IJAMS
INTERNATIONAL JOURNAL OF ADVANCED MULTIDISCIPLINARY STUDIES
Volume III, Issue 1 January 2023, eISSN: 2799-0664

Survey on Practices in Pesticide Handling and the Use of Personal Protective Equipment by Farmers of Mankayan, Benguet, and Bauko, Mt. Province

CECILIA B. SAMONTE
c.samonte@bsu.edu.ph

LEONARDO L. SAMONTE
l.samonte@bsu.edu.ph

Benguet State University,
La Trinidad 2601, Benguet, Philippines
College of Teacher Education and
College of Arts and Sciences

Abstract — The study delves into a survey on the practices of farmers in pesticide handling and the use of personal protective equipment as well as the role of women farmers in relation to pesticide and PPE use. Mixed methods employing quantitative and qualitative methods were used. Results revealed that a considerable number of respondents were very much aware of the proper handling of pesticides, the use of PPE, and its possible health effects and they know that the basic PPE has to be used by farmers while spraying their vegetables. Results further bared that almost all of the respondents have farms in the open fields, that they sprayed for an average of 4-6 hours per spraying schedule, sprayed twice a week, and mostly followed what was suggested on the label. The majority of the respondents followed the proper handling of pesticides, and the use of personal protective equipment except for an apron and goggles, and do know the possible health effects of pesticides on the farmers. They likewise followed the concentration of pesticide as recommended, and most of them mixed two or more pesticides. Respondents observed strictly hygienic practices. This study would be of vital importance for the need to develop prevention or mitigating programs to reduce risks posed by pesticides to agricultural workers and their families.

Keywords — Practices in Pesticide handling, Personal Protective Equipment,Pesticide disposal, and, Hygienic Practices.

I. Introduction

The provinces of Ifugao, Mountain Province, and Benguet in the Cordillera Administrative Region in the Northern Philippines have become baskets of semi-temperate vegetables. These provinces have considered vegetable farming as one of their main sources of livelihood. Of these three provinces, Piadozo et al. (2013) revealed that semi-temperate vegetables in the Philippines are largely grown in Benguet, hence the province has long been known as the salad bowl of the Philippines. Masillem (2012) likewise revealed that the municipality of Bauko, Mountain Province is gifted with fertile soil hence, farming and vegetable gardening are the major sources of

household income. In fact, she found that 85% of its total household is engaged in this occupation and 6,705 hectares or 37.76% of its total land area is devoted to agriculture.

Over the years, the vegetable industry is known to rely heavily on commercial fertilizers and pesticides. Farmers use fertilizers and pesticides to enhance yield and control pests and diseases. Ngidlo (2013) asserts that indeed, pesticides and chicken dung are essential materials in sustaining the growth, productivity, and quality of vegetables. Pesticides have become an integral part of present-day farming, and play a major role in increasing agricultural productivity (Jallow et al. 2017) and in pest management (Giri et al. 2009). Calvalho (2006) and Owusu-Boateng et al. (2013) likewise pointed out that pesticides are often used to manage pests and diseases to enhance agricultural productivity.

With the desire of farmers to increase their agricultural productivity, enhancing their agricultural inputs by using helpful measures like using chicken manure and modern technologies is needed. Indeed, Calvalho (2006) pointed out that in the past decades, the use of pesticides to enhance agricultural yield and protect crops from pests and diseases has been highly promoted.

However, problems exist because of the lack of knowledge and awareness among farmers on the proper handling of pesticides. These problems may be traced to the indiscriminate practice and bad attitude of the farmers in the management of the pesticides leading to poor health conditions. That means that while the production and yields may have been enhanced by these technologies, the health of the farmers is at stake. Ocho et al. (2016) stressed that while developing countries have benefited from pesticide use, increasing dependence on these substances and adverse effects on human health and the environment has caused considerable concerns; especially since more persistent and hazardous pesticides are commonly used, often with little or no education, monitoring or regulatory control. Due to a lack of training and education programs for safe use from industries or the government, farmers are not much aware of the risks and rarely follow proper safety methods when using pesticides. Such lack of knowledge, bad practices, and erroneous attitudes on the use and management of pesticides may result in health problems if not attended to by concerned agencies. In fact, Joseph et al. (2003) learned that in rural Asia, 60% of all fetal deaths were related to pesticide poisoning. Also, if improperly used, pesticides can lead to secondary pest outbreaks (Gross and Rosenheim, 2011), and residues in primary and derived agricultural products that endanger both the environment and human health (Osman et al. 2010) and although farmers' knowledge of pesticide hazards was high, the reported safety measures were poor (Jallow et al. 2017).

With the above literature on the effects of pesticides on the health and lives of vegetable farmers, it is imperative that a study should be conducted as to how our agricultural farm workers apply the training and seminars conducted by concerned agencies.The farmers now a days are the technological group and they need to be oriented on some guidelines on the important use of the personal protective equipment and proper disposal of wastes to be shared by experienced agriculturists. Besides, the use of apron and face masks are also necessary to be worn when

handling pesticides and spraying vegetables. In this way, their level of awareness and application will be assessed if there is a need for continuous education on pesticide management.

Though, research conducted earlier by Yassin et al. (2002) revealed that the farm workers reported high levels of knowledge on the health impact of pesticides (97.9%). Besides, most farm workers were aware of the protective measures to be used during the application of pesticides. Jallow et al. (2017) likewise revealed that the majority of the farmers acknowledged that pesticides were harmful to their health (71%) and the environment (65%). However, farmers' level of knowledge of pesticide safety is insufficient. Giri et al. (2009) found that the reading practice of Nepalese on pesticide labels is very poor due to the use of a foreign language, unclear instructions on the label as well as carelessness of the users. In addition, they discovered that the majority of farmers did not have a clear understanding of the pictograms' meanings. Rijal et al. (2018) supported said findings when they found that all of their respondents neither knew the harmful effects of pesticide residues nor practiced proper pesticide disposal methods. Over 90% of growers rely on local pesticide retailers (i.e., Agro-vets) for technical know-how about pesticide selection, handling, and use.

On the practice of storing pesticides, Jallow et al. (2017) found that the majority of the farmers (59%) stored their pesticides in locked chemical stores designated only for pesticides. Respondents also stored their pesticides in open sheds just for pesticides (34%) and in the open field (30%). This attitude can be adapted if authorities from the Philippines and the local government units and health authorities would educate the farmers on pesticide use and management as well as craft policies or statutes that would regulate the use of pesticides and the manner of disposing of the pesticide wastes and leftovers. Likewise, the bad practices can be minimized if there are policies that would sanction violators. Waskom and Yergert (1994) cited that federal law requires that concentrated pesticides be stored in a secured area. Therefore, outdoor storage containers should be located within a permanently fenced area. Be sure to post warning signs near each entrance to the storage facility. Huici et al. (2017) revealed that in Santa Cruz, Bolivia, 93% of farmer-respondents disposed of their empty containers in vulnerable places. Halimatunsadiah et al. (2016) argued that the ignorance of vegetable safety regarding the appropriate pesticide usage by farmers was undeniable, as the market demands only products with good extrinsic quality. In most cases, farmers tend to harvest the vegetable products shortly after a few days of the last pesticide spraying.

Jallow et al. (2017) argued that protective measures during and after pesticide application are important to reduce exposure to pesticides. In their findings, it turned out that the majority (58%) of the farmers did not use any personal protected equipment (PPE) when mixing or spraying pesticides. The reasons the respondents indicated for not using PPE are lack or non-availability of PPE when needed (35%), PPE being uncomfortable in hot and humid climates places (90%), too expensive (65%), and slowing you down (29%) were the most reasons cited. Over 70% of respondents did not wash work clothing used while mixing or spraying pesticides separately from

other clothes. Similarly, 46% of respondents reported that they did not consider wind direction when spraying pesticides. Halimatunsadiah et al. (2016) likewise observed that farmers tend to ignore the recommended pre-harvest interval written on the label in order to keep the good appearance of vegetable products. It is a current practice for farmers to apply pesticides to their crops in the afternoon and harvest the vegetable products by the next morning without any concern about hazardous pesticide residue due to the economic advantage. In Benguet, Philippines, Lu (2010) exposed that 94% of her respondents said that they have worked with or used pesticides in their lifetime, and 16.4% of this population used pesticides in their own households. A majority (87%) reported occupational exposure to pesticides during their farm work while 13% were exposed accidentally. The predominant form of exposure was liquid mist (56.5%). The most common route of pesticide entry in the study was respiratory followed by dermal and ocular entry at 68.9%, 60.5%, and 38%, respectively.

As cited by a group of pharmacy students from the findings of doctor Cheng; the farmers from kapangan sometimes fail to take precautionary measures when exposed to these hazardous chemicals. Most of the farmers do not use protective gear while spraying but merely long-sleeved cotton shirts and wide-brimmed hats or “bandana”. In the preparation of pesticides to be sprayed, some of the farmers used their bare hands to stir the pesticides while the others used a stick or a piece of wood. Also, three-fourths reported that three-fourths wash their hands and sometimes face before drinking, eating, or smoking (Ramos et.al., 2004).

This study is meant to gather data as to the extent of knowledge on the use, handling, and waste disposal of pesticides in selected areas of Benguet and Mt. Province. Taking into consideration the immediate health effects (acute effects) of these pesticides on agricultural workers and the factors related to the proper use of personal protective equipment during pesticide preparation and application and their hygienic practices after application. Farmers that grow cabbage, potato, Chinese cabbage, and carrot alternately in a year are the target respondents.

The results would be of vital importance as to the need to develop prevention and constant programs to reduce risks posed by pesticides to agricultural workers and their families. To introduce to the farmers in our communities the importance of using the face mask and apron when spraying vegetables especially on the sloppy and windy farm site. Extension activities on the preparation and distribution of flyers on this concern will be done to constantly remind the farmers of the precautionary measures in pesticide management.

The combined efforts of the government agencies and non-government agencies to educate our agricultural farm workers about proper pesticide management have been conducted over the years and are still constantly being reminded in the form of printed materials, media, and face-to-face campaigns but in spite of these efforts, many of our farm workers are hesitant to follow these simple advice. With these, the study aims to determine the current knowledge and practices on pesticide management of agricultural farm workers of Benguet and Mt. Province.

1. To determine the current knowledge of using PPE and the factors related to its use;
2. To determine the current practices among farmers in handling pesticides (preparation and application);
3. To determine the current practices among farmers in disposing of pesticide wastes;
4. To determine the hygienic practices of farmers after applying pesticides.

II. Methodology

Study area

The study was conducted in Kada, a conventional vegetable farming community situated on top of the mountain in the boundaries of Bauko, Mountain Province, and Mankayan, Benguet. These huge vegetable farming communities are part of barangays Sadsadan, Monamon Sur and Sinto in Bauko, Mountain Province and Barangay Balili in Mankayan Benguet. The place is a huge agricultural plantation cultivating the target commodities such as cabbage, wombok, potato, and carrot alternately on a yearly basis.

The kind of pesticides we deal with are fungicides and insecticides.

Sampling and research design

Respondents were randomly selected in the study area. An estimate of 100 to 150 respondents who have been and are still directly involved in the use of pesticides. Referrals were the specific approach used to get in touch with the targeted respondents of 100- 150. Mixed methods will be used in the study. The quantitative method was used mainly to treat the responses on objectives 1,2 & 3 while the qualitative method is for objectives 4,and 5. Also, a key informant interview (KII) was used with people identified through referrals in order to get first-hand knowledge about the community or study site.

The descriptive statistical method was used in the analysis of some of the data. Descriptive statistics such as frequency distribution, percentages, and the Likert scale were the tools to describe the farm workers' level of awareness of pesticide use, the extent of practices, and the level of awareness of the immediate health effects of pesticide use.

Data collection

Survey questionnaires, interviews, and field observations were used to gather information. The face-to-face interview was conducted with the farmers who are directly involved in pesticide management.

The questionnaire includes closed-ended and open-ended questions. The closed-ended questions contain a multiple-choice format for the participants to just select the appropriate answer or answers that best describe their thoughts relative to the subject matter. It was translated into the vernacular if needed for the participants to understand each item. Open-ended questions are intended to clarify some vague answers and to ferret some necessary information that is not elicited by the questionnaire.

All personal information gathered during the study was kept confidential.

Data gathered:

Personal Profile which includes the name of the respondent (optional), age, gender, educational attainment, years in farming, years of using pesticides, civil status, number of children/household members, the role of the respondent in managing the farm, farm area, attendance to seminars/training related to pesticide management and membership to organizations were the main information that were noted.

To confirm the data taken from the farmers on pesticide use and farm practices, the triangulation method was used. Hence, interviews with financiers (if applicable), barangay officials, and health workers were likewise conducted.

As to the type of pesticides that were commonly used, the researchers documented the various pesticides that were displayed at the main farm supplies and establishments in La Trinidad, Benguet with the consent of the owners, for the respondents to easily identify and recall which pesticides they have been using during the year. These are the common establishments that dispose of pesticides to farmers and retail establishments in the locality.

To determine how farmers dispose of their pesticide wastes. Interviews with the Secretary to the Sangguniang Bayan, Municipal Agriculturists, and/or Barangay officials will also be conducted if there are existing ordinances on the proper disposal of pesticide and agricultural wastes.

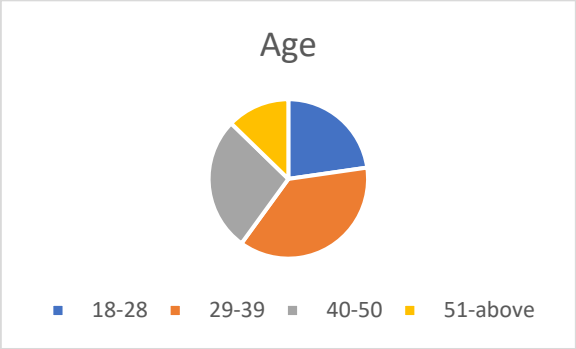
III. Results and Discussion

The study was conducted in Kada, a conventional vegetable farming community situated on top of the mountain in the boundaries of Bauko, Mountain Province, and Mankayan, Benguet. These huge vegetable farming communities are part of barangays Sadsadan, Monamon Sur and Sinto in Bauko, Mountain Province and Barangay Balili in Mankayan Benguet. The place is a huge agricultural plantation cultivating the target commodities such as cabbage, potato, and carrot alternately on a yearly basis.

Table 1. Demographic Profile of Respondents

DEMOGRAPHIC PROFILE		
Profile	n	%
Age		
18-28	25	22.73%
29-39	41	37.27%
40-50	30	27.27%
51-above	14	12.73%
Gender		
Woman	27	24.55%
Man	83	75.45%
Educational Attainment		
Illiterate/Non-schooled	2	1.82%
Elementary grade level	32	29.09%
High school graduate	40	36.36%
Technical-Vocational graduate	8	7.27%
College-Level	15	13.64%
College graduate	13	11.82%

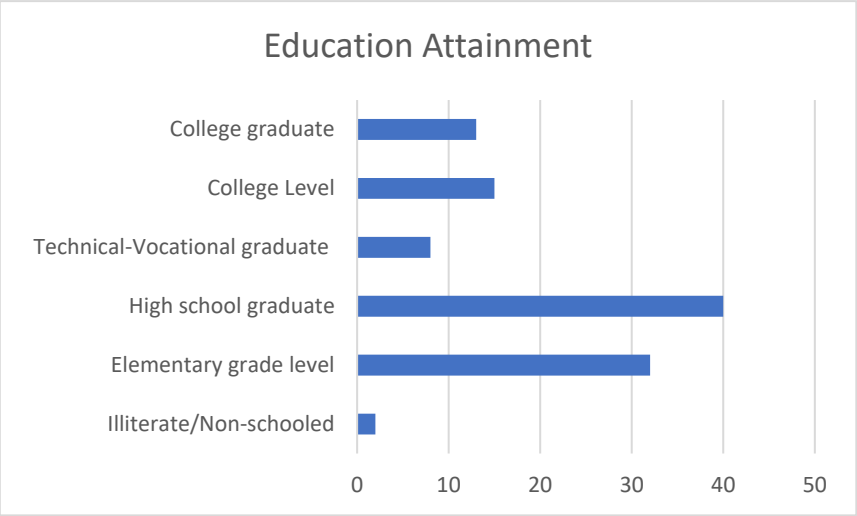
Figure 1. Age of respondents



Age. Most of the ages of farmers had between 29-30 (37.27%) followed by ages 40-50 (27.27%). It implies that those active in farming are the middle-aged groups of farmers.

Gender. 75.45 % of the respondents were male, while 24.55% were females. The farmers were dominated by males. This is attributed to the fact that males, mostly household heads, traditionally control assets such as land and tree crops more than females (Anang et.al. 2013).

Figure 2. Educational attainment of respondents



Educational Attainment. The respondents were mostly high school graduates (36.36 %). Followed by elementary grade level (29.09 %), college-level (13.64%), college graduate (11.82%), and technical-vocational graduate (7.28%). The least number of (1.82%) respondents were illiterate. Since a majority of the farmers had some formal education, there is a likelihood that they will understand the composition of pesticide utilization to some extent. Moreover, these educated farmers will assist their co-farmers to perform some critical tasks (e.g. calibration of sprayers, measurement, and mixing of pesticides, and elaborate color-coding on the pesticide containers). However, Anang et.al. (2013) and Boateng et.al (2014) reported that lower levels of education may affect the farmers' operational habits and health-related hazards in relation to chemical usage.

Table 2. Awareness of Proper Handling of Pesticides.

PROPER HANDLING OF PESTICIDES		
Questions	**Level of Awareness**	
	Mean	**DE**
1. I always seek advice from an agricultural extension on the correct methods of pesticide application.	4.09	Moderately aware
2. I read labels on pesticide containers in order to know their use.	4.25	Very much aware
3. I understand and follow pesticide labels.	4.00	Moderately aware
4. I do not store leftover pesticides in drinking containers.	4.43	Very much aware
5. I am aware that there are pesticides that are banned or restricted for use.	4.44	Very much aware
6. I am aware of the reasons for banning or restricting pesticides.	4.12	Moderately aware
7. I am aware that pesticides will affect the environment.	4.68	Very much aware
8. I am aware of the indication and meaning of the colors of the pesticide containers red is highly toxic, green is slightly toxic-, and yellow is extremely toxic.	3.92	Moderately aware
Overall	**4.24**	**Very much aware**

Legend:

1.00-1.80	Not aware at all
1.81-2.60	Slightly aware
2.61-3.40	Somewhat aware
3.41-4.20	Moderately aware
4.21-5.00	Very much aware

In table 2 the respondents were very much aware of the proper handling of pesticides with an overall mean of 4.24. Except, for some indicators with moderately aware and these are the following; I always seek advice from an agricultural extension on the correct methods of pesticide application (4.09), I understand, and I follow pesticide labels (4.00), I am aware of the reasons for banning or restricting pesticides (4.12) and I am aware of the indication and meaning of the colors of the pesticide containers like red is highly toxic, green is slightly toxic and yellow is extremely toxic (3.92).

The high educational attainment of the respondents attributes to the “very much aware” result of the farmers in their level of awareness of the handling of pesticides. The 1.82% illiterate could seek help from their co-farmers who are mostly educated. Indicators with “moderately aware” outcomes could be improved by seeking assistance from co-farmers or through attending seminars and training along with specific concerns.

During the interview, a number of farmer-respondents revealed that they learned of the banned pesticides (gramoxon) due to suicide cases that happened in some farming places involving

farmers. The study of Batani, R.S. et al. (2013) support this finding when they found that most of the suicide cases in an agricultural barangay were in eastern Benguet through the ingestion of an herbicide known as Gramoxon. This eventually led to the banning of said herbicide.

As revealed during the interview, the common source of their knowledge on the proper handling of pesticides is basically their fellow farmers and the "company technicians" who held meetings with farmers to promote farm products including particular pesticides distributed by their companies. "Company technicians" are those who recommend and sell to the farmers the pesticides manufactured by the various pesticide manufacturers. Interview results revealed that only a few farmers sought advice from the sales ladies of farm establishments selling pesticides because accordingly, these ladies are not farmers and are just there in the business establishments to sell. Their problem with the company technicians is that they would single out only the products that their company sells.

This implies then that bulk of the knowledge and awareness of farmers on the proper handling of pesticides started when they were young observing the activities of their parents and neighbor farmers such that when they were already engaged in farming, they already have the awareness of the ins and outs on the proper use of pesticides. Besides, the farmers' knowledge of the proper handling of pesticides could be attributed to their social and educational exposures considering that most of them have undergone informal training and formal education. The farmers' organization in this study area should invite speakers in order to inform them or present updates and new trends about the practices in the proper handling of pesticides in order to develop the "safety-first attitude" of farmers.

Table 3. Awareness of Personal Protective Equipment (PPE)

PERSONAL PROTECTIVE EQUIPMENT (PPE)		
Questions	Level of Awareness	
	Mean	DE
1. I am aware that I need to wear safety glasses and/or goggles when spraying.	4.21	Very much aware
2. I am aware that I need to wear rubberized plastic hand gloves.	4.25	Very much aware
3. I am aware that I need to wear protective field boots.	4.85	Very much aware
4. I am aware that I need to wear a proper outfit like a windbreaker.	4.25	Very much aware
5. I am aware that I need to I wear a bonnet when spraying.	4.22	Very much aware
6. I am aware that I need to wear face masks when spraying.	1.86	Slightly aware
7. I am aware that I need to wear long sleeve shirt when spraying	4.85	Very much aware
8. I am aware that I need to wear long pants when spraying	4.83	Very much aware
9. I am aware that I need to use an apron, especially when mixing pesticides.	3.59	Moderately aware
10. I am aware that I need to use a cap or hat when spraying.	4.58	Very much aware
Overall	4.15	Moderately aware

Legend:

1.00-1.80	Not aware at all
1.81-2.60	Slightly aware
2.61-3.40	Somewhat aware
3.41-4.20	Moderately aware
4.21-5.00	Very much aware

The respondents faithfully observed the proper use of personal protective equipment such as; the use of boots, long sleeve shirts, long pants, and the use of caps or hats when they mix and spray the pesticides as shown with individual means of 4.85; 4.85; 4.83, and 4.58 respectively. Most of the indicators were perceived by the respondents as very much aware, however, these were greatly affected by some indicators such as; I am aware that I need to use an apron, especially when mixing pesticides with a mean of 3.59 (moderately aware). Also, the indicator I am aware of I need to wear a face mask when spraying with a mean of 1.86 (slightly aware). The use of personal protective equipment (PPE) has an overall mean of 4.15 or moderately aware.

This new normal, the use of PPE should be strictly imposed on the farmer respondents and the younger group of farmers. We observed that heavy-duty technologies are being used as the power sprayer so some farmers are exposed to a greater volume of pesticides. Hence, farmers

should wear an apron during the preparation and mixing of pesticides. Besides, pests are resistant to the mild concentration of pesticides so farmers prepare strong and high concentrations of pesticide solutions, especially during extreme weather conditions. Sprayers should wear face masks and coveralls so that their face will be fully protected from any spillage of pesticide solution. If the sprayers are not comfortable with the recent face mask then design and come up with appropriate masks. Also, observe the time when spraying on the farm which should be very early in the morning to avoid the rising of the temperature due to sunlight. Any restrictions to these will be liable for such penalties formulated in the addendum of policies and new guidelines.

Table 4. Awareness of the Possible Health Effects of Pesticides to the Users.

POSSIBLE HEALTH EFFECTS OF PESTICIDES TO THE USERS		
Questions	Level of Awareness	
	Mean	DE
1. I am aware that pesticides when ingested can kill a person.	5.00	Very much aware
2. I am aware that pesticides when inhaled can cause respiratory problems and dizziness.	4.62	Very much aware
3. I am aware that eyesight is affected when exposed to pesticide.	4.51	Very much aware
4. I am aware that exposure to pesticides affects the health of the fetus in the womb.	4.42	Very much aware
5. I am aware that exposure to pesticides can cause fatigue.	4.27	Very much aware
6. I am aware that exposure to pesticides can cause skin irritation.	4.45	Very much aware
7. I am aware that exposure to pesticides causes nausea.	3.77	Moderately aware
8. I am aware that exposure to pesticides causes vomiting.	4.09	Very much aware
9. I am aware that exposure to pesticides causes breathing problems.	4.31	Very much aware
10. I am aware that exposure to pesticides causes brain disorders.	3.90	Moderately aware
11. I am aware that exposure to pesticides causes liver and kidney damage.	4.26	Very much aware
12. I am aware that exposure to pesticides causes reproductive damage.	3.92	Moderately aware
13. I am aware that exposure to pesticides causes cancer.	3.95	Moderately aware
Overall	4.27	Very much aware

Legend:

1.00-1.80	Not aware at all
1.81-2.60	Slightly aware
2.61-3.40	Somewhat aware
3.41-4.20	Moderately aware
4.21-5.00	Very much aware

Results in table 4 indicate that respondents are very much aware (VMA) of some negative health effects of pesticides to them which is shown by the overall mean of 4.27. Of the 8 statements that respondents are very much aware of the top 4 are as follows: exposure to pesticides can kill a person (5.00); exposure to pesticides can affect the respiratory system and thereby can cause respiratory problems and dizziness (4.62); exposure to pesticides can affect eyesight (4.51); and exposure to pesticide can affect other vital parts of the human body such as the liver, kidney breathing, reproductive system, and other diseases (4.26). Only 5 statements got a result of moderately aware (MA).

The educational attainment of the respondents had attributed to the "very much aware" level of knowledge exhibited by the farmers. Likewise, the pesticide training attended (72.73%) by most of the respondents contributed to their level of awareness which is "very much aware". During farmers' forums and training, they could be raising some questions and clarifications about health concerns.

According to Nicolopoulou, et. al., (2016), pesticide residues have also been detected in human breastmilk samples and there are concerns about prenatal exposures and health effects on children. As revealed by Mrema et.al., (2017), women farm workers are frequently exposed directly or indirectly when working as pesticide applicators during soil preparation, planting, harvesting and routine activities such as hunting pests, farm monitoring, and washing pesticides contaminated clothes. Moreover, Staudacher et.al., (2020) claimed that the negative effects of pesticides can be managed over the whole life cycle, from purchase via storage and application, to residual and waste management by nurturing the professionalization of farmers.

Table 5. Current Practices in Using PPE and Factors Related to its Use.

SOP #2. CURRENT PRACTICES IN USING PPE AND FACTORS RELATED TO ITS USE		
Questions	n	%
I wear safety glasses and/or goggles when spraying.		
Yes	32	29.09%
No	78	70.91%
I wear rubberized plastic hand gloves when spraying.		
Yes	66	60.00%
No	44	40.00%
I wear protective field boots when spraying.		
Yes	98	89.09%
No	12	10.91%
I wear a proper outfit like a windbreaker when spraying.		
Yes	89	80.91%
No	21	19.09%
I wear a bonnet when spraying.		
Yes	91	82.73%
No	19	17.27%
I wear face masks when mixing and spraying.		
Yes	90	81.82%
No	20	18.18%
I wear long sleeve shirt when mixing and spraying.		
Yes	101	91.82%
No	9	8.18%
I wear long-sleeve trousers/pants when spraying.		
Yes	108	98.18%
No	2	1.82%
I use an apron, especially when mixing pesticides.		
Yes	12	10.91%
No	98	89.09%
I use a cap or hat when spraying.		
Yes	97	88.18%
No	13	11.82%

Table 5 indicates the current knowledge of the farmers in using PPE and the factors related to its use. As shown in the table, a considerable number of farmers responded that they are currently using personal protective equipment (PPE) while they are preparing and spraying pesticides. The farmer-respondents answered in the affirmative when asked if they used the following personal protective equipment while spraying such as; long sleeve trousers/pants (98.18%); long sleeve shirts or jackets (91.82%), field boots (89.09%); bonnets or caps (82.73); and outfits like windbreaker or plastic coat (80.91%). What they don't use while spraying and mixing pesticides are goggles and an apron.

There were two statements however which were not worn by most respondents the use of an apron when mixing pesticide in a container (10.91%) and the use of goggles (29.09%). In fact, some respondents don't consider it necessary to be using an apron because anyway, they are using sticks or elongated wood to stir the solution. However, using an apron, especially when mixing pesticides should also be imposed because it serves as a protection from the harmful health effects of pesticides in the different parts of the body. The of use goggles or a face shield is advisable if the farm is sloppy and it's windy or when their plant is a sweet pea (Lathyrus odoratus) or the plant they are spraying is above their heads or is head-level as the pesticide can easily be blown away by the wind causing their eyes to be sprayed. This scenario is true especially if the farmer uses a knapsack sprayer where they are close to the nozzle of the sprayer. This problem was minimized however because of the introduction of the power sprayer. Besides, the problem of farmers getting sprayed when spraying is minimized because nowadays, only a very few farmers plant sweet peas because it entails more time to take care of it especially if it is windy aside from the difficulty of gathering sticks to support climbing peas.

As reported by Hernandez et.al.(2008) that pesticides may cause adverse respiratory health effects among farmers and have been considered one causal factor for the increase in asthma prevalence. In addition to the findings of Hernandez et. al. (2008), short-term exposure to pesticides indicated a drop in cholinesterase >25% of baseline levels. These findings would pose for more training to be conducted and promote the use of aprons and face masks essentially in preparing and spraying pesticides.

Table 6. Farm Workers Practices on the Use of Pesticides.

SOP 3. FARM WORKERS PRACTICES ON THE USE OF PESTICIDES		
Questions	n	%
Type of agricultural field		
Closed Field	2	1.82%
Open Field	108	98.18%
Closed and Open Fields	0	0.00%
Hours working in the field with pesticides		
1-3 hours	39	35.45%
4-6 hours	59	53.64%
7 hours or more	12	10.91%
Frequency of application of pesticide		
Once a week	8	7.27%
2x a week	92	83.64%
3x a week	10	9.09%
I don't spray against the wind		
Yes	108	98.18%
No	2	1.82%
Pesticide concentration applied		
As Recommended	56	50.91%
Less than recommended	8	7.27%
More than recommended	46	41.82%
Mixing pesticides		
Mixing two pesticides	36	32.73%
Mixing more than two pesticides	65	59.09%
Not mixing	9	8.18%
Storage of pesticide products		
At Home	13	11.82%
Farm Site	75	68.18%
Others	22	20.00%
Place of Pesticide Preparation		
Home Kitchen	2	1.82%
Home Garden	4	3.64%
In the Field	95	86.36%
Others	9	8.18%

The current practices among farmers in handling pesticides (preparation and application) are shown in table 6. Of the 110 farmer-respondents 108 or 98.18% worked in an open field

plantation and very few farmers (1.82 %) worked in a closed field. None of the farmers worked in both closed and open fields.

For the number of hours that the farmers worked in the field with pesticides, 53.64 % spent 4 to 6 hours; 39.09 % spent 1 to 3 hours and 10.91 % spent 7 hours or more. This activity of the farmers is attributed to the land area that they till or if they have assistance from their family members or other people to help them facilitate the work. Likewise, it depends if they use a power sprayer or knapsack sprayer.

As to the frequency of application of pesticides; a majority of the farmers (83.64%) apply pesticide twice a week, and very few farmers (9.09%) applied thrice a week. Accordingly, the more frequently it rains, the more frequently they spray especially for potatoes as they easily wilt during rainy days. Hence, the frequent schedule in spraying fungicide. Some respondents confided that the frequency is reduced during the season especially when it comes to the problem of blights.

Almost all of the farmers (98.18%) know very well that they should not spray against the wind. The farmers can only discover this farm practice if they spray during windy conditions. Lu[3,4,5] documented the risk factors associated with pesticide exposure. These were re-entering a recently sprayed area, spraying against the wind, using a damaged backpack sprayer, spills on the back, spills while mixing pesticides, and wiping sweat on the face with a residue-contaminated piece of fabric. Benguet farmers as well as farmers from India use backpack sprayers due to their easy availability and suitability for their crops in spraying[19].

Also, the farmers consider the concentration of pesticide applied and a majority of them (50.91%) followed the recommended concentration as indicated in the pesticide container, followed by more than the concentration that is recommended (41.82%). Furthermore, farmers did the mixing of pesticides and 59.09% of them mixed two or more pesticides, 32.73 % mixed two pesticides, and lastly, 8.18% does not mix two or more pesticides. In most cases, respondents mixed fungicide with insecticide as it is very taxing to be spraying fungicide and insecticide separately.

As to the storage of pesticides, 68.18% of the farmer-respondents placed the pesticides in their farmhouse. They only bring home the unused pesticides when on their farms, there is no secure place. Finally, 86.36% of the farmer-respondents prepared the pesticides on their farm sites. Considering the volume of mixed pesticide that they are going to spray, and for the convenience of the farmers, drums are stored in the elevated portion of the farm or in the middle of the farm for easy maneuvering of the hose especially if said farmers use the power sprayer.

The higher level of education of the farmer-respondents affected the better performance of the farmers to do critical tasks as mentioned by Anang, BT, and Mensah F. Asamoah (2013). Some of these practices performed by farm workers properly are the following; most farmers know very well that they should not spray against the wind (98.18%) in order to protect themselves from

being wet with pesticide solution. Also, farmers followed the correct measurements (50.51%) of pesticide concentration as indicated in the container, etc.

Table 7. Current Practices in Disposing of Pesticide Wastes

SOP #4. CURRENT PRACTICES IN DISPOSING PESTICIDE WASTES		
Questions	n	%
1. Manner of disposal of empty pesticide containers.		
I use them as local waste containers with the non-biodegradable waste	14	12.73%
I place them in a collection bin/waste-recovery site for dealers to retrieve and dispose	16	14.55%
I Burn Them	37	33.64%
I Bury the Container	20	18.18%
I was and pile them on the farm	7	6.36%
Others	16	14.55%
2. Manner of disposing excess/unused diluted pesticide		
I empty the container by re-spraying the vegetable	45	40.91%
I put them in a container to be used again	46	41.82%
I spill them away	19	17.27%

On the manner of disposal of empty pesticide containers, results show that 33.64% burned the pesticide wastes while 18.18% bury the containers. One respondent revealed that his boss has a backhoe that he used in digging deep holes for used pesticide containers. During the field interview, we noted that there were 2 respondents who recycled the thick plastic containers as hand trowels and flower pots. They used this in lieu of using their bare hands when planting potatoes or cabbage seedlings. According to them, instead of just throwing the pesticide wastes at the side area of the farm, recycling them is the best option. As claimed by women respondents, most of their experiences in handling pesticides happened when they were still not yet married.

As to the unused diluted pesticide, the farmer-respondents would put them in a container to be used during the next spray schedule (41.82%) while 40.91% of the respondents throw them away. On the other hand, 17.27% of the respondents would empty the knapsack sprayers by respraying the vegetables with the excess diluted pesticide. With the expensive pesticide in the market, farmers could not just put to waste pesticide leftovers. Some claim that preserving or covering them to be used again is useless as their nutrients would be exposed and would not be effective anymore.

An irony is noticed in this practice of disposing of pesticide wastes that most of the respondents have attended pesticide training (72.73%) but most of the farmers practice burying (33.64%) and burning (18.18%) pesticides wastes, the practices which are being avoided. Besides,

the chemical companies are not strict in the implementation of guidelines, 86.36% of the respondents attested that they failed to collect empty pesticide containers regularly so the

waste are just piled in the garden. To improve the practices of the farmers, other strategies could be recommended as younger farmers could be mobilized to access information channels, such as smartphones, YouTube, and television. Use social media to promote alternative pesticide management such as proper disposal of wastes, use of PPE, and hygienic practices (Staudacher et.al., 2020).

Table 8. Hygienic Practices among Farmers in the Handling of Pesticides.

SOP #5. Hygienic Practices among farmers in disposing of pesticide wastes.		
Questions	n	%
I wash my hands and face with soap when I eat in between applications of pesticides.		
Yes	110	100.00%
No	0	0.00%
I wash my hands and face with soap when I drink in between the application of pesticides.		
Yes	110	100.00%
No	0	0.00%
I wash my hands after the application of the pesticide.		
Yes	110	100.00%
No	0	0.00%
I change my clothes just after spraying pesticides.		
Yes	107	97.27%
No	3	2.73%
I take a bath immediately after mixing or spraying.		
Yes	98	89.09%
No	12	10.91%
I wash my work clothes separately.		
Yes	97	88.18%
No	3	2.73%

Table 8 reveals that the three statements on hygienic practices after pesticide applications have been observed by all (100%) of the respondents after using pesticides. They washed their hands and faces with soaps before they eat or drink, and they washed their hands after the application of pesticides. Most respondents (89.09%) take a bath immediately after spraying although 10.91% admitted that they take a bath only when they go home after the day's work considering the far distance between their farms and their homes. This implies that they take a bath only around 6 p.m after reaching home would mean longer exposure to the pesticide residue and this would certainly pose more danger to their health. The high educational attainment and training

in pesticide management have contributed to the 100% hygienic practices exhibited by the respondents.

The ability of the farmers to perform critical tasks required a little bit of higher education as reported by Anang et. al. (2016) and a similar trend was reported by Boateng et.al., (2014) that this may affect the farmer's operational habits and health-related hazards and behaviors in relation to chemical usage.

IV. Conclusion

Based on the results, the following conclusions are drawn:

1. Middle-aged male farmers (29-50 years old) are more engaged in using pesticides than the female and older farmers; practically all farmers are literate as most of them have finished either elementary or secondary level; most middle-aged farmers have longer exposures to pesticides having spent 16 years or more in vegetable farming; a majority of the respondents are classified as "medium time farmers" as they spent 4-6 hours spraying their farms per day indicating the average land area that they are planting; most farmers get ideas on pesticide use from sellers of pesticide products and from fellow farmers; a majority of the respondents are not used to looking at the marks or color-coding as indicated on the pesticide containers; and finally, a considerable number of respondents observed that the pesticide dealers are remiss in cleaning their dirt by not collecting the wastes of their products.

2. The farmers have higher awareness and better knowledge of the proper handling and use of pesticides, especially on its implications to the environment and possible health effects on the users as well as on the importance of properly using Personal Protective Equipment (PPE) while administering the pesticides.

3. Most of the farmers observed religiously the health protocols when applying the pesticides by shielding themselves with personal protective equipment (PPE) albeit not complying exactly with the prescribed protective equipment. Some PPE such as the use of an apron and goggles may not be considered absolutely necessary by most farmers.

4. Farmers are into open field farming due to its economic practicality. Closed field farming entails huge expenses especially in putting up the greenhouses. To most farmers, the natural way of farming in open fields entails less expense. Furthermore, most farmers are classified as "medium time" as compared to "big-time farmers" and could only afford to cultivate an average size of farmland which is manifested by a shorter period for spraying. Medium-time farmers usually cultivate more or less half a hectare of land.

5. Farmers learned the proper use of pesticides like spraying techniques, pesticide mixing, and other pesticide management strategies from personal or vicarious experience and from the guidance of pesticide dealers.

6. Irresponsible attitude of farmers in burning pesticide wastes is destructive to the environment and is inimical to humans and other living creatures. A considerable number of farmers know the value of being economical as they do not just throw away unused diluted pesticides although almost the same number of respondents just throw away unused diluted pesticides arguing that to keep them for the next spray schedule would be useless because it chemical contents already have evaporated. Finally, the frequency of applying pesticides is the call of the farmer depending on the weather and the status of the plants.

7. Farmers appreciate the values of physical hygiene and a healthy body as they became conscious of it.

REFERENCES

[1] Anang, BT and Mensah Asamoah (2016). Pesticide Exposure and the Use of Personal Protective Equipment by Cocoa Farmers in Ghana.Environmentalsystemresearch.springeropen.com/articles/10.1186/
[2] Bhattacharjee, S.etal., (2013). Impacts of Pesticide Exposure on Paddy Farmers' Health. 2:18-25. https://banglajol.info/index.php/JuEB.
[3] Boateng, DO. et.al., (2014). Impact of Illegal Small Scale Mining (Galamsey)on Cocoa Production in Atiwa District of Ghana.Int. J.Adv.Agri.Res.2:89-99.
[4] Carvalho, FP. (2006). Agriculture, pesticides, food security and food safety. Environmental Science and Policy. (9) 685-692.
[5] Deveau, JST (2009). How Weather Conditions Affect Spray Applications. https://www.omafra.gov.ow.ca/english/crops/facts/09-037w.htm.
[6] Erbaugh, J.M., Donnermeyer, J., and Amujal, M., (2007). Assessing the Impact of Farmer Field School Participation on IPM Adoption in Uganda: In:AIAFE 2007 Proceedings of the 23rd Annual Conference," Internationalization with Cultural Leadership, 20-24 May 2020" Montana, USA.
[7] Food and Agricultural Organization (FAO) of the United Nations. (2014). Pesticides: Balancing Crop Protection and Responsible Use; Plant Production and Protection Division: Rome, Italy.
[8] Giri, YP, Maharjan R, Sporleder R and Kroschel J. (2009). Pesticide use practices and awareness among potato growers in Nepal.
[9] Gross, K and Rosenheim JA. (2011). Quantifying secondary pest outbreaks in cotton and their monetary cost with causal-inference statistics. https://www.ncbi.nlm.nih.gov/pubmed. Accessed on April 2, 2018.
[10] Halimatunsadiah AB, Norida M, Omar D and Kamarulzaman NH. (2016). Application of pesticide in pest management: The case of lowland vegetable growers. International Food Research Journal 23(1): 85-94.

[11] Hernandez, A.F. et.al.,(2008). Pesticides and Asthma,CurrOpin, , Clinical Immunology. JABBjournal. 11:90-96.https://doi.org/10.31893/
[12] Huici, O, Skovgaard M, Condarco G and Jensen OC. (2017). Management of empty pesticide containers - A study of practices in Santa Cruz, Bolivia. Environmental Health Insights Volume 11: 1–7.
[13] Jallow MFA, Awadh DG, Albaho MS, Devi VY and Thomas BM. (2017). International Journal of Environmental Research and Public Health.
[14] Jeyaratnam, J. (1990). Acute pesticide poisoning: A major global health problem. World Health Stat. Q. 43,139–144.
[15] Joko, T. et.al., (2020). Pesticide Poisoning and the Use of Personal Protective Equipment (PPE) in Indonesian Farmers. Hindawi Journal of Environmental and Public Health. Vol.2020Articles ID5379619.https://doi.org/10.1155/2020/5379619.
[16] Joseph A, Abraham S, Muliyil JP, George K, Prasad J, Minz S, Abraham VJ and Jacob KS. (2003). Evaluation of suicide rates in rural India using verbal autopsies. BMJ, 24; 326 (7399): 1121-1122.
[17] Kawarazuka, N., Duong Tuan Minh and Elisabeth Simelton., (2020). Gender, Labor Migration and Changes in Small-scale Farming on Vietnam's North-Central Coast. researchgate.net/publication. DOI.10.1080/14672715.
[18] Lambrecht, I. Vanlauve, B. and Maertens, M. (2016). Agricultural Extension in Eastern Democratic Republic of Congo. Eur.Rev.Agric.Econ.43:841-874.doi.10.1093/erae/jbv039.
[19] Litchfield, MH. (2005). Estimates of acute pesticide poisoning in agricultural workers in less developed countries. Toxicol. Rev. 24, 271–278.
[20] Lu, J.L. (2010). Analysis of trends of the types of pesticide used, residues, and related factors among farmers in the largest vegetable producing area in the Philippines. Journal of Rural Medicine. 5(2): 184-189.
[21] Masillem, D. (2012). Characterization of Vegetable Producing Community in Bauko, Mountain Province. Benguet State University-Open University. Online
[22] Matthews, G. (2008). Attitudes and behaviors regarding the use of crop protection products. A survey of more than 8500 smallholders in 26 countries. Crop Prot. 27, 834–846.
[23] Mrema, E. J. et. al. (2017). Pesticide exposure and Health Problems among Female Horticulture Workers in Tanzania. Sage journal. 26: 220-240. https://doi.org/10.1177/1178630217715237.
[24] Nicolopoulou-Stamati, P. et. al. (2016). Chemical Pesticides and Human Health: The Urgent Need for New Concept in Agriculture Frontier Public Health.https://www.doi.org/10.3389/fpubh.2016.00148.
[25] Ngidlo, R. (2013). Impacts of Pesticides and Fertilizers on soil, tailwater, and groundwater in three vegetable-producing areas in the Cordillera Region, Northern Philippines. American Journal of Experimental Agriculture.
[26] Ocho, FL, Abdissa FM, Yadessa GB and Bekele AE. (2016). Smallholder farmers' knowledge, perception, and practice in pesticide use in South-Western Ethiopia. Journal of Agriculture and Environment for International Development - JAEID 2016
[27] Osman KA, Al-Humaid AM and Al-Redhaiman KN. (2010). Monitoring of pesticide residues in vegetables marketed in Al-Qassim region, Saudi Arabia. Ecotox. Environ. Saf. 73, 1433–1439.

[28] Owusu-Boateng G and Amuzu KK. (2013). A survey of some critical issues in vegetable crops farming along River Oyansia in Opeibea and Dzorwulu, Accra-Ghana. Global Advanced Research Journal of Physical and Applied Sciences.
[29] Piadozo MES, Fujishima H and Shimizu AK. (2013). Problems of the Marketing System for Vegetables Grown in the Highlands in the Philippines: A Case Study of Vegetables Grown in Benguet and Laguna. Accessed on March 11, 2018. http nodaiweb.university.jp/ noukei/pdf
[30] Perez I, C Gooc, JR Cabili, MJO Rico, MS Ebasan, MJG Zaragoza, AFS Redondo, RR Orbita and MLDG Lacuna. (2015). Pesticide use among farmers in Mindanao, Southern Philippines. Advances in Environmental Sciences- International Journal of the Bioflux Society [Internet]. [cited 2020 August 30]; 7(1): 90-108. Available from: https://www.researchgate.net/publication/276280143_Pesticide_use_among_farmers_in_Mindanao_Southern_Philippines.
[31] Rijal, JP, Regmi R, Ghimire R, Puri KD, Gyawaly S and Poudel SP. (2018). Farmers' Knowledge on Pesticide Safety and Pest Management Practices: A Case Study of Vegetable Growers in Chitwan, Nepal.
[32] Sidchogan-Batani, R. (2013). Engaging Women's Knowledge and Practices in Negotiating Climate hazards: The Integrative Roles of Kankana-ey Women. Institute.inc.,42(1/2):39-75.
[33] Staudacher, et.al., (2020). Comparative Analysis of Pesticide Use Determinants Among Smallholder Farmers from Costa Rica and Uganda.sagejournals.pub.com.77:40-47.https://doi.org/10.1177/1178630220972417.
[34] Valleser, V., et.al., (2020). Establishment of Gender-Inclusive Coconut-Based Multi-Storey Farm Model in Bukidnon, Philippines. College of Agriculture, MSU. AGRISE; 20:1;652-661.
[35] Waskom RM and MD Yergert. (1994). Best management practices for pesticide and fertilizer storage and handling. Colorado State University Cooperative Extension.
[36] Yassin MM, TA Abu Mourad and JM Safi. (2002). Knowledge, attitude, practice, and toxicity symptoms associated with pesticide use among farm workers in the Gaza Strip. (downloaded March 5, 2018).
[37] Zselecsky, L. et.al., (2012). Mapping Gendered Pest Management Knowledge Practices and Pesticide Exposure Pathways in Ghana and Mali. Agriculture and Human Values. Springer Science. 32:4. DOI:10.1007/s10460-015-9590-2.