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Pesticides Use Practice and its Related Factors among Farmers in Pyin Oo Lwin Township, Myanmar

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Abstract

The purpose of this descriptive cross-sectional study was to assess pesticides use practice and its significant factors among farmers in Pyin Oo Lwin Township, Myanmar. Data were collected from eight villages using proportional and simple random sampling from January to February 2013. A total sample of 219 farmers who grew flowers and vegetables was interviewed with structured questionnaires. Result indicated that the average age of respondents was 39.8 years and S.D. of 13.2 with a male to female ratio of 1.05:1. The majority of them were between 40 and 49 years old, married and lived with their children having average 79.74 US $ per month. Totally, 57.1 % had been using pesticides for more than 10 years. In addition, 47 % had good knowledge, 16.9 % had good perception, and most respondents had moderate accessibility to protective equipment but low accessibility to information, low availability to training program, and low social support. It revealed that their pesticides use practices were significantly and positively correlated with gender, monthly income, education, knowledge on pesticides danger and its usage, and accessibility to protective equipment and information, and social support. All had a positive correlation at p-value < 0.05.

Keywords: Pesticides use practice; Flower and vegetable growing farmers; Myanmar

1.0 Introduction

Pest outbreak usually occurs on rice, pulses, cotton, vegetables and flowers and the use of chemical control is an effective method in Myanmar (FAO, 2007). In addition to that, due to the introduction of multiple cropping system and intensive

Agricultural program, pest has become more problematic. As a result, the trend of pesticide use is annually enhancing. Moreover, according to Ministry of Agriculture and Irrigation (2009), there are significant problems with low quality pesticides in the market (Than, 2006) , use of the old pesticide formulations (FAO, 2007), and no registered pesticides identified yet by the Rotterdam Convention and Stockholm Convention in Myanmar(Than,2006). In addition, there are public health and environmental problems in Myanmar due to the adverse effects of pesticides. According to general survey conducted in sixteen states and division hospitals, 23 out of 216 acute pesticides poisoning cases resulted in deaths due to organophosphates, 9 deaths out of 89 and 6 deaths out of 82 by insecticide and rodenticide, respectively (Myint, 2005). In 2006, 47 deaths occur out of 532 pesticides poisoning cases and 59 deaths out of 608 cases in 2007 (Thein, 2012). The utilization of pesticides with preventive measures is still weak according to the previous research done in Myanmar. It was found that unsafe attitudes and hazardous practices in pesticides usage are very common due to financial constraints and problems in using recommended protective measures especially when spraying from boats in Inle Lake where pesticide is used mainly to increase yield of tomatoes by preventing the pest (UNDP-Myanmar, 2012).

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Pyin Oo Lwin mainly produces flowers and vegetables in Myanmar. The most important flowers grown intensively are chrysanthemum, aster and gladiolus, which are exported to every corner of Myanmar throughout the year. Moreover, Pyin Oo Lwin also produces a wide range of vegetables (Aye, 2007) and exports them to every part of Myanmar throughout a year. Total vegetables growing area in Myanmar is 407 million hectare and total production is 4,357 million metric ton (Ministry of Agriculture and Irrigation, 2009). Last, vegetables are a major component in daily diet of Myanmar.

As chemicals have an immediate knock-down effect and are easily available in the local market, farmers commonly use pesticides to prevent insect pests. According to this pesticides use in demand of vegetable and flower production in this area, it creates the researcher to conduct this research**.**

Methods

The research is a cross sectional descriptive study to identify the socio demographic characteristics, knowledge of famers on pesticide and its usage, perception about pesticides use, accessibility to protective equipment and information about pesticides and its use, social support and pesticides use practices among farmers. The research was conducted between 17th January and 16th February 2013 in Pyin Oo Lwin Township, Mandalay Division, in Myanmar.

Study location

Pyin Oo Lwinis a town in Mandalay Division, Myanmar, situated in the Shan hilly region, some 67 kilometers (42 miles) east of Mandalay, and at an altitude of 1,070 meters (3,510 ft.) with the total population of 386,815 according to the data from Myanmar Information Management Unit (Worldatlas, 2012). Due to its climate, horticultural crops such as flower and vegetables are mostly cultivated using farm inputs especially pesticides. There are 47 village tracts and they are divided into 146 villages with 21,288 households. Map of Pyin Oo Lwin is displayed in Figure 1.

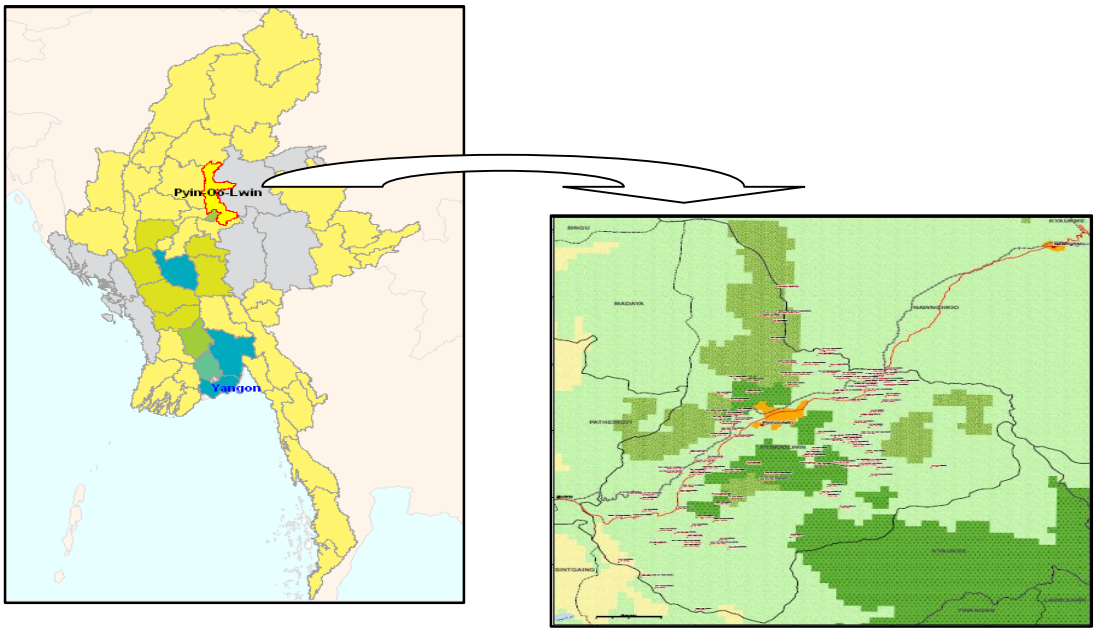

Figure 1: Map of Pyin Oo Lwin Township in Myanmar

Study population and sampling

The study population was farmers 15 years old and above who grow flowers and vegetables and use pesticides in Pyin Oo Lwin Township, Mandalay Division, and Myanmar. Totally, 219 participants were estimated and sampled from the population. The sampling participants were done by targeting 146 villages at Pyin Oo Lwin Township through eight clusters based on the geographic units.

From each cluster, numbers of villages were proportionally and randomly sampled according to the density of villages in each cluster. Finally, number of households at each village was proportionally and randomly chosen according to the density of households in villages.

Data collection

Data collection was carried out by using the structured questionnaires. Pretest was conducted before the actual data collection. Collection of data for reliability test was done in Than Lynn Township as average farmers working at this place were similar in socio demographic condition of the target research area. This reliability was tested by using Cronbach's coefficient of alpha and alpha value was 0.786. After adjusting the questionnaires, data collection was started in the study area.

Ethical issues

All respondents were informed the study objectives and confidentiality was maintained in the study. The verbally informed consent was requested from individual respondent and the participation was optional. The respondents had the rights to ask any questions related to their survey questions. No name was recorded and all respondents were kept as anonymous. All answers were kept in confidential, locked in the cabinet, and any others could not have a chance to access all data except the researcher. After all data were computerized, these answers were destroyed. Ethical approve was obtained from the Ethical Review Committee of Mahidol University with the approval protocol of 265/2555 (MUPH 2013-1-30)

Statistical analysis

Mean, standard deviation and %age for all variables were calculated according to their scale of measurement by using SPSS. For testing association between independent and dependent variables, Pearson's correlation and Chi-square test were used. The significant level was set up at alpha level of 0.05.

Measurement and scoring criteria

1. Pesticides use practice

The pesticides practice among vegetables and flowers growing farmers were divided into four parts (always, sometimes, rarely, never) and questions were included according to the frequency to perform this practices. the levels of performing practices were categorized into three different levels: high, moderate and low level based on total mean score (Table 1).

Table 1: Percentage of levels of pesticides use practice

High level	>80 % of total scores
Moderate level	60-80 % of total scores
Low Level	<60 % of total scores

2. Knowledge and perception

The correct answers for knowledge were given as 1 score, the incorrect as no score. While the scores for perception was divided according to Likert Scale. The levels of perception were classified as strongly agree, agree, uncertain, disagree, and strongly disagree. The % level of knowledge and perception was divided into three different criteria as below (Table 2).

Table 2: Percentage of levels of knowledge and perception

Good Knowledge/perception	>80 % of total scores
Fair Knowledge/perception	60-80 % of total scores
Poor Knowledge/perception	<60 % of total scores

3. Enabling factors

Enabling factors included accessibility to protective equipment, information from media and availability of training program. The enabling factors were differentiated into three levels as high, moderate and poor levels as below (Table 3).

Table 3: Percentage of levels of enabling factors

High	>80 % of total scores
Moderate	60-80 % of total scores
Low	<60 % of total scores

Results

The general characteristics of 219 respondents were revealed as age, gender, marital status, educational level, monthly income, years of pesticides use, number of children living with respondents, and number of children under fifteen years old working in the fields are summarized in Table 4. The youngest age was 16 years and the eldest was 72 years with the average age of 39.8 years and SD of 13.2 with a male to female ratio of 1.05:1. In addition, the majority of respondents (24.7%) were between 40 and 49 years old.

Approximately, 76.3 % of the respondents were got married, and 41.1 % of respondents finished primary school followed by secondary school (32.9 %) and only 3.2 % were belonged to college, university or higher education. However, 4.6 % were still the illiterates among respondents. The average monthly income was over 79.59 US $ (1US$ = 879.5 Kyats) which meant over 70,000 Kyats with SD of 30,478.77 and the majority (65.8%) owned between 30,000 and 100,000 Kyats. Furthermore, most respondents (57.1%) had been using pesticides in agriculture for more than ten years and only 5 % t had used pesticides for their planting for less than one year with the average of 12.1 years of pesticides use and S.D. of 6.33.

Respondents had 7 children at most and 29.7 % had no single child. Excluding single respondents of 20.5 %, more than half (51.1 %) had two to four children by having average 3 children and S.D. of 1.72 for total respondents.

Table 4: Distribution of socio-demographic characteristics of respondents (n= 219)

Characteristics of respondents	Number (%)
Age (in complete years)	
15-19	9 (4.1)
20-29	46(21.0)
30-39	51(23.3)
40-49	54(24.7)
50-59	41(18.7)
60-69	17(7.8)
70+	1(0.5)
Gender	
Male	112(51.1)
Female	107(48.9)
Marital Status	
Single	45(20.5)
Married	167(76.3)
Divorced	3(1.4)
Separated	4(1.8)
Educational level	
Illiterate	10(4.6)
Primary school	90(41.1)
Secondary school	72(32.9)
High school	40(18.3)
College/University or higher	7(3.2)
Monthly income (Kyats)	
Less than 30,000 Kyats	24(11.1)
30,000 to 100,000 Kyats	144(65.8)
More than 100,000 Kyats	51(23.3)
Years of pesticides use	
Less than 1year	11(5.0)
1-10 years	83(37.9)
More than 10 years	125(57.1)
Number of children living with respondents (n = 174)	
No child	16(9.2)
1 child	27(15.5)
2-4 children	89(51.1)
More than 4 children	42(24.1)

The knowledge level of the respondents about dangers and pesticides use was presented in the following Table 5. Result revealed that 47.0 % of the respondent was belonged to good knowledge, however, compared to overall fair and poor knowledge level (53.0 %), the %age was quite lower. The overall average score was 8.91 with S.D. of 2.25.

Table 5: Knowledge levels about harmful effects of pesticides and its use (n=219)

Levels of knowledge	Number (%)
Good knowledge (10-12 scores)	103(47.0)
Fair knowledge (8-10 scores)	66(30.2)
Poor knowledge (0-7 scores)	50(22.8)
Mean ± S.D. = 8.91 ± 2.25	

Perception is reviewed by perceived susceptibility, severity, benefits and barriers consequently. Result indicated that over half of respondents (56.6 %) had fair perception. The average was 3.69 with S.D. of 0.52 (Table 6).

Table 6: Levels of total perception towards harmful effects of pesticides and its use (n=219)

Levels of total perception	Number (%)
Good perception(>4.2 scores)	37(16.9)
Fair perception (3.4 – 4.19 scores)	124(56.6)
Poor perception (<3.39 scores)	58(26.5)
Mean ± S.D. = 3.69 ± 0.52	

Enabling factors included accessibility to protective equipment, information from media and availability of training program. Accessibility was assessed by availability and affordability of protective equipment. Result showed that over 65 % were belonged to low level which meant that over half of respondents could not access or afford to buy or get information from media or obtain training program (Table 7).

Table 7: Levels of total related factors towards pesticides use practice (n=219)

Levels of enabling factors	Number (%)
High (>15.scores)	5(2.3)
Moderate (11-15 scores)	71(32.4)
Low (<11scores)	143(65.3)
Mean ± S.D. = 9.75 ± 3.44	

Practicing pesticides included four different parts starting from preparing pesticides, during spraying, after spraying and during not using days. Regarding to the Table 8, over 45 %, nearly half of respondents practice pesticides in appropriate ways; however, there were 11.2 % who did not practice well with the average 2.27 and S.D. of 0.35.

Table 8: Levels of pesticides use practice (n=219)

Levels of total pesticides use practice	Number(%)
High practice (>2.4 scores)	92(43.0)
Moderate practice (1.8-2.39 scores)	98(45.8)
Low practice (<1.79 scores)	24(11.2)
Mean ± S.D. = 2.27 ±0.35	

In parts of some socio-demographic characteristics, factors such as gender and educational status had significant correlations with pesticides use practices when tested with Chi-square (p-value < 0.05) as shown in the Table 9.

Table 9: Correlation between some socio-demographic characteristics and pesticides use practice

Socio-demographic characteristics	Levels of total pesticides use practice			χ^2 (df)	p- value
	High	Moderate	Low		
	Number (%)	Number (%)	Number (%)		
Gender					
Male	41(18.7)	48(21.9)	23(10.0)	8.723	0.013*
Female	53(24.2)	46(21.0)	8(3.7)	(2)	
Marital Status					
Single	21(9.6)	18(8.2)	6(2.7)	0.325	0.85
Married, Divorced, Separated	73(33.3)	76(34.7)	25(11.4)	(2)	
Educational level					
Illiterate, Primary school	37(16.9)	48(21.9)	15(6.8)	11.43	0.022*
Secondary school	30(13.7)	27(12.3)	15(6.8)	(4)	
High, College, Vocational school	27(12.3)	19(8.7)	1(0.5)		

*Significance at p-value < 0.05

In addition, the correlation between other predisposing factors and pesticides use practices are presented in Table 10. Factors such as years of pesticides use and number of children living with respondents had no significant correlation with practicing pesticides safely. Although age was not significant with total pesticides use practices, correlation was found significant after spraying (r=0.142, p-value <0.05). It was found that monthly income was correlated with total pesticides use practices at (r=0.148) and p-value < 0.05. The knowledge was correlated with pesticides use practices (r = 0.423, p-value <0.001). In addition, the perception was correlated with pesticides use practices (r=0.396, p-value <0.001). However, perceived susceptibility was not associated with overall practices.

Table 10: Correlation between predisposing factors and pesticides use practice

Predisposing factors	Types of pesticides use practice									
	During preparing		While spraying		After spraying		During not using		Pesticides use practice	
	r	p-value	r	p-value	r	p-value	r	p-value	r	p-value
Age	0.03	0.627	0.013	0.848	0.142	0.035*	0.084	0.21	0.033	0.627
Monthly income	0.162	0.02*	0.15	0.022*	0.066	0.328	-0.005	0.94	0.148	0.029*
Years of pesticides use	-0.045	0.506	-0.057	0.398	0.042	0.538	-0.028	0.686	-0.045	0.506
No of children	0.073	0.339	0.078	0.326	-0.008	0.912	0.001	0.99	0.065	0.395
Knowledge	0.36	<0.001*	0.367	<0.001*	0.232	<0.001*	0.324	<0.001*	0.423	<0.001*
Total perception	0.314	<0.001*	0.374	<0.001*	0.191	0.005	0.303	<0.001*	0.396	<0.001*
Perceived susceptibility	-0.04	0.519	0.063	0.356	0.004	0.958	0.125	0.066	0.038	0.571
Perceived severity	0.10	0.135	0.147	0.030*	0.003	0.969	0.148	0.029*	0.142	0.036*
Perceived benefits	0.34	<0.001*	0.302	<0.001*	0.084	0.215	0.295	<0.001*	0.355	<0.001*
Perceived barriers	0.303	<0.001*	0.335	<0.001*	0.292	<0.001*	0.177	0.009*	0.362	<0.001*

*Significance at p-value < 0.05

Not only total enabling, but also accessibility to protective equipment, and information from media were significantly correlated with pesticides use practice (r= 0.71, p-value < 0.001) except receiving training program including during preparing, while and after spraying, and when not used as in Table 11.

Table 11: Correlation between enabling factors and pesticides use practice

Factors	Types of pesticides use practice									
	During preparing		While spraying		After spraying		When not used		Total pesticides use practice	
	r	p-value	r	p-value	r	p-value	r	p-value	r	p-value
Total Enabling	0.71	<0.001*	0.68	<0.001*	0.2	<0.001*	0.32	<0.001*	0.71	<0.001*
Accessibility to protective equipment	0.71	<0.001*	0.703	<0.001*	0.23	<0.001*	0.20	<0.001*	0.69	<0.001*
Information from media	0.43	<0.001*	0.364	<0.001*	0.13	0.06	0.38	<0.001*	0.44	<0.001*
Receiving Training program	0.67	0.33	0.102	0.161	0.09	0.18	0.09	0.19	0.11	0.12

*Significance at p-value < 0.05

In addition, it was found that there was significant positive correlations between social support and pesticides use practices while preparing (r=0.441, p < 0.001), while spraying (r=0.40, p < 0.001), after spraying (r=0.31, p < 0.001) and when not use (r=0.347, p < 0.001) (Table 12).

Table 12: Correlation between social support and pesticides use practice

Factors	Types of pesticides use practice									
	During preparing		While spraying		After spraying		When not use		Total pesticides use practice	
	r	p-value	r	p-value	r	p-value	r	p-value	r	p-value
Social Support	0.441	<0.001*	0.40	<0.001*	0.31	<0.001*	0.34	<0.001*	0.489	<0.001*

*Significance at p-value < 0.05

Discussion

The average age among respondents in this study was 39.8 and most respondents were between 30 and 49 years old. Although it was different with the study by Schenker et al.(2002) (average age of 54 years), it was quiet similar to the study of William et al.(2006) in Ghana. In this study, there was not a significant association between age and pesticides use practices. However, there was a significant association between age and after spraying pesticides (r=0.142, p<0.05). This would be different from a previous study by Schenker et al.(2002) who proved that the younger the farmers less than 40 years old, the better protection they used. On the other hand, this study was still similar to Ntow et al.(2006) and Hashemi et al.(2012) where farmers whether older or younger had no significant correlation of safety measures.

Another interesting variable was gender. Similar to the previous studies of investigators (Ntow et al.,2006) ; Schenker et al.,2002; Zyoud et al.,2010 ; Pasiani,2012), the proportion of male respondents were higher in number around 51.1 % compared to 48.9 %. In this present study, there was an association between gender and pesticides use practices (χ^2 = 8.7, p<0.05) similar to the studies of Schenker et al.(2002) and Atreya (2007). However, in these previous studies, male respondents had high level of awareness and better use of protection from pesticides which was different with this present study. In this study, female respondents had high level of pesticides use practices safely by 24.2 % compared to 18.7 % male respondents. Over 76 % respondents got married in this study; however, there was no correlation between marital status and pesticides use practice (p>0.05). Concerning with education of respondents, the highest education for most respondents around 41 % was primary school. Only 3.2 % had higher education such as college or university. There were still 4.6 % of the respondents who were illiterate.

That could cause difficulties for those farmers to read the labels and instructions containing how to take care of themselves from hazardous effects of pesticides on the pesticides containers. Similar to the previous studies of researchers (Jensen et al., 2011; Zyoud et al.,2010; Gaber & Abdel-Latif, 2012), most farmers had only basic education. In addition, there was a strong association between education and safe use of pesticides (χ^2 = 11.438, p<0.05) in this study. Poor educated farmers practice pesticides poorly compared to that of high educated farmers. This was similar to the studies by Gaber and Abdel-Latif (2012) and the study from Cambodia (Jensen et al., 2011) where moderate pesticides poisoning cases were reduced by 55% (OR = 0.45, CI 95%: 0.22–0.91) as farmers with high education who followed each protective measure compared to low educated farmers.

Income was indirectly affected to farmers for buying protective equipment in protecting themselves from pesticides dangers. Their average income was over 70,000 Kyats which meant 79.59 US$ (1US$ = 879.5 Kyats). Totally, 65.8 % farmers owned around 70,000 Kyats per month but there were only 11 % who had less than 30,000 Kyats. In fact, monthly income was totally correlated with safe use of pesticides (r=0.148, p<0.05). Farmers with higher income were able to buy protective equipment almost all the times. Therefore, income indirectly caused benefits to farmers in protecting themselves from harmful effects of pesticides.

The majority of the farmers around 57 % had been using pesticides for their agriculture for more than 10 years. This was similar to the previous studies of investigators (Ntow, 2006: Jensen et al., 2011; Mekonnen & Agonafir, 2002). Although the studies done by investigators (Chaleosilp,2002; Schenker et al.,2002; Jensen et al., 2011) showed that years of pesticides use was positively and significantly associated with safe use of pesticides, there was no association in this study concerning with years of pesticides use in both during preparing, spraying, after spraying, and during when not using pesticides. The reason was that old farmers still could follow traditional ways of spraying pesticides and not care much about pesticides dangers and its usage or poor information, enabling factors and social support for those old farmers.

Regarding to knowledge level of respondents, 47 % of the respondents had good knowledge, 30.1 % had fair knowledge and 22.8 % had poor knowledge. Although good knowledge belonged to higher number of respondents, it was quite lower when compared with the combination of the percentage of fair and poor knowledge. This study was similar to the study in Gaza Strip in which 97.9 % had high level of knowledge. On the other hand, the majority of farmers had low knowledge in the study of Pascale et al.(2004). In fact, there was a positive correlation between knowledge and pesticides use practices (r=0.423, p<0.001) as in the studies of Zyoud et al.(2010), and Perry et al. (2002).

Literally, knowledge can be gained from not only information distributed from media or past experience but also from social support in delivering information about pesticides use and its danger. Low knowledge respondents may be farmers who could not access information from media, poor recognizing of past experience and social support as both information from media and social support were positively correlated with pesticides use practices (r=0.44, p<0.001) and (r=0.489, p<0.001) respectively. Therefore, farmers with better knowledge practiced pesticides more safely.

In addition, overall perception for the majority of respondents was in fair perception around 56.6 %. 16.9 % were belonged to good perception whereas 26.5 % had poor perception. Total perception was significantly associated with pesticides use practices in this study (r=0.396, p<0.001) as in the study of investigators (Schenker et al.,2002; Gaber & Abdel-Latif, 2012). However, in this study, there was no correlation between perceived susceptibility and pesticides use practices (r=0.038, p=0.571) including all four times such as during preparing, while and after spraying, and during not using days. Despite being poor in their perception towards susceptibility as most farmers thought that they were not susceptible to get any harms from pesticides and many farmers disagreed that they will not use pesticides in the future even knowing harmful effects of pesticides, the total practice was in moderate level as the majority of farmers had good knowledge. In addition, the explanation of perceived susceptibility, perceived severity, and perceived benefits had no significant relationship with pesticides use practices after spraying pesticides was found out. For after spraying, majority of farmers washed hands at once after spraying and took a bath right away after spraying, and nearly half of respondents washed protective equipment after using since the more no barriers in using pesticides safely, farmers perceived better pesticides use practices (r=0.362, p<0.001).

In this study, 65.3 % had low enabling factors and only 2.3 % had high enabling factors. For accessibility to protective equipment, over half of farmers had protective equipment to use in the field. Since there was accessibility of protective equipment in moderate level, there was a positive correlation between accessibility to protective equipment and pesticides use practices ($r=0.69$, $p<0.001$). Not only accessibility to protective equipment, getting information from media was low for these respondents in this study. Therefore, although 47 % had good knowledge, there were total 53.0 % had both fair and poor knowledge. Furthermore, getting information from media was positively associated with total pesticides use practices ($r=0.44$, $p<0.001$) including during preparing, while and after spraying, and during when not using pesticides. The more farmers get information from media, the better they can practice pesticides safely.

Receiving training was also the interesting variable which was found that many farmers did not get training and only few got training program from pesticides selling companies. However, with the few number of getting training program, it is hard to evaluate whether training can improve preventive behaviour as there was also no association between training program and pesticides use practices. It was not similar to the previous study done by Kleebkaew et al.(2005) as training can improve the awareness and practices of farmers in using pesticides safely.

The majority of farmers were in low support about information. When interviewed with farmers, it was found that most farmers did not want to hire from relatives because they perceived that it was tedious. Another fact was that agriculturist rarely came and educated about pesticides usage and its protection. In addition, it was very rare that village health staff or volunteers to disseminate information about healthy protection against pesticides. There was a positive correlation between social support and pesticides use practices ($r=0.489$, $p<0.001$). It was similar to the study done by Federico & Rother (2015) in which farmers who got social support compared to others had more preventive behaviours in using pesticides.

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