Farmers' Awareness on using Pesticides and Its Environmental Impacts in Thongwa Township (A Case Study on West Village)

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Abstract **— The agriculture sector is one of the most important sectors for the country's economy. In Myanmar, every farmer usually uses pesticides in agriculture for increasing yield. Pesticides can cause many problems for human health and environment through water, air and soil. The main objective of the study is to assess the knowledge and practices concerned with use of pesticides of the farmers in Thongwa Township. To achieve the objective, one hundred and twenty farm workers in West Village were selected by applying simple random sampling method. Data collection was carried out by doing as the case study, face to face interviews with questionnaires. To analyze the data, descriptive statistics are used concerning frequency and percentage. By studying this research, pesticides are used more in various types of pests control in growing pulse and beans than paddy cultivation. The study shows that most of farmers do not wear protective materials when spraying pesticides because they are not well-educated and not aware of safety precaution measures. And also, most of the farmers are lack of awareness about registered pesticides. Although they know the negative impacts of pesticides on health and environment, they do not usually practise the safety manners. Farmers dispose the pesticide bottles and bags near the farm. Over half of farmers get information about the knowledge of using pesticides from pesticide sellers who prioritise selling pesticides to farmers for their self-profit. The study recommends that it is necessary to educate farmers for wearing protective equipment and on the proper disposal of pesticide bottles. The pesticide dealers need to explain how to use pesticides safely and also government should widely inform and induce the public about registered pesticides via training programs.**

Keywords: agriculture, pesticides, farmers, knowledge, awareness

I. Introduction

The agriculture is the most important sector for food production. In Myanmar, rice and bean and pulses are grown basically everywhere. In general, farmers grow rice during the monsoon season and beans and pulses during the dry season. Pesticides are used more in various types of pests control and in growing pulses and beans than paddy cultivation. Farmers use pesticides to improve agricultural production and increase yield.

The benefits of pesticides include increased food production, increased profits for farmers and the prevention of farm diseases especially it is possible to combat pests and produce larger amount of farm profits.

On the other side, the use of pesticide poses environmental problems such as air pollution and water pollution caused by toxic waste of pesticide and the death of fish and other insects. Agriculture sector causes pollution through pesticides and fertilizers applied to major corps as well as vegetable cultures. An increase of using high technology and pesticides to accelerate productivity of crops for providing population demand is a factor that worsens the environment and human health.

From a regulatory perspective, Myanmar has a basic management regime managing registration, production, distribution and use of pesticides. Pesticides, a valuable tool for agricultural production, must be used with great care, an expert warns. Safe pesticides handling practices include reading and following label information and direction, wearing clean personal protective equipment, never eating, drinking or smoking products when handling pesticides, showering and washing hair and cleaning under the fingernails at the end of each day, and do not dispose the empty containers into river, creek, fish ponds and water way. So, Farmers' practice of using pesticides can effect on environment and the health of human who lives near these areas. Thus, it is important to find out farmers' awareness and practice levels relating to the safely use of pesticides. The objective of the study is to access the knowledge and practices concerning with pesticide use of the farmers in West village.

II. Material And Methods

A. Scope of the Study

Among sixty four village tracts in Thongwa Township, West village was chosen to participate in this study. This village is situated in western part of Thongwa. There are about (2556) population and (730) households. Among them, (324) households are living on the farms and growing paddy, pluses and beans. In this study, (120) farm households were selected to collect the data.

B. Methods of the Study

The study used descriptive statistics regarding frequency and percentage to analyze the data. Firstly, the related reference books, journals, internet sources are studied to obtain the background information on awareness of the farm households, and, secondly, the quantitative method is used to collect and examine the level of knowledge on pesticide using of (120) farm households from West Village as a primary data.

III. Literature Review

A. Awareness

Awareness is a state of being conscious of one's self and one's surroundings. A state of being conscious and aware of one's awareness is called self-awareness and is considered a higher form of awareness. The science of biological psychology defines awareness as perception and cognitive response to a situation or circumstance. Awareness was defined by different authors. Praphol Milinthajinda defined awareness as an expression of feeling or perception, opinion, mindfulness of individuals; a state in which an individual has ability to understand and evaluate particular conditions or events, where the

individual's experiences of those particular conditions or events and length of time engaged are the factors of having awareness. Sommai Wanson described that awareness was similar to feeling or perception. A difference is that awareness is based cognitive approach and ability to be conscious of events, objects or sensory patterns. From the review, it was therefore to summarize that awareness was individuals' perception and recognition happened in a sudden towards particular conditions or events.

B. Pesticides

Pesticides are substances that are meant to control pests, including weeds. The term pesticide includes all of the names such as herbicide, insecticides, nematicide, molluscicide, piscicide, avicide, rodenticide, bactericide, insect repellent, animal repellent, antimicrobial, fungicide and disinfectant. The most common of these are herbicides which account for approximately 80% of all pesticide use. Most pesticides are intended to serve as plant protection products (also known as crop protection products), which in general, protect plants from weeds, fungi, or insects.

In general, a pesticide is a chemical or biological agent that deters, incapacitates, kills, or otherwise discourages pests. Target pests can include insects, plant pathogens, weeds, molluscs, birds, mammals, fish, nematodes, and microbes that destroy property, cause nuisance, or spread disease, or are disease vectors. Along with these benefits, pesticides also have drawbacks, such as potential toxicity to humans and other species.

C. Impacts of Pesticide use in Agriculture

The primary benefits are the consequences of the pesticides' effects- the direct gains expected from their use. The effect of killing caterpillars feeding on the crop brings the primary benefit of higher yields and better quality of vegetables. If the credits of pesticide include enhanced economic potential in terms of increased production of food and fiber, and amelioration of vector-borne diseases, then their debits have resulted in serious health implications to man and his environment.

Some of these chemicals do pose a potential risk to human and other life forms and unwanted side effects to the environment. Pesticides can contaminate soil, water, turf, and other vegetation. In addition to killing insects or weeds, pesticides can be toxic to a host of other organisms including birds, fish, beneficial insects, and non-target plants. Insecticides are generally the most acutely toxic class of pesticides, but herbicides can also pose risks to non-target organisms. Pesticides can reach surface water through runoff from treated plants and soil. Contamination of water by pesticides is widespread. At a larger outlook, economic losses can be rooted from misuses of pesticide with shortage of knowledge and awareness of safety.

D. Effects of Pesticides on Human Health and Environment

Organophosphate pesticides used in the vegetables gradually get deposit into human body and has a link with cancer (Miah et al.2014). Wimalawansa and Wimalawansa (2014) assessed the impact of changing agricultural habits, including the excessive and indiscriminate use of toxic agrochemicals, allowing continued environmental contamination and contamination of the human food chain. Contamination of soil and water with toxic agrochemicals (e.g., phosphate fertilizer contaminated with heavy metals, pesticides and herbicides etc.) are a particular concern. These pollutants in water generally are in small quantities, and thus, cannot be seen or tasted. Therefore, their harmful effects do not manifest in humans for several years but led to the escalation of deadly disease like chronic kidney disease.

Kumar et al. (2013) concluded that pesticides are often considered a quick, easy and inexpensive solution for controlling weeds and insect pests in urban landscapes. Pesticides have contaminated almost every component of our environment and non-target organisms ranging from beneficial soil and microorganisms, to insects, plants, fish, and birds. Contrary to common misconceptions, even herbicides can cause harm to the environment.

Pesticides have contaminated almost every part of our environment and pesticide residues are found in soil, air and in surface and groundwater. Pesticide contamination poses significant risk to the environment and non-target organisms ranging from beneficial soil microorganisms to insects, plants, fish, and birds. The environmental deterioration due to pesticides is endangering the situation of future (Sitaramaraju et.al. 2014).

IV. The Role Of Agriculture In Thongwa Township

A. Background Information

Thongwa township is located in South Yangon District, Yangon Region. It is 48 kilometers southeast of the Yangon. It has an area of 835.5 km^2 .There are 12 wards, 64 village tracts in Thongwa Township. The population was 163165 in 2018. The majority of the people (134992) in this Township live in rural areas and only 28173 living in urban areas. The population density of Thongwa Township is 195 people per square kilometer. Among the village population, 57 percent are farm households and the rest (43 percent) are non-farm households. The total agricultural land is 146505 acres and accounts for 70.96 percent of total areas. Most population living in rural areas have to mainly rely on the farming as the primary means for livelihood. Paddy land (*le*) is 144978 acres, accounting for 98.9 percent of the total agricultural areas. The rest is 939 acres (0.6%) is orchard (*uing*) and 588 acres (0.4 %) toddy palm (*dani*).

B. Condition of Agricultural Production

Before 1990s, Thongwa Township was a typical paddy single crop area. In the dry season, some dry season crops (such as groundnuts, sunflower and cowpea) were grown on a limited scale. At that time, paddy was the only scheduled crop in the area that was subject to government procurement. The major crop pattern in Thongwa Township changed dramatically in the early 1990s. Rain-fed paddy remained the crop grown in the monsoon season (May – October), but in the dry season (November – April), green gram (*Pedisein*) was cultivated. The paddy land is cultivated to the maximum in the township. By the end of the 1990s, green gram acreage increased over 90,000 acres. In 2018-2019, Green gram cultivated areas increased to 129984 acres. Green gram has become the second crop after monsoon paddy. Most of the households earn on living by the agricultural farms. All farmers use

the different kinds of pesticides to control pests and for increasing the yield of paddy, beans and pluses. For increasing agricultural production and productivity, use of chemical inputs such as pesticides has increased. However, they have no proper awareness on how to use the systematically, how to dispose the containers after used, how to prevent the risks of pesticides and also they do not consider the consequences of the negative effects of pesticides.

V. Case Study On West Village

There are 64 villages in Thongwa Township. The West Village is located in the western part of Thongwa Township. The total population is (2556) people and there are (730) households. Their occupations are farmers, factory workers, vendors, manuals and small retailer shops. Most of the people in the West Village are low-income group and (324) households out of (730) households earn on living by the agricultural farms, owning from two to fifty acres. They are growing a variety of crops. Almost all the cultivating areas are located near the house of the farmer. Many farmers in this area use the multiple types and variety of chemical pesticides to control pests and diseases affecting crops. It is the place that highly cultivates crops (including rice, pluses and beans) the whole year. So, this area can be assumed that the use of pesticides is higher than any other villages.

VI. Results And Discussion

Table (1) shows socio-economic characteristics of the respondents. According to this survey, 87% of the farmers are male and 13% of them are female respondents. The number of male is normally higher than that of female in the farm. The study showed that majority (32.5%) of the respondents was between the age of 51 and 60 years. And also, the years of experience in using pesticides of farmers have been long. The years of using pesticides experiences of the 84 farmers ranged from 1-20, with an average age of 18 years.

The majority of respondents (29%) are monastery level, 27% are primary level, 25% are secondary level, 15% are high level and 4% are graduate level. Therefore, it is concluded the most people are not well-educated due to their low investment in their education.

The majority (42%) of the respondents are a farm size of less than 10 acres. This could be related to the small-scale farming practices coupled with the use of manual tools in almost at the farming practices pesticide application inclusive. The most respondents (68%) have an annual income between MMK2000000 and MMK3000000 because their cultivated land areas are less than 10 acres. Results showed that three (2.5%) respondents had an annual income over MMK6000000 because they possessed over 20 acres. Therefore, the income of farmers are mainly dependent on farm possess.

Table (1) Socio-economic Characteristics of the Respondents

Variables	Frequency	Percentage
Gender		
Male	104	86.7
Female	16	13.3
Age(Years)		
Between 20 and 30	3	2.5
Between 31 and 40	16	13.3
Between41 and 50	29	24.2
Between 51 and 60	39	32.5
Over 60	33	27.5
Level of Education		
Monastery Level	35	29.0
Primary Level	32	27.0
Middle Level	30	25.0
Higher Level	18	15.0
Graduate Level	5	4.0
Family members (Number)		
Less than 3	44	37.0
3-5	61	51.0
6-10	15	12.0
More than 10	-	-
Farm Size		
Less than 5 Acres	35	29.0
Between 5 Acres and 10 acres	51	42.0
Between 11 Acres and 20 Acres	26	22.0
21 Acres and above	8	7.0
Annual Income (MMK ,000)		
Less than 2000	-	-
2000-3000	81	68.0
3001-4000	26	22.0
4001-5000	6	5.0
5001-6000	4	3.0
More than 6000	3	2.0
Use of pesticides experience (Years)		
1-10	43	36.0
11-20	41	34.0
21-30	32	27.0
31-40	3	2.0
Over 40	1	1.0

Source: Surveyed Data (March, 2019)

Table (2) reveals that the farmers have got the sources of knowledge for choosing the types of pesticides for their fields. According to the table, most of the farmers (71.7%) have got knowledge about the pesticides which are used in their fields from the sellers of pesticides. They knew the names of the pesticides they were using but they do not know whether these pesticides are registered or not. Among them, (1.7%) of the respondents got the information from their friends, (5.8%) achieved the knowledge from other farmers, (18.3%) got the information from the Agricultural Development, and only (2.5%) knew themselves. This means that most of the respondents are more reliable to the sellers and they usually investigate about the pesticides from their regular sellers.

Table (2) Sources of Information about Using Pesticides

Source of Information	Frequency	Percentage
Friends	2	1.7
Near from farmer	7	5.8
From seller	86	71.7
From Department of Agriculture	22	18.3
Not from anyone	3	2.5
Total	120	100

Source: Surveyed Data (March, 2019)

According to the table (3), most farmers (78.3%) spray pesticides without using personal protective equipment. By seeing this condition, most farmers do not understand the actual effectiveness of personal protective equipment because their education level is not too high and lack awareness of pesticide and safety precaustion measures. Most of the respondents answered that they spray twice a day, in the morning and evening and did not avoid even in the days with high wind.

Table (3) Usage of the Personal Protective Equipment

Clothing facilities on worksite	Frequency	Percentage
No dress	94	78.3
Dress	26	21.7
Total	120	100.0

Source: Surveyed Data (March, 2019)

In table (4), (112) respondents out of (120), by percentage (93%), always mix the pesticides they used in their fields while only (8) respondents mix the pesticides in other places. It was found that most of farmers have mixed pesticides in the farms.

TABLE (4) PLACE OF MIXING PESTICIDES

Place of mixing pesticides	Frequency	Percentage
Home	0	0
Field	112	93.0
Other	8	7.0
Total	120	100

Source: Surveyed Data (March, 2019)

Table (5) shows the place of disposing the empty pesticide containers after using by farmers. In the table, (94.2%) of them have disposed the empty containers near the fields which is sprayed the pesticides, 5% released the other places and 0.8% disposed it at home. This means that all the respondents did not have enough knowledge for releasing the empty containers and they do not take care of their health as well as environment.

TABLE (5) PLACE OF DISPOSING EMPTY PESTICIDE CONTAINERS

Disposal of pesticide empty containers	Frequency	Percentage
Home	1	0.8
Field	113	94.2
Other	6	5.0
Total	120	100

Source: Surveyed Data (March, 2019)

According to the table (6), the majority of respondents (82.5%) are washing their clothes separately and taking a bath and cleaning up after they had sprayed the pesticides and (17.5%) do not wash their clothes separately. Result indicated that farmers know the negative impact of using pesticides concerning their health.

TABLE (6) SITUATION OF WASHING CLOTHES SEPARATELY

Washing Clothes Separately	Frequency	Percentage
Yes	99	82.5
No	21	17.5
Total	120	100.0

Source: Surveyed Data (March, 2019)

From the table (7) it can be seen that the majority (above 90%) of respondents knew that pesticides harm livestock, human health and environment in this village. They did not smoke, eat or drink while spraying pesticides. It was found that the respondents' level of knowledge was high. Although they have knowledge regarding this problem, they do not apply this knowledge in practice.

TABLE (7) KNOWLEDGE OF RESPONDENTS ABOUT THE IMPACT OF PESTICIDES

Knowledge	Yes (%)	No (%)
Pesticides affect human health	120 (100)	-
Pesticides affect livestock	111 (93)	9 (7)
Pesticides affect environment	119 (99)	1 (1)

Source: Surveyed Data (March, 2019)

VII. CONCLUSION

The results showed that in spite of farmers have knowledge about the potential negative effects of pesticides on the human and for somewhat on the environment, lack of their safety measures was dominant. Almost the farm workers lack knowledge of the importance of personal protective equipment as well as they do not pay attention to the mixing place of pesticides because they usually mix the pesticides with water near by the fields before spraying them. Moreover, they release the empty pesticide bottles and bags near the fields. Results obtained from the above data show that this improper manners and practices affected the environment and habitat around the fields.

The study shows that most of farmers do not wear protective materials when they are spraying pesticides because they are not well-educated and not aware of safety precaution measures. And also, most of the farmers are lack of awareness about registered pesticides. Although they know the negative impacts of pesticides on health and environment, they do not usually practice the safety manners. Farmers dispose the pesticide bottles and bags near the farm.

Over half of farmers get information about the knowledge of using pesticides from pesticide sellers. As a result, they answered that they know how pesticides affect seriously on human and environment and the disadvantages of using pesticides but in practice, they never take care the proper ways of using pesticides. Beside it is studied that they do not have full knowledge about the using pesticide and explore from the reliable sources such as Department of Agriculture because they only get the information from their regular sellers and they just know only what the sellers said.

The study recommends that it is necessary to educate farmers for wearing protective equipment and on the proper disposal of pesticide bottles. The pesticide dealers need to explain how to use pesticides safely and also government should widely inform and induce the public about registered pesticides via training programs. As the Department of Agriculture, it is necessary to conduct the trainings for the farmers to use the pesticides systematically and be aware of the negative impacts of pesticides on environment and human health. As well as it needs to support the ways of using the preventive clothes such as masks, hats and gloves, to mix the pesticides with water far from the water sources especially near the creeks and wells, and to dispose the empty containers after user.

According to the study, most farmers answered that they know the negative impacts of using pesticides but in practice, they do never obey the guidelines of practicing pesticides. So, it should broadcast widely about advantages and disadvantages of using pesticides through TV channels that the using pesticide without attention and overuse can directly impacts the users and environments.

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