

**PREVALENCE OF KNOWLEDGE, ATTITUDE AND PRACTICE ON
PESTICIDES SAFETY AMONG OIL PALM PESTICIDE HANDLERS IN
JOHOR**

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For my beloved mother and father



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ABSTRACT

Awareness on possible risk factor in pesticides, by the change of attitude such as applying correct technique during spraying and change of behaviour can increase the safety and performance of workers. However in Malaysia, there are limited studies that cover or highlighted deeply the knowledge, attitude and practice of the workers. Moderate or low level of knowledge could put farm workers at risk when contact is made with pesticide residue on plants, soil, and dust particles after spraying. The objective of this study is to assess the level of knowledge, attitudes and practices of pesticide usage among oil palm plantation workers in Johor and to identify the relationship between knowledge, attitude and pesticides practice of the workers. This study is quantitative in nature and involved 132 respondents which represents 90% of the population of oil palm workers in Johor. Bivariate correlation indicates that there were significant relationships between knowledge and practice. It is found that only Knowledge-Practice (P-K) is found to be highly significant ($r < 0.05$). This shows that higher knowledge will result to safer practice. There is no relationship between knowledge and attitude and between attitude and practice. Majority of respondents shows moderate level of knowledge (72%) and attitude (79%) but safer level of practice (85%). This study shows that the knowledge of these workers need to be strengthen in agricultural community of Johor in order to reduce number of accidents, current statistics and for any future incidents.

ABSTRAK

Kesedaran tentang faktor risiko dalam racun perosak, dengan menukar sikap sepertimelaksanakan teknik yang betul semasa penyemburan dan mengubah tingkah laku boleh meningkatkan keselamatan dan prestasi pekerja. Walau bagaimanapun di Malaysia, terdapat kajian yang terhad berkaitan pengetahuan, sikap dan amalan pekerja di mana isu-isunya tidak diketengahkan secara mendalam dan teliti. Tahap pengetahuan yang sederhana atau rendah dapat meletakkan pekerja ladang berada dalam keadaan berisiko apabila berhadapan dengan sisa racun makhluk perosak pada tumbuhan, tanah dan zarah debu selepas menyembur racun. Oleh itu, objektif kajian ini adalah untuk menilai tahap pengetahuan, sikap dan amalan penggunaan racun perosak di kalangan pekerja ladang kelapa sawit di Johor serta untuk mengenal pasti hubungan antara pengetahuan, sikap dan amalan racun perosak di kalangan pekerja ladang. Kajian ini bersifat kuantitatif dan menggunakan 132 responden iaitu 90% daripada pekerja ladang sawit di Johor. Keputusan korelasi bivariat menunjukkan terdapat hubungan yang signifikan antara pengetahuan dan amalan. Didapati bahawa hanya pengetahuan dan amalan menunjukkan hubungan yang signifikan ($r < 0.05$). Ia menunjukkan corak yang sama untuk ilmu pengetahuan yang tinggi menyebabkan amalan yang lebih selamat. Tidak terdapat hubungan antara pengetahuan dan sikap dan antara sikap dan amalan. Majoriti responden menunjukkan tahap sederhana di dalam pengetahuan (72%) dan sikap (79%) tetapi tahap lebih selamat untuk amalan (85%). Kajian ini menunjukkan bahawa ilmu pengetahuan perlu dikukuhkan kepada pekerja ladang sawit di Johor dalam usaha untuk mengurangkan kemalangan, statistik semasa serta mengelakkan daripada sebarang kemalangan pada masa akan datang.

CONTENTS

	TITLE	i
	DECLARATION	ii
	DEDICATION	iii
	ACKNOWLEDGEMENT	iv
	ABSTRACT	v
	ABSTRAK	vi
	TABLE OF CONTENTS	vii
	LIST OF TABLES	x
	LIST OF FIGURES	xii
	LIST OF APPENDICES	xiii
	LIST OF FORMULAS	xiii
	LIST OF ABBREVIATIONS	xiv
CHAPTER 1	INTRODUCTION	1
	1.1 Research Background	1
	1.2 Problems Statement	5
	1.3 Gap Analysis	7
	1.4 Objectives of Study	8
	1.5 Scopes of Study	9
	1.6 Limitation of Study	9
	1.7 Significant of Study	10
CHAPTER 2	LITERATURE REVIEW	11
	2.1 Type of Pesticides	15
	2.2 Pesticide Safety, Handling and Storage	16
	2.3 Pesticide Health Effect	20
	2.4 Pesticide Route of Exposure	23
	2.5 Knowledge, Attitude and Practices	25
	2.6 Pesticides Legislation	29

2.7	Pesticides Usage in Oil Palm	30
2.8	Conceptual Definition	31
CHAPTER 3	METHODOLOGY	29
3.1	Research Introduction and Design	33
3.2	Area of Study	34
3.2.1	Questionnaire	35
3.3	Study Instrument	36
3.4	Sample Size	37
3.5	Method of Analysis	38
CHAPTER 4	RESULTS AND DISCUSSION	40
4.1	Demography Analysis	40
4.1.1	Gender	40
4.1.2	Marital Status	41
4.1.3	Age	42
4.1.4	Race	43
4.1.5	Nationality	43
4.1.6	Educational Background	44
4.1.7	Work Background	45
4.1.8	Working Experience	45
4.1.9	Medical History	46
4.1.10	Weight Distribution	47
4.1.11	Pesticides	48
4.1.12	Frequency of Spraying Pesticide	50
4.1.13	The Person who spray Pesticide	51
4.1.14	Reason to Change Personal Protective Equipment(PPE)	51
4.1.15	Occupational Safety and Health (OSH) Training Participation	52
4.1.16	Pesticide Application Training Participation	53
4.1.17	Pesticide Application Training Agency	53
4.2	Knowledge, Attitude, Practice Overall Respondents	54
4.2.1	Normality Distribution Analysis	55

4.2.2	Average Mark FOR KAP	55
4.2.3	Level Of Knowledge Of Pesticide Usage	57
4.2.4	Level Of Attitude Of Pesticide Usage	59
4.2.5	Level Of Practice Of Pesticide Usage	60
4.2.6	Overall Components Answer Summary	62
4.2.7	Overall Total Score By Respondents	66
4.2.8	Mean Score and mean percentage score of respondent citizen toward KAP	66
4.3	Knowledge-Attitude-Practice Correlation	67
4.3.1	Overall Correlation Summary	68
4.3.2	Knowledge-Attitude Correlations	70
4.3.3	Knowledge-Practice Correlations	73
4.3.4	Attitude-Practice Correlations	77
CHAPTER 5	CONCLUSION AND RECOMMENDATION	82
5.1	Conclusion	82
5.2	Recommendation	83
REFERENCES		84
APPENDICES		91



LIST OF TABLE

Table Index	Content	Page
Table 1.1	Ten most Supporting Journals and Articles in Supporting This Research	7
Table 1.2	Gap Analysis Table *Note that KAP study is still new to our country	8
Table 2.1	Classes of Pesticides, Hazard Type and Exposure Target	13
Table 3.1	Questionnaire Parts and Content Details	32
Table 3.2	Questionnaire Parts and Questions Structure	33
Table 3.3	Cronbach's Alpha Value for Pilot Test	34
Table 3.4	Individual Score on KAP	34
Table 3.5	Mean Score on KAP Grading and Analysis	35
Table 4.1	Gender of respondents	36
Table 4.2	Marital Status of respondents	37
Table 4.3	Age Distribution of respondents	38
Table 4.4	Racial Distribution of respondents	39
Table 4.5	Nationality of Respondents	40
Table 4.6	Educational Background of Respondents	41
Table 4.7	Occupation of Respondents	42
Table 4.8	Working Experience of Respondents	43
Table 4.9	Medical History of Respondents	44
Table 4.10	Weight Distribution of Respondents	45
Table 4.11	Pesticide Usage Distribution of Respondents	47
Table 4.12	Fungicide Usage Distribution of Respondents	47

Table 4.13	Rodenticide Usage Distribution of Respondents	47
Table 4.14	Insecticide Usage Distribution of Respondents	47
Table 4.15	Pesticide Spraying Frequency of Respondents	50
Table 4.16	Pesticide Sprayer Among Respondents	51
Table 4.17	Respondents' Reason to Change PPE	52
Table 4.18	OSH Training Participation	53
Table 4.19	Pesticide Spray Training	53
Table 4.20	Pesticide Spray Training Agency	54
Table 4.21	Average Mark for Each KAP and Total Mark of Respondents	56
Table 4.22	Average Mark for Each KAP and Average Mark of Respondents	56
Table 4.23	The Summary of Total Respondents who scored Correct and Wrong with Comment in Knowledge Part	63
Table 4.24	The Summary of Total Respondents who scored Correct and Wrong with Comment in Attitude Part	65
Table 4.25	The Summary of Total Respondents who scored Correct and Wrong with Comment in Practice Part	66
Table 4.26	Descriptive analysis on respondent citizen towards KAP	67
Table 4.27	Overall Correlation Summary	69
Table 4.28	Summary of Knowledge-Attitude Correlation Pairs	72
Table 4.29	Summary of Knowledge-Practice Correlation Pairs	76
Table 4.30	Summary of Attitude-Practice Correlation Pairs	80



LIST OF FIGURES

Figure Index	Contents	Page
Figure 1.1	Conceptual Framework	6
Figure 2.1	Types of Pesticide Exposure	14
Figure 2.2	Types Of Intentional Exposure	14
Figure 2.3	Types of Unintentional Exposure	15
Figure 2.4	Types and Level of Pesticide Exposure	16
Figure 2.5	Types of Exposure, Disease and Death Reported	16
Figure 2.6	The number of permanent disability accident occurring in 2013	18
Figure 2.7	Workers mixed pesticides without wearing proper PPE	21
Figure 3.1	Flowchart of The Study	30
Figure 3.2	Overall Flow Chart of Questionnaire Development	31
Figure 4.1	Gender of respondents	37
Figure 4.2	Normality Distribution on KAP	53
Figure 4.3	The Percentage of Knowledge	55
Figure 4.4	The Percentage of Attitude	57
Figure 4.5	The Percentage of Practice	58
Figure 4.6	The Percentage of Overall KAP	64

LIST OF APPENDIX

Appendix Index	Appendix List	Page
A1	Questionnaire	92
A2	Correlation Analysis	110

LIST OF FORMULAS

Formula Index	Formula NameList	Page
3.1	Kirkwood Formula (n) : $\frac{z(P-(1-P))}{d}$	37



LIST OF ABBREVIATIONS

OSH	Occupational Safety and Health
CPO	Crude Oil palm
EPA	Environment Protection Agency
WHO	World Health Organization
MoA	Ministry of Agriculture
OPCs	Organophosphate Compounds
FAO	The Food and Agriculture Organization of the United Nations
GPS	Global Positioning System
PPE	Personal Protective Equipment
NaWQA	National Water Quality Assessment
DDT	Dichloro-Diphenyl-Trichloroethane
KAP	Knowledge, Attitude, Practice
DOA	Department of Agriculture
MoAC	Ministry of Agriculture and Cooperatives
BGBD	Below Ground Bio-Diversity
IPM	Integrated Pest Management
FFS	Farmers Field School
SALM	Skim Amalan Ladang Baik Malaysia
GCMS	Gas Chromatography–Mass Spectrometry
RTG	Royal Thai Government

CHAPTER I

INTRODUCTION

1.1 Research Background

Pesticides are chemically manufactured compounds used to control weeds, insects, and other pests on farms and in urban areas. It can be harmful to humans and the environment if they contaminated water resources (National Water Quality Assessment (Nawqa, 2010)). The Food and Agriculture Organization of the United Nations (FAO) defines pesticide as any substance or mixture of substances intended for preventing, destroying or controlling any pest, including vectors of human or animal disease, unwanted species of plants or animals that causing harm during or otherwise interfering with the production, processing, storage or marketing of food, agricultural commodities, wood and wood products or animal food stuffs. It can also be administered to animals for the control of insects, arachnids or other pests in or on their bodies (FAO, 1986).

Pesticides are generally known to be toxic and can be hazardous to users if not properly handled. This means that the high probability of pesticides use and pesticides induced side effect growing in developing countries would be a reality if the farmers' rate of awareness, knowledge, attitudes and practices on pesticides use are not properly considered with necessary actions taken in accordance to the recommendations (Tijani, 2012).

The world population is expected to grow 50 percent which is equivalent to nine billion people over the next 50 years. The food demand is expected to double by 2050 due to the diet demands of the growing population (WHO, 2004).

Millenniums ago, the agriculture sector has developed and undergone series of developments since the earliest cultivation time at Babylonian Egypt, Indus Valley of India, Africa's Sahel, Eastern North America, Mesoamerica, Andes, Amazonia, New Guinea, Near East (Fertile Crescent), S. India, China, Sahel, West Africa and Ethiopia (Gorlinski, 2012). So, many productivity enhancement, such as irrigation, crop rotation, fertilizers and pesticides have been formulated from ammonium nitrate, selective breeding, mechanization and farm subsidies (Gorlinski, 2012). Agriculture has developed from the earliest time to the modern agriculture.

The birth of agriculture industrialisation first occurred in 1900 by means of livestock, poultry, fish and crops that were produced using techno scientific, economic and political methods. Specifically genetic technology, agricultural machinery, economies production scale, new market consumption creation, genetic patent protection and global trade (Gorlinski, 2012).

In early 90's, the United States has applied three improvements in their agricultural practice namely 1) the use of power machinery such as tractors, drainage, pumps and electric poultry equipment, 2) the use of chemical application and 3) biological science for animal and crop production such as artificial insemination and hybrid corn. After fifty years of full electrification, a wider use of chemicals to control weeds and pests that is based on computer science and information technology, as well as sensor systems and GPS technologies with satellite tracking and onboard computer monitoring to assist in more precise chemical application in order to improve marketing efficiencies and management system (Paarlberg, 2009).

Despite all modern technology discoveries and inventions, the application of this technology has still not reached developing countries like Malaysia, Indonesia, India as well as other developing countries, although they are among the highest agricultural production nation where agriculture is their main source of income.

More than 60% of Africans struggle to make their living in farming or grazing animals with most of them are women (80% of agricultural labor in Africa is provided by women and girls). On average they earn only one dollar per day, and one third are malnourished. Situations in Africa is much worse than ever as these African farmers

are poor and hungry because the productivity of their land and their labor has not yet been enhanced by any of modern science applications.

Environmental risks of agro chemical became an important issues in the 1960s, following the 1962 publication of Rachel Carson's *Silent Spring*. The book helped moved the modern environmental movement to implement stronger regulations on pesticide use throughout the developed world and promoted less toxic and less persistent alternatives since the first generation of pesticides were highly poisonous chemicals.

Apart of saving money, farmers must learn to reduce the use of chemical for greener environment also. This can be done by integrating other pest management practices into their operations by purchasing new crop seeds with greater resistance to insects and disease and by moving toward for more precise fertilizer application methods including satellite-based GPS systems that permit what is called "precision farming" (Paarlberg, 2009).

China has started the oil palm industry and production even though it does not have the capability to export and is continuously importing oil palm from suppliers like Malaysia. Some historians reported that China and Japan start agricultural activities almost at the same time. China exports very little oil palm and it's oil production could not afford the demands in China. Therefore China becomes the end consumer of the oil palm for the import sector. Imports will increase dramatically as the living standards increase. Demand is expected to grow 10% per year, which is about 8.6 million tonnes in 2015 and 12 million tonnes in 2020. More than 5,000 companies in China are known to be end users of oil palm. Most of the large companies are vertically integrated and involved in many parts of the oil palm supply chains from importing, processing and manufacturing (WWF, 2011).

In Thailand, more than 120,000 farmers are involved in oil palm cultivation mostly from small to medium sized farms. Small farmers owning less than fifty hectares manage approximately 70% of the total area planted with oil palm. They have a similar share in total FFB production. Smallholder schemes such as the Nucleus Estate Schemes (NES) in Indonesia or FELDA in Malaysia does not exist in Thailand. In most cases, farmers act completely independently from the oil palm crushing mills and are not linked to mills by contracts or any other formal arrangements. In a few

cases, farmer cooperatives have been managed to establish their own cooperative mill with government support (Expansion, Asia, Palm, Communities, & Peoples, 2011).

The Great Garden of Bogor in Malaysia, on May 1817 had a small-holder of agriculture group. By 1831, new plants were introduced and oil palm are one of them followed by coffee, sugar and tobacco. The evolutions of Indonesian agriculture, can be further explained during the colonialization age of the Dutch era, Japan era, and early independence period. Order pattern and early method of oil-drop for Commando in 1815-1950, mass guidance pattern in 1960-1970 were some of improvements and findings during the eras. The education pattern later evolved as Development Machine (1970-1999), Local Autonomy pattern (1999-2006) and Local Autonomy pattern under Law on agricultural extension (2006 – Now) as the current education pattern.

Eco-labelling, green label, organic certificate and ISO 14000 are demands that related directly to environment and this is a n important task for the agricultural extension workers. Agricultural extension is expected to be able to make environment as part of development in Indonesia (Hariadi, 2012).

Despite all the technologies, methods and practices were brought to Malaysia and all other developing countries. The records of reported pesticides poisoning still exist and are more alarming and escalating in numbers with inner injury (SOCSO, 2013). Since the early 1980s, the global land area under oil palm production has more than tripled, reaching almost 15 million ha in 2009, accounting for almost 10% of the world's permanent crop land (Faostats, 2011; Sheil *et al.*, 2009). In Peninsular Malaysia alone, it is estimated that there are 4.3 million of citizen involved in 1.5 million hectares of rubber plantation and 0.6 mil hectares in oil palm plantations . This number does not put into account of those who are involved in other agricultural productions that still use pesticide in their plantation procedures.

An annual report by Social Security Organization (SOCSO) reported that in 2013 there were 2249 accidents in agriculture sector. Although the number of accidents was not as high as manufacturing and industrial sector, attention shall be given and suitable steps need to be taken in order to reduce the number of accidents and injuries as well as chronic diseases that are related to agriculture sector (Laporan Tahunan 2013 PERKESO, 2014).

1.2 Problem Statement

Currently, the top 15 pesticide compounds found in water are among those with the highest usage. These include five of the most heavily used agricultural herbicides and one degradation product. Five herbicides are extensively used in urban areas, and another four are of the most commonly used insecticides. This is a serious problems as there are more than 90% of water and fish samples from all streams were found to contain one or several pesticides. Pesticides found in water were primarily those that are still used, whereas those found in fish and sediment are organochlorine insecticides, such as DDT, that were used heavily decades ago(National Water Quality Assessment (Nawqa, 2010).

This study assessed the general awareness of oil palm farmers in Johor on their use of farm level pesticides. Specifically, the study seeks to assess the socio economics of pesticide users, the level of awareness on the harmful and beneficial effects of pesticides use as well as knowledge, attitudes and practice of pesticide use among farmers in the study area.

Pesticide problems have been identified as a major environmental health problem in agriculture sector (Zainal Abdin *et al.*, 2012). The latest investigation showed a moderate to low awareness among farm workers towards the fate of pesticide residue in soil, air, plants and groundwater. Besides, moderate or low level of knowledge could put farm workers at risk when contact is made with pesticide residue on plants, soil, and dust particles after spraying (Tijani *et al.*, 2012).

Human exposure of pesticides is an important health and social issue as it usually results in serious health problems such as stroke, epilepsy, respiratory disorders cancer and other. Death has been known to occur in some places as a result of exposures of pesticides (Tijani *et al.*, 2012). Current challenges that agricultural workers face are knowledge, attitude and good practice regarding health hazard of pesticides have not been well assessed in Malaysia (Rafee *et al.*, 2012). Exposure of pesticides can cause a variety of disorders and diseases (Goldner *et al.*, 2010;Adigun *et al.*, 2010). The major economic and environmental losses due to the application of pesticides in public health are 1.1 billion dollars per year in USA (Pimentel, 2005). Mental health symptoms are associated with pesticide use, towards the occurrence of

depressions (Weisskopf *et al.*,2013). The use of pesticides may also increase the potential of developing Hodgkin lymphoma disease (Navaranjan *et al.*, 2013).

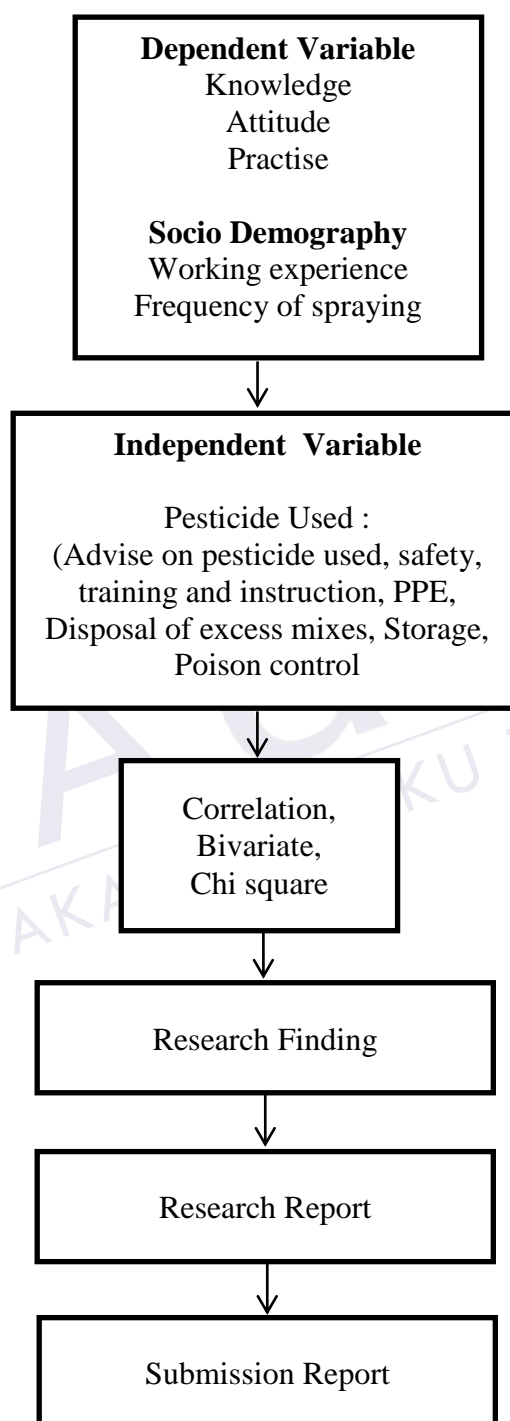


Figure 1.1: Conceptual Framework

1.3 Gap Analysis

The gap of this study is achieved through review of some previous researches related to this study, including knowledge, attitude and practice of pesticide as listed in Table 1.1.

Table 1.1: Ten most Supporting Journals and Articles in Supporting This Research

Article No	Title
1	Agricultural Practices In Oil Palm Plantations And Their Impact On Hydrological Changes, Nutrient Fluxes And Water Quality In Indonesia: A Review (2012)
2	Assessment Of Farm Level Pesticide Use Among Maize Farmers In Oyo State, Nigeria (2012)
3	Knowledge, Attitude And Practices In Insecticide Use, Serum Cholinesterase Levels And Symptom Prevalences Among Shogun Orange Farmers In Khao-Phanom District, Krabi Province Thailand, (2012)
4	Organophosphate Pesticide Exposure And Dialkyl Phosphate Urinary Metabolites Among Chili Farmers In Northeastern Thailand(2014)
5	Risk Assessment Of Pesticide Exposure On Health Of Pakistani Tobacco Farmers (2010)
6	Occupational Safety And Health In Commodity Agriculture: Case Studies From Malaysian Agricultural Perspective (2014)
7	Occupational exposure to pesticides, nicotine and minor psychiatric disorders among tobacco farmers in southern Brazil (2014)
8	Individual and organizational factors associated with the use of personal protective equipment by Chinese migrant workers exposed to organic solvents (2015)
9	Pesticide Handlers' Knowledge, Attitude and Practice (2013)
10	Knowledge, attitude, and practice of Indonesian farmers regarding the use of personal protective equipment against pesticide exposure(2015)

Table 1.2 listed the existed gaps of by listing the differences between this study with previous literatures

Table 1.2: The Gap of Analysis of Knowledge, Attitude and Practice

ARTICLE NO.	YEAR	AUTHOR	COUNTRY	ISSUES								
				KNOWLEDGE	ATTITUDE	PRACTICE	PPE	PESTICIDES MANAGEMENT, & LAW	OIL PALM	ENVIRONMENT	OCCUPATIONAL HEALTH	
1	2012	I.Comte	Indonesia			/		/			/	
2	2012	A.Tijani	Nigeria			/						
3	2012	P.Boonya-Kawee	Thailand	/	/	/		/				/
4	2014	N.Taneepa-Nishkul	Thailand									/
5	2010	D.A.Khan	Pakistan					/	/		/	/
6	2014	S.Bahri	Malaysia				/		/	/		/
7	2014	NMX Faria	Brazil					/				/
8	2015	L. Lu	China				/	/	/			
9	2013	S.A.Haddad	Bahrain	/	/	/		/				
10	2015	MCG Yuantari	Indonesia	/	/	/						

Table 1.2 depicts that there are some empty issues, that have not covered, highlighted deeply and thoroughly by the journals. Therefore it is very important to provide the information regarding the knowledge, attitude, and practice as well as Personal Protective Equipment (PPE) and intense explanation regarding pesticides and their usage by the oil palm workers. It is believed that the researcher could provide good information throughout this study since it will benefit the field of occupational safety and health enforcements, oil palm developers as well as for future researchers.

1.4 Objectives of Study

The main purposes in conducting this study is to assess the pesticide safety and the level of knowledge, attitudes and practices of pesticide usage among oil palm plantation workers in Johor, to provide a good situation presentation and to propose possible solution in order to reduce the short term sickness that agricultural workers are experiencing, as well as the long term exposure affecting the community. The following are three specific objectives to support the main objectives of the study:

- i. To determine the relationship between workers' knowledge towards workers' attitude in the plantation.
- ii. To determine the relationship between workers' knowledge towards their practice during their working hours in the plantation or farm.
- iii. To determine the relationship between the recommended safe practice towards worker's attitude regarding pesticide usage.
- iv. To study the distribution of pesticides usage and application in the oil palm plantation.
- v. To study the management of personal protective equipment.
- vi. To study the participant on safety and health training programme.

1.5 Scopes of Study

The scopes of the study are :

- i. Conducted only in the state of Johor with oil palm sector (plantation) as the focus.
- ii. Seven oil palm plantation around Muar, Segamat, Batu Pahat, Kluang, Pontian, Mersing and Kota Tinggi are visited to distribute the questionnaire.
- iii. Selection of respondents was through simple random technique.
- iv. The target population of this study was 132 respondents.
- v. The instrument used in this study were questionnaire and interview session with oil palm workers as the respondents.
- vi. The questionnaire are distributed to pesticide sprayer at oil palm plantation.

1.6 Limitations of Study

The purpose of this research is to investigate the level of knowledge, attitude and practice of pesticide usage at oil palm plantations in Johor. Therefore, the data collection from this research is specifically from oil palm plantations within the state of Johor only. Thus, the result cannot be generalized over a broad context to all

plantation workers from other agricultural activities whom also used pesticide in their plantation.

The instrument for data collection was questionnaire, thus limiting the point of view in analysing the result. Another unavoidable factor is that the respondents who filled the questionnaires were also subject to cognitive errors that could exert influence to the research result.

In addition, the confounders may due to individual factors such as age, body-mass-index (BMI), smoking behaviour and genetic inheritance illness that may cause misunderstanding and overestimation of the true effect and conclusion made after the study.

The last limitation in this study is the researchers have no administrative power over the management initiatives to improve their workers in term of further improvement, good pesticide management and practice of good pesticides usage . Any improvement may affect the common routine and habitual harm potential, thus, limiting the possibility of injury and illness.

1.7 Significant of Study

This study can identify the improvement of preventive activities towards pesticide poisoning and other poisoning-ill-related injuries by providing information, training and equipment with appropriate personnel protection in the agricultural field specifically at farms and plantations.

Management in farm industry requires improvement of safety at workplace so incident of injuries and disease that cause from the pesticides can be reduced. Therefore, the skilled and experienced workers necessities and health is well preserved.

Through this study, awareness of possible risk factor in pesticide scan be done. Changing the attitude such as employing correct technique during spraying can reduce the risk factors and ensure workers' safety as well as performance.

CHAPTER 2

LITERATURE REVIEW

Pesticides are substances or mixtures of substances intended to repel or combat pests that attack plants and animals. Pesticides are regarded as a basic tool in pest management because they provide a dependable, rapid and effective means of controlling most of the pests when used judiciously. Pesticides by their nature are harmful to man and environment. This is noted by Ibitayo (2007) that pesticides are however, poisonous by design and poisonings result from unsafe use of these chemicals. Consequently, pesticides may be the most prevalent and serious occupational hazards faced by farmers and agricultural workers in Malaysia. Although pesticides can be used to effectively combat pests of crops and livestock for improved yield, improper usage and control may result in unintended consequences.

Agricultural yield is strongly depended on crop protection measures for its economic value and maximum productivity. The top most target of pesticide use is to increase food security and at the same time to remove any invulnerabilities of agricultural products. There are a lot of threats in the agricultural sector initializing from the farms themselves to the traders, suppliers, retailers and to the customers. The agricultural products can be in the type of raw fruits, vegetable crops or in other processed forms from the original products that are extracted from the plantations.

In Southern Asia, the countries has improved agriculture sector as they have developed from traditional rice cultivation into a more complex market oriented crop cultivation to meet the demands. Therefore, the agriculture activities as well as land

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