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Farmers' Knowledge on Using Pesticide in Zamboanga City, Philippines

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Abstract: *Pesticides are substances or mixtures of substances that are being used to prevent, destroy, repel, or mitigate pests. Nonetheless, pesticides may cause hazard if used excessively or if misused. With this, the researchers aimed to determine the farmers' knowledge on using pesticide in Zamboanga City specifically in the barangays of Manicahan, Capisan and Tugbungan. This study employed descriptive-quantitative research design. There were 90 farmers participated in this study and answered the Farmer's Knowledge on Using Pesticide Checklist. Frequency and percentage was used to treat the collected data. Most of the farmers utilized insecticides to treat pests. Farmers used a variety of pesticides and have received pesticide safety training. The majority of farmers practice IPM and observe protective measures. Despite of complying these safety measures, majority of farmers experienced variety of health problem that may attribute to their exposure on pesticides such as excessive sweating, headache and skin irritation. Further, the farmers witnessed the impact of pesticides on the environment. To reduce the health and environmental dangers of pesticides, comprehensive intervention strategies must be implemented by the government such as conducting a continuous training on safety, updating farmers' knowledge on latest techniques in pest control, implementing the usage less toxic pesticides, and integrating new technologies for pest control.*

Keywords: *Farmers' Knowledge, Pesticides, Pests, Agriculture*

1. INTRODUCTION

Pesticides are substances or mixtures of substances that are being used to prevent, destroy, repel, or mitigate pests. Any organism that causes plant diseases is considered a pest (Nicolopoulou-Stamati *et al*., 2016). Agricultural pesticides are chemicals used by farmers to prevent pests from having an impact on the growth and productivity of crops (Jeyaratnam, 1990; Jallow *et al*, 2017). According to World Health Organization or WHO (2018), there are 1000 different pesticides are used around the world. It became an essential part of modern farming, and they play a significant role in increasing agricultural productivity. However, the indiscriminate and widespread use of pesticides can cause serious pest outbreaks, extinction of non-target species, soil, water, and air pollution, and residues in primary and derived agricultural products, that became a world's major environmental and human health issues (Pimentel, 2005; Jallow *et al*, 2017). Zaw Lwin *et al*. (2018), Boedeker *et al*. (2020), and Thapa *et al*. (2021) stated that pesticides can cause harm in the nervous system, reproductive system, and endocrine system, and may lead to death. Pesticide-related diseases may even affect farmer performance, as farmers are the primary workers in the agricultural industry (Damalas & Koutroubas, 2016). Pesticide hazards can occur as a result of the improper use of highly toxic substances, failure to follow preventive principles, lack of protective measures, or the use of defective protective equipment during chemical pesticide exposure (Litchfield, 2005).

WHO estimated that there were 1 to 5 million cases of chemical pesticides poisoning and nearly 20,000 deaths among farmers and agricultural workers every year. WHO also emphasized that developing countries consume more than half of the pesticides available worldwide (Taghdisi *et al*, 2019). Worldwide efforts to use less toxic chemicals, such as organochlorines and organophosphate pesticides, and to include warning labels to communicate risk information to users have not been very successful. Hence, many farmers in developing countries use more pesticides in their farms, and became vulnerable on the effect of chemical in their health (Ajayi & Akinnifesi, 2007; Yap & Demayo, 2015).

The Philippines is considered as developing and agricultural country. Since there is a high competition in food production, Filipino farmers rely heavily on pesticides to boost yields (Snelder *et al*, 2008; Lu, 2010). Many Filipino farmers' health issues have never been reported as being directly caused by pesticide use. Many rural Filipino farmers are superstitious, attributing their health problems to unknown factors rather than the toxic chemicals in the pesticides they use. While the Philippine government has regulated pesticides and banned chemicals with high toxicity, it is commonly observed that the agriculture department has never monitored farmers' understanding of pesticides and their uses (Yap & Demayo, 2015). Majority of the crops grown in the country can be seen in various regions. Zamboanga Peninsula is one the region that supplies most of the crops in the Philippines like corn, palay (rice), coconuts, and fruits. Zamboanga City is one of the cities in this region, and there were no study conducted in the city that explore the knowledge of farmers' on the safe usage of pesticides.

With this study, the researchers aimed to determine the knowledge of farmers on the safety usage of pesticide in Zamboanga City in terms of:

- pesticide type and product names;
- knowledge and training on using pesticides and other pest control techniques;
- protective measure (before, during and after) using pesticides; and
- impact of pesticides on the farmers' health and in the environment.

The information gathered will be useful in developing policies and training programs to reduce occupational risks from pesticide poisoning among farmers and agricultural workers.

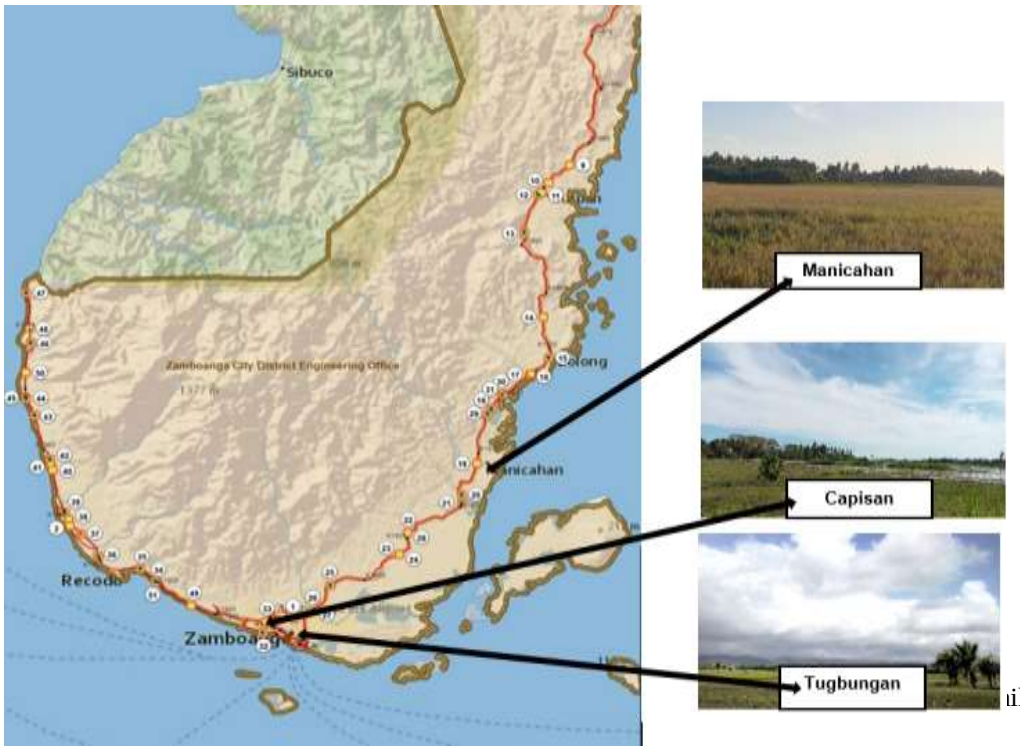
2. METHODS

Research Design

This study employed descriptive-quantitative research design to determine the knowledge of farmers in Zamboanga City on the safety usage of pesticide in terms of pesticide type and product names, knowledge and training on using pesticides and other pest control techniques, protective measure (before, during and after) using pesticides, symptoms experience after spraying and pesticides impact on the environment.

Research Locale

This study were conducted in three different barangays in Zamboanga City: Manicahan, Capisan and Tugbungan. These barangays are known for producing rice in the City. Figure 1 shows the map of Zamboanga City and the locations of the three barangays.



ilippines.

Research Instruments

Farmer's Knowledge on Using Pesticide Checklist (FKUPC), a researcher-made instrument were used in this study. The FKUPC contains 6 parts: Part 1 collects the demographic information of the respondents such as the age, length of years as farmer, gender, educational attainment and land tenure; Part 2 determines the type of pesticides and product names used by farmers; Part 3 determines the knowledge and training of farmers on using pesticides and other pest control techniques; Part 4 determines the

protective measures of farmers before, during and after using pesticides; Part 5 determines the symptoms experienced by farmers after using pesticides; and Part 6 determines the knowledge of farmers on the impact of pesticides on the environment. There were three employees from Department of Agriculture (DA) validated the FKUPC. The FKUPC was translated into local dialect for better communication.

Data Gathering Procedure

The researchers visited the three barangays and invited the farmers to participate in the study. The researchers oriented the farmers as to the nature of the study and distributed the informed consent. After the farmers signed the informed consent, the researchers distributed the FKUPC. The farmers answered the FKUPC for 10 to 20 minutes. Afterwards, the researchers retrieve the FKUPC.

Statistical Treatment of Data

Frequency and percentage was used to treat the data collected in this study. A frequency and percentage distribution is a representation of data that shows the number of observations for each data point or group of data points.

3. RESULTS AND DISCUSSION

Demographic Profile of the Farmers

There were 90 farmers coming from Manicahan, Capisan and Tugbungan participated in this study. Table 1 shows the demographic profile of the farmers.

Table 1.
Demographic Profile of the Respondents (N=90).

	Frequency	Percentage (%)
Age Group		
< 20	10	11.12
21 – 30	12	13.33
31 – 40	18	20.00
41 – 50	23	25.55
51 – 60	27	30.00
Length of Years as Farmer		
5 – 10	14	15.55
11 – 20	24	26.66
21 – 30	16	17.77
31 – 40	29	32.22
41 – 45	7	7.80
Gender		
Male	61	67.77
Female	29	32.23
Educational Attainment		
No Schooling	16	17.77
Elementary	27	30.00
High School	38	42.23
College	9	10.00
Land Tenure		
Own	4	4.44
Caretaker	12	13.33
Rent	1	1.11
Casual (Just Farmer)	73	81.12

It can be seen in Table 1 that most of the respondents belong to the age group of 51-60 (30.00%), while there were few respondents belong to the age group less than 20 (11.12%). As to the length of years as farmers, most of the respondents belong to

31 to 40 years (32.22 %), while there were few respondents belong to 41 to 45 years (7.80%). As to the gender of the farmers, most of the respondents were male (67.77%), while the rest are female. In terms on educational attainment, most of the respondents reached high school (42.23%), while few reached college level (10.00%). In terms on land tenure, most of the respondents are casual (81.12%), while few rent the land (1.11%).

Pesticide Type and Product Names

Pesticides come in a variety of forms to combat certain pests. The name "-cide" comes from the Latin word "to kill." Herbicides, insecticides, and fungicides are the most often used pesticides. Table 2 shows the type of pesticide and the name of the product that is being used by farmers.

Table 2.
The Pesticide Types and Product Names used by Farmers (N=90).

Pesticide Type & Product Names	Frequency
Herbicides	
Rouge	13
Machete	37
2,4-D Ester	45
Fungicide	
Kocide	13
Insecticides	
Sevin	19
Parakuhol	41
Bushwack	6
Cymbush	14
Magnum	6
Brodan 31.5 EC	38
Karate 2.5 EC	7
Solomon	8
Snailkill	11
Y-kurat	10
Thiodan	13
Paraulod 300EC	9
Alika	15
Selecron	13

It can be seen in Table 2 that farmers utilized 3 different types of pesticides, with insecticides being the most common. This finding is consistent with Yap and Demayo (2015), who found that insecticides are the most commonly utilized pesticides. There were 14 insecticides used by farmers which are Sevin, Parakuhol, Bushwack, Cymbush, Magnum, Brodan 31.5 EC, Karate 2.5 EC, Solomon, Snailkill, Y-kurat, Thiodan, Paraulod 300EC, Aika, and Selecron. The second most common pesticide being used is herbicide, which reduces the cost and drudgery in weed control (Rahman, 2016). There were 3 herbicides being used by the farmers, which are the Rouge, Machete, and 2, 4-D Ester. The least type of pesticide commonly used by the farmers is fungicide, wherein, they only use Kocide. Among the types of pesticides being used by the farmers, insecticides are the most harmful type of pesticides and herbicides can also harm non-target creatures (Aktar *et al*., 2009).

Knowledge and Training on using pesticides and other Pest Control Techniques

While spraying pesticides, particles might be swallowed by the farmers through air or can cause contamination in drinking water, food, or soil. Transport, storage, and handling must all be done with extreme caution. As a result, having knowledge and training in the use of pesticides and other pest control techniques is necessary. Table 3 shows the farmers' knowledge and training on using pesticides and other pest control techniques.

Table 3.
Farmers' Knowledge and Training on Using Pesticides and Other Pest Control Techniques (N= 90).

	Frequency	Percentage (%)
Source of Pesticides		
One	25	27.77

Many	65	72.23
Pesticide Brand Used		
Same	36	40.00
Different	54	60.00
Training on Pesticide Safe Handling		
Yes	63	70.00
No	27	30.00
Pest Control Techniques		
Organic Production	8	8.89
Integrated Pest Management (IPM)	69	76.66
Biological Control	13	14.45
Training on Integrated Pest Management(IPM)		
Yes	71	78.88
No	19	21.12

It can be seen in Table 3 that most of farmers (72.23%) purchased pesticides from different retailer, while others (27.77%) purchased pesticides from a single vendor. Further, many farmers (60.00%) used different brands of pesticides, while only few (40.00%) used one brand. According to Yap and Demayo (2015), the use of different types of pesticides depend on type of pests that attacked a specific area and the brands used were no longer effective because the pests became tolerant. In terms on pesticide safe handling training, most farmers (70.00%) received trainings in safe handling of hazardous chemicals, while others (30.00%) did not undergo any trainings. In terms on pest control, most farmers (76.66%) used Integrated Pest Management (IPM) training to control pest, while 14.45% and 8.89% of the farmers used biological and organic production control respectively. Hence, most of the farmers (78.88%) received training on IPM, a pest control system for agricultural crops that is based on an ecological approach (Kusumaward, 2018).

Protective Measure (Before, During and After) using Pesticides

Pesticides can be useful, but can also be hazardous if used carelessly. As a result, precautions should be taken before, during, and after pesticide application. Table 4 shows the protective measure implemented by farmers before, during, and after using pesticides.

Table 4.
Protective Measures of Farmers when using Pesticides (N=90).

	Frequency	**Percentage (%)**
Before Spraying Pesticides		
Read Pesticide Label/ Instructions		
Yes	60	66.66
No	30	33.34
Follow Pesticide Label		
Yes	55	61.12
No	35	38.88
Wear Gloves while Mixing		
Yes	44	48.88
No	46	51.12
Wear Mask while Mixing		
Yes	39	43.33
No	51	56.67
During Spraying of Pesticides		
Wear Boots		
Yes	43	47.78
No	47	52.22
Wear Gloves		
Yes	54	60.00
No	36	40.00
Wear Goggles		

Yes	56	62.22
No	34	37.78
Wear Hat		
Yes	29	32.22
No	61	67.78
Wear Mask		
Yes	67	74.44
No	23	25.56
Wear Long-Sleeved Clothes		
Yes	73	81.11
No	17	18.89
Wear Long Pants		
Yes	58	64.44
No	32	35.56
Smoke while Spraying		
Yes	11	12.22
No	79	87.78
Eat/ Drink while Spraying		
Yes	27	30.00
No	63	70.00
After Spraying Pesticides		
Take a Bath/ Changed Clothes		
Yes	63	70.00
No	27	30.00
Put a Sign After Spraying on the Field		
Yes	61	67.78
No	29	32.22
Container Disposal		
Buried	69	76.67
Stored at Home	9	10.00
Separate Storage	12	13.33
Put a Sign where Bottles Buried		
Yes	73	81.11
No	17	18.89

It can be seen in Table 4 that before spraying pesticides, the majority of the farmers read the pesticide instructions (66.66%) and follow the pesticide label (61.12%). These findings concur with the findings of Tuna *et al*. (2012), that most of his farmer-respondents always read the instructions for pesticides. Nonetheless, most of the farmers do not wear gloves (51.12%) and masks (56.67%) when mixing pesticides. During the spraying of pesticides, most of the farmers wear gloves, goggles, masks, long-sleeved clothes, and pants. However, most farmers do not wear boots and hats when spraying pesticides. According to Yap and Demayo (2015), not wearing boots and hats is most likely because it is inappropriate, unnecessary, and uncomfortable. Almost all of them even avoid smoking (87.78%) and eating or drinking (7.00%) while spraying. Following the spraying sessions, sanitary practices such as changing clothes and taking a bath were followed. Almost all of the farmers (70.00%) took a bath and changed their clothes after spraying. Nonetheless, most farmers (67.78%) do not place a sign or flag that will warn other people that the field is newly sprayed with pesticides. After using the pesticides, most of the farmers (76.67%) burry the empty container, and 81.11% of them label the buried site.

Impact on Farmers' Health After Spraying

Since farmers are exposed in pesticides, they may experience some effects on their health. These effects may appear several hours after exposure. Table 5 shows impact on farmers' health after being exposed on pesticides.

Table 5.
The Impact of Pesticides on the Health as Experienced by Farmers (N=90).

Symptoms	Frequency
Skin Irritation	66

Eye Irritation	30
Headache	73
Excessive Sweating	85
Cough	48
Dry Throat	41
Dizziness	28

It can be seen in Table 5 that farmers experienced skin irritation, eye irritation, headache, excessive sweating, cough, dry throat, and dizziness. This finding concurs with the study of Zyoud *et al*. (2010), who found that 37.5% of farmers experienced itchy skin, 37.0% had headaches, 24.9% had excessive sweating, and 21.3% had diarrhea. Nonetheless, Jallow et al. (2017) suggest that some of the symptoms may have been caused by factors other than pesticide exposure, such as excessive sun exposure, especially if no head protection is worn. It can be seen that even if the farmers are knowledgeable about the safety measures, and practice them, still they experience some of the symptoms.

Impact of Pesticides on the Environment

Pesticides are beneficial to crops, yet they have significant negative influence on the environment. Excessive use of pesticides has the potential to destroy biodiversity. Table 6 shows the effect of pesticides as perceived by the farmers.

Table 6.
The Impact of Pesticides on the Environment as perceived by the Farmers (N=90).

	Frequency	**Percentage (%)**
Air Contamination		
Yes	66	73.33
No	24	26.67
Water Contamination		
Yes	58	64.45
No	32	35.55
Death Fishes, Frogs and Birds		
Yes	64	71.11
No	26	28.89

It can be seen in Table 6 that farmers witnessed the contamination of air, and water, and the death of organisms such as fishes, frogs, and birds after pesticide application. According to Glotfelty & Schomburg, (1989) and Aktar *et al*. (2009), vegetation can be directly sprayed with pesticides, or pesticides can drift or diffuse from the treated area, contaminating the air, water, soil, and non-target organisms and plants. Even from ground equipment, some pesticide drift occurs during every application.

To reduce the health and environmental dangers of pesticides, comprehensive intervention strategies must be implemented by the government such as conducting a continuous training on safety, updating farmers' knowledge on latest techniques in pest control, implementing the usage less toxic pesticides, and integrating new technologies for pest control.

4. CONCLUSION

Majority of farmers used insecticides to treat pests. Farmers uses a variety of pesticides and have received pesticide safety training. The majority of farmers practice IPM and take protective measures. Nonetheless, the farmers experienced and witnessed the impact of pesticides on their health and on the environment.

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