



UNIVERSITI PUTRA MALAYSIA

***INFLUENCE OF KNOWLEDGE, ATTITUDE AND SKILL OF GOOD
AGRICULTURE PRACTICE ON OIL PALM PRODUCTION IN SEEDLING
ASSISTANCE SCHEME IN MALAYSIA***

SHEILYZA MOHD ISHAK

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By

SHEILYZA MOHD ISHAK

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

November 2017

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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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November 2017

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Oil palm industry has contributed significantly to the Malaysian economy. About 35-40% of oil palm is being planted by the smallholders which produced about 33% of the total crude palm oil (CPO) on average. Under 9th Malaysian Plan (2006-2010), RM 37.6 million grants in form of good quality of oil palm seedling have been allocated for 5,697 of smallholders through the Oil Palm Seedling Assistance Scheme (SBABB) coordinated by Malaysian Palm Oil Board (MPOB).

Results of the previous study showed that only 10% of SBABB participants obtained 10t/ha/year of fresh fruit bunch (FFB) which is the standard or expected output while others produce less than 10t/ha/year which is considered as low yield of output. As 2015-2016, SBABB scheme implemented almost 8-9 years, the productivity should be reviewed either meet the expected yield. The centrality of knowledge, skills and attitude on agriculture has been highlighted by number of researcher as the “fourth factor of production”. However, influence of KAS among SBABB participant on oil palm productivity was unknown and studies on same scenario still lacking in Malaysia. Finding of this study would fill in the research gap and to elucidate the relationship of KAS on GAP on oil palm production among SBABB participants

This study was carried out at Sabah and Sarawak whereby a total of 180 respondents have been interviewed using structured questionnaire. The simple random sampling method was used as sampling technique. The questionnaire comprised five (5) sections.

The result shows that the most predominant age categories of smallholders are between 48-59 years old and they have medium knowledge and skill in operating their farms. Most of the smallholders owned 1-7ha of the farm. In term of yield, all respondent produce lower than the average production of 20t/ha/year ranging between 10-20t/ha/yr.

The result also shows that 65% variation of FFB production caused by seven (7) factors and five (5) of them have a positive relationship to the yield. The 5 factors are farm size, followed by knowledge in farm management, skills operating their farm, perception on MPOB and perception on SBABB itself. These factors are important determinants to enhance the farmers to increase their yield. As the recommendation, smallholders should increase skill and knowledge about farm management via extension services and the application of GAP in their farm.

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

**PENGARUH PENGETAHUAN, SIKAP DAN AMALAN DALAM AMALAN
PERTANIAN BAIK TERHADAP PENGELUARAN HASIL KELAPA SAWIT
DI DALAM SKIM ANAK BENIH SAWIT BERKUALITI DI MALAYSIA**

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Industri sawit adalah penyumbang terbesar kepada ekonomi Malaysia. Hampir 35-40% daripada kawasan penanaman sawit dijalankan oleh pekebun kecil yang mana penyumbang purata 33% daripada jumlah pengeluaran minyak mentah sawit (MSM). Di bawah Rancangan Malaysia Ke-9 (2006-2010), sejumlah RM 37.6 juta geran telah diperuntukkan dalam bentuk input pertanian iaitu anak benih sawit berkualiti yang telah memberi faedah kepada seramai 5,697 pekebun kecil melalui Skim Bantuan Anak Benih Sawit Berkualiti (SBABB) yang dilaksanakan oleh MPOB.

Penemuan penyelidikan yang lepas menunjukkan hanya 10% daripada peserta skim SBABB yang memperolehi hasil buah tandan segar (BTS) 10t/hektar/tahun iaitu memenuhi kepada piawai atau jangkaan hasil manakala selebihnya memperolehi hasil kurang daripada 10t/hektar/tahun dan diklasifikasikan sebagai hasil rendah. Sehingga 2015 ke 2016, skim SBABB telah mencapai 8 ke 9 tahun pelaksanaan. Sehubungan dengan itu, produktiviti sawitnya perlu dinilai semula samada mencapai hasil yang dijangkakan. Kepentingan pengetahuan, sikap dan amalan terhadap pertanian sering dikatakan oleh beberapa penyelidik sebagai “faktor ke empat dalam pengeluaran hasil”. Bagaimanapun, kesan KAS dikalangan peserta SBABB terhadap pengeluaran hasil masih tidak diketahui dan penyelidikan berkaitan isu berkenaan masih kurang di Malaysia. Penemuan dalam kajian ini akan memenuhi jurang penyelidikan dan mengkaji hubungkait antara KAS dan GAP dalam pengeluaran hasil sawit di kalangan peserta skim SBABB.

Penyelidikan ini dijalankan di Sabah dan Sarawak di mana seramai 180 orang responden telah ditemubual menggunakan borang kaji selidik yang berstruktur. Kaedah persampelan rawak digunakan dan soalan dalam borang kaji selidik dibahagikan kepada lima bahagian.

Hasil menunjukkan, umur pekebun kecil adalah di antara 48-59 tahun dan mereka mempunyai pengetahuan dan amalan yang sederhana terhadap operasi ladang. Kebanyakan juga pekebun kecil mempunyai luas kebun di antara 1-7 hektar. Dari segi hasil, semua responden memperolehi hasil antara 10-20t/hektar/tahun iaitu lebih rendah daripada hasil purata iaitu 20t/hektar/tahun.

Hasil juga menunjukkan 65% variasi hasil BTS dipengaruhi oleh tujuh faktor dan lima daripadanya mempunyai hubungkait yang positif terhadap hasil. Lima faktor berkenaan adalah saiz kebun, diikuti oleh pengetahuan dan amalan terhadap pengurusan ladang, persepsi terhadap MPOB dan persepsi terhadap skim SBABB itu sendiri. Kesemua faktor ini adalah penting sebagai penentu untuk peningkatan hasil BTS pekebun kecil.

Sebagai cadangan, pekebun kecil perlu meningkatkan kemahiran dan pengetahuan terhadap amalan pengurusan ladang melalui khidmat nasihat dan amalan pertanian baik (GAP) di kebun mereka.

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LIST OF ABBREVIATIONS

MPOB	Malaysia Palm Oil Board
PORIM	Palm Oil Research Institute of Malaysia
TUNAS	Pusat Tunjuk Ajar Sawit
OPNCC	Oil Palm Nursery Competency Certificate
SBABB	Skim Bantuan Anak Benih Berkualiti
FFB	Fresh Fruit Bunch
OER	Oil Extraction Rate
CPO	Crude Palm Oil
KAS	Knowledge, Attitude, Skill
GAP	Good Agriculture Practice
FELDA	The Federal Land Development Authority
FELCRA	Federal Land Consolidation and Rehabilitation Authority
IREC	Integration Research and Extension Division
PIU	Project Implementation Unit
ESU	Extension Services Unit
CLI	Crop and Livestock Integration Unit
TSBMPOB	Tapak Semaian Benih MPOB

CHAPTER 1

INTRODUCTION

This study fundamentally focuses on the Influence of Knowledge, Attitude And Skill (Kas) On Good Agriculture Practice (GAP) To Oil Palm Production Among MPOB's Oil Palm Seedling Assistance Scheme (SBABB) Participants . The Malaysia's oil palm sector, the role of agricultural extension agents, agricultural extension agencies and oil palm smallholders are discussed in this chapter.

1.1 Agriculture in Malaysia

Malaysia obtained her independent 59 years ago and agriculture has contributed substantially to its gross domestic product. Currently, about 11.2% of Malaysia's GDP is from agriculture. Apart of that, the significance of the agricultural sector also reflected in terms of employment, releasing labour for the growing industrial sector, export revenue, export tax and duty, as well as social and economic development.

The most important role of agriculture is to support national food security. It was observed that the basic principles underlying the agricultural policies before (1948-1957) and after (1957-2020) independence were mainly directed to higher productivity and better quality of produce for all crops grown in the country. During the pre-independence, the agricultural policies were formulated by and for the interest of British colonial. The emphasis was on plantation crops such as rubber, oil palm and cocoa. On the other hand, the policies after independence mainly addressed the poverty issues among farmers. The policies focused on how to enhance the income of farmers in order to reduce poverty in the agricultural sector and to minimize the intersectoral inequality between the agricultural and non-agricultural sectors. After independence, Malaysia formulated four agricultural policies namely, National Agricultural Policy 1,2,3 (NAP 1-3) and the National Agro-food Policy (NAM).

In 1984, the first National Agricultural Policy (NAP) was launched to provide much more all-encompassing policy approach to agricultural development. The NAP was designed to ensure a balanced and sustained rate of growth in the agricultural sector vis-à-vis the other sectors of the economy. The policy objectives of the NAP aimed specifically at maximising income from agriculture through effective and efficient utilisation of the country's resources and the revitalization of the sector's contribution to the national economy. An important rationale behind the formulation of the NAP was the concern for the slower rate of growth of the agriculture sector relative to other sectors of the economy and the prevailing poor state of affairs in agricultural productivity.

The second National Agricultural Policy (NAP2) was the extension of the NAP1. This policy aimed to address the challenges faced by the agricultural sector, especially in the meeting the demand for agro-food products in the domestic and global markets. The NAP2 puts greater emphasis on productivity, the efficiency of agro-food production to enable this sector to contribute to the economic growth. The objectives were to increase production, competitiveness and sustainable production. During the NAP2 the government provides incentives through the development of few infrastructures and subsidy programs that benefit smallholder's farmers in all sub-sectors. The government also opened new land areas for industrial crops (rubber and palm oil) as well as for agro-food (paddy, pineapple and vegetables).

The Third National Agricultural Policy (NAP3) was a revised version of the NAP2. This policy was formulated after the government realized the effect of the 1997-1998 Asian Financial Crises (AFC) and the liberalization of the financial markets to Malaysia's economy. The AFC was a wakeup call for the government on the importance of agriculture as the food providers for the people. The NAP3 was formulated to address the challenges faced by this sector such as, the economic structures changes due to lack of arable land, shortage of labor due to competition with other sectors, the efficiency and the utilization of resources in order to improve competitiveness. In addition, the concern is also on the availability of food for domestic consumption.

The National Agro-food Policy (NAP4) was formulated to address challenges in domestic and global market to ensure sustainable production for food security and safety. The policy has been put in place to tackle issue of sustainable agriculture and the competitiveness of the agro-food industry with food safety and nutrition aspects along its value chain. It also aims to reform and transform the agro-food industry to become a more modern and dynamic industry. Under NAP4, agriculture has been identified as a National Key Result Area (NKRA).

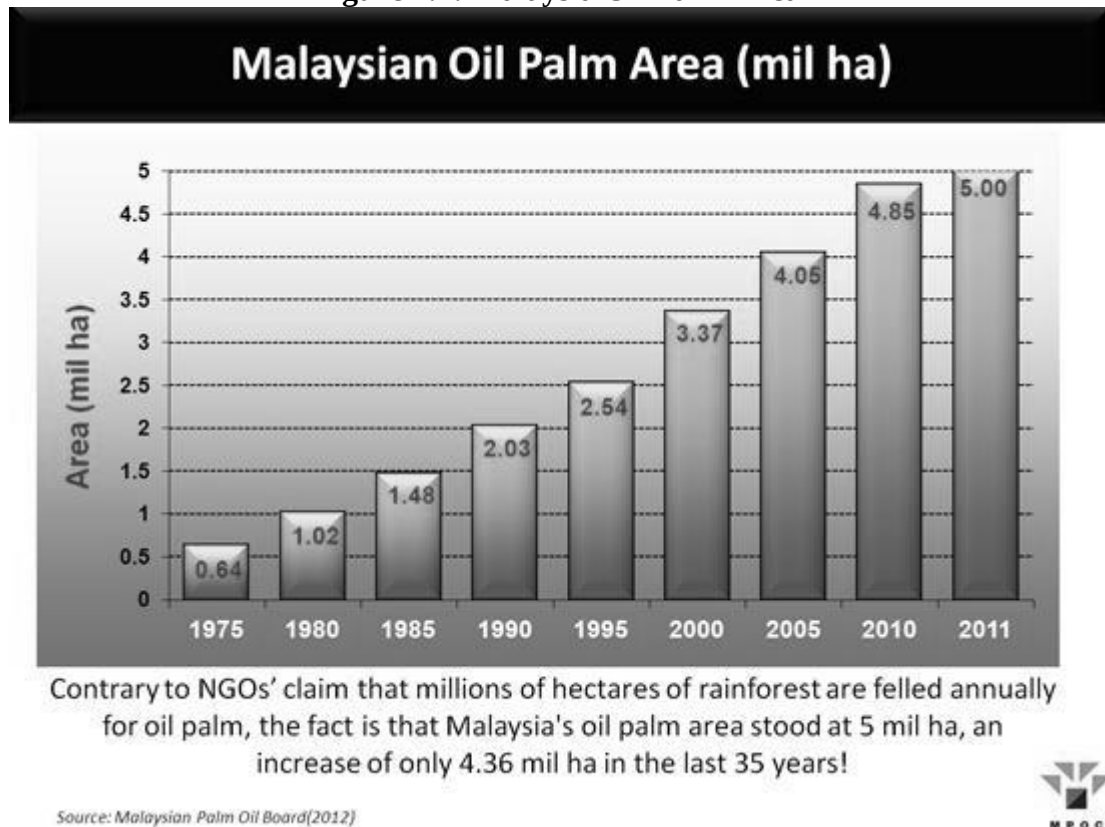
1.2 Malaysia Oil Palm Industry

The oil palm industry in Malaysia is a thriving and profitable business. The industry has been around since the end of 19th when the oil palm arrived on our shores in 1875 as ornament plants. The first commercial palm oil cultivation was done in Selangor in 1917 and the first plantation set up in 1912. Oil palm that planted in Malaysia is African oil palm *Elaeis guineensis*.

As deliberated by Moll (1987), the history of oil palm plantation in Malaysia, it actually was started faster in after the war than in Sumatra and production was again in full swing by 1947. Acreages were slowly but steadily increased throughout the 1950s and thereafter planting proceeded at the fastest rate. This was due to not only confident of the future potential oil palm market, but also to the need felt by plantation companies to diversify their interests and to reduce their dependence on a rubber

plantation. The rate of planting in Malaysia accelerated in the 1960s and 1970s. In 1960, there were only 55,000 hectares (Figure 1.1)

Figure 1.1: Malaysia Oil Palm Area



Tun Abdul Razak was the Deputy Prime Minister and Minister of Rural Development when he implemented the FELDA schemes with the ideas of solving many rural problems. Through these schemes, he really solved many problems all in one instance, such as providing land for the landless, creating employment for the unemployed, providing homes for the homeless, reducing communist infiltration among the rural population and initiating economic growth of the country on the relatively low investment.

Both FELDA and Group Settlement Schemes were designed to ensure that the settlers of both schemes would be able to obtain incomes above the poverty level. The area of each smallholding was 4 ha or 10 acres. Such an area will allow settlers of the schemes to create new communities with incomes well above the poverty level and are thus able to enjoy a higher standard of living. Facilities for processing their produce can also be easily organised on a group basis to ensure high-quality products, which could be sold at competitive prices. Unfortunately, no firm arrangements were made to ensure that their holdings should not be fragmented except for FELDA schemes that were established later.

The increase in productivity, particularly for oil palm, was meteoric. The expansion began with 451,069t in 1970 to 2.4 million tonnes in 1980 and 6.1 million tonnes in 1990 and 13.3 million tonnes in 2003. This was indeed remarkable. Thus, the policy

of the government to recognise that agriculture should be the engine for growth in the early years of independence was very successful. The availability of labour for development in agriculture was abundant; particularly tin mine workers who became unemployed as a result of low tin prices. Moving those who volunteered to settle on new land schemes was made easy because of the promise that each family would be given 4 ha of land.

The oil palm industry has transformed to become Malaysia's key socio-economic driver that eradicate poverty and provide direct employment. At the same time, the competition by another main palm oil producer, Indonesia, has placed our downstream palm oil sector under strain and dragging to the decreasing of palm oil prices. The government has undertaken the necessary approach to boost the sector's competitiveness by targeting to boost the country's total Gross National Income (GNI).

Economic Transformation Programme (ETP) was formulated following the global financial crisis of 2008 when the entire world was grappling with the debilitating effects of economic recession. Although during this tough time and Malaysia back was pushed against the wall, this decision was taken with tough, bold measures to weather external volatility while accelerating economic growth to become a high-income nation by 2020. Despite anomalies materialising in 2016, Malaysia' economy continued to attain solid gross domestic product (GDP) growth aftermath, clocking in at six per cent (4.2%) for the whole year, sustaining a trajectory of over 4% since the start of the NTP in 2010 and on occasion, outpacing the global growth rate.

The GNI contribution by NKEA also account for the majority share of the structure of the GNI, as well as showing diversification in Malaysia GNI structure. As the immediate impact of the private sector-led growth has been the creation of a wealth of employment opportunities for Malaysians. Since 2010, the economy has recorded 2.26 million new jobs (Table 1.1)

Table 1.1: GNI Value 2016 (RM Billion)

NKEA Sector	2016
Agriculture	68.1
Palm Oil/ Rubber	64.9
Oil, Gas & Energy	179.7
Electrical & Electronics	57.0
Wholesale & Retail	181.9
Education	9.7
Healthcare	10.9
Communication Content & Infrastructure	58.1
Tourism	73.3
Financial Services	64.8
Business Services	58.6
Total NKEA	827.2
Other Industries	367.5
Total GNI	1,194.6

Source: ETP 2016

In formulating the ETP, one of the Government's objectives was to reduce its historical reliance on revenue from oil and gas and encourage diversification of sectors in the Malaysian economy. It was to this end that 12 National Key Economic Areas (NKEAs) were identified as areas for focused development. The 12 core NKEA identified are as Table 1.2.

Table 1.2: Twelve Core National Key Economic Areas (NKEA)

NKEA 1	Oil, Gas and Energy
NKEA 2	Palm Oil
NKEA 3	Financial Services
NKEA 4	Tourism
NKEA 5	Business Services
NKEA 6	Electronics and Electrical
NKEA 7	Wholesale and Retail
NKEA 8	Education
NKEA 9	Healthcare
NKEA 10	Communications Content and Infrastructure
NKEA 11	Agriculture
NKEA 12	Greater Kuala Lumpur/Klang Valley

Source: ETP, 2016

Malaysia oil palm industry spans the entire value chain from plantation to downstream activities. Its development is mainly private sector-driven and is still heavily skewed towards upstream activities, namely production of fresh fruit bunches (FFB) in plantation, processing of FFB in mills and palm kernel crushing and palm oil refining activities. While government support is primarily targeted at promoting downstream activities and supporting independent smallholders, the core focus of the Palm Oil

National Key Economic Area (NKEA) is to reinforce the leading role of the private sector in steering the palm oil industry.

There were eight entry-point projects (EPPs) were set as key performance indicators to measure achievement of Government's Palm Oil NKEA. MPOB manages about 6 of the eight EPPs. Five of the EPPs address upstream productivity and sustainability, while the other three address downstream value addition and sustainability (Table 1.3)

Table 1.3: Eight Entry-Point Project (EPP) of Oil Palm NKEA

Value Chain	Entry Point Project	
Upstream (Productivity and Sustainability)	EPP1	Accelerate replanting
	EPP2	Improve fresh fruit bunches yield
	EPP3	Improve worker productivity
	EPP4	Increase oil extraction rate
	EPP5	Biogas facilities at palm oil mills
Downstream (Expansion and Sustainability)	EPP6	Developing oleo derivatives
	EPP7	Commercialising 2 nd generation biofuels
	EPP8	Expediting growth in food and health based downstream segments

Source: ETP, 2016

From the statistics reported by Economic and Industry Development Division MPOB in 2016, the oil palm planted area in 2016 reached 5.74 million hectares, an increase of 1.77% as against 5.64 million hectares recorded in the previous year. This was mainly due to the increase in newly planted area in Sarawak, which recorded an increase of 4.86% or 0.07 million hectares. Peninsular Malaysia is the largest oil palm planted area, with 2.68 million hectares or 47% of total oil palm planted area, followed by Sabah with 1.55 million hectares or 27%, while Sarawak accounted for 1.51 million hectares or 26.3% (Table 1.4).

Table 1.4: Oil Palm Planted Area by Region in Malaysia (mill. hectares)

Region	2012	2013	2014	2015	2016
Peninsular Malaysia	2.56	2.59	2.62	2.66	2.68
Sabah	1.44	1.48	1.51	1.54	1.55
Sarawak	1.08	1.16	1.26	1.44	1.51
Total	5.08	5.23	5.39	5.64	5.74

Source: MPOB, 2016

1.3 Malaysia Palm Oil Board (MPOB)

The need to intensify research programmes in agricultural crops led to the separation of the research activities of the Department of Agricultural by the formation of Malaysian Agricultural Research Development Institute (MARDI) in 1970. It was later

found that oil palm could be further separated from MARDI by the establishment of Palm Oil Research Institute of Malaysia (PORIM) in 1979.

MPOB was incorporated by an Act of Parliament (Act 582) and established on 1 May 2000, taking over, through a merger, the functions of the Palm Oil Research Institute of Malaysia (PORIM) and the Palm Oil Registration and Licensing Authority (PORLA). Each of these respective organisations has been involved in the oil palm industry for more than 20 years and it is to render more effective services as well as to give greater national and international focus to the industry that MPOB was instituted.

MPOB is the premier government agency entrusted to serve the country's oil palm industry. Its main role is to promote and develop national objectives, policies and priorities for the well-being of the Malaysian oil palm industry. MPOB has more than three decades of concerted effort in research and development along the entire value chain. Several technologies have made the transition from the laboratory to the marketplace.

List of MPOB role are as follows:

- 1) To implement policies and development programmes, to conduct and promote research and development activities relating to the oil palm industry.
- 2) To regulate, register, coordinate and promote all activities relating to the oil palm industry.
- 3) To develop, promote and commercialise research findings as well as provide technical, advisory and consultancy services to the oil palm industry.
- 4) To develop and maintain markets for oil palm products as well as promote efficient marketing.
- 5) To liaise and coordinate with other organisations inside or outside Malaysia to further enhance the oil palm industry in Malaysia.
- 6) To plan and implement training programmes and human resource development in line with the needs of the oil palm industry.
- 7) As resource and information centre of the oil palm industry including the publication and dissemination of information on oil palm as well as other oils and fats.

MPOB derives its funding mainly from cess imposed on the industry for every tonne of palm oil and palm kernel oil produced. In addition, MPOB receives budget allocations from the government to fund development projects and for approved research projects under the Intensification of Research in Priority Areas (IRPA) programme.

The vision of MPOB is to become the premier Nobel Laureate - producing research and development institution, providing leadership and impetus for the development of a highly diversified, value-added, globally competitive and sustainable oil palm industry. While the mission of MPOB is to enhance the well-being of the Malaysian oil palm industry through research, development and excellent services. Therefore several R&D and services division was developed to support vision and mission as mention above. (Figure 1.2).

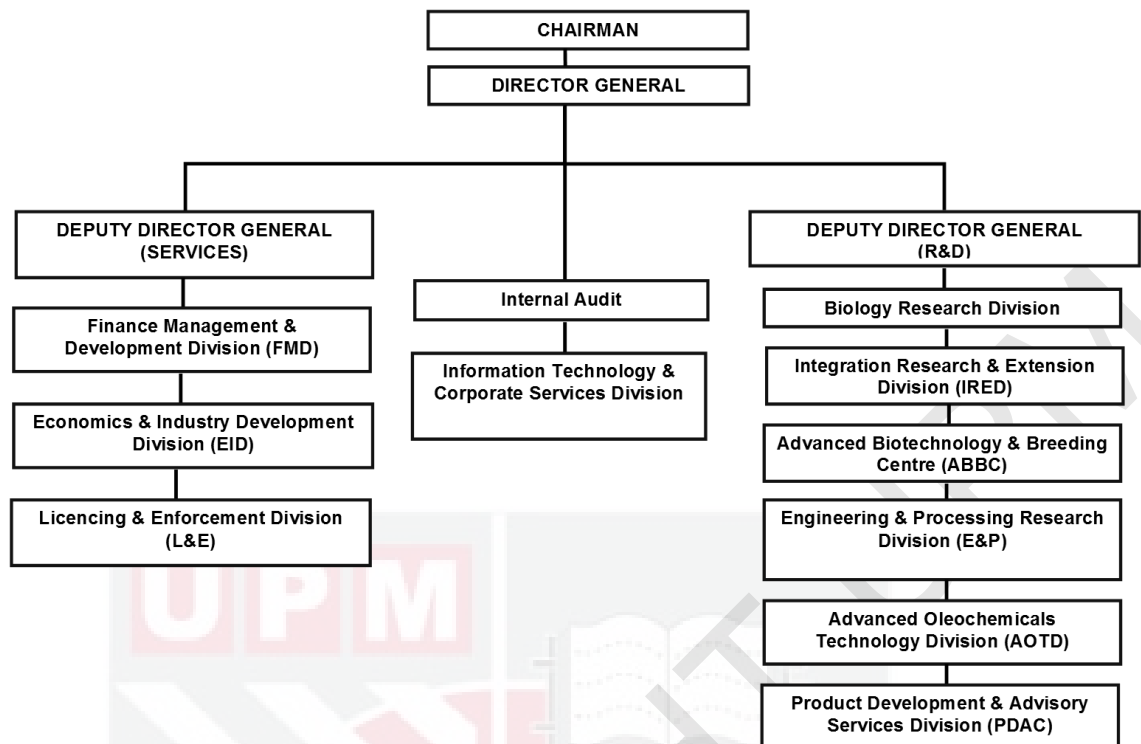


Figure 1.2: MPOB Organization Chart

1.4 Integration Research and Extension Division (IRED)

Integration Research and Extension Division (IRED) are one of the divisions under MPOB which responsible to serve services to the independent oil palm smallholders in Malaysia (Figure 1.3).

There are three (3) units under IRED roof which are:

1) Project Implementation Unit (PIU)

This unit responsible for coordinating and delivering oil palm assistance scheme announced by the government to the smallholders. It's involved scheme under 9th Malaysian Plan (2006) until the latest is 11th Malaysian Plan (2015).

2) Extension Services Unit (ESU)

The main business of ESU is to do an extension work and disseminate technologies to the smallholders. However, to gain the influence power, they also responsible for the distribution of incentives, with an eye to persuading farmers to change in the promoted direction.

3) Crop and Livestock Integration Unit (CLI)

This unit mainly working on research regarding the suitable model of crop and livestock integration with oil palm for smallholders. The technology developed then to be disseminated to the smallholders by the ESU.

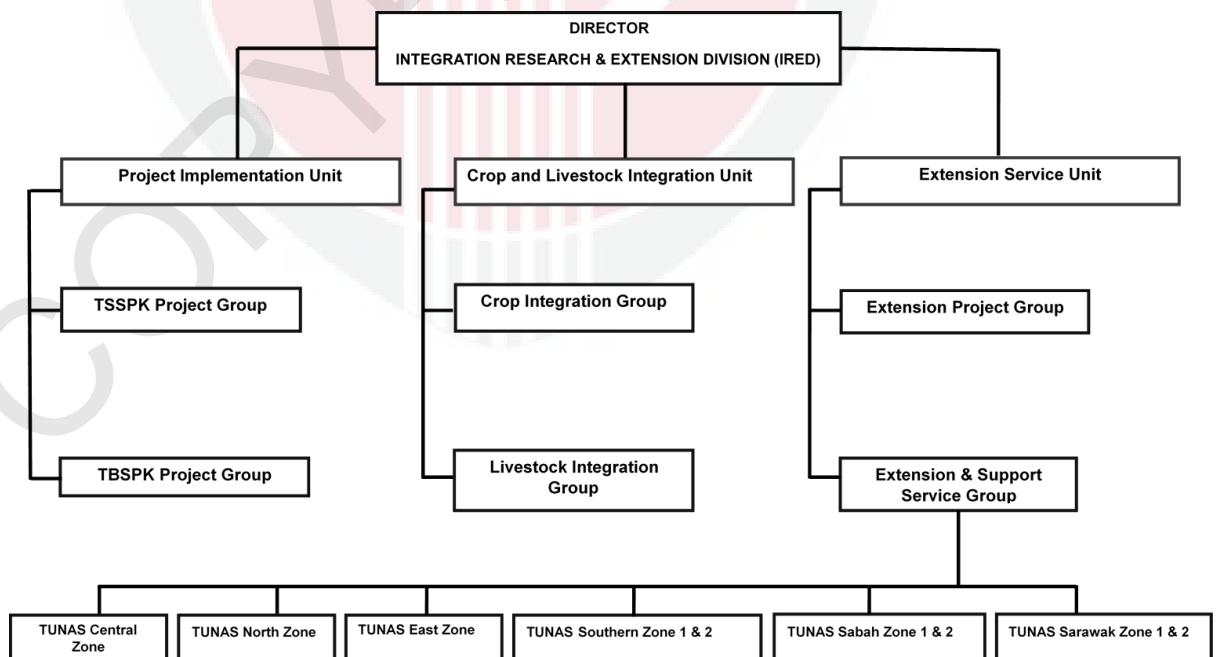


Figure 1.3: IRED Organization Chart

The mission of IRED is to maximise income through high oil palm productivity and mixed farming. In addition, the vision of this division is to be a premier reference centre on oil palm cultivation and maximum land-use for the development of progressive and dynamic oil palm growers.

The functions of IRED are: 1) To carry out research on extension and mixed farming; 2) To provide planned and effective extension services; 3) To develop best models of crop and livestock integration with oil palm; 4) To provide excellent advisory and consultancy services, and 5) To ensure efficient delivery system of development projects.

1.5 Oil Palm Smallholders

Oil palm smallholder production has much to offer to the oil palm industry in terms of sustainability and credibility. Smallholders are not minor players. In the two countries responsible for over 80% of world oil palm production, Indonesia and Malaysia, smallholders account for 35-40% of total area of planted oil palm and as much as 33% of the output. Elsewhere, as in the West African countries that produce mainly for domestic and regional markets, smallholders produce up to 90% of the annual harvest (Table 1.5)

As per describe by (Vermeulen, 2006), smallholders are taken here to mean family-based enterprises producing palm oil from less than 50ha of land (the definition used by the Roundtable on Sustainable Palm Oil). In practice, people in this smallholder's category are often also holders of customary rights (or otherwise new settlers) and perhaps also labourers on nearby plantations, all of which affect the choices they make as smallholders.

In the year 2016, independent smallholders are the second largest area accumulated of 0.93 million hectares or 16.3% of the total planted area in Malaysia. The number was expanding in line with increasing of the year. Oil palm independent smallholders at Peninsular Malaysia hold more than half or 55.6% out of total area planted by Malaysia's independent smallholders.

Table 1.5: Oil Palm Planted Area by Category in Malaysia 2016 (Mil. Hectares)

Category	2012	2013	2014	2015	2016
Independent Smallholders	0.69	0.75	0.81	0.85	0.93
FELDA	0.70	0.70	0.69	0.71	0.71
FELCRA	0.17	0.17	0.17	0.17	0.17
RISDA	0.08	0.08	0.07	0.08	0.07
State	0.31	0.31	0.33	0.35	0.34
Private	3.13	3.22	3.32	3.45	3.52
Total	5.08	5.23	5.39	5.64	5.74

Source: MPOB Pocketbook 2016, Economic & Industry Development Division
MPOB

At present, the main types of arrangement for smallholders are:

- 1) **Supported Smallholders:** growers who cultivate palm oil with the direct support of either government agency or private sector. The basic concept is that the government agency or private plantation company provides technical assistance and inputs of seed stock, fertilisers and pesticides, on a loan basis, sometimes partially subsidised by the government. There may be a verbal or written contract delineating the agreement and possibly including guarantees of sales, plus a term of calculating the mill prices. Examples in Malaysia (RISDA, FELCRA, FELDA, SALCRA, SLDB).
- 2) **Independent Smallholders:** Growers who cultivate palm oil without direct assistance from the government or private companies. They sell their crop to local mills either directly or through traders. In Malaysia, independent growers are proliferating as independent mills multiply and FELDA schemes mature towards less regulation and subsidy. Proportion number and holding area of oil palm independent smallholders in Malaysia are presented in Table 1.2
- 3) **Collective Landowner Schemes** are another option for local communities who hold land title or recognized customary land rights. These are land leases or joint ventures, whereby local landowners rent out use rights of their land to a plantation company or collect a share of profits base on the equity value of the land. This is not strictly a smallholder model but can be an attractive alternative for local landowners. The mini estate or Konsep Baru in Malaysia (Sabah and Sarawak) and lease-lease-back schemes in Papua New Guinea are current models.

Table 1.6: Proportion Number and Holding Area of Smallholders by State 2016

State	Independent Smallholder		Area		Average Area
	Number	%	Hectares	%	
Johor	78,704	31.05	207,484	23.5	2.64
Kedah	6,795	2.68	24,725	2.8	3.64
Kelantan	1,562	0.62	4,996	0.57	3.20
Melaka	3,114	1.23	11,347	1.29	3.64
N. Sembilan	6,439	2.54	23,533	2.67	3.65
Pahang	11,365	4.48	45,428	5.14	4.00
Perak	42,880	16.91	109,995	12.46	2.57
Perlis	14	0.01	68	0.01	4.86
Pulau Pinang	2,367	0.93	9,019	1.02	3.81
Selangor	21,990	8.67	43,057	4.88	1.96
Terengganu	3,278	1.29	10,851	1.23	3.31
Semenanjung Malaysia	178,508	70.41	490,503	55.55	2.75
Sabah	36,305	14.32	217,403	24.62	5.99
Sarawak	38,699	15.27	175,098	19.83	4.52
Malaysia	253,512	100	883,004	100	3.48

Source: MPOB (2016)

1.6 Oil Palm Seedling Assistance Scheme (SBABB)

Through 9th Malaysian Plan (2006-2010), RM37.6 million grants have been allocated for the implementation of Oil Palm Seedlings Assistance Scheme (SBABB) which Malaysian Palm Oil Board (MPOB) as the implementer (EPU, 2008). The objective of the schemes is to increase productivity and income of smallholders through the planting of good quality oil palm seedlings and also to promote and increase oil palm plantings for smallholders in Sabah and Sarawak.

SBABB was launched by the Minister of Plantation Industries Commodities on 14 November 2005. At the first, this scheme has been introduced to Sabah and Sarawak and then has been extended to Peninsular of Malaysia in July 2007.

Through the scheme, it has benefited about 5697 smallholders. The requirements for application are open for independent smallholders with holding not more than 5 hectares. For Sabah and Sarawak's smallholders, the holding should not more than 7 hectares. Even though, the maximum areas for approval were limited to 5 hectares. In the beginning, the scheme components included oil palm seedling with the age 12-14 month and 1 bag of 50kg of phosphate fertilizers for each hectare approved. However, starting in September 2008, the component of the scheme has been added with 0.5t/ha of MPOB F1's compound fertilizers.

Suppliers of oil palm seedling for SBABB were needed to comply with OPNCC (Oil Palm Nursery Competency Certification Standard). This to ensure oil palm seedling supplied were of good quality. The seedling should undergo culling process before the

delivery. All SBABB's participants were given with extension services by the local MPOB's TUNAS Officers about planting aspect and oil palm management.

As the scheme was ended in the year 2010, several studies were undertaken to evaluate the outcome and impact of the scheme. According to Zulkifli (2013), the survey found that participants of the SBABB scheme were achieved high first-year FFB yield as compared to non-participants. However, there were only 10% of SBABB participants obtained more than 10 tonnes hectare-1 of the first year FFB yield which categorized in a good performance as compared to Expected FFB yield (t/ha).

This is supported by the study conducted by Khairuman (2008) on initial performance of the SBABB scheme which found that plots of two third of the respondents were properly managed while one-third are not, even though the early agriculture-input assistance and training have been given to the participants.

Preliminary output by Zulkifli 2013 recorded the reason smallholders failed to apply GAP is because of limited capital to fertilized their farm and to control pest and disease as average holding area owned by smallholders are mostly below than 2.2 ha. Moreover, young seedling typically requires nearly 8 years to reach peak output capacity, and taking the area out of production for 3 or more years did not make good economic sense under the circumstances, especially for smallholder's producers. Therefore the oil palm might not properly manage and will result in the under-performed farm.

1.7 Problem Statement

The main areas of concern are this regard is in Indonesia and some parts of the Malaysia Borneo. At these two countries produce the vast majority of global exports of palm oil, it is in their joint interest to ensure that valid environmental concerns are addressed, for example by encouraging smallholders to join certification schemes such as RSPO (Roundtable on Sustainable Oil Palm, www.rspo.org). To a great extent, the larger commercial plantation companies are already focussed on international trade have both the means and incentive to improve their sustainability status. However, a major additional challenge in some regions will be to meet RSPO or similar criteria while still facilitating the economic development of the estimated three million oil palm smallholders worldwide who face real difficulties in complying with such schemes.

It is in the interests of the oil palm industry as a whole to try to address these issues together, rather than on a piecemeal company-by-company or region-by-region basis. For example, the poor image of oil palm presented by some NGO has led to an increasing trend in some parts of Europe for boycotts of oil palm products by both retailers and consumers. Such blanket bans show that there tends to be no

differentiation between “good” and “bad” sources of oil palm and the entire sector end up being tarred by poor practice in a few areas.

Therefore to facilitate the current requirement, the smallholders are encouraged to apply at least one of the good agricultural practices consistently (e.g MPOB Codes of Practices, Malaysia Standard of Good Agricultural Practices (GAP) developed by MPOB together with SIRIM, Malaysia Sustainable Palm Oil (MSPO)).

As for June 2016, about 1,411,879ha plantation was certified with MPOB Codes of Practices (MPOB CoGAP), MSPO, and RSPO by the local and international certification body. GAP was one of the element and criteria in MSPO certification. Among of the GAP requirement is to preserve soil fertility, control of soil erosion, monitoring of soil surface moisture, monitoring of ground water and integrated pest & disease control are actually parts of the MSPO’s requirement.

Applying GAP is the basis to increase the productivity and quality of oil produced. Apart of that, it also the requirement for MSPO certification. Through GAP certification, smallholders only required complying with at least 23 mandatory clauses from 27 total clauses listed.

Previous research about GAP acceptance among Malaysian oil palm independent smallholders showed that only 26% of the respondent totally complied with GAP requirement. While 58% of them partially-comply and balance about 16% did not comply. From this study also found that most of the smallholders not applying sufficient amount of fertilizer and not doing record book keeping although they know the importance of it.

GAP would definitely affect the yield. Continual of cultivation of oil palm on land using low quality of seedling and without organic or inorganic fertilizers lead to low yields which could reduce 0.1-59% yield compared to the normal quality of oil palm (Tam, 1973) and consequences inability to afford input purchases. The relatively poor yield of palm oil in commercial and smallholder’s plantation compared to the proven potential yield of some existing varieties, coupled with lack of progress in improving this situation over the past decade has attracted much comment in the industry and more widely (USDA, 2012).

In general, smallholders usually will gain fresh fruit bunch (FFB) yield between 14.0-18.0 t/ha/year compared to the national average which about 18-22 t/ha/year (revised every year). However, outstanding performance also can be gained or in fact could attain up to 30t/ha/year and it's proven by MPOB 30 tonner’s club members (Table 1.7).

Table 1.7: Oil Palm FFB Yield of Independent Smallholders (2012-2016)

FFB YIELD (t/ha/year)	2012	2013	2014	2015	2016
Peninsular	18.87	19.14	18.49	17.57	14.29
Sabah	18.52	15.49	15.42	16.10	14.47
Sarawak	16.82	17.84	18.49	17.87	17.32
Total	18.53	18.21	18.00	17.33	16.12

Source: MPOB (2017)

MPOB has introduced 30 tonner's club members. The members are among the progressive smallholders who attained FFB yield more than 30t/ha/year (MPOB, 2007). They applied Good Agriculture Practices (GAP) which concludes the usage of quality oil palm seedling.

Thus, from early on 20th, the government financed oil palm subsidy, subsidized smallholder's credit and controlled oil palm prices. Therefore, through SBABB, an allocation budget has been delivered to assist smallholders at the critical early stages of planting. Application of good quality of seedling and fertilizer will eliminate the potential cause of low-productivity oil palm cultivation.

The most important criterion of GAP, which is the usage of good quality of oil palm seedling is one of the strategies toward achievement of National FFB Yield Production 35 t/ha/year with Oil Extraction Rate (OER) about 25%. In the meantime, there are many of new planting were situated at Sabah and Sarawak because of area availability.

However, this assistance only supports in the early stages of planting and still need smallholders to actively participate and responsible to maintain their oil palm during the non-economic period which is 2-8 years, depends on the performance of their farm. As 2015-2016, SBABB scheme implemented almost 8-9 years, the productivity should be reviewed either meet the expected yield.

There is an abundance of international studies which have found that attitude, knowledge, and skills are the main factors to improve productivity and performance. Bergevoet (2009), in his study, mentioned that there is a positive relationship between attitude, goals, and objectives towards entrepreneurial behavior and productivity increment. Azman (2013) have discussed farmer's knowledge as an important element in development, and it's extremely important in this challenging era. In the early on 1945, the knowledge approach was driven by main objectives to maximize productivity and profit. The centrality of knowledge, skills and attitude on agriculture has been highlighted by number of researcher as the "fourth factor of production". However, level of KAS and its influence of KAS among SBABB participant on oil

palm productivity was unknown and studies on same scenario still lacking in Malaysia. Moreover, through Innovation Adoption Diffusion Model, Risenberg and Gor (1989) also highlighted that knowing farmer's perception and preferences towards the program would help program planner to transfer information about innovative farming practices more effectively. Filling this research, theoretical and practice gap is the main objectives of this study, which seeks to elucidate the relationship of knowledge, attitude, and skill of SBABB participant's on GAP in oil palm production.

Therefore, this study was conducted to provide answers to questions as follows:-

- 1) What is the respondents' level of knowledge, attitude and skill practice in oil palm farming?
- 2) What is the respondents' perception level on SBABB and MPOB as the implementer?
- 3) What is the relationship between sociodemographic profiles and the respondents' KAS level on GAP in oil palm production?
- 4) What is the impact of SBABB to respondents' skill, knowledge and attitude in oil palm production?

1.8 Objectives of the Study

1.8.1 General Objective

The general objective of the study is to determine the relationship between KAS level on GAP among SBABB participants in oil palm production.

1.8.2 Specific Objectives

Specifically, the objectives are:

- 1) To determine respondents' level of knowledge, attitude and skill practice in oil palm farming?
- 2) To determine respondents' perception level on SBABB and MPOB as the implementer?
- 3) To examine the relationship between sociodemographic profiles and the respondents' KAS level on GAP in increment of oil palm production?
- 4) To clarify the impact of SBABB to respondents' skill, knowledge and attitude in oil palm production?

1.9 Significance of Study

Persistent low productivity would be detrimental to the government's objectives of eradicating poverty and achieving an equitable distribution of wealth among its population. Furthermore, MPOB vision is to achieve the national target (35:25) where for 35 tonnes of FFB per hectare per year, the oil extraction rate has been set at 25

percent by 2020. Since oil palm is the major export crop and also one of the major export earners, poor performance at farm level will have serious repercussion on the economic growth of the country.

All these are difficult, explaining the long-standing and often contentious emphasis on agricultural input subsidies for oil palm sector especially for smallholders. This subsidy involves large-scale registration and application and targeting farmers across the country. Thus, evaluation of the programme effectiveness, efficiency and their contribution to sustainable development subsidy policies are needed to be measured.

This study as such hopes to generic new information that could be utilised to improve the productive capacity of the existing farms as well as new oil palm areas which the government hopes to develop under the Palm Oil NKEA, the target to GNI for 2020 is RM178 billion.

1.10 Definition of Terms

Good Agriculture Practices (GAP): For this study GAP referring to a collection of principles develop by MPOB and SIRIM to apply for on-farm production and post-production processes of oil palm, resulting in safe and healthy food and non-food agricultural products, while taking into account economic, social and environmental sustainability

Oil Palm Production: refer to oil palm FFB yield / hectare/ year

1.11 Organization of Thesis

This section covers the organisation of this study. This study has been organised into five (5) chapters. The introduction in Chapter 1 covers the introduction, problems statement, objectives of the study, research questions and significance of the study.

Chapter 2 summarises previous literature and finding related to the good agriculture practices, agricultural extension and reviews of the related theoretical model.

Chapter 3 describes the methodology adopted in this study. It is presented in details about the research design including questionnaire as the instrument of study, details about the area of the research study, population and sample method, data collecting technique and analysis conducted for the study.

Chapter 4 summarises the results and analysis of this study and lastly, Chapter 5 discusses the conclusion and provides recommendations for future study in this field.



REFERENCES

- Ayat K. Ab. Rahman, Ramli Abdullah, Faizah Mohd Shariff and Mohd Arif Simeh (2008). The Malaysian Palm Oil Supply Chain: The Role of the Independent Smallholders. *Oil Palm Industry Economic Journal*, Vol 8 No.2 (2008) p17-27.
- Ajzen, I. (1991). The theory of planned behavior. *Organizational behavior and human decision processes*, 50(2), 179-211.
- Ali, Z. A. N., Siti, M. A., Balu, N., Ainul, S. S., Norhidayu, A., Nur, A. H., (2017). An Economic Study on Technical Efficiency Among Independent Smallholders in Sabah & Sarawak. *Proceeding of Palm Oil Economic Review & Outlook Seminar 2017*. 17 January 2017.
- Altschuld, J. W., & Zheng, H. Y. (1995). Assessing the effectiveness of research organizations: An examination of multiple approaches. *Evaluation Review*, 19(2), 197-216.
- Available at <http://www.wkkf.org/Pubs/Tools/Evaluation/Pub3669.pdf>
- Azman, A., D'Silva, J.L., Samah, B.A., Man, N., Shaffril, H.A.M. (2013) Relationship between Attitude, Knowledge, and Support towards the Acceptance of Sustainable Agriculture among Contract Farmers in Malaysia. *Asian Social Science*; Vol 9, No. 2: 2013 pp 99-105. <http://dx.doi.org/10.5539/ass.v9n2p99>
- Baker, H. R. (1984). *A proposal for Canadian study of agricultural Transfer/Extension*. Unpublished manuscript.
- Baker, T. L. (1994). *Doing social research*. 2nd edition. New York: Mc Graw Hill Inc. 499 p.
- Bala R. et al., (2005). Firm Size, Ownership and Performance in the Malaysia Palm Oil Industry. *AAMJAF*, Vol. 1, 81-104
- Barao, S. M. (1992). Behavioral aspects of technology adoption. *Journal of Extension*, 30(2), 13-15.
- Barnes, M., H. Sullivan and E. Matke (2004) *The Development of Collaborative Capacity in Health Action Zones: A Final Report from the National Evaluation: Birmingham: University of Birmingham*. URL: http://www.socialresearch.bham.ac.uk/downloads/HAZ_FINAL_REPORT_JAN_11.pdf (downloaded 11 October 2016)
- Barnes, M., E. Matka and H. Sullivan (2003) Evidence, Understanding and Complexity: Evaluation in Non-Linear Systems', *Evaluation* 9(3): 265-84
- Basiron, Y. (2007). Palm oil production through sustainable plantations. *European Journal of Lipid Science and Technology*, 109(4), 289-295.
- Basiron, Y., & Weng, C. K. (2003). Going back to basics: Producing high palm oil yields sustainably. *Oil Palm Bulletin*, May (46), 1-14.

- Bergevoet, R. H., Ondersteijn, C. J. M., Saatkamp, H. W., Van Woerkum, C. M. J., & Huirne, R. B. M. (2004). Entrepreneurial behaviour of Dutch dairy farmers under a milk quota system: goals, objectives and attitudes. *Agricultural Systems*, 80(1), 1-21.
- Blackburn, D. J. (Ed.). (1984). *Extension handbook*. Canada: University of Guelph.
- Breure, K (2003). The Search for Yield in Oil Palm: Basic Principles. *The Oil Palm. Management for Large and Sustainable Yield*. (Eds. T. Fairhurst and R. Hardter). Potash & Phosphate Institute/ Potash Institute of Canada and International Potash Institute. : 59-98
- Chen, H. T. (1990). *Theory-driven evaluations*. Sage.
- Chuan, C. L. (2006). Sample size estimation using Krejcie and Morgan and Cohen statistical power analysis: A comparison. *Jurnal Penyelidikan IPBL*, 7, 78-86.
- Conley, T., & Udry, C. (2001). Social learning through networks: The adoption of new agricultural technologies in Ghana. *American Journal of Agricultural Economics*, 83(3), 668-673.
- Corley, R. H. V., & Tinker, P. B. H. (2008). *The oil palm*. John Wiley & Sons.
- Corley, R.H.V (1983). Potential Productivity of Tropical Perennial Crop. *Experimental Agriculture*, 19: 217-237
- Corley, R.H.V (1998). What the Upper Limit to Oil Extraction Ratio?. *Proceeding of International Conference on Oil and Kernel Production in Oil Palm – A Global Perspective*. (Eds. N. Rajanaidu, I.E Henson and B.S Jalani). : 256-269. Palm Oil Research Institute of Malaysia. Kuala Lumpur
- Cramb, R. A. (2013). Palmed off: Incentive problems with joint-venture schemes for oil palm development on customary land. *World Development*, 43(0), 84-99. doi:<http://dx.doi.org/10.1016/j.worlddev.2012.10.015>
- Dave Pride. (2012). Environmentally Friendly Weed Control in Oil Palm Plantation. Palm Oil Truth Foundation <http://www.palmoiltruthfoundation.com> 26 April 2017
- Davis, F., (1989) Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology. *MIS Quarterly*, 13, 319-340
- Denis, J.M. (2014). The Future of Oil Palm As A Major Global Crop: Opportunities and Challenges. *Journal of Oil Palm Research* Vol. 26 (1) March 2014 p.1-24
- Donaldson, S., (2005) 'Using Program Theory-Driven Evaluation Science to Crack the Da Vinci Code', M.C., Alkin and C.A Christie (eds) *Theorist's Model in Action*, New Direction in Evaluation, 106, pp. 65-84
- Douthwaite B., T.Kuby, E.Van de Fliert and S.Schulz, (2003b) 'Impact Pathway Evaluation: An Approach for Achieving and Attributing Impact in Complex Systems' *Agricultural Systems* 78:243-65

- Eagly, A. H., & Chaiken, S. (1993). In Eve Howard (Ed.), *The psychology of attitudes*. United States of America: Ted Buchholz.
- Economic Transformation Programme (2016) Annual Report in 2016. https://www.pemandu.gov.my/assets/publications/annual-reports/ETP_2016_EN.pdf. Downloaded 3 April 2017
- EPU (2008), *Economic Planning Unit*, surat kepada MPOB bertarikh 29 Januari 2008, ruj: UPE (S) 12-9/3/17. *Unpublished*
- Fitzherbert, E. B., Struebig, M. J., Morel, A., Danielsen, F., Brühl, C. A., Donald, P. F., & Phalan, B. (2008). How will oil palm expansion affect biodiversity? *Trends in ecology & evolution*, 23(10), 538-545.
- Funnell, S. (1997) Program Logic: An Adaptable Tool for Designing and Evaluating Programs. *Evaluation News and Comment* 6(1): 5-7
- Goh, K.J., et al., (2009). Fertilizer Management and Oil Palm Productivity in Malaysia. FELDA Agriculture Services Sdn. Bhd.
- Guilford, J.P. (1956). *Fundamental Statistics in Psychology and Education*. New York: McGraw Hill
- Hamdan Abu Bakar (2013). *EPP2: Comparison on ISH Average FFB Yield 2012 and 2013, Appendix 4, NKEA Meeting: MPOB-PEMANDU 2/2003, 8 May 2013, Bangi. Unpublished.*
- Hasnah, Fleming, E., & Coelli, T. (2004). Assessing the performance of a nucleus estate and smallholder scheme for oil palm production in west sumatra: A stochastic frontier analysis. *Agricultural Systems*, 79(1), 17-30. doi:[http://dx.doi.org/10.1016/S0308-521X\(03\)00043-X](http://dx.doi.org/10.1016/S0308-521X(03)00043-X)
- Hassan, A., Noordin, T. A., & Sulaiman, S. (2010). The status on the level of environmental awareness in the concept of sustainable development amongst secondary school students. *Procedia - Social and Behavioral Sciences*, 2(2), 1276-1280. doi:<http://dx.doi.org/10.1016/j.sbspro.2010.03.187>
- Hawthorne, M., & Alabaster, T. (1999). Citizen 2000: Development of a model of environmental citizenship. *Global Environmental Change*, 9(1), 25-43. doi:[http://dx.doi.org/10.1016/S0959-3780\(98\)00022-3](http://dx.doi.org/10.1016/S0959-3780(98)00022-3)
- Holme, I., & Solvang, B. (1997). *Forskningsmetodik-Om kvalitative och kvantitative metoder*. Lund: Studentlitterature.
- Idris Omar (2005a). A survey on Bank Pertanian Malaysia Oil Palm Replanting Credit Scheme: Adoption of Oil Palm Replanting Technology, MPOB Report OP (124) 2005 GENERAL. pp 9-10
- Idris Omar (2012). *Impak Program IRED terhadap pekebun kecil. MPOB.Unpublished.*

- Idris Omar, Amran Ariffin, Nek Daud Ahmad and Hairi Jati (2006). Impak Pemindahan Teknologi Pusat TUNAS Sabah ke atas Prestasi Ladang Pekebun Kecil Sawit, Prosiding Persidangan Kebangsaan Pekebun Kecil Sawit 2006, 20-21 November 2006, Hotel Promenade, Kota Kinabalu, Sabah. pp 215-216
- Ismail, A., & Mamat, M. N. (2002). The optimal age of oil palm replanting. *Oil palm industry economic journal*, 2(1), 11-18.
- Ismail, B. (Ed.). (2005). *Land and agricultural policy: A mismatch*. Malaysia: Malaysian Palm Oil Board.
- Jalani, B. S., Basiron, Y., Darus, A., Chan, K. W., & Rajanaidu, N. (2002). Prospects of elevating national oil palm productivity: a Malaysian perspective. *Oil Palm Industry Economic Journal*, 2(2), 1-9.
- Jusoh, L., Mohd Noor M., Mohd Tayeb, D., Ahmad Kushairi, D. (2003). Economics of Higher Planting Density in Oil Palm Plantation. *Oil Palm Industry Economic Journal*. Vol. 3(2)/2003.
- Kelsey, D.L., & Hearne, C.C. (Ed.). (1955). *Cooperative extension work*. Ithaca, N. Y.: Comstock Pub. Associates.
- Khairuman Hashim, Idris Omar, Amran Ariffin & Mohamad Arfan Johari (2008). Prestasi Awal Skim Bantuan Anak Benih Sawit Berkualiti di Sabah dan Sarawak. Prosiding Persidangan Kebangsaan Pekebun Kecil Sawit 2008, MPOB, Bandar Baru Bangi Selangor. ms. 181-196.
- Krueger, A. O., Schiff, M., & Valdés, A. (1988). Agricultural incentives in developing countries: Measuring the effect of sectoral and economy wide policies. *The World Bank Economic Review*, 2(3), 255-271.
- Lamble, W. (1984). Diffusion and adoption of innovations. *Extension Handbook*, DJ Blackburn (ed.), University of Guelph.
- Lateh, H., & Muniandy, P. (2010). Environmental education (EE): Current situational and the challenges among trainee teachers at teachers training institute in Malaysia. *Procedia - Social and Behavioral Sciences*, 2(2), 1896-1900. doi:<http://dx.doi.org/10.1016/j.sbspro.2010.03.1005>
- Lowery, S., & DeFleur, M. (1995). Milestone in Mass Communication Research. White Plains, NY: Longman Publishers
- Lynn R. Kahle, Pierre Valette-Florence (2012). Marketplace Lifestyles in an Age of Social Media. New York: M.E. Sharpe, Inc. ISBN 978-0-7656-2561-8.
- Mark, G., & Poltrock, S. (2001), Diffusion of a Collaborative Technology across Distance. Proceeding of the 2001 *International Association for Computing Machinery SIGGROUP Conference on Supporting Group Work*, 232-241. Boulder, Colorado
- Mathews, J., & Foong, L. C. (2008). Good agricultural practices to increase oil palm oil yield in malaysia. *Proceedings of the Roundtable Discussion on Oil*

Palm:Narrowing the Yield Gap Towards Vision 35:25, Sabah. , 634.614 (063)
MPOB(26-27 November) 40-54.

- Meerah, T. S. M., Halim, L., & Nadeson, T. (2010). Environmental citizenship: What level of knowledge, attitude, skill and participation the students own? *Procedia - Social and Behavioral Sciences*, 2(2), 5715-5719.
doi:<http://dx.doi.org/10.1016/j.sbspro.2010.03.933>
- Mohamad, R.B, Wibawa, W., Mohayidin, M.G., Puteh, A.B., Juraimi, A.S., Awang, Y., Lassim, M.B.M (2010). Management of Mixed Weeds in Young Oil-Palm Plantation with Selected Broad-Spectrum Herbicides. *Pertanika J. Trop. Agric. Sci.* 33(2): 193-203
- Mohd Noor Mamat (2008). Oil Palm Replanting Policy for Malaysian Palm Oil Industry. Proceedings of the Roundtable Discussion on Oil Palm: Narrowing the Yield Gap towards Vision 35:25. 26-27 November 2007
- Moll, H. A. J. (1987). Oil palm in Malaysia. *Oil palm in Malaysia.*, 135-166.
- MPOB (2017), *Factsheet Pekebun Kecil Sawit Jun 2017*, Integration Research & Extension Division (IRED).
- MPOB (2016), *Factsheet Pekebun Kecil Sawit Disember 2017*, Integration Research & Extension Division (IRED).
- MPOB Operational Plan 2014. (2014). (Operational Plan No. Volume 2: Non Research Division). Malaysia: Malaysian Palm Oil Board.
- Muhamad Rizal, A.R., Tsan, F.Y (undated). Rainfall Impact on Oil Palm Production and OER at FELDA Triang 2.
- Murphy, D.J (2003). Working to Improve the Oil Palm Crop. *Inform* 14 (11) : 670-671
- Mustazah, M., (2009). Kejayaan FELDA Yangambi memperolehi anugerah “The Brandlaureate SME’s Chapter Awards 2008”. FASSB Kemajuan Penyelidikan Bil. 52, Jun 2009
- Nagarajan, N., Vanheukelen, M., & Europäische Kommission. (1997). *Evaluating EU expenditure programmes: a guide; ex post and intermediate evaluation*. Office for Official Publ. of the European Communities.
- Neda, T., Azimi, H., Bahaman, A.S., Jegak, U., (2013). Attitude of Malaysian Extension Workers Towards Sustainable Agricultural Practices. *American Journal of Environmental Science*, 9(1):33-37
- Noormahayu, M.N., Khalid, A.R., Elsadig, M.A (2009) Financial Assessment of Oil Palm Cultivation on Peatland in Selangor, Malaysia. *Mires and Peat*, Volume 5 (2009), Articles 02,1-18
- Nurhanani, M., Nazirah, C.J., Ainul, S.S., Mohamad, A. J., Amran, A., Nursuhana, D., Parthiban, K., Tan, S.P., Hasmiza, D., Khairul, A., Shakir, A., Mohd, K. A. I.,

- Hamdan, A.B. (2016). Penerimaan Guna Amalan Pertanian Baik (GAP) di Kalangan Pekebun Kecil Sawit Persendirian di Malaysia. Prosiding Persidangan Kebangsaan Pekebun Kecil Sawit 2016. p. 169-183.
- Othman, N., (1990). Factor Affecting Cocoa Productivity Among the Smallholders in West Malaysia. *Department of Management Science University of Stirling*
- Patricia Roger (2018), Develop Programme Theory. http://www.betterevaluation.org/en/plan/define/develop_logic_model [Accessed 11 January 2018]
- Paul Boghossian (2007), Fear of Knowledge: Against relativism and constructivism, Oxford, UK: Clarendon Press, Chapter 7, pp. 95–101
- Ramli (2013), Technical Efficiency of Independent Oil Palm Smallholders (ISH) in Peninsular Malaysia with Respect to Fertiliser and Land Size. *Oil Palm Industry Economic Journal*, Vol 13 No.2 (2013) p27-37.
- Reddy, A.A. (1987) Adoption and Diffusion of Farm Information. Extension Education. pp. 277-292. Batpatla, India: Sree Lakshmi Press
- Riesenberg, L.E and Gor, C.O., (1989) Farmers Preferences for Method of Receiving Information on New or Innovative Farming Practices. *Journal of Agricultural Education*. 30 (3), 7-13
- Roger E.M (1983). Diffusion of Innovation, Third Edition, The Free Press New York. pp 5.
- Roger, E (2003) Diffusion of Innovation, 5th Edition, New York: The Free Press
- Rogers, E.M., (1962) Diffusion of Innovation, New York: The Free Press
- Rogers, E.M; Shoemaker, F.F (1971) Communication of Innovation: A Cross-Cultural Approach. New York: The Free Press
- Rogers, P., A. Petrosino, T.Hacsi and T.Huebner (2000) Program Theory Evaluation: Practice, Promise and Problems, in P. Roger, A. Petrosino, T. Hacsi and T.Huebner (eds) *Program Theory Evaluation: Challenges and Opportunities*, pp. 5-13, New Directions in Evaluation Series. San Fransisco, CA: Jossey-Bass.
- Roslan, A., Mohd Arif, S., Ramli, A., & Adzmi, H. (2010). A study on the perceptions of the supervised fertilizer cluster (KBT) Members in the KBT programme. *Oil Palm Industry Economic Journal*, 10(1), 14-25.
- Ryu, Cheong-san (2017). "Educational Significance of Soft Skills and Hard Skills". *The Journal of Korean Practical Arts Education*. 23(1): 1–17
- Sharma, M. Y. P., Sharma, M., Chan, K. W., PP Yong, Y. Y., Chin, C. W., & Jalani, B. (1999). *Oil palm breeding programme and the performance of DXP planting materials at United Plantations Berhad* (No. A-). PORIM-ASGARD.

- Sheilyza Mohd Ishak (2016). Kajian Awal Penilaian Outcome EPP1: Tanam Semula dan Tanam Baru Sawit Pekebun Kecil. 11-12 October 2016. Persidangan Kebangsaan Pekebun Kecil Sawit 2016, Kinta Riverfront Hotel, Ipoh, Perak.
- Smith, C. B., & Wilson, M. C. (1930). Agricultural extension system of the United States.
- Soyebo, K. O., Farinde, A. J. and Dionco-Adetayo, E. D. (2005): Constraints of Oil Palm Production in Ife Central Local Government Area of Osun State. *Nigeria. J. Soc. Sci.* 10(1): 55-59
- Suandi, T., & Subali, S. (2008, June). AN EVALUATION OF COCOA SMALLHOLDER DEVELOPMENT PROGRAMME (CSDP) IN TENOM SABAH REGION1. In *Paper presented at the International Conference on Agricultural Extension (AGREX) on* (Vol. 15, p. 19).
- Tam, T.K. (1973) Culling and selection in oil palm nurseries. In *Advances in oil palm cultivation (Wastie, RL & Earp, D A, eds). Incorporated Society of Planters, Kuala Lumpur.* ms. 104 -105.
- Tarmizi AM, Hamdan A.B, Zin Z.Z and Ariffin D. (2003). Formulation of Balanced Fertilizer for Oil Palm.
- Tarmizi, A.M, Hamdan, A.B., Mohd Tayeb, D. and Chan, K.W. (1999). Development and Validation of PORIM Fertilizer Recommendation System in Malaysia Oil Palm, *Proceeding PORIM Inter. Oil Palm Congress 1999*, Palm Oil Research Institute of Malaysia, Kuala Lumpur. p.203-215
- Tétard, F., & Collan, M. (2009, January). Lazy user theory: A dynamic model to understand user selection of products and services. In *System Sciences, 2009. HICSS'09. 42nd Hawaii International Conference on* (pp. 1-9). IEEE.
- Tey, Y. S., Li, E., Bruwer, J., Abdullah, A. M., Brindal, M., Radam, A., . . . Darham, S. (2014). The relative importance of factors influencing the adoption of sustainable agricultural practices: A factor approach for malaysian vegetable farmers. *Sustainability Science*, 9(1), 17-29.
- Triandis, H. C. (1971). *Attitude and attitude change*. United States of America: John Wiley & Sons, Inc.
- USDA (2012). Malaysia: Stagnating Palm Oil Yield Impede Growth. *Commodity Intelligence Report* (December 2012). <http://www.pecad.fas.usda.gov/highlight/2012/12/Malaysia/>
- Ursiny, T., Demoss, G., & Marc A. Ybaben (Eds.). (2011). *The top performer's guide to attitude*. Malaysia: Advantages Quest Sdn Bhd.
- Venkatesh, V., & Bala, H. (2008). Technology acceptance model 3 and a research agenda on interventions. *Decision sciences*, 39(2), 273-315.
- Vermeulen, S., & Goad, N. (2006). *Towards better practice in smallholder palm oil production*. Iied.

W.K. Kellogg Foundation, (2004) Logic Model Development Guide. Battle Creek, MI: W.K. Kellogg Foundation.

Wahid, M. B., Abdullah, S. N. A., & Henson, I. E. (2005). Oil palm. *Plant Production Science*, 8(3), 288-297.

Wahid, M. B., Abdullah, S., & Henson, I. (2005). Oil palm-achievements and potential. *Plant Production Science-Tokyo-*, 8(3), 288.

Weiss, C. (1998). Evaluation: Method for Studying Programs and Policies. Eaglewood Cliffs, N.J: Prentice Hall

Weiss, C.H., (1995). Nothing as Practical as a Good Theory: Exploring Theory-Based Evaluation for Comprehensive Community Initiatives for Children and Families, J.P. Connell, A.C. Kubisch, L.B. Schorr and C.H Weiss (eds) *New Approach to Evaluating Community Initiatives*, pp. 65-9. Washington, DC: Aspen Institute.

Zulkifli Abd Manaf, Ayat K Ab Rahman, Nurul Aimi Abd Halim, Suboh Ismail And Ramli Abdullah (2013). *Assessment of the Oil Palm Seedlings Assistance Scheme on Fresh Fruit Bunch Yield and Income of Smallholders*. *Oil Palm Economic Journal*. ms. 35-44.