural research symposium, 404-408.

Noordin, W. D., Najib, L. R., & Tajuddin, I. (1984). Rubber fertilizer: Importance and Guideline for smallholder Rubber Plantation. Rubber Research Institute Malaysia Planters Conference, 3-5 Dec, 1984, Kuala Lumpur: RRIM.

Nord, M. (1994). Natural resources and persistent rural poverty: in search of the nexus. Social Nature Resources, 7 (3), 205-220.

Nunnally, J. C. (1978). Psychometric Theory. McGraw-Hill Book Company, pp. 86-113, 190-255.

Olsson, P., Folke, C., & Hahn, T. (2004). Social-ecological transformation for ecosystem management: the development of adaptive co-management of a wetland landscape in southern Sweden. Ecology and Society, 9(4).

Oroian, I., Paulette, L., Rusu, T., & Dumitras, A. (2007). The effects of environmental factors on the quality of human life and ecosystems in Romania. Journal of Food Agriculture and Environment, 5(1), 248.

Osman, R. & Vanaja, V. (2008). Malaysian Rubber Board's Transfer of Technology Programmes for the Rubber Industry. In IRRDB Conference and Annual Meeting, 13th -14th Oct. 2008, Selangor.

Pallant, J. (2001). SPSS Survival manual: a step by step guide to data analysis using SPSS for windows (versions 10 and 11): SPSS student version 11.0 for windows. Open University Press.

Patrick, G. F., & Musser, W. N. (1997). Sources of and responses to risk: factor analyses of large-scale US cornbelt farmers. Risk management strategies in agriculture, 7.

Peleg, O. (2012). Social anxiety and social adaptation among adolescents at three age levels. Social Psychology of Education, 15(2), 207-218.

Pelling, M., & High, C. (2005). Understanding adaptation: what can social capital offer assessments of adaptive capacity? Global Environmental Change, 15(4), 308-319.

Peluso, D. L., Carleton, R. N., & Asmundson, G. J. (2011). Depression symptoms in Canadian psychology graduate students: do research productivity, funding, and the academic advisory relationship play a role? Canadian Journal of Behavioural Science, 43(2), 119-127.

Pennings, J. M. E., Isengildina-Massa, O., Irwin, S. H., Garcia, P., & Good, D. L. (2008). Producers' complex risk management choices. Agribusiness, 24 (1), 31–54.

Performance Management and Delivery Unit (2014). Palm oil and rubber NKEA fact sheet. Retrieved from http://etp.pemandu.gov.my/upload/NKEA_Factsheet_Palm_Oil_Rubber.pdf

Peterson, G. (2002). Political Ecology and Ecological Resilience. Ecological Economics, 35, 323-336.

Phillips, J. (2007). Communication and mental processes: Experiential and analytic processing of uncertain climate information. Global Environmental Change, 17(1), 47-58.

Ployhart, R. E., & Bliese, P. D. (2006). Individual adaptability (I-ADAPT) theory: Conceptualizing the antecedents, consequences, and measurement of individual differences in adaptability. In Understanding adaptability: A prerequisite for effective performance within complex environments (pp. 3-39). Emerald Group Publishing Limited.

Podsakoff, N. P., Lee, J., Podsakoff, P. M., & MacKenzie, S. B. (2003). Common method biases in behavioral research: a critical review of the literature and recommended remedies. Journal of Applied Psychology, 88, (5), 879–903.

Pulakos, E. D., Arad, S., Donovan, M. A., & Plamondon, K. E. (2000). Adaptability in the workplace: development of a taxonomy of adaptive performance. Journal Applied Psychology, 85 (4), 612-24.

Pulerwitz, J., Gortmaker, S. L., & DeJong, W. (2000). Measuring sexual relationship power in HIV/STD research. Sex Roles, 42, (7–8), 637–660.

Rahim, M. S. (2008). Concept and practice of extension education. Buletin Pengembangan Extension Bulletin, 1.

Raju, K. V., & Jose, P. T. (1990). The economics of rubber based industry in Kerala (Doctoral dissertation, Cochin University of Science and Technology).

Ravallion, M. (2002). Are the Poor Protected from Budget Cuts? Evidence from Argentina. Journal of Applied Economics, 5, (1).

Ravallion, M. (2013). How long will it take to lift one billion people out of poverty? The World Bank Research Observer, 28(2), 139-158.

Razak, M.S. (2010). Prospek Cerah Industri Getah di Malaysia. Retrieved from http://mohamadsofee.blogspot.com/2010/12/prospek-cerah-industri-getah-malaysia.html.

Reardon, T. (1997). Using evidence of household income diversification to inform study of the rural nonfarm labor market in Africa.

Reed, M. G. (1999) "Jobs Talk": Retreating from the Social Sustainability of Forestry Communities. The Forestry Chronicle 75, 755-763.

Rehima, M. (2006). Analysis of red pepper marketing: The case of Alaba and Siltie in SNNPRS of Ethiopia. Master Thesis, Harmaya University.

Rickson, R. E., Western, J. S., & Burdge, R. J. (1990). Social Impact Assessment: Knowledge and Development. Environmental Impact Assessment Review 10, 1-10

RISDA (2006). Memperkasakan Masyarakat Pekebun Kecil Ke Arah Kemiskinan Sifar Amanat Pengurusan RISDA 2006 oleh Ketua Pengarah RISDA. Retrieved from https://www2.risda.gov.my/BPS/AmanatPengurusan2006.html

RISDA (2017). Program Pengembangan RISDA Bagi Pembangunan Pekebun Kecil Dalam Industri Getah. Kuala Lumpur. Retrieved from https://www.risda.gov.my/index.php/my/media-risda/pengumuman/berita-terkini-pengumuman.

Rivera, W. M. (1997). Agricultural extension into the next decade. European Journal of agricultural education and extension, 4(1), 29-38.

Roessig, J., Woodley, C., Cech, J., & Hansen, L. (2005). Effects of Global Climate Change on Marine and Estuarine Fishes and Fisheries–Study of the WWF–World Wide Fund for Nature.

Rosegrant, M. and Cline, S. (2003). Global food security: Challenges and policies. Science, 302, 1917-1919.

Rosse, J. G., & Hulin, C. L. (1985). Adaptation to work: An analysis of employee health, withdrawal, and change. Organizational behavior and human decision processes, 36(3), 324-347.

Roumasset, J. (1976). Rice and risk: Decision making among low-income farmers. Journal of Economic Literature, 15 (3), 980-983

Ruben, B. D. & Kealey, D. J., (1983). Cross-cultural personnel selection criteria, issues, and methods. Handbook of intercultural training, 1, 155-175.

Sabitha, M. (2006). Kaedah penyelidikan sains sosial. Petaling Jaya: Prentice Hall.

Sadoulet, & Alain, J. (1995). Quantitative development policy analysis. Baltimore: Johns Hopkins University Press.

Saegert, S., & Winkel, G. H. (1990). Environmental psychology. Annual review of psychology, 41(1), 441-477.

Sarason, I. G., Sarason, B. R., Shearin, E. N., & Pierce, G. R. (1987). A brief measure of social support: practical and theoretical implications. Journal of Social and Personal Relationship, 4(4).

Schmitt, N. (1996). Uses and abuses of coefficient alpha. Psychological Assesment, 8 (4), 350-353.

Schneider, L. C. & Pontius, R. G., (2001). Land-cover change model validation by an ROC method for the Ipswich watershed, Massachusetts, USA. Agriculture, Ecosystems & Environment, 85(1), 239-248.

Schunn, C. D., Lovett, M. C., & Reder, L. M. (2001). Awareness and working memory in strategy adaptivity. Memory & Cognition, 29(2), 254-266.

Shah, J. A., Asmuni, A. & Ismail, A. (2013). Roles of extension agents towards agricultural practice in Malaysia. International Journal on Advanced Science, Engineering and Information Technology, 3(1), 59-63.

Shamsudin, T., & Raja, B. S. (1985). Approaches to agricultural development and development in rubber smallholding sector in Malaysia.

Shiferaw, B., & Bantilan, M. C. S. (2004). Agriculture, rural poverty and natural resource management in less favored environments: Revisiting challenges and conceptual issues. Food, Agriculture and Environment, 2(1), 328-339.

Shultz, T. W. (1975). The value of ability to deal with disequilibria, Journal of Economic Literature, 13, 827-96.

Silcock, T. H. (1967). The Promotion of industry and the planning process in Thailand: Social and economic studies in development. Canberra: Australian University Press.

Sinkaiye, T. (2005). Agricultural extension participatory methodologies and approaches. Agricultural Extension in Nigeria, 220-233.

Siwar, C., Alam, M. M., Murad, M. W., & Al-amin, A. Q. (2009). A review of the linkages between climate change, agricultural sustainability and poverty in Malaysia. International Review of Business Research, 5, 309-321.

Smit, B., & Wandel, J. (2006). Adaptation, adaptive capacity and vulnerability. Global environmental change, 16(3), 282-292.

Smit, B., Burton, I., Klein, R. J., & Street, R. (1999). The science of adaptation: a framework for assessment. Mitigation and adaptation strategies for global change, 4(3), 199-213.

Smith, A. D. (2003). Routledge philosophy guidebook to Husserl and the Cartesian Meditations. Psychology Press.

Stedman, R. C., Patriquin, M. N. And Parkins, J. R. (1999). Forest dependence and community well-being in rural Canada: A Longitudinal Analysis, Forestry, 84 (4).

Stedman, R. C. (1999). Sense of Place as an Indicator of Community Sustainability. The Forestry Chronicle 75, 765-770.

Steinfeld, R. J. (2001). Coercion, contract, and free labor in the nineteenth century. Cambridge University Press.

Stern, N. (2006). What is the economics of climate change? World Economics-Henley on Thames-7(2), 1.

Stokes, C. J., & Howden, S. M. (2009). Adapting Agriculture to Climate Change: Preparing Australian Agriculture, Forestry and Fisheries for the Future. (CSIRO Publishing: Canberra).

Townsend, R. (2011). Financial Systems in Developing Countries: Growth, Inequality, and Policy Evaluation in Thailand. New York: Oxford University Press.

Tucker, P., & Gilliland, J. (2007). The effect of season and weather on physical activity: a systematic review. Public health, 121(12), 909-922.

Turner, R. J., Frankel, B. G., & Levin, D. M. (1983). Social support: Conceptualization, measurement, and implications for mental health. Research in community & mental health.

Twigger-Ross, C. L., & Uzzell, D. L. (1996). Place and identity processes. Journal of environmental psychology, 16(3), 205-220.

Useche, P., Barham, B.L., & Foltz, J.D., (2009). Integrating technology traits and producer heterogeneity: A mixed-multinomial model of genetically modified corn adoption. American Journal of Agricultural Economics, 91, 444–461.

Uyanik, G. K., and Guler, N. (2013). A study on multiple linear regression analysis. Social and Behavioral Sciences,106, 234-240.

Valdes, A., and Konandreas, P. (1981). Assessing Food Security Based on National Aggregates in Developing Countries. Boulder, Colo: Westview Press.

Verheye, W. (2010). Growth and Production of Rubber. In: Verheye, W. (ed.), Land Use, Land Cover and Soil Sciences. Encyclopedia of Life Support Systems (EOLSS), UNESCO-EOLSS Publishers, Oxford, UK.

Warren-Thomas, E., Dolman, P.M., & Edwards D.P. (2016). Increasing demand for natural rubber necessitates a robust sustainability initiative to mitigate impacts on tropical biodiversity. Conservation Letter, 8, 230-241.

Webster, J. F. E., & Deshpande, R. (1989). Organizational culture and marketing: defining the research agenda. The journal of marketing, 3-15.

Weiss, T., & Berger, R. (2006) Reliability and validity of a Spanish version of the posttraumatic growth inventory. Open Journal of Medical Psychology, (4), 2.

Wethington, E., & Kessler, R. C. (1986). Perceived support, received support, and adjustment to stressful life events. Journal of Health and Social behavior, 78-89.

World Bank and International Monetary Fund (2010). Global Monitoring Report 2010. The International Bank for Reconstruction and Development/The World Bank. Washington, DC.

World Bank (2011). On the Edge of Uncertainty. Poverty Reduction in Latin America and the Caribbean during the Great Recession and Beyond. The World Bank. Washington, DC. Retrieved from http://www.worldbank.org/.

Yaakob, O., & Chau, Q. P. (2005). Weather downtime and its effect on fishing operation in Peninsular Malaysia. Journal Technology, 42, 13-26.

Yapici, S., & Yapici, M. (2015). Developmental and Learning Psychology. Ankara: Ani Publishing, 2005

Yeshitila, A. (2012). Analysis of vegetable marketing in Eastern Ethiopia: The case of potato and cabbage in Kombolcha Woreda, East Hararghe Zone, Oromia National Regional State. Master Thesis, Haramaya University.

Zikmund, W. G. (2003). Business research methods. 7th edition. Thomson South Western Ohio.

Zivkovic, D., Jelic, S., & Rajic, Z. (2009). Agricultural extension service in the function of rural development. 113th Seminar, December 9-11, 2009, Belgrade, Serbia, European Association of Agricultural Economists.