

**YANGON UNIVERSITY OF ECONOMICS
MASTER OF PUBLIC ADMINISTRATION PROGRAMME**

**FARMERS KNOWLEDGE, ATTITUDE, AND PRACTICE ON
PESTICIDE USAGE IN HMAWBI TOWNSHIP
(CASE STUDY ON VEGETABLE GROWERS)**

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EMPA - 34 (16th BATCH)**

DECEMBER, 2019

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(CASE STUDY ON VEGETABLE GROWERS)**

**A thesis submitted in partial fulfillment of the requirements for the
Master of Public Administration (MPA) Degree**

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ABSTRACT

Pesticide use is quite common in Myanmar agriculture sector and its misuse resulted in both human health problems and environmental pollution. The study aims to analyze the knowledge, attitude and practices on inappropriate use of pesticide and protection equipment. The survey collects primary data by interview with structured questionnaire and descriptive method is used. The results showed that general score of knowledge, attitude and practices are about 42%, 20% and 9% respectively. As knowledge, attitude and practices of the respondents are positively and significantly correlated each other's in pesticide using practices, improving knowledge could affect to change attitude, and practice of Myanmar vegetable growers.

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TABLE OF CONTENTS

	Page
ABSTRACT	i
ACKNOWLEDGEMENTS	ii
TABLE OF CONTENTS	iii
LIST OF TABLES	v
LIST OF FIGURES	vi
LIST OF ABBREVIATIONS	vii
CHAPTER 1 INTRODUCTION	1
1.1 Rational of the Study	1
1.2 Objective of the Study	3
1.3 Method of Study	3
1.4 Scope and Limitations of the Study	3
1.5 Organization of the Study	3
CHAPTER 2 LITERATURE REVIEW	4
2.1 Introduction to Pesticide	4
2.2 Advantages and disadvantages of Pesticide Usages	5
2.3 Pesticides Usage and Related Health Problem	6
2.4 Pesticide poisonings	7
2.5 Review of Previous Studies	11
CHAPTER 3 PESTICIDE USING SITUATION IN MYANMAR	13
3.1 Brief overview of Myanmar Agriculture development Sector	13
3.2 Vegetables Sector development in Myanmar	15
3.3 Role of Non- Government Institution in Agricultures sector	17
3.4 Agriculture development laws' in Myanmar	19
3.5 Food Safety System	21
3.6 Agriculture Plantation and Agro economic Analysis of Pesticide Use	22

CHAPTER 4	SURVEY ANALYSIS	
4.1	Survey Profile	25
4.2	Survey Design	26
4.3	Survey Findings	27
CHAPTER 5	CONCLUSION	45
5.1	Findings	45
5.2	Recommendation	47
REFERENCES		
ANNEX		

LIST OF TABLES

Table No.	Title	Page
2.1	Acute Toxicity of Pesticides	8
3.1	Pesticides Utilization for Plant Protection	24
4.1	Estimated Size of Population	26
4.2	Baseline Characteristics of Respondents, Yangon Region, Myanmar	27
4.3	Farming situation and pesticide use of Respondents	28
4.4	Spending time for spraying pesticides	29
4.5	Respondent's knowledge on health impact of pesticide	30
4.6	Respondents Knowledge on pesticide Usage	32
4.7	Respondents Attitude on pesticide usage	33
4.8	Respondents' prevention practices on pesticide usage	36
4.9	Acute health impact experience on chemical pesticide usage	40
4.10	Level of Vegetable Grower's Knowledge on Pesticide usage among Respondents Gender, Age, and Education	41
4.11	Level of Vegetable Growers' Attitude on Pesticide usage among Respondents' Gender, Age, and Education	42
4.12	Level of Vegetable Growers' Practices on Pesticide usage among Respondents Gender, Age, and Education	43
4.13	Correlation between Knowledge, attitude and practices on pesticides using behavior among Respondents	44

LIST OF FIGURES

Figure No.	Title	Page
1	Ways Pesticides Enter the Body	6

LIST OF ABBREVIATIONS

ASEAN	:	Association of South East Asian Nation
ADB	:	Asia Development Bank
ADS	:	Agriculture Development Strategy
CSO	:	Central Statistical Organization
DICA	:	Directorate of Investment and Company Administration
EIA	:	Environmental Impact Assessment
EPA	:	Environmental Protection Agency
EU	:	European Union
FAO	:	Food and Agriculture Organization (United Nation)
FDI	:	Foreign Direct Investment
FDI	:	Foreign Direct Investment
FY	:	Fiscal Year
GAP	:	Good Agricultural Practices
GDP	:	Gross Domestic Products
GHS	:	Globally Harmonized System
MNCs	:	Multi National Countries
MADB	:	Myanmar Agriculture Development Bank
MALI	:	Ministry of Agriculture, Livestock and Irrigation
MAPCO	:	Myanmar Agribusiness Public Corporation
MIL	:	Myanmar Investment Law
LIFT	:	Livelihood and Food Security Funds
PAN	:	Pesticide Action Network
SAICM	:	Strategic Approach to International Chemicals Management
UN	:	United Nations
UNOPS	:	United Nations Office for Project Services
UMFCCI	:	Union of Myanmar Federation of Chambers of Commerce and Industry
US	:	United States
US\$:	United States Dollar
WHO	:	World Health Organization

CHAPTER I

INTRODUCTION

1.1 Rationale of the Study

Pesticides are substances that are used in forestry, agriculture, and horticulture and for increasing yield of crops, improving the plant products appearance. During the recent years global population is gradually increase is high demand in food sovereignty and food security issue. Climate smart agriculture is promote to use chemical pesticide around the world without proper to access of knowledge how to use the pesticide to free from the threat of human health.

In the 21st century, the most common diseases associated with pesticides are asthma, autism and learning disabilities, birth defects and reproductive dysfunction, diabetes, Parkinson's and Alzheimer's diseases, and several types of cancer. Their connection to pesticide exposure increasing despite efforts to restrict individual chemical exposure, mitigates chemical risks, and imposes risk assessment-based policy.

Globally, pesticide poisoning is the most common way for committing suicide (31%).The pesticide-related suicide in Europe is 4% and 50% in the western Pacific region. This number does not proportion to pesticide usage. In Europe, only 2% of pesticide suicides uses occur whereas the sales of pesticide products were 29% of the global sales. In Asia, as high as91% of pesticide suicides are reported but there were only 25% of the global sales of pesticides (Gunnell, Eddleston, Phillips, Konradsen 2007).

In developing countries malnutrition and infectious diseases often intensify the negative effects of pesticide poisoning. Moreover, the peoples are poisoned while applied pesticides to farms, because personal protective equipment is not affordable, not easily available, damaged, or impractical in hot and humid climates. Safety precautions are provided in foreign languages or are not understandable, especially by alphabets but also by those who can read (Eddleston, Karalliedde, Buckley, Fernando, Hutchinson, Isbister, & Sheriff 2002).The risk so fine appropriate disposal

and storage of pesticides should not be underestimated. In developing countries such as Myanmar there is often improper management, storage, and disposal to reduce hazards and risks of pesticides and pesticide handling (van der Hoek, Cole, Hutchinson, Daisley, Singh, & Eddleston,2003).Pesticides may be mistaken for food due to storage at homes. Pesticide containers are often thrown to the surrounding or the irrigation channels

Myanmar is the second largest country in Southeast Asia. The economy of Myanmar is mainly based on agriculture. Around 60% of the population lives in rural areas sustaining their livelihood directly or indirectly on agricultural activities. Food security for the people and raw material production for domestic agro-based industries are heavily dependent on the agricultural sector (Kudo, Kumagai, & Ishido2013, FAO, 2012). During the monsoon seasons most farmers grow paddy, in the cool and dry seasons most farmers plant pulses, oilseeds and maize. However, the low yields and labor intensive keep Myanmar on the lower end of the Asian productivity spectrum. Agricultural sectors accounted for only 38% of GDP and 23% contributes in export earnings (Eurocham Myanmar, agriculture guide 2018).In order to increase the crop yields, pesticides are widely used by farmers across the country.

After late of 1960s, the use of pesticides began as one of the measures taken to increase production in the agricultural sector in Myanmar. The large increases in pesticide use have been observed due to massive imports of pesticides from the People's Republic of China.

Another concern in Myanmar is poor documentation and regulation of imported pesticides and the instruction to use is not user-friendly farmers. The improper disposal of chemicals could cause the environment contamination and ecological disruption over the times. More effective pesticide regulations and enforcement is needs to reduce the long-term costs to the sector and health impact of farmers and consumers.

In addition, Myanmar lacks an effective and fully of operational system for pesticide regulation and controls. There has no effective system to advocate the farmers regarding best practices in sustainable pest management and pesticide use. Banned, unregistered or counterfeit products are widely available on the pesticide market resulted in overuse, misuse, mishandling and mismanagement of pesticides.

Pesticides are threatening the long term survival of ecosystems, loss of biodiversity and significant human health consequences. The challenges of knowledge

and safety practices on pesticide usage in agriculture sector classified into four themes such as technical, organizational, Financial and human recourses. The big challenges of Safety practice on pesticide usage in agriculture sectors because of the insufficiency of alternatives to pesticides, lack of knowledge to sustainable of pesticide use, and the weak enforcement of regulations and laws on pesticide use.

1.2 Objective of the Study

The Objective of the study is to analysis the knowledge and practices on inappropriate use of pesticide protection equipment which used to reduce exposure.

1.3 Method of the Study

This study uses descriptive method by quantitative approach. The primary data collection was done by structured questionnaire with in-person survey. Questionnaire type is structure questionnaire including likert-type scales which are used for measuring knowledge, attitude and practices.

1.4 Scope and Limitations of the Study

The knowledge, attitude and practices on pesticide usage of risk taking behavior of health in vegetable growers, farmer and fame worker. There were limited into pesticide using and usage practices problems which conducted with pesticide knowledge. But this study is not representing into health diseases or health treatment, and it is show to current criteria of pesticide prevention practices of vegetable growers.

1.5 Organization of the Study

This study consists of five chapters. The first chapter presents rationale of the study, objective of the study, and research method of the study, scope and limitation of the study and organization of the study. The second chapter described Classification of Pesticide, advantages and disadvantage of pesticide and pesticide usage and health related problem. Chapter three is overview of pesticide situations in Myanmar. Then Chapter fourth reflects data analysis and interpretation on key issues on knowledge and practice on pesticide usage. Chapter five presents the suggestions based on survey findings.

CHAPTER II

LITERATURE REVIEW

2.1 Classification of Pesticides

Pesticide is a material that destroys feral animals, insects, fungi or plants. Furthermore, pesticide substance or mixtures are used to prevent, destroy, repel, or mitigate. Nowadays many of different pesticides are using. Pesticides using are not only into agriculture but also veterinary, domestic, institutional and many other places. These are really valuable in protecting plants from insects and pests. Pesticides may be classified in several ways which it's the target pests they destroy, for example, insecticides, herbicide, rodenticide and others they may also be classified according to the chemical class they belong to for example organochlorines, organophosphates, carbamates, pyrethroids, nitrophenols, nicotinoides etc (David and Jeyaratnam, 1996). Another system of classification may be according to the degree or type of damage caused such as that developed by the World Health Organization. Other classified systems, based on combined functional and chemical properties of the pesticides, have also been proposed (Hogstedt, 1992).

Insecticides are intensive and kill insects. It can be used in agriculture, medicine, industry. Insecticides usages are highly in farming sectors 20th century's production. It can be changed the ecosystems and poisonous to humans from food chain. Insecticides residue or food contamination hazards are, in general closely related to and may be measured in term of chronic toxicity of the chemical and the amount of residue appearing on or in the food as its reaches the consumers.

Herbicides are targeting to remove unwanted plants or weeds. Pre-emergent herbicides are useful only on plants that haven't emerged from the soil yet. Using the wrong herbicides ends up being time-consuming, expensive and potentially harmful.

Fungicides are biocide chemical compounds. It can kill fungi or fungal spores. These are applying both in agriculture and animals which get fungal infection. Fungicides help to inhibit or prevent the growth of fungi on plants, roots or seeds.

Applied as a spray, power or systemic formula, they provide protection to mature plants, crops and help keep seeds.

Rodenticides are used to kill mice, rats, moles and other rodents. Some rodenticides are dangerous after one contact while others require more than one. Many rodenticides are secondary poisoning risk to animals.

2.2 Advantages and Disadvantages of Pesticides Usage

Pesticides can be controlled pests because each and every country around the world, pesticides is not only benefit for agriculture economics but also public health sector. Although chemical pesticide use for effective vegetables, crops such as pomelo, egg-plant, directly to affect as the persistent organic pollutant pesticides to the land, ground water, atmosphere. In the other hand, it can be affected on the environment and its impact on human health. The pesticides have so many advantages and disadvantages.

2.2.1 Advantages of Pesticides Usage

Advantages of pesticides usage is easy to train and can apply in needy places. Pesticides help farmers in preventing crop damage from harmful insects. If pesticides used properly, may not have significant side effect on humans and animals. The important benefits of pesticide use is they kill pests quicker than different pest manipulate methods. This is because pesticides are especially formulated chemicals that target sure pests. Once administered in a crop that has been invaded by way of the pest, pesticides start working right now through affecting the normal biological functions of the organs of the insect. Pesticides are also easy to apply.

Once administered in a crop that has been invaded by the pest, pesticides start working immediately by affecting the normal biological functions of the organs of the insect. Pesticides are also easy to use. Most pesticides, a farmer is simply required to combine the pesticide with a special quantity of water and then spray the crop. There are powder pesticides that a farmer applies to the crop that is infested with pests without delay. Thus, it takes a few minutes or hours to use the pesticide and manipulate the pest.

There is likewise a huge variety of pesticides from which a farmer or gardener can choose from. This implies that a farmer can without problems find the pesticide that they need to manipulate a specific pest of their farm. Additionally, if a pest has

developed resistance to a specific pesticide, a farmer can use every other. Moreover, if a pest has developed resistance to a specific pesticide, a farmer can use another. There are some facts of advantages are recent pesticides are very efficient. It can kill the intended pests that contact with these pesticides. Results are obvious and the pests are killed shortly. Pesticides being used are very cheap to control pests and pesticides applied labor cost is not too high because it is very easy and quickly.

2.2.2 Disadvantages of Pesticides Usage

Although insecticides are essential to farmers, using them can pose a hazard to the farmer, his circle of relatives and animals. For instance, at the same time as a pesticide is overused in controlling a particular pest it may increase resistance. If the tendencies for the resistance are genetic-based absolutely, then the pesticide will now not be powerful in controlling that pest. Pesticide can influence human health, injury or death to the person contact, other people or household pets when used incorrectly. Pesticides can influence the other unintended animals. Pesticides are applied wrongly, it is might pollute the water and soil. Pesticides can enter the food chain.

2.3 Pesticides Usage and Related Health Problems

The FAO/WHO International Code of Conduct on Pesticide Management (2015) defines Highly Hazardous Pesticides as: Pesticides that are stated to provide in particular high tiers of acute or chronic hazards to health or surroundings in line with the world over common category structures along with the World Health Organization (WHO) or the Globally Harmonized System of Classification and Labeling of Chemicals (GHS) or their listing in relevant binding international agreements or conventions.. Additionally, pesticides can cause severe or irreversible harm to health or the environment under conditions of use in a country may be considered to be and treated as highly hazardous. (Utembe& Gulumian, 2015)

Pesticides are highly hazardous and affect to human health or the environment. According a survey, the acute illnesses are contact with pesticides and the chronic illnesses are due to long-term contact this.

The acute illnesses in humans such as fatigue, headaches and body aches, skin discomfort, poor concentration, skin rashes, feelings of weakness, circulatory problems, dizziness, nausea, vomiting, excessive sweating, impaired vision, tremors, panic attacks, cramps, etc., are the symptoms of pesticide poisoning and in severe

cases coma and death (Bödeker, Dümmler , 1993, Alavanja,Hoppin, Kamel 2004). The patients or physicians can link the symptoms of acute pesticide poisoning to pesticide exposure of short time contact when it occur. The severity of symptoms is a scale ranging from mild to reasonable to severe or lethal (Jahresbericht, 2009)

The chronic illnesses of pesticides caused by using a long period even though the amounts are small. Symptoms of chronic illnesses can't be notice for a long time, and then cause the late effects. These affect not only the person who exposed but also the surrounding population. According to the results of various epidemiological studies, the person who has been exposed to the pesticides has high risk of contracting non-Hodgkin lymphomas and leukemia. Other studies show the association between pesticide use and sarcomas, multiple myelomas, cancer of the prostate, pancreas, lungs, the breasts, ovaries, testicles, kidneys, liver, and intestines as well as brain tumors (ChemTrust, 2010; WHO, 2008).

Pesticide exposure can harm the human nervous system. There are the connections between pesticide exposure and reduced sensitive faculties, disruption in cognitive and psychomotoric functions and depression. Specific pesticide can increase the risk of getting bigger Parkinson's disease (Hancock, Martin, Maythaw , 2008).

The exposure of pesticides causing children's neurological growth disorder has been investigated. But laboratory studies show the possibility of correlations (Bjorling-Poulsen, Andersen, Grandjean 2008).

2.4 Pesticide Poisonings

One million of accidental acute pesticide poisonings are occurred worldwide annually, by WHO 1990 expected. Even though, these are only the registered case in hospitals. The WHO reported that the level of poisonings was considerably underestimated. Several years ago, the funding for a WHO project on the epidemiology of pesticide poisoning was discontinued (J. Tempowski, WHO, 2012).

The case of 20,000 people who died worldwide in 1990 (WHO, 1990)are unintentional poisonings. Current of statistics had become obtainable since 2008. According to this WHO data, two-thirds of people (346,000) are dying in developing countries because of unintentional poisoning (WHO, 2008). The toxic chemicals such as pesticides cause the poisoning substances (Bundesinstitutfür Risikobewertung, 2009). Researchers pointed 71% of these sufferers might have been prohibited by improving chemical safety measures (Jahresbericht, 2009).

Chronic poisonings are not easy to define and has limitations. Since registration systems and regional studies, poisoning cases that can be proven without any doubt to have been caused by pesticide exposure. According to 1990 WHO data, 735,000 cases of particular chronic effect and 37,000 unspecific health effects such as cancer were expected (Jeyaratnam, 1990)

According to the classification of WHO, pesticides are classified in five classes that ranging from extremely hazardous (class Ia), slightly hazardous (class III), and unlikely to present acute hazard (Class U). The Pesticide Action Network (PAN International) published a list of highly hazardous pesticides of four hundred highly hazardous pesticide active substances as international classification systems in market worldwide. (PAN Germany, 2011). Seven of the ten most used pesticides in Asia are included on the list of extremely hazardous pesticides, indicated in PAN Asia and the Pacific research on 82 of the 150 pesticides used in Asia. In developing countries, the poisoning pesticides are easily available on the markets (G. Vaagt, 2005). 30% of the pesticides trading illegally in developing countries do not meet internationally recognized safety standards (PAN Germany, 2011) and becoming significant global problem.

Table (2.1) Acute Toxicity of Pesticides

Class	Classification	LD50 for the rat (mg/kg b.w.)			
		Oral		Dermal	
		Solids	Liquids	Solids	Liquids
I (a)	Extremely hazardous	<5	<20	<10	<40
I (b)	Highly hazardous	5-50	20-200	10-100	40-400
II	Moderately hazardous	50-500	200-2000	100-1000	400-4000
III	Slightly hazardous	>501	>2001	>1001	>4001
U	Unlike to present acute hazard	>2000	>3000		

Source: WHO, 2010

A number of pesticides are unsafe chemicals, but they have power to control over the various pests. Pesticides are toxic substance to land, water and air. That is why it is very significant to follow the directions of the labels on the pesticide

container. Careless use of pesticide can poison users as well as other people, animals and plants.

Oral Entry is the pesticide entry through the mouth from the food, the liquids or many other ways. Pesticides taken through the mouth result in the most extreme poisoning as compared to other forms of exposure. Pesticides may be ingested by means of twist of fate, through carelessness, or intentionally. The maximum common cases of unintended oral exposure are those in which insecticides were saved in an unlabeled bottle or food box.

There are many cases wherein humans, especially children, have been poisoned by way of ingesting pesticides from a tender drink bottle. People have also been poisoned through ingesting water saved in infected containers. Workers dealing with pesticides or utility system can also eat immoderate levels of pesticides in the event that they do no longer wash their arms before ingesting or smoking.

Respiratory Entry can be breathed through the mouth and nose from sprays, vapors or powders. Certain pesticides can be inhaled in sufficient quantities to cause extreme harm to nose, throat and lung tissues, or to be absorbed thru the lungs into the bloodstream. Vapors and very small particles pose the most critical risks.

The chance of poisoning from respiratory publicity is remarkable because of the fast and whole absorption of pesticides via lung tissues. Lungs may be uncovered to pesticides with the aid of inhalation of powders, airborne droplets or vapors. Working with wet table powders can be hazardous due to the fact the powder may be inhaled throughout blending operations and usually includes concentrated pesticide energetic component.

The hazard from inhalation of pesticide spray droplets is reasonably low when dilute sprays are being carried out with conventional low strain software device. This is due to the fact most droplets are too big to remain airborne and be inhaled. However, whilst high pressures are used or ultra-low volume (ULV) or fogging gadget is used, the capability for breathing exposure is multiplied. The droplets produced for the duration of those operations are within the mist or fog size-variety and can be carried on air currents for a sizeable distance. Many pesticides supply off a vapor when exposed to air.

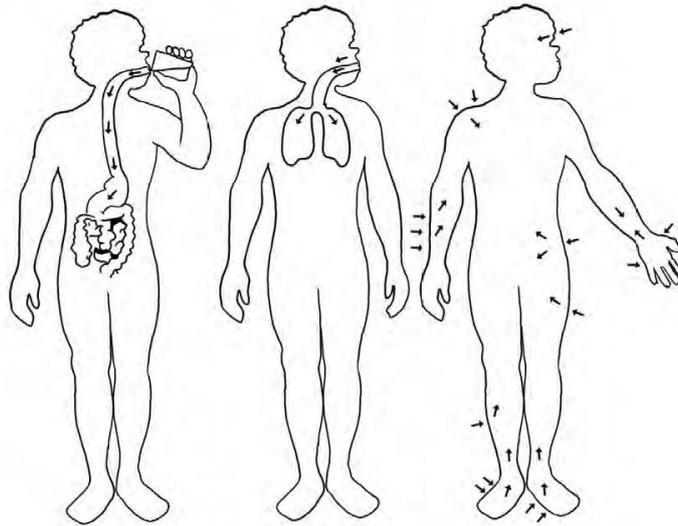
As temperatures increase, vapor levels of many pesticides increase. Fumigants are used because their toxic vapors are desirable for pest control. They also have the highest hazard with respect to worker exposure to vapors. Some no fumigant

pesticides are toxic to pests as liquid or solid formulations, but also give off vapors which could be toxic to applicators or bystanders. The hazard is greatest in enclosed spaces where there is little air movement. For example, high vapor levels could result from a spill in an unventilated storage area or application in a confined space such as a greenhouse. Air currents due to wind or ventilation can substantially reduce vapor levels.

Many pesticides that produce vapors provide a warning of their presence by their smell or by causing irritation of the eyes, nose and throat. However, some pesticide vapors have little smell and provide little warning of their presence.

Dermal entry, Liquid spray can be absorbed through the skin and eyes. It very quickly absorb through the eyes, forehead and forearms. In typical paintings conditions, skin absorption is the most not unusual direction of pesticide poisoning. Absorption will retain as long as the pesticide stays in contact with the skin. The price of absorption is distinct for every a part of the frame (see diagram). The head (in particular the scalp and ear canal) and the genital regions are particularly prone. Absorption may additionally arise as a result of a touch, spill or waft whilst blending, loading or making use of a pesticide. Applicators may also be exposed to residues on application gadget, shielding garb or treated surfaces after pesticide utility. Following exposure, residues also can be transferred from one part of the frame to any other. A reduce or skin abrasion can substantially boom pesticide absorption. The dermal toxicity of a pesticide depends at the pesticide formula, the area of the frame contaminated and the period of the exposure. In trendy, liquids are extra without problems absorbed through the skin than moist table powders or granules. The risk from skin absorption will increase while employees are blending insecticides because they're dealing with concentrated pesticides that incorporate a high percent of active elements.

Figure (2.1) Ways Pesticides Enter the Body



Source: WHO, 2013

If the pesticide is used careless, this can cause poison the people or other animals. Some of the facts are accidentally included not reading instruction of pesticide container for safe and effective use. Pesticide container used as food or drink bottle. Children are taking mistake the pesticide. Children and pets can reach the place where pesticide containers are kept. The protective equipment is not wearing when using pesticide. When applying pesticide, food and drink are not covered. The spray drifts away to other areas because of windy conditions and spraying which do not need to the pesticide areas. Don't move the people and animals, away from the pesticide applying area.

2.5 Reviews on Previous Studies

Naw Thet Thet Htun (2017) studied on Farmers' Behavior and Health Awareness Regarding Usage of Pesticides (Case Study: Taikkyi Township), that observe became discovered that the farmers have lack of knowledge and awareness for protection practices even they are the usage of pesticide daily. Most of the respondents do not care the product is registered or not. In order to have attention on protection of insecticides, campaigns are to be raised through agricultural personnel or volunteer technicians. On the other hand, the majority should have awareness at the protection of meals due to the residues of chemical substances from pesticides.

May Lwin Oo, Mitsuyasu and Huynh Viet (2012) studied on Farmers' Perception, Knowledge and Pesticide Usage Practices: A Case Study of Tomato

Production in Inlay Lake, Myanmar. Their locating that farmers' know-how on pest enemies and IPM became minimum inside the study web site and farmers had been mainly dependent on pesticides with the dearth of non- chemical alternatives.

Thant zaw Lwin, Aung Zaw Min, Mark Gregory Robson, Watt siriwong (2017) studied. Their finding includes Myanmar is a developing agricultural nation that inevitably uses pesticides in agricultural food production.

Naing Kyi Win and Pradem Chamjai prepared research were to study: the socio-economic characteristics of farmers and their knowledge of soybean production; extension activities affecting the adoption of improved soybean production technologies; The findings revealed that the adoption of improved soybean production technologies was less than 50 percent except for the adoption of improved varieties.

Ye Maung Swe (2016) studied on Good Agricultural Practices (GAP) Adoption by way of Monsoon Paddy Farmers (Case Study: Hmawbi Township, Yangon Division), that become discovered that the general public of farmers have low degree of training and most of them are nonetheless relying on the conventional cultivation technique on agricultural manufacturing.

CHAPTER III

PESTICIDE USING SITUATION OF MYANMAR

3.1 Brief Overview of Myanmar Agriculture Development Sector

Myanmar's Agriculture systems are varied more than commonly thought. During the wet monsoon seasons most farmers grow paddy, while during the cool and dry season some farmers grow pulses, oilseeds and maize other than paddy. However, gradually, decrease the crop yields and high labor use keeps Myanmar on the lower end of the Asian productivity spectrum.

Historically, Myanmar was a major exporter of rice, while in more recent times it has become an important exporter of pluses and annual crops (including oilseeds and vegetables). It has ample herbal resources together with fertile and numerous agro-ecological land areas, water, forests, and a shoreline of over 2000 km. Experiences in other transition economies in South East Asia, consisting of Vietnam and Laos, as well as China, advocate that agriculture and the rural financial system respond unexpectedly to monetary reforms and might provide massive economic profits all through the early ranges of reform. However, whilst the ability for widespread production and productivity profits in agriculture and the herbal assets sector, inclusive of fisheries and forestry, is giant, Myanmar additionally faces a few bold challenges in understanding this capacity. In Myanmar, there may be a gender-based department of hard work in crop- cultivation, despite the fact that it could differ consistent with cropping patterns with the aid of state and region.

About 70% of the population in Myanmar resides in rural area and agriculture is their main livelihood. While the agriculture sector contributes 29.8% of national GDP (2014-2015). The agriculture sector also accounts for between 25-30% of total exports by value (ADB,2013) Pulses are currently the main agriculture export item, bringing in \$1,152 million in 2015/16, with rice, livestock and fisheries, the other main agricultural export items, each generating between \$400-500 million. The production of paddy continues to dominate Myanmar's agricultural production (45.7% of harvested area and 53.4% of production volume of major crops produced in

Myanmar) at 28.2 million MT (2014/15), but has seen a slight decline in production levels since 2010-15. While the country as a whole has a surplus of rice and the self-sufficiency rate is estimated at around 168%, Mandalay and Magway regions and Chin State report deficits, with self-sufficiency rates of 66%, 98%, and 69% respectively. (ADS and Investment plan 2016)

Agricultural productivity is slowly low the results of multiple factors, many of which are associated with the undersupply of quality agricultural inputs. In order to uplift the socio-economic condition of farmers and improve the overall performance of the agriculture sector, the Ministry of Agriculture, Livestock and Irrigation (MOALI) has made it a concern to assist the development of the countrywide financial system through powerful implementation of a proactive portfolio a long way attaining regulations and strategic thrusts.

Myanmar's agriculture has traditionally involved little use of pesticide. However this has rapidly changed. With massive import from the People's Republic of China (PRC) and large increases in application rates, official statistics reflect a 1000% increase in quantities applied between 2005 and 2010 (CSO 2012)

In May 2012, 600 farmers from Yangon and Naypyitaw region were conducted the survey and the results show that pesticides mostly used were organophosphates and organochlorine compounds, phenthoate, particularly dimethoate and endosulfan (Aung *et al.*, 2012). However, these substances are prohibited to use in most countries. The survey also indicated that the promoting and importing of insecticides is increasing with the economical opening-up of Myanmar and meanwhile, the poor knowledge of handling the pesticides could lead to further misuse and overuse.

The aim of those new regulations and strategic thrusts, called Agriculture Policy 2016, is to create the allowing surroundings with the intention to sell the production of a extra and more varied range of excessive value agricultural, farm animals, and fishery merchandise. A fundamental intention of Agriculture Policy 2016 is to take advantage of the comparative benefit that Myanmar has within the manufacturing of those excessive value merchandise which are in increasing demand in each home and international markets.

3.1.1 Agriculture Development Strategy and Investment Plan in Myanmar (ADS)

The Agriculture Development Strategy has three pillars such as governance, raising productivity, and raising competitiveness. A key concern of governance pillar is to secure property rights of smallholder plunging into global market competition. ADS and agriculture policy more broadly swings between the government's need to facilitate capital accumulation, while keeping social legitimation. Agriculture productivity requires the adoption of appropriate technologies and know-how to increase efficiency and sustainability of agriculture consistently with market demand. The competitiveness pillars focuses on ensuring that farmers and agro- enterprises are integrated into effective value chains and are competitive in regional and global markets. (Bello, 2018)

3.2 Vegetable Sector Development in Myanmar

Vegetable plays an important role in agriculture sector. It is focused in Food Value Chain Road Map (2016-2020) for the integrated development of the food industry of Myanmar because it is need to increase the production of safe and high quality vegetables, flowers and fruits proportionally to reach domestic demand, particularly for the cities. Adoption of GAP (Good Agriculture Practices) and PGS (Participatory Guarantee System) and Chemical Pesticide free practice to produce safe vegetables and quality assurance should be further improved. Despite of there is no separate and accurate data only for pesticide use in the vegetable sector as a whole plays a vital role in daily livelihood of people especially who are engaged with poverty line.

If the whole vegetable sector is being developed, its sector will be grown proportionately and accordingly by consumers need. The vegetable sector has the critical to become one of the most important agricultural sub-sectors. Nowadays Vegetable cultivation, handling, and selling in Myanmar have been cultivated and doing mostly by small farmers and smallholders. Millions of people are participated in activities of growing, harvesting, transportation, and trading of vegetables. It is strongly correlated with the rural and urban poor people, their employment and income generation (VSAT, 2016). Vegetables, which are produced on 400,000 hectares, currently provide an essential supply of earnings for up to an envisioned 750,000 smallholder farmers in Myanmar. For extra than 35 percent of these farmers,

veggies are idea to symbolize their primary source of own family income. The total value of vegetable sales at farm gate level is estimated to be USD 1.2 billion. (Morris and Mar Lar Soe, 2019). Vegetable cultivation can be divided into three distinct groups such as; Smallholders who are main suppliers of vegetables to the markets, backyard farmers who are numerous in number, and large commercial farms, currently limited to only a few enterprises. Although average landholdings in Myanmar in the region are 2.5 ha (6.1Acres), the majority of vegetables are produced on smaller plots only about 0.25 ha (0.6 Acres). While growing markets and constrained land necessities, smallholder farming systems offer desirable potential for pro-poor growth and the reduction of rural poverty in Myanmar. However, with confined know-how and get entry to improved technologies, the profitability for plenty smallholders stays underexploited (Morris and Mar Lar Soe, 2019). The local demand for fresh and quality vegetables is increasing and especially in middle income and higher income family. There is big potential for exports with quality and pre and postharvest improvements. Myanmar has abundant availability of land and water, and combining with proper technical which can make year-round production and competitive advantage to promote for the development of the vegetable sector.

Agricultural sectors in terms of economic growth, rural employment and income generation. Its products include fresh fruits, vegetables and flowers – provide earnings for about 15% of rural households in Myanmar. (Newzeland Embassy, 2015) The domestic market demand for fresh vegetable products will grow and there are plenty possibilities for yield and quality improvements. With a good strategy and a comprehensive plan, Myanmar could become the vegetable garden for Southwest China and some parts of Southeast Asia.

During recent years, Myanmar has regulated for Food safety of Crop and Vegetables sector. There are four government departments such as Department of Agriculture, City Development Committees, and Food and Drug Administration, and Department of Consumer Affairs which involved to the food safety of whole vegetable sector. Although those departments engaged in terms of cultivation, transportation, handling, storage, processing, packaging, selling activities, there is no description of accurate and specific declaration on the role and responsibilities among four departments. There is no specific regulator for the safety of vegetables in Myanmar. Although institutions such as Department of Agriculture, City Development Committees, and Food and Drug Administration, and Department of

Consumer Affairs are organized, specific demarcation lines on the role and responsibilities among these four organizations.

The Department of Agriculture (DoA) is responsible for safety of raw agricultural produces and vegetables before taking any further processing and packaging. DoA is mainly concerned on farm activities and practices, and only focus on agriculture raw food production. Plant Protection Division, Department of Agriculture has focused on announcement and publication for Codex Maximum Residue Limit (MRL) of pesticide, herbicide, and fungicide for export crops and commodities to ASEAN and other countries such as rice, beans, pulses, maize, and mango and so on. But there is no such announcement and publicity other products such as vegetable. There is no legal and regulatory system relating to chemical residues and hazards is currently existed for raw vegetables such as maximum residue limit (MRL) and microbiological hazards. Only Checking, inspection, and regulation of microbiological hazards have been working when packing and processing foods. Ministry of Agriculture, Livestock and Irrigation engage GAP has been referred here again for food safety measures of vegetables. But GAP is the voluntary-based protocol and the enforcement can be weakened since there is no proper legal binding and responsibility by respective department.

FDA mainly emphasized on packed and processed foods only. Food distributed in the markets, FDA inspects on chemical food safety hazards like dyes, food additives, contaminants and microbiological hazards in processed and packed foods. It meant that FDA not responsible to see raw food and vegetables.

3.3 Role of Non-Government Institutions in Agriculture Sector

On the other hand, Non-Government Institutions also have participated in the agriculture development sectors in Myanmar such as technological assistance for Myanmar agriculture development strategy and policy regulations, Fund support to Myanmar sustainable integrated farm practice project and consumerism rights awareness activities.

3.3.1 Giga Sustainable Management Institute

Giga Sustainable Management Institute (GSMI) is non-governmental organization was founded in 2013 based in Yangon with branches throughout Myanmar, Kyah and Southen Shan Zone as well as Northern Shan and Mandalay.

GSMI organized Grassroots leadership Training (GLT) among Farmers, consumerism awareness-raising events, advocacy for different stakeholders and seminars for education on the rights and responsibilities of consumers due to poor quality products, unsafe food issues and inferior services that have negative effects on consumers and the natural environment. Indeed, there is an urgent need for better consumer education amongst general consumers, entrepreneurs and the authorities. GSMI organized the Consumerism Rights forum at Mandalay; there are a lot of farmers, consumers and respective government attended. GSMI's role will always be primarily an advisory one to the government and an advocacy one to the general public. GSMI is one of the Myanmar Consumer Union (MCU). Therefore, was formed on 18 November 2012 with 15 executive committee members from medical, legal, educational, agricultural, engineering, scientific and economic backgrounds, among others. The MCU plans to develop 15 states/divisions and 325 township-level branches to strengthen relations and partnerships in both national and international organizations working for consumer rights and responsibilities, and food hygiene.

3.3.2 UNOPS' Livelihood and Food Security Fund (LIFT)

UNOPS' Livelihood and Food Security Fund have been supported and collaborative with Ministry of Agriculture, Livestock and Irrigation through operational and normative projects and it has activities in several townships across the country. Since 2009, LIFT intensified its support in normative project areas through agriculture technical assistance to several ministries and stakeholders in policy and technical support in Myanmar agriculture development strategy and Formulation and Operationalization of National Action Plan for Poverty Alleviation and Rural Development through Agriculture (NAPA) with Food and Agriculture Organization FAO, Food Security Policy Project Research Highlights, Assessing the Requirements for Food and Nutrition Security Concept Mapping Research Study, Framing System analysis-A guidebook for researchers and development practitioners in Myanmar, Access and utilization in agriculture and aquaculture report, Improving value change and Market Assess. LIFT funds supported Farmer Field school projects conducted by Metta Development Organization.

3.5.3 Metta Development Foundation

Metta Development Foundation is a non-governmental organization, established in 1998 to assist communities in Myanmar recover from the devastation consequences of conflict and humanitarian emergency. Metta has been conducted Participatory Action Research (PAR) tool to community development. After PAR tools have been practiced local people learn to identify their resources and needs. Based on the findings, they then plan and implement their own projects. As a result, a comprehensive range of community development projects have promoted health and nutrition, water and sanitation, holistic early childhood education and crop-based sustainable and integrated farming practices. Among them sustainable and integrated farming practices to build the food security and food sovereignty of communities through our programme approach of sustainable farming, bio-diversity conservation, local seed promotion and natural resource management by communities. Establishing village banking systems and sustainable social protection mechanisms that include access to market, value addition and value chain developments who has been organic agriculture farmers. Metta will have significantly expanded its national level networks as well as stronger engagement with regional networks such as the Towards Organic Asia movement.

3.4 Agriculture Development laws' in Myanmar

3.4.1 Myanmar Pesticide Law (14/2016)

The existing pesticide law which support legitimate protection for places of cultivates land to maintain biodiversity and environmental sustainable agriculture. The Pesticide Law was reenacted on 20th January 2016 as Pyidaungsu Hluttaw Law No.14, 2016) The 11th Waxing of Pyatho,1377 M.E which were both designed for Myanmar Agriculture development sectors. A complete review of Pesticide Legislation in Myanmar was not part of the terms of reference of agriculture development Strategy. Myanmar possesses a display of legislation and standards that directly or indirectly regulate pesticide distribution and use. According to the notification numbers (05 /2018) and (06 /2018) of the Pesticide Registration Board, 41 active ingredients are prohibited for formulation of pesticides and 7 types of pesticides are limited for the specific usage as fumigant and rodenticide. Pesticide Law should be law enforcement and create Quality insurance systems in the private sector and Independent information systems to farmers.

3.4.2 Consumer Protection Law

The Department of Consumer Affairs has responsible as regulator for all consumer protections and focal department for the implementation of the Consumer Protection Law. The Law was enacted on March 2019. There are some clauses which broadly mentioned about the safety of goods or services for consumer side. The law is mentioned in the section 2 of the law, the responsibilities of the Inspection officer make inspection on rescript of complaints from consumers (or) to monitor, do necessary due inspection, and to make sure that the unsafe goods and services are not existed any more in market, if it is identified to be hazardous to consumer. The Department of Consumer Affairs will do the prioritization of the sector and cooperate with related government and government organizations in order to make sure the safety of goods and services for consumer. Food quality control in Myanmar, mainly registration of good products, registration of businesses for importing, manufacturing, or exporting food products and licensing of businesses for storage or distribution and sales of goods. According to the supervision of the Consumer protection law, there are co-operations with governments and organizations including international, local and non-governmental organizations regarding the food products business in Myanmar. However, the Consumer Protection law awareness level is still low among people. So government, NGOs and CSOs should play critical role to function the Consumers Protection Law.

3.4.3 National Food Law

The National Food Law has been amended in 2013. The FDA division was upgraded and established as separate Department of Ministry of Health in April, 2013 with aiming to ensure the safety and quality of Food, Drugs, Medical Devices and Cosmetics in Myanmar. FDA head office is in Nay Pyi Taw with two main branches in Yangon and Mandalay, and small branches in important border trade zones such as Muse, Kalthaung, Myawaddy and Tamu. FDA is responsible for GMP inspection and certification for local food manufacturing businesses, food import and export inspection and certification recommendation, and health certification. Myanmar is the long time member of WHO, FAO, CAC and WTO. Myanmar participates in ASEAN Trade Protocol and Regional Sanitary and Phytosanitary Agreement (SPS) and Technical Barrier to Trade Agreement (TBT). Government enforces to practice Good Manufacturing Practice (GMP) mandatory in food processing industries. FDA

encourages all sectors of food manufacturers to implement Hazard Analysis Critical Control Point (HACCP) concept and Risk Analysis to all food control officers (Dr. Yi Yi Htwe, FDA). Apart from FDA and government organizations, there are also food safety service providers in Myanmar. They are: Food Security Working Group (FSWG), Food Science and Technology Association (FoSTA), Myanmar Food Processor and Exporters Association (MFPEA), Myanmar Consumer Union and so on.

3.4.4 Guideline of Good Agriculture Practice in Myanmar (GAP)

Guideline of Good agricultural practice (GAP) are specific methods which, when applied to agriculture, create food for consumers or further processing that is safe and wholesome. The purpose of this document is to set out Good Agricultural Practices to be implemented by producers of fruits and vegetables to improve the safety and quality of their produce, while at the same time protecting the environment and safeguarding the health and safety of their workers. ASEAN GAP standards for production, harvesting and postharvest handling, packing, processing and preparation of commodities to prevent or minimize hazards.(GAP,2004) ASEAN GAP addresses food safety, environmental impacts, workers' health, safety and welfare and quality produce. It is essential that all organizations involved in the food production chain accept their share of the tasks and responsibilities to ensure that GAP is fully implemented. To maintain consumers' confidence in fresh produce, GAP standards must be adopted. All growers should be able to demonstrate their commitment to do this

3.5 Food Safety System

Control system in Myanmar is multi-agency approach along the food-chain in collaboration with other stakeholder departments and agencies (Dr. Tun Zaw, 2015). The government departments and institution related to food safety and quality standards are Department of Health, Departments from Ministry of Agriculture, Livestock and Irrigation, National Standards and Quality Department under the Department of Research and Innovation, Department of Consumer Affairs of Ministry of Commerce, Municipal Health Department under City Development Committees and so on. National drug law was enacted in 1992.

The Myanmar Food and Drug Board of Authority is the main authority for meals protection measures and it is chaired through Minister for Health with the

availability of the National Drug Law 1992. Its participants are comprised from associated departments and experts from applicable fields of specialties. The authority is vested energy with the aid of the law to lay down policy, guidance on production, distribution, importation, exportation, satisfactory assurance, widespread setting, classifying to control food, meals components and substandard foods, labeling and commercial. The Authority is likewise empowered to do so in step with the meals regulation on those who do not follow the regulations. To ensure efficient and uniform manipulate of the coverage and pointers of the Myanmar Food and Drug Board of Authority, the Food and Drug Supervisory Committees are formed at extraordinary stage as Central, State and Division, District and Township respectively. The Director General of Health Department is the chairperson of the committee at central level and the Director of FDA as the secretary. Other members are from City Development Committee, Myanmar Police Force, Department of General Administration, Department of Livestock and so on.

The Food and Drug Administration (FDA) is the regulatory/implementing agency for food and drug safety, guided by the above-mentioned steering bodies. The Food and Drug Division of the Department of Health has been upgraded as Food and Drug Administration (FDA) since 1995 for the enforcement of regulatory affairs, inspection training, advisory services and laboratory services for the testing of microbiological and chemical of food and water. The National Food Law was promulgated in 1997 which in line with WHO model food law and amenendent 2013. FDA, Department of Health referred Codex Alimentarius Commission (CAC) as working materials and FDA is contact point for CAC.

3.6 Agriculture Plantation and Agro Economic Analysis of Pesticide Use

At the moment approximately 10,000 metric tonnes pesticides are legally imported per year. Since 2010 imports are quite stable, whereas between (2006-2009) the amount of legally imported pesticides varied between 4,000 and 6,000 metric tonnes per year. This figure of 10,000 metric tonnes doesn't include any pesticides imported illegally. (Alterra Wageningen, UR Wageningen, 2015)

For pesticide management, Myanmar is a Party of the Stockholm Convention on Persistent Organic Pollutants and also of the Montreal Protocol on Substances that deplete the Ozone Layer (2001). Although a number of responsibilities have been extra or much less fulfilled, for some responsibilities that is much less clear. For

instance, DDT is certainly only legal for malaria manage, hence complying with the Convention, however it's far doubtful if a file on the use of DDT has been drafted. Despite of Myanmar is not a Party of the Rotterdam Convention at the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade it has his very own list of banned pesticides and insecticides situation to regulations. Moreover Myanmar isn't always a Party of the Basel Convention on the Control of Trans Boundary Movements of Hazardous Wastes and their Disposal.

In relation to the area a challenge titled “Assisting international locations in Southeast Asia toward attaining pesticide regulatory harmonization” has been executed. APPPC Regional Workshop on Enhancement of Regional Collaboration in Pesticides Regulatory Management in Asia was held in 2012. Consequently, Myanmar project has taken steps to ban or restrict various hazardous pesticides.

As for national pesticide legislation, Myanmar possesses a review on legislation and standards that directly or indirectly regulate pesticide distribution and use. The old Pesticide Law enacted 1990 in state but the new Pesticide Law was enhanced in 2016. 2016 pesticide Law is under revision. More effective pesticide regulation is needed to avoid long-term costs to the sector and threat to the health of farmers and consumers.

The Multinational Agrochemical Companies such as Syngenta, Bayer Crop science, Dupont and Sumitomo global company imported 10 % of technical grade active ingredients (TC) and various companies engage in import and formulating activities. Agriculture input complex products are imported by local Myanmar companies such Myanmar awba group. On the other hand, fast change can be ascribed to massive importation from China and poor supervision of imports crossing its border.

Table (3.1) Pesticides Utilization for Plant Protection

Year	Pesticides (In Gallon)
2010-2011	1,283,183
2011-2012	1,527,083
2012-2013	1,121,715
2013-2014	1,161,840
2014-2015	1,113,634
2015-2016	3,160,986
2016-2017	5,814,480
2017-2018	12,662,605

Source: Myanmar Statistical Yearbook, 2018.

The agricultural sector of Myanmar will likely increase the usage of more and more agricultural inputs complex in the near future in order to get quantity and quality products. As the results, the market of agriculture input complex become larger. The Myanmar Fertilizer, Seed and Pesticide Entrepreneurs Association were found in 2013. This Association has been led by Myanmar awba group and its handles to agriculture sector development and functions of the markets for chemical fertilizers and pesticides.

CHAPTER IV

SURVEY ANALYSIS

4.1 Survey Profile

Hmawbi is located in northern part of Yangon region and under the administration of northern district. It shares border with Mingalardon, Shwepyitha, Htantabin, Taikkyi, and Hlegu townships. Hmawbi has total (476) square km and it is comprised with (4) wards and (39) village tracts. Total population of Hmawbi Township is (244,607) with (56,469) households, according to 2014 census report. Average household size is (4.1) persons and each household size is lower than the Union average. Economically productive population between (15-64 years) is (67.8%), the total number of working population is (165,843) people in this township. Percentage of urban population is only (10.6%). Total literacy rate is (95.2%) and disability rate is (4.7%). Among the households, (56.5%) is accessing electricity for lighting and other uses. According to 2014 census, (23.8%) of employed persons aged (15-64 years) are skilled labors in agriculture, forestry and fishery and it is the highest portion. (18.4%) of workers work in elementary occupations. Hmawbi Township is chosen as a study area because it has more vegetable growers than other townships in Yangon region and supplies one third of the needs of vegetables of Yangon Region. In addition, the vegetables growers can very easily access the necessary pesticides, insecticides and others for their cultivation as there are Myanmar Awba, Piti Pyaesone and Marlar Myaing which produce agricultural inputs. Among them Myanmar Awba Agricultural Input Complex is the largest. The vegetable growers are selected as samples to analyze their knowledge, attitude, and practices concerning the use of personnel protection equipment.

4.2 Survey Design

In this study in order to find out of knowledge, attitude and awareness of respondents who live in study area. Based on the objective, exploring this study would answer questions on what is knowledge, attitudes and practices about chemical

pesticide use among vegetable growers of study area. The survey period was from July 2019. Stakeholders in supply side and distribution chains are mainly divided into four categories and the estimated approximate population data are collected as described below. The sample size of 250-respondents is farmer, vegetable growers in Hmawbi Township. The sampling method is a simple random method and the three village tracts such War Net Chaung, Aut War Net Chaung and Hlapada Village tracts in Hmawbi Township in Hmawbi Township are selected geographically.

Table (4.1) Estimated Size of Population

Sr	Category	Expected Population Size
1	Farmers	2235
2	Transporters	100
3	Wholesales	200
4	Retailers	715
	Total	3250

Source: Department of Agriculture (Hmawbi Township)

Myanmar version of structured questionnaires was used for this study. The pretest was conducted at questionnaires were modified accordingly. The questionnaire consisted of five parts as follows which three parts. Part one included socio-demographic characteristics of participants are included age, gender, education and income of family. Part two included Farming Situation of participants will be including farm size, farming duration, farming practices and pesticide usage. Part three are included vegetable growers' Knowledge on Pesticide usage. Part four contained vegetable grower's attitude on Pesticide usage and finally, Part five included vegetable grower's practices on Pesticide usage.

4.3 Survey Findings

In this section, the data analysis is described with the percentage of quantitative data collected from the 250 respondents, including 171 male farmers and 79 female farmers. The analysis of data with percentage will be reported by dividing into four sections; respondent profile and characteristics, vegetable grower Knowledge, attitude and practices on Pesticide usage.

4.3.1 Socio-economic Background (part I)

Participated vegetable growers demographical data are shown in table. A total participants of (250) vegetable growers were participated in this survey conducts.

Table (4.2) Baseline Characteristics of Respondents, Yangon Region, Myanmar (n-250)

Age	Male		Female	
	Respondents	(%)	Respondents	(%)
< 35	31	12.4	19	7.6
35 – 49	70	28	48	19.2
50 – 60	70	28	12	4.8
Total	171	68.4	79	31.6
Education	Male		Female	
	Respondents	(%)	Respondents	(%)
Bachelor degree or equivalence	4	1.6	0	0
High School or equivalence	18	7.2	7	2.8
Monastery	4	1.6	1	0.4
Primary School or equivalence	81	32.4	54	21.6
Middle school or equivalence	59	23.6	16	6.4
Others, specify	5	2	1	0.4
Total	171	68.4	79	31.6
Average family income per month (Kyats)	Male		Female	
	Respondents	(%)	Respondents	(%)
< 200,000	28	11.2	30	12
200000 – 300000	87	34.8	31	12.4
>300000	52	20.8	15	6
No Answer	4	1.6	3	1.2
Total	171	68.4	79	31.6

Source: Survey data (2019)

By the Table of (4.2) Majority of vegetable growers were 28% in Male and 19.2 % were female total (47.2%) of in this study and their age group were between (35-50years). Under 35 year vegetable growers were 12.4% in male and 9.6 % in Female, total was 23%. And between (50-59years) of vegetable were (28%) in male and (4.8%) in female respectively. Almost of vegetable were male (68.4%) and vegetable growers were only (31.6%) out of total (250) respondents.

Regarding education, as like most of vegetable growers were 32.4% in Male and 21.6 % in Female total (54%) presents to primary school level, thus followed by middle school (30%) of total respondents of vegetable were 23.6% in male and 6.4% in female, in high school level vegetable growers were (10%), 7.2 %in male and 2.8% in female, only (5.6%) of respondents were reached to university level/graduate level. Nearly half percentage of (47.2%) respondents are earning per monthly family incomes (2000000 to 300000) kyats and less than income level(2000000) kyats families have (23.3%) and more than (300000) kyats income level families revealed as a few (21.4%) of vegetable growers.

Table (4.3) Farming Situation and Pesticide Use of Respondents (part II)

Farm size Acre	Male		Female	
	Respondents	(%)	Respondents	(%)
< 5	160	64	72	28.8
6-9	5	2	4	1.6
> 10	5	2	0	0
No Answer	1	0.4	3	1.2
Total	171	68.4	79	31.6
Duration of engaging in farm (years)	Male	Female		
	Respondents	(%)	Respondents	(%)
< 15	51	20.4	35	14
15 – 20	52	20.8	32	12.8
> 20	66	26.4	11	4.4
No Answer	2	0.8	1	0.4
Total	171	68.4	79	31.6
Pesticide used in farming (years)	Male	Female		
	Respondents	(%)	Respondents	(%)
<10	48	19.2	34	13.6
10-14	28	11.2	17	6.8
>15	91	36.4	28	11.2
No Answer	4	1.6	0	0
Total	171	68.4	79	31.6

Source: Survey Data (2019)

According to the table (4.5) Farming situation and pesticide use vegetable growers (64%) in male and (28.8%) in Females, total 93.2 % were owned less than (5) acre and (5-9) acre are 3.6% and more than (10) acre farm size of vegetable growers are 2%. According to the data, percent were indicated to duration of engaging farming, have more than (20) years and less than 15 years engaged in farm have 34.4% and middle stratify level of 15 years to 20 year have 33.6 %. Next statement of duration of pesticide used experience in farm involving (33.2%) of vegetable growers are less than (10) years. Each of (11.4%) and (47.2%) of vegetable were used pesticide in their farming were (10-15) years and over (15) years respectively. Over 15 years' vegetable growers have used pesticide. In this study, Most of the participants of vegetable growers were only used the chemical pesticide. The statement of each seasonal cropping pesticide using, most of participants are answered to only chemical pesticide used their farming years. In chemical using practices, less than 10 year has 83 respondents, between 10 years to 15 has 42 respondents and 15 year over has 118 respondents, is respectively.

In this study showed that chemical pesticide expensed in the previous year used in vegetables cultivating. In the chemical pesticide cost expenditure for vegetable growers (33.2%) expensed in costs of between (50000-100000) kyats. Farm workers of (41.6%) expended over (100000) kkyat and (19.2%) expended less than (50000) kyats. On the other hand, chemical pesticide expenditure has 122664 kyats in mean level and minimum and maximum has 5000 to 1500000 kyats.

Table (4.4) Spending time for spraying pesticides

Time (minutes)	Male		Female	
	Respondents	(%)	Respondents	(%)
<60	114	45.6	69	27.6
60-120	39	15.6	9	3.6
>120	16	6.4	0	0
No Answer	2	0.8	1	0.4
Total	171	68.4	79	31.6

Source: Survey data (2019)

According to table (4.4) show the result of average spraying time (minutes) in their farming; vegetable growers (73.2%) spend less than (60) minutes and (6.4%)

only spent more than (120) minutes. Most of the vegetable grower's choice the time for spraying pesticide in the evening period because of avoids the daytime's sunshine before the effects of chemicals start working.

Knowledge on pesticide usage (part III)

Table (4.5) Respondent's knowledge on health impact of pesticide

Issue	Yes		No	
	respondents	%	respondents	%
Chemical pesticide could enter your body by 3 roots inhalation, skin and mouth	248	99.2	2	0.8
Chemical pesticides have only immediate (acute) toxic.	182	72.8	68	27.2
The most common root of chemical pesticide entering the body is through the skin.	246	98.4	4	1.6
All chemical pesticides are allowed to use in our country.	82	32.8	168	67.2
Chemical pesticides that are very strong is the best for farmer to use	86	34.4	164	65.6
Cancer is related with chemical pesticide.	238	95.2	12	4.8
The toxicities of chemical pesticide use include the residue in plant, soil and water.	247	98.8	3	1.2
Toxicity of chemical pesticide occurs among those who spray chemical pesticide only.	190	76	60	24
Chemical pesticides use do no harm to the brain.	33	13.2	217	86.8
Nausea, vomiting and rash are not related with chemical pesticide.	39	15.6	211	84.4

Source: Survey data (2019)

According to the Table (4.5) Respondents' knowledge in health impact of pesticide is found. Among them respondents, it was 248(99.2%) know well the impact

chemical pesticide could enter the body with three routes skin, mouth inhalation. 77.8% only know the immediate acute toxic symptom but 26.4% do not the knowledge of pesticide acute toxic symptom. 98.4% respondents know the common route of chemical pesticide entered the body is skin. 98.8% respondents know cancer is related with chemical pesticide. As the result show respondents understand the knowledge of health relative impacts. 67.2 % of respondents know about the knowledge of country restricted for some pesticide but 30% of respondents do not the restricted pesticide imported by government.

Table (4.6) Respondents Knowledge on pesticide Usage (n=250)

Information	Easy		Normal		Difficult	
	Respondents	%	Respondents	%	Respondents	%
Finding information about pesticide toxic is	81	32.4	31	12.4	138	55.2
Understanding the label that come with chemical pesticide container is	163	65.2	35	14	52	20.8
Judging the advantages and disadvantages of chemical pesticide using is	71	28.4	58	23.2	121	48.4
Finding information on how to manage pesticide toxic is	58	23.2	37	14.8	155	62
Deciding not to use chemical pesticide against advice from family, friends and neighbors is	62	24.8	35	14	153	61.2
Understanding about chemical pesticide spraying appropriate practice (such as dose, timing, concentration, etc.) is	132	53	20	8	98	39.2
Understanding how to use chemical pesticide properly in the media (such as radio, television, poster, newspaper, magazines) is	126	50.4	5	2	119	47.6

Source: Survey data (2019)

According to Table (4.6) while the 27% of vegetable growers easy to access information of pesticide toxic and 55.2% over half of vegetable growers difficult to access the information of pesticide toxic. In this result vegetable growers do not know the how to get information of pesticide toxic from respective agriculture Department. 62 % of vegetable growers easy to understand the chemical pesticide container came with label, but 20.8% do not understand the label from chemical pesticide container. Only 25% of vegetable growers have ability to judge advantages and disadvantages of chemical pesticide using, 48.4 % could not judge advantages and disadvantages of chemical pesticide using. 59.6% vegetable grower could not escape for influencing of neighbor, family and friend advice to chemical pesticide use, only 24 % could against advice of chemical pesticide use from family, friend and neighbor .Although 53% over half of vegetable growers have a knowledge how to chemical pesticide spraying appropriate practice such as dose, timing, concentration,35.2% of vegetable growers do not have the knowledge how to chemical pesticide spraying appropriate practice such as dose, timing, concentration. Etc. nearly half of vegetable grower understand the how to use of chemical pesticide properly awareness message from media, other half could not understand chemical pesticide properly use awareness from media.

Vegetable Growers' Attitude on pesticide usage (Part IV)

Table (4.7) Respondents Attitude on pesticide usage (n=250)

Issue	Agree		Disagree		Indifferent	
	Respondents	%	Respondents	%	Respondents	%
Chemical pesticide help increasing the crop yields.	70	28	160	64	20	8
Using chemical pesticides is better and more efficient for pest control	208	83.2	27	10.8	15	6

Table (4.7) Respondents Attitude on pesticide usage (n=250) (Continued)

Issue	Agree		Disagree		Indifferent	
	Respondents	%	Respondents	%	Respondents	%
Frequently changing new chemical pesticides could increase more crop yields	95	38	125	50	30	12
Using mixtures of many types of chemical pesticides is better in controlling insects.	47	18.8	176	70.4	27	10.8
Could use pesticide following neighbor's practices without reading the label first, if they have already had a good result.	29	11.6	188	75.5	33	13.2
You do not need to wear protective devices while spraying pesticide, if it is inconvenient	119	47.6	125	50	6	2.4

Table (4.7) Respondents Attitude on pesticide usage (n=250) (Continued)

Issue	Agree		Disagree		Indifferent	
	Respondents	%	Respondents	%	Respondents	%
Pesticide is useful but may pollute the environment if improperly used	213	85.2	20	8	17	6.8
People should have a bath with soap thoroughly after spraying pesticide to wash away the pesticide that may be attached with the body	231	92.4	7	2.8	12	4.8

Source: Survey data (2019)

According to table (4.7) 64% of vegetable growers do not agree chemical pesticide help to increase the crop yields. But 83 % of vegetable growers believe that chemical pesticide using is best efficient for pest control. 75% of vegetable growers have attitude of checking the label before using chemical pesticide. While 50% of vegetable growers have concept of PPE (personal protection equipment while spraying the pesticide even in inconvenience, 47.6 % of vegetable growers do not want to wear PPE when they are inconvenience. 85%of vegetable growers know about how to use the pesticide properly to avoid the harmful of environment. 92.4% have opinion to take a bath with soap thoroughly after spraying pesticide.

Vegetable growers' practices on pesticide Usage. (part V)

Table (4.8) Respondents' prevention practices on pesticide usage

Information	Never/ seldom		Sometime		Always/ usually	
	Respondents	%	Respondents	%	Respondents	%
You use chemical pesticide based on seller recommendation	117	46.8	7	2.8	126	50.4
You use chemical pesticide based on neighbor recommendation	114	45.6	47	18.8	89	35.6
You use chemical pesticide based on the authorities recommendation	152	60.8	56	22.4	42	16.8
You check information about the efficiency of pesticides before buying	48	19.2	78	31.2	124	49.6
You buy chemical pesticide which labeled properly and having warning sign of chemical, manufacturer name and registration number	114	45.6	8	3.2	128	51.2

Vegetable growers' practices on pesticide Usage. (part V)

Table (4.8) Respondents' prevention practices on pesticide usage

Information	Never/ seldom		Sometime		Always/ usually	
	Respondents	%	Respondents	%	Respondents	%
You check the information on adverse impact of chemical pesticide before using	109	43.6	79	31.6	62	24.8
You read the instruction on the label before using chemical pesticides	17	6.8	91	36.4	142	56.8
You use more than type of pesticide mix together to increase the effectiveness.	34	13.6	64	25.6	152	60.8
You used mouth to blow blocked knapsack nozzles	210	84	21	8.4	19	7.6
You used hand (do not wear gloves) to stir or mix chemical pesticide	161	64.4	37	14.8	52	20.8
You wear mask cover nose and mouth while spraying chemical pesticide even though the weather is hot	112	44.8	14	5.6	124	49.6

Table (4.8) Respondents' prevention practices on pesticide usage (Continued)

Information	Never/ seldom		Sometime		Always/ usually	
	Respondents	%	Respondents	%	Respondents	%
You wear long-sleeved shirt and trousers when spraying chemical pesticide.	24	9.6	15	6	210	84.4
You wear goggle when spraying chemical pesticide.	220	88	7	2.8	23	9.2
You always check your equipment before spraying	29	11.6	12	4.8	209	83.6
You stop spraying chemical pesticide while having strong wind	58	23.2	14	5.6	178	71.2
Children usually play in the areas which are spraying chemical pesticides	218	87.2	3	1.2	29	11.6
You separate clothes wearing when spraying chemical pesticide, do not washing with other clothes	141	56.4	89	35.6	20	8
You eat food or drink water in the chemical pesticide spraying areas	224	89.6	5	2	21	8.4

Table (4.8) Respondents' prevention practices on pesticide usage (Continued)

Information	Never/ seldom		Sometime		Always/ usually	
	Respondents	%	Respondents	%	Respondents	%
You storage chemical pesticide in separate room, does not mixed or contaminate,	42	16.8	22	8.8	186	74.4
You reused chemical pesticide containers for water or food	235	94	0		15	6

Source: Survey data (2019)

According by table Likert scale question type is use in question about chemical pesticide exposure prevention practice in fame workers. The characteristics of chemical pesticide exposure prevention include 20 statements question. 50.4 % of vegetable growers use pesticide by seller recommendation but 46.8 % vegetable growers never use pesticide recommended by Seller. 60.4% over half of vegetable growers have not practices of pesticide usage based by agriculture Department recommendation. This result mean then there are some gap between agriculture Department and vegetable growers in the sectors of proper pesticide usage and to check appropriate usage of pesticide. 60.8% of vegetable growers mix pesticide to get higher effectiveness to control pest. 45.6% of vegetable growers never see the labeled properly and having warning sign of chemical, manufacturer name and registration number. 88% of vegetable growers never wear the goggle when they spray the chemical pesticide. This results show that, vegetable growers do not know very well about pros and cons of mix pesticide. Because inappropriate practice on pesticide, it can harmful to human health and environmental.

Table (4.9) Acute health impact experience on chemical pesticide usage

Information	Never/ seldom		Sometime		Always/ usually	
	respondents	%	respondents	%	respondents	%
Have you ever feel nausea, vomiting during/ right after sparing chemical pesticide.	125	50	70	28	55	22
Had rash/ itching during/ right after sparing chemical pesticide.	129	51.6	88	35.2	33	13.2
Had eye irritation during/ right after sparing chemical pesticide.	110	44	94	37.6	46	18.4
Had dizziness during/ right after sparing chemical pesticide.	116	46.4	99	39.6	35	14
Deterioration of conscious during/ right after sparing chemical pesticide.	215	86	20	8	15	6
Unconscious during/ right after sparing chemical pesticide.	233	93.2	13	5.2	4	1.6

Source: Survey data (2019)

According to Table (4.9) it shows that 50% of vegetable growers never experience nausea and vomiting after and during spraying the chemical pesticide, but 28% of vegetable growers have some experience of nausea and vomiting and 20% of vegetable growers always have experience of nausea and

vomiting after and during spraying the chemical pesticide. On third of vegetable growers have some experience in skin rash, eye irritation and dizziness after and during spraying the chemical pesticide. It means that some of vegetable growers have knowledge on personal protection equipment usage; other could not apply in PPE in regular practices

4.4.2 Level of Knowledge, attitude and practices on chemical pesticide usage

Table (4.10) Level of Chemical Pesticide Knowledge among Respondents Gender, Age, Education (n=250)

Variable		Knowledge						Total	
		Low		Moderate		High			
Gender	Male	8	3.2	100	40	63	25.2	171	68.4
	Female	3	1.2	33	13.2	43	17.2	79	31.6
	Total	11	4.4	133	53.2	106	42.4	250	100
Age Group	<35	0	0	24	9.6	26	10.4	50	20
	35-49	7	2.8	43	17.2	56	22.4	106	42.4
	50-59	4	1.6	66	26.4	24	9.6	94	37.6
	Total	11	4.4	133	53.2	106	42.4	250	100
Educational Qualification	Primary school level	3	1.2	66	26.4	77	30.8	146	58.4
	Middle School level	8	3.2	50	20	17	6.8	75	30
	High School level	0	0	11	4.4	14	5.6	24	10
	Graduate	0	0	3	1.2	1	0.4	4	1.6
	Total	11	4.4	133	53.2	106	42.4	250	100

Source: Survey data (2019)

Table (4.10) show that Cross tabulation method used to quantitatively analyze the relationship between multiple variables to understand correlations of demographic characteristics of the respondents and awareness level score. Generally, Most of respondents gain moderate awareness score in term of gender and age. According to table the dominant number of informants who know knowledge of chemical Pesticide

score are 171 (68.4%) male interviewees, 106 (42.2%) of respondents who are age between 35 to 49.

Table (4.11) Level of Vegetable Growers' Attitude on Pesticide usage among Respondents' Gender, Age, education (n=250)

Variable		Attitude						Total	
		Low		Moderate		High			
Gender	Male	16	6.4	123	49.2	32	12.8	171	68.4
	Female	7	2.8	53	21.2	19	7.6	79	31.6
	Total	23	9.2	176	70.4	51	20.4	250	100
Age Group	<35			39	15.6	11	4.4	50	20
	35-49	11	4.4	66	26.4	29	11.6	106	42.4
	50-59	12	4.8	71	28.4	11	4.4	94	37.6
	Total	23	9.2	176	70.4	51	20.4	250	100
Educational Qualification	Primary school level	11	4.4	99	39.6	36	14.4	146	58.4
	Middle School level	12	4.8	52	20.8	11	4.4	75	30
	High School level			21	8.4	4	1.6	25	10
	Graduate					4	1.6	0	1.6
	Total	23	9.2	176	70.4	51	20.4	250	100

Source: Survey data (2019)

Table (4.11) Cross tabulation method used to quantitatively analyze the relationship between multiple variables to understand correlations of demographic characteristics of the respondents and attitude level score.

Generally, Most of respondents gain moderate awareness score in term of gender and age. According to table the dominant number of informants who know attitude of chemical Pesticide score are 176(70.4%) is moderate level , 71(28.4%) of respondents who are age between 50 to 59.

Table (4.12) Level of Vegetable Growers' Practices on Pesticide usage among Respondents Gender, Age, Education (n=250)

Variable		Practices						Total	
		Low		Moderate		High			
Gender	Male	16	6.4	139	55.6	16	6.4	171	68.4
	Female	7	2.8	66	26.4	6	2.4	79	31.6
	Total	23	9.2	205	82	22	8.8	250	100
Age Group	<35	0	0	46	18.4	4	1.6	50	20
	35-49	11	4.4	83	33.2	12	4.8	106	42.4
	50-59	12	4.8	76	30.4	6	2.4	94	37.6
	Total	23	9.2	205	82	22	8.8	250	100
Educational Qualification	Primary school level	11	4.4	119	47.6	16	6.4	146	58.4
	Middle School level	12	4.8	58	23.2	5	2	75	30
	High School level	0	0	24	9.6	1	0.4	25	10
	Graduate	0	0	4	1.6	0	0	4	1.6
	Total	23	9.2	205	82	22	8.8	250	100

Source: Survey data (2019)

Demographic characteristics of the respondents and exposure prevention practice levels score are shown in contingency table. The majority of respondents have moderate perception score regarding education background. Table (4.12) indicates the number of informants who received moderate scores are 205(82%) respondents and 106 (42.4%) informants who are age between 35-49.

In general, informants received higher participation in prevention practice score regarding gender. It is noticeable that the numbers of interviewees who have high practice score are 171 (68.4%) male respondents.

Correlation between Knowledge, attitude and prevention practices on chemical pesticide using behavior among Respondents

Pearson's correlation coefficient method is used to measure association between knowledge, attitude and practices variables.

Table (4.15) Correlation between Knowledge, Attitude and Practices on Pesticides Using Behavior among Respondents (n=250)

Items		Knowledge score	Attitude score	Practice score
Knowledge_score	Pearson Correlation	1	.596**	.440**
	N	250	250	250
Attitude_score	Pearson Correlation	.596**	1	.520**
	N	250	250	250
Practice_score	Pearson Correlation	.440**	.520**	1
	N	250	250	250

** . Correlation is significant at the 0.01 level (2-tailed).

Source: Survey Results (2019)

The table (4.15) reveal significant positive linear correlations between knowledge- attitude ($r=0.596, p < 0.01$) knowledge- practices ($r=0.440, p < 0.01$) and attitude –practices ($r=0.596, p < 0.01$).

Since the values of correlation between knowledge- attitude is 0.596, a moderate upward (positive) relationship. While a weak upward (positive) linear relationship can be seen for both knowledge- practices because correlation value is about +0.30.

Knowledge, attitudes and practices of the respondents are positively and significantly correlated each other, raising knowledge can change attitudes of respondents as well as practices in pesticide using behavior in farmers and farm workers.

CHAPTER V

CONCLUSIONS

5.1 Findings

To reach the targets, the survey analysis was done based on the vegetable growers' answers related to chemical pesticide usage, storage, disposal and the ways of handling pests and diseases. The study display that chemical pesticide are one of primary inputs of agricultural process in Myanmar

Regarding the general respondents' profiles of respondents in the survey, the 31.6 %of respondents were female while the 68.4% of respondents were male. the first research finding express that (35-49) ages 47.2% of vegetable growers and (50-59) ages 40% and only under 35 ages (20%) of vegetable growers who is supply-side in Hmawbi township obtained up over 50% primary school education level and some of them didn't get any formal education at all. And 30% of vegetable growers obtained middle school education. Only 1.6 % of vegetable growers obtained high education level. This indicates that the overall education levels of the people in vegetable growers who are supply-side stakeholders are very poor, which influences and determines the farm behavior and practices as well as selling and marketing practices. Almost all of them are using pesticide with traditional ways and they are far away from modern agricultural knowledge, food safety knowledge, and abilities to use modern technologies. The research finding indicates that, the participation and involvement of educated workforce in to give proper pesticide using behavior is urgently needed for improvement appropriate precaution for farmer health when they are growing plants and safety food produces.

Vegetable growers on Farm Practices experience and pesticide using experience study were (92.8%) of the vegetable growers were owed less than (5) Acres and (5-10) (3.6%) and more than (10) Acres farm size of farm workers were only (1.6 %). The results show Hmawbi Township farming practices Acres gradually decrease among in vegetable growers. Next statement of duration of pesticide used experience in farm involving (47.6%) of vegetable growers were over than (15) years.

Each of (32.2%) and (18%) of vegetable growers were used pesticide in their farming were less than 10years and (10-15) years respectively. In this study, all of the participants of vegetable growers were only used the chemical pesticide. The statement of each seasonal cropping pesticide using, all participants are answered to only chemical pesticide used their farming years. In chemical using practices, over than 15 years has 113 respondents, between 10 years to 15 have 45 respondents and less than 10 years has 82 respondents, is respectively. In this survey results, regularity of application and use of toxic chemicals pesticide increase risks of farmer health damages due to chemical exposure.

According to results show that (73.2%) vegetable grower spend less than (60) minutes and (6.4%) only spent more than (120) minutes. Most of the vegetable grower's choice the time for spraying pesticide in the evening period because of avoids the daytime's sunshine before the effects of chemicals start working

According to chemical pesticide usage knowledge about chemical pesticide health impact results, 99% of vegetable growers have higher knowledge in Chemical pesticide could enter the body by 3 roots inhalation, skin and mouth. 95.2% of vegetable growers understand about cancer related with chemical pesticide. But 76% of vegetable growers believed that toxicities of chemical pesticide could affect only on spray area, 22.8 % of vegetable growers know very well about the Toxicity of chemical pesticide usage knowledge results show that, 55.2% of vegetable grower could easily to find information about pesticide toxic. On the other hand, 52% of vegetable growers easily to understand the label that came with chemical pesticide container. 53% of vegetable growers have the knowledge of how to appropriate practice of chemical pesticide such as dose, timing, and concentration) But 25% of vegetable growers only could judge advantages and disadvantages of chemical pesticide using, 48.4 % of vegetable growers difficult to judge the advantages and disadvantages of chemical pesticide using.59.6% of vegetable difficult to avoid from family, friends and neighbor. Although 47 % of vegetable growers could understand sharing information from radio, and television, such as knowledge of chemical pesticide usage, but 47.6% of vegetable growers difficult to understand the how to use chemical pesticide properly from media such as radio, television.

According to survey finding on attitude on pesticide usage among on pesticide vegetable growers, 64% of vegetable growers disagree on chemical pesticide help increasing the crop yields. 83% of vegetable growers believe that chemical pesticide

using is the best of pest control mean, they do not know alternative ways to pest control. While 50% of vegetable growers disagree about frequently changing new chemical pesticides could increase more crop yields, 30% of vegetable growers agree that frequently change new chemical pesticide could increase more crop. Actually chemical pesticide it not related crop yield increasing. While the 50% of vegetable growers have concept of PPE (personal protection equipment while spraying the pesticide even in inconvenience, 47.6 % of vegetable growers do not want to wear PPE when they are inconvenience.

Vegetable growers' practices on pesticide usage show that while the 50.4% of vegetable growers always use the chemical pesticide based on seller recommendation but 46.8% never use the seller recommended. 60.8% of vegetable grower never used chemical pesticide based on authority recommendation . It means that they are some gap between agriculture Department and vegetable growers. On third of vegetable growers have some experience of skin rash, eye irritation and dizziness after and in cause of spraying the chemical pesticide. It means that some of vegetable growers have knowledge on personal protection equipment usage; other could not apply in PPE in regular practices

5.2 Recommendations

In this study was scoped upon the 250 respondents and Yangon region of Myanmar and study on the demographic factors compared with determinant factor of chemical pesticide prevention exposure. According to the significant findings of the research, five major areas are focused for strong recommendations and it is described as below.

It is strongly recommended that the pesticide practices, Knowledge, attitude using pesticide handling pesticide and storages contamination, handling practices, storages facilities, and from the side of selling and distribution standards pesticide should be addressed for fresh and healthy vegetables. Pesticide safety law and food safety law for protect consumer right, and the proper enforcement system must also be established. It is strongly recommended that the initiation of better inter-departmental coordination is urgently needed among the government Departments and organizations like Department of public health, Department of food and drugs administration, Department of agricultures, Department of Health, and Department of consumer affairs in order to promote the safety of farmer to practice good agriculture

practice (GAP) ,Participatory Guarantee System (PGS) for organic food to get fresh and healthy vegetables and other foods. It is strongly recommended to up-date all such related data for growing of vegetables like number of farmers, growing Hectare by farmer wise, crop wise and township wise, yield, value of production and so on. On the other hand public health Department and agriculture Department need to coordinate to aware to farmers to get knowledge of Good agriculture practice and organic practice related to reduce pesticide health impact experience.

Chemical pesticide preventive exposure is closely relying upon the education and pesticide knowledge. NGOs play most vital role in organic farming practices projects. Before implementing activities for organic farming project, NGOs should do baseline assessment to identify gaps and health impact assessment should do for ordinary farming practice with pesticide. In order to agriculture sustainable projects, funding of NGOs need to be secured, should request technical assistance from different institutions. NGOs should mobilize to farmer, farm workers to participate in pesticide impact awareness activities and need to collaborate with Farmer groups. Capacity building programs should provide to Farmer who grow organic food and value change and market linkage process. NGOs should publish IEC materials (information, education and communication) of pesticide impact knowledge and distribute to reach more public. Public outreach campaigns, trainings and workshops of NGOs should design to raise awareness to reach maximum number of participants.

Research need to do to identify gaps, between farmers and seller previous research and challenging reasons for farmers. Academic institution, Ministry of health NGOs, experts, and other entity can do research on pesticide impact experience in invisible health signs. Researchers should collaborate with public for community-based participatory research to raise community awareness, participation and to build capacity of farm worker in the community. There should be watchdog organization for proper pesticide using behavior monitoring and evaluation. Data archive organization need to set up database system to document Pesticide health impact list and need to update regularly.

Moreover, the governments should improve monitoring system in regulation use of restricted pesticide and controlling local production of pesticides. There are a lot of promotion about pesticide using in agriculture sector but very few to declare about negative impacts of pesticide use on health and environmental impact due to pesticide. So NGOs, CSOs and agriculture Department should do nationwide

information campaign warning against the use of unbranded pesticides and giving awareness about negative impacts of pesticide use on health and environment should be made through various media (i.e, radio, TV and print media) to ensure wide coverage. Public health Departments and agriculture Departments should give pamphlets to pesticide user that provide information on the long and short- term illness because of pesticide use. On the other hand, should put billboards near rural agriculture lands to raise public awareness on the effect of pesticides.

Finally, recommended to encourage on knowledge sharing of pesticide awareness around the country side of Myanmar because of low education level of vegetable growers in general. The main problem about education is accessibility. It is very important to create an environment that children in the village are enabling to attain the level of education they wanted to be. According to this finding, the more respondents having appropriate pesticide exposure prevention practice, the less they used the expense for pesticide use. Thus, it was pointed that awareness raising session about not only pros and cons of the pesticide use but also preventive exposure practice should be promoted in all aspect. The advantages of pesticide application to improve production and increase yield are usually short term. On the other hand, its effects on farmers' health and on the environment are long term and sometimes permanent.

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APPENDIX

INTERVIEW QUESTIONS

FARMERS KNOWLEDGE, ATTITUDE, AND PRATICE ON PESTICIDE USAGE

IN HMAWBI TOWNSHIP

CASE STUDY ON VEGETABLE GROWERS

Part 1: Demographic and Socio-Economic

No	Information
1	Age..... years (full year)
2	Sex () 1. Male () 2. Female
3	Education attainment () 1. No formal education () 2. Primary School or equivalence () 3. Middle School or equivalence () 4. High school or equivalence () 5. Bachelor degree or equivalence () 6. Others, specify
4	Average family monthly incomeKyats.

Part 2: Farming situation and pesticide use

No	Information
5	Farm size.....hecta/
6	Duration that you engaging in farm..... years.
7	Duration of experience that you have used pesticide in farming..... years
8	Each season of cropping pesticide you use () 1. Organic pesticide only () 2. Chemical pesticide only () 3. Both equally () 4. Both but organic pesticide more than chemical () 5. Both but chemical more than organic
9	How long have you used organic pesticideyears
10	How long have you used chemical pesticide.....years

11	Expense on organic pesticide in the previous season.....Kyats VegetablesKyats,
No	Information
12	Expense on chemical pesticide in the previous season.....Kyats VegetablesKyats,
13	Average time spend for each pesticide sprayingminutes

Part 3: Farmers' Knowledge on pesticide

No	Awareness on pesticide using	Difficult	Normal	Easy
14	Finding information about pesticide toxic is			
15	Understanding the label that come with chemical pesticide container is			
16	Judging the advantages and disadvantages of chemical pesticide using is			
17	Finding information on how to manage pesticide toxic is			
18	Deciding not to use chemical pesticide against advice from family, friends and neighbors is			
19	Understanding about chemical pesticide spraying appropriate practice (such as dose, timing, concentration etc.) is			
20	Understanding how to use chemical pesticide properly in the media (such as radio, television, poster newspaper magazines is			

No	Knowledge on adverse impact of chemical pesticide	Yes	No
21	You know that chemical pesticide could enter your body by 3 routes inhalation, skin and mouth		
22	You know that chemical pesticides have only immediate (acute) toxic.		
23	You know that the most common route of chemical pesticide entering the body is through the skin.		
24	You know that all chemical pesticides are allowed to use in our country		
25	You know that chemical pesticides that are very strong is the best for farmer to use		
26	Cancer is related with chemical pesticide.		
27	The toxicities of chemical pesticide use include the residue in plant, soil and water.		
28	Toxicity of chemical pesticide occur among those who spray chemical pesticide only.		
29	Chemical pesticides use do no harm to the brain		
30	Nausea, vomiting and rash are not related with chemical pesticide		

Part 4: Farmers' Attitude on pesticide usage

No	Opinion	Dis-agree	In-different	Agree
31	Chemical pesticide help increasing the crop yields.			
32	Using chemical pesticides is better and more efficient for pest control			
33	Frequently changing new chemical pesticides could increase more crop yields			
34	Using mixtures of many types of chemical pesticides is better in controlling insects.			

No	Opinion	Dis-agree	In-different	Agree
35	Could use pesticide following neighbor's practices without reading the label first, if they have already had a good result.			
36	You do not need to wear protective devices while spraying pesticide, if it is inconvenient			
37	Pesticide is useful but may pollute the environment if improperly used			
38	During pesticide spraying, we could eat food or drinking water.			
39	People should have a bath with soap thoroughly after spraying pesticide to wash away the pesticide that may be attached with the body			
40	Using organic pesticide is inconvenient			
41	Organic pesticide is less efficacy in pest control than chemical pesticide			
42	You prefer using chemical pesticide than organic pesticide.			

Part 5: Farmers' Practice on pesticide usage

No	Practices	Never/seldom	Sometime	Always/usually
43	You use chemical pesticide based on seller recommendation			
44	You use chemical pesticide based on neighbor recommendation			
45	You use chemical pesticide based on the authorities recommendation			
46	You check information about the efficacy of pesticides before buying			
47	You notice chemical pesticide which labeled			

No	Practices	Never/ seldom	Sometime	Always/ usually
	properly and having warning sign of chemical, manufacturer name and registration number			
48	You check the information on adverse impact of chemical pesticide before using			
49	You read the instruction on the label before using chemical pesticides			
50	You use more than type of pesticide mix together to increase the effectiveness.			
51	You used mouth to blow blocked knapsack nozzles			
52	You used hand (do not wear gloves) to stir or mix chemical pesticide			
53	You wear mask cover nose and mouth while spraying chemical pesticide even though the weather is hot			
54	You wore long-sleeved shirt and trousers when spraying chemical pesticide.			
55	You wear goggles when spraying chemical pesticide.			
56	You always check your equipment before spraying			
57	You stop spraying chemical pesticide while having strong wind			
58	Children play in the areas which are spraying chemical pesticides			
59.	You separate clothes wearing when spraying chemical pesticide, do not wash with other clothes			
60	You eat food or drink water in the chemical pesticide spraying areas			
61	You store chemical pesticide in separate			

No	Practices	Never/ seldom	Sometime	Always/ usually
	room, does not mixed or contaminate			
62	You reused chemical pesticide containers for water or food			
63	<p>Have you ever feel acute health impact experience such as</p> <ol style="list-style-type: none"> 1. Nausea, Vomiting () 2. Rash, Itching () 3. Eye irritation () 4. Dizziness, () 5. deterioration of conscious () 6. Unconscious () <p>during and after spraying chemical pesticide.</p>			