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Field Survey: Collection and Analysis of Data on Pesticide Poisoning Incidents among Farmers in Belize 2021

Final Report



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Abbreviations and Acronyms

<u>AR</u>	Assessment Report
<u>BHIS</u>	Belize Health Information System
<u>eHealth</u>	Electronic Health
<u>FAO</u>	Food and Agriculture Organization of the United Nations
<u>FFW</u>	Farmers & Farm Workers
<u>GOB</u>	Government of Belize
<u>IDB</u>	Inter-American Development Bank
<u>KISS</u>	Keep It Short and Simple
<u>NGO</u>	Non-Profit Organization
<u>MOA</u>	Ministry of Agriculture
<u>MOHW</u>	Ministry of Health and Wellness
<u>PCB</u>	Pesticide Control Board
<u>PPE</u>	Personal Protective Equipment
<u>SE</u>	Socio-Economic
<u>SHPF</u>	Severely Hazardous Pesticide Formulations
<u>SPM</u>	Summary for Policymakers
<u>UB</u>	University of Belize

EXECUTIVE SUMMARY

In June 2020, the University of Belize (UB) administered a field survey titled; Collection and Analysis of Data on Pesticide Poisoning Incidents among Farmers in Belize. The field Survey was funded by the Food and Agriculture Organization of the United Nations (FAO) part of the Rotterdam Convention Secretariat. The Rotterdam Convention of the United Nations, to which Belize is a Party, has a core objective of mitigating the adverse effects of pesticides on human health. This includes actions to reduce poisoning incidents due to Severely Hazardous Pesticides Formulations.

The Belize Pesticide Poisoning among Farmers & Farm Workers Survey questionnaire included 42 questions, covering questions such as:

1. Gender and age of the respondent
2. Name of the pesticide involved
3. How the incident occurred
4. What Personal Protective Equipment (PPE) was being used at the time of the incident (if any)
5. If not, why were the required PPE not being worn
6. Route of exposure (nose, skin, eyes, mouth)
7. Acute health problems experienced as a result
8. What treatment was given, including self-treatment or medical attention was sought.
9. Data collector's information.

The survey questionnaire was similar to the one used for Jamaica and Trinidad & Tobago in 2020, except that the Class I & II toxicity pesticides most commonly sold in Belize retail farm stores was

listed rather than those of the previous countries. The survey questionnaire modifies the Rotterdam

Convention Severely Hazardous Pesticide Formulation Form – Human Health Incidents and captures all required information.

The objective of the survey is to identify pesticides that appear to be significant health hazards under the normal conditions of use. The top 10 list of these pesticides involved are: 1) 2,4-D Amine 60 SL, 2) Newmectin 1.8 EC, 3) Gramoxone 20 SL, 4) Super Pro-Quat 20 SL, 5) Malathion, 6) Jackpot 5 EC, 7) Cypermethrin 25 EC, 8) Glyphosate, 9) Helosate and 10) Karate Zeon 5 CS (see Table 4). Noteworthy, none of these pesticides that made this top 10 list were from the Class I Toxicity (most toxic pesticides) group. The pesticides from the Class I Toxicity group involved in the incident were: Vydate 24 SL, Lannate 21.6 SL, Lannate 90 SP, and Lash 90 SP and were ranked 17th, 19th, 20th, and 26th, respectively. A subsequent review of the pesticides was done to identify the reported pesticides' active ingredients (see Table 29). Some 27 active ingredients were identified, with the most poisoning incidents involving 2,4-D or abamectin (15.5% each); next were glyphosate or paraquat (10.3% each), with lambda cyhalothrin (8.2%) in fifth place.

The survey revealed that the farmers interviewed had experienced mild to severe reactions from pesticide usage in the field. Hence, measures need to be implemented to enhance farmers' and farm workers' knowledge of all the pesticides in the list of the Class I Toxicity so that they would be aware of the most toxic pesticides available in the market.

Furthermore, the data indicates that FFW respondents were not frequently using pesticides in the Class I Toxicity group, which is a good farming practice for safety reasons. This survey also revealed that 33.3% of the farmers used a mixture as a pesticide. This survey revealed that 7.1% of the incident occurred While Diluting, Mixing, or Opening Pesticides. Mixing some pesticides

is not always a problem, such as an insecticide with a fungicide, and is recommended. However, some mixtures expose the person to double poisoning from two (2) toxic products, while some are a waste of money as both perform the same function (see Table 30 in the Annex). The Pesticide Control Board and the Ministry of Agriculture need to address this problem through education initiatives on mixing acceptable vs. harmful or wasteful products.

The Survey results indicate a need for FFW to receive practical training on using a sprayer when working on a farm, especially when the weather is windy. Also, farmers need to keep track or be constantly aware of the weather and avoid spraying on windy days. These results suggest that proper training must be provided to FFW on the importance of wearing PPE when using pesticides at the farm. Moreover, training must also be focussed on getting the FFW to experience behavioural change that conforms to best practices of wearing PPEs when using pesticides at their respective farm. The survey suggests that FFW are not wearing their Personal Protective Equipment (PPE), especially masks when working on their farms.

Moreover, in general, the incidence of pesticide poisoning in Belize has been trending upwards, and the most significant year over year increase is in the 2020 to 2021 period when the Poisoning Incident among FFW was almost doubled (i.e., 1.8 times) from 41 cases in 2020 to 73 cases in 2021 (see Chart 3). Kindly note that the increase in the incidence of pesticide poisoning in Belize for 2021 is even more significant as the period for 2020 was a full year while the period for 2021 was only for the period January to August.

The report presented results and analysis to five specific questions requested by the FAO consultant. These questions are:

1. *How did pesticide poisoning affect females regarding pesticide, symptoms, severity, and treatment?*

It was found that nine (9) females were affected by pesticide poisoning in Belize for the period July 2018 to August 2021 (see Table 9). Most (55.6%) of the nine (9) females were 40 years of age or younger (usual child-bearing age), while 44.6% were over 40 years old. The majority of the female pesticide incidents occurred via inhalation when these females were around the farmers or farm workers while spraying the farmyard. The pesticides that affected these nine (9) females more often were Malathion and 2,4-D Amine 60 SL pesticides; each of these pesticides affected two females. Furthermore, none of these pesticides that affected the females involved in the pesticide poisoning cases were from the Class I Toxicity group. These nine (9) females affected by pesticide poisoning experienced the most common symptoms of dizziness and headaches. The most common type of treatment that these nine females received were: Self Treatment (4) followed by Nothing/No Action (3), Went to a Private Doctor (1), and Washed the chemical off immediately (1).

2. *What Personal Protective Equipment were FFW victims of inhalation pesticides poisoning wearing when working with pesticides on the farm?*

Because the reported major route of pesticide poisoning was by inhalation, there was a review of the PPE being worn to protect from inhalation at the time of those incidents (see Table 22). The relevant items reported were (1) those recommended for inhalation protection - “respirator with cartridges”, of which 10 inhalation incidents still occurred (11%), or “dust mask with pesticide absorbing particles (single use)” with 4 incidents (4%); (2) those providing some protection - spray mask, with 14 incidents (15%) reported; (3) those not

recommended/not effective against inhalation - “regular dust mask” had 22 incidents (24%), scarf or cloth over nose and mouth had 17 incidents (19%). Kindly note that 15 or 16.3% of the 92 FFW victims of inhalation poisoning were wearing “No PPE”. In general, it seems that FFW victims of inhalation poisoning were wearing more ineffective PPEs than effective PPE when working with pesticides on the farm. It is alarming that 15% of the cases occurred although recommended inhalation protection was being used; this needs to be addressed.

3. *Does suitable Personal Protective Equipment always work for FFW when they work with pesticides?*

The PPEs are working well as there were only 2 or 1.3% of all 150 pesticide poisoning victims were wearing all the PPE (i.e., Rubber Gloves, Coverall / Overall, Goggles, Respirator with Cartridges, Water Boots, Long Sleeve Shirt & Long Pants) (see Table 23). For a future study, it would be good to determine how these two victims were still affected by the pesticides when they wore all PPEs. Perhaps it may be due to improper use of PPEs or a defect in the PPEs. Notable was the fact that 14 persons reportedly were poisoned by inhalation despite wearing their recommended respirator with cartridges (10) and dust masks with pesticide-absorbing particles (4). This requires further investigation by the authority.

4. *What are the incidents of the Farmers and Farmworkers in Belize victims experiencing pesticide poisoning symptoms "extremely severe / very serious problem" but they did not seek medical attention in terms of pesticide, symptom, the treatment used rather than medical attention?*

There were 96 of the 150 FFW in the survey who were victims experiencing pesticide

poisoning symptoms "extremely severe / very serious problem." Of these 96 victims, self-treatment was the primary treatment used rather than seeking medical attention when respondents felt the effects of the pesticide, accounting for 34.4% of these victims (see Table 25). Treatments followed this: "I continued spraying, and after I had finished, I washed the chemical off," "I washed the chemical off immediately," "Rested / Stopped Using the Pesticide," and "Nothing / No Action" accounting for 34.4%, 26.0%, 17.7%, 14.6%, and 7.3% respectively.

In terms of symptoms, the top 10 most common symptoms are Headache, Skin Irritation/Itching, Skin Burns, Eye Irritation / Burning, Nausea, Sneezing, Dizziness, Excessive Sweating, Skin Rash, Vomiting, and Tightness of Chest / Asthma (see Table 26). On the other hand, no farmers and farmworkers experienced Pinpoint Pupils, Diarrhea, Coughing Blood, Excessive Salivation, Fainting, and Other symptoms.

In terms of pesticides, the top 5 most common pesticides that were being used during the pesticide exposure incidents by the Farmers and Farmworkers who did not seek medical attention but experienced extreme or severe symptoms were 2,4-D Amine 60 SL, Gramoxone 20 SL, Newmectin 1.8 EC, Pro-Quat 20 SL, Karate Zeon 5 CS (see Table 27). Thankfully, none of these chemicals belonged to the Class I Toxicity group. Nevertheless, a further 24 pesticides were involved in the pesticide exposure incidents by the Farmers and Farmworkers who did not seek medical attention but experienced extreme or severe symptoms.

5. *Did the Class I toxicity group (most toxic pesticides) affect Farmers and Farmworkers in Belize?* We found that each pesticide within the Class I toxicity pesticides group except for Folater and Quickphos affected Farmers and Farm Workers. The predominant pesticide from the Class I toxicity pesticides group that affected Farmers and Farmworkers in Belize was

Vydate 24 SL, followed by Lannate 21.6 SL, Lannate 90 SP, and Lash 90 SP (see Table 24).

6. *What are the incidents of the Farmers and Farmworkers in Belize victims experiencing pesticide poisoning symptoms "extremely severe / very serious problem" but they did not seek medical attention in terms of pesticide, symptom, the treatment used rather than medical attention?*

There were 96 of the 150 FFW in the survey who were victims experiencing pesticide poisoning symptoms "extremely severe / very serious problem." Of these 96 victims, self-treatment was the primary treatment used rather than seeking medical attention when respondents felt the effects of the pesticide, accounting for 34.4% of these victims (see Table 25). Treatments followed this: "I continued spraying, and after I had finished, I washed the chemical off," "I washed the chemical off immediately," "Rested / Stopped Using the Pesticide," and "Nothing / No Action" accounting for 34.4%, 26.0%, 17.7%, 14.6%, and 7.3% respectively.

In terms of *symptoms*, the top 10 most common symptoms are Headache, Skin Irritation/Itching, Skin Burns, Eye Irritation / Burning, Nausea, Sneezing, Dizziness, Excessive Sweating, Skin Rash, Vomiting, and Tightness of Chest / Asthma (see Table 26). On the other hand, no farmers and farmworkers experienced Pinpoint Pupils, Diarrhea, Coughing Blood, Excessive Salivation, Fainting, and Other symptoms.

In terms of *pesticides*, the top five (5) most common pesticides that were being used during the pesticide exposure incidents by the Farmers and Farmworkers who did not seek medical attention but experienced extreme or severe symptoms were 2,4-D Amine 60 SL, Gramoxone 20 SL, Newmectin 1.8 EC, Pro-Quat 20 SL, Karate Zeon 5 CS (see Table 27).

Thankfully, none of these chemicals belonged to the Class I Toxicity group. Nevertheless, a further 24 pesticides were involved in the pesticide exposure incidents by the Farmers and Farmworkers who did not seek medical attention but experienced extreme or severe symptoms.

7. *Did Farmers and Farmworkers know the health hazards of Class I toxicity pesticides and those pesticides in incidents that caused "extremely severe / very serious" symptoms used on the farm?*

It was found that most (54.9%) Farmers and Farmworkers either did not know (7.0%) or were not sure (47.9%) whether the 26 pesticides that belonged to the Class I toxicity pesticides group and those pesticides in incidents that caused "extremely severe / very serious" symptoms used on the farm were a health problem. This tells us that majority of Farmers and Farmworkers still do not know enough of the health hazards of the pesticides used on their farms.

The top three (3) pesticides that Farmers and Farmworkers were most knowledgeable of in terms of pesticides belonging to the Class I toxicity pesticides group and pesticides that were in incidents that caused "extremely severe / very serious" symptoms used on the farm were Gramoxone 20 SL, 2,4-D Amine 60 SL and Lannate 21 with scores of 80.0%, 78.5%, and 69.2% respectively. On the other hand, the top three (3) pesticides that Farmers and Farmworkers were least knowledgeable of in terms of belonging to the Class I toxicity pesticides group and pesticides that were in incidents that caused "extremely severe / very serious" symptoms used on the farm were Folater 15 GR, Rotaprid Gold 37 and Quickphos 56 GE with 21.5%, 24.6%, and 26.2% respectively. It is alarming to see that Farmers and Farmworkers had very poor knowledge of two (2) of the most toxic

pesticides (Folater 15 GR and Quickphos 56 GE) being a health problem on the farm even after being a victim of an incident involving the use of these pesticide(s) at the farm which caused them to suffer from "extremely severe / very serious" symptoms.

CHAPTER 1

1.0 Introduction

Belize has a population of about 430,191 (July 2021) and a per capita income of BZD \$1,168. The country has undergone a significant economic transformation over the last decade due to the commercial oil discovery in 2005. Belize has experienced a significant decline within the last two (2) years, like many other countries, mainly due to the negative effect of the global pandemic COVID-19 on the tourism industry. Similarly, for the last two (2) years, the Agriculture industry has been the primary source of income and employment. The agriculture sector kept the country afloat during the pandemic and has awakened the policymakers within the government of Belize to the importance of Belize's sustainability.

Agriculture in Belize is characterized by three sub-sectors: a) a relatively well-organized traditional export sector for sugar, banana, citrus, and fisheries, b) a more traditional, small-scale farm sector, producing food mainly for local consumption; and c) a non-traditional commercial export sector. The use of pesticides in the agriculture sector is widespread and regulated by the Pesticides Control Board, established in 1988 under the Ministry of Agriculture to carry out the provisions of the Pesticides Control Act. The functions of the Pesticides Control Board are geared toward the comprehensive control of pesticides in Belize. Pesticides are used mostly in agriculture and public health to control pests and diseases. While pesticides play an important role in sustaining our food supply and controlling vector-borne human illnesses, they may also be hazardous to human health and the environment if not used as intended.

The Rotterdam Convention of the United Nations has a core objective of mitigating the adverse effects of pesticides on human health. This includes reducing poisoning incidents due to Severely

Hazardous Pesticide Formulations (SHPFs). The subject of this study is pesticide poisoning in farming communities in Belize.

The project aimed to identify pesticides that appear to be a significant health hazard under the ordinary conditions of use and provide data that all stakeholders will utilize to reduce the incidence and severity of pesticide poisoning in Belize. The subsequent review of those pesticides and their adverse health effects by the national pesticide regulatory agency may warrant notifications to the Rotterdam Convention secretariat to recommend listing as SHPFs so that the FFWs can utilize the information-sharing mechanisms of the Convention.

Figure 1: Training Day for Interviewers



Figure 2: Training Day 1



The University of Belize (UB) team completed training and fieldwork from July 26 to August 13, 2021 (see Figures 3 & 4). We achieved interviewing the target number of 150 persons with poisoning incidents who met the required criteria:

- i. had one or more pesticide poisoning incidents in the past three years,
- ii. experienced one or more symptoms listed in the questionnaire, and
- iii. can name the pesticide(s) that was (were) being used.

Figure 3: Manually Collecting Data on a Remote Farm



Figure 4: Collecting Data Electronically



The researchers completed quality control measures on the questionnaires submitted to ensure that each interview was genuine and all questions were answered with clear responses. The data were further cleaned to ensure that all errors were captured and corrected. To verify the genuineness of

the survey data, the Field Supervisor contacted all farmers or farm workers who had a listed telephone number. These farmers or farm workers were asked a sample of questions from their respective questionnaires. The farmers or farm workers' responses received did match the data entered by the data collector.

CHAPTER 2

2.0 Methodology

This chapter covers the study design and methodology, including sampling, study population, data collection, quality control measures during and after data collection, and the survey team governance.

2.1 Study Population

The survey targeted farmers from across the entire country. The interviewers approached the Farmers and Farm Workers (FFW) in the major farming areas where hazardous pesticides are regularly used to determine whether they have been adversely affected by agricultural use of pesticides in the past three (3) years (i.e., June 2018 to August 2021). Suitable persons were interviewed on farms, pesticide retail stores, farmer's markets, and farmer training. A target of 150 persons responding yes, were interviewed right away based on:

- Having experienced one or more adverse health effects arising from an incident and
- Knowing the pesticide that was being used

Excluded from the Survey were:

- Incidents of deliberate misuses, such as suicide attempts,
- Accidental poisoning of children due to improper storage and
- Second-hand information (the victim must be the person interviewed)

2.2 Methods and Instrument

Face-to-face interviews via a semi-structured modular web-based questionnaire were conducted for selected convenience samples of FFW. The only survey instrument used for this study is the survey questionnaire that is modular in fashion; inter alia, it is comprised of four (4) modules (M)

to include: M-I: Participant Information (Survey Control Information); M-II: Demographics; M-III: Pesticide Information and its Effects on the Farmers and Farm Workers; M-IV: Data Collector's Details (for Quality Control purposes). Given the multiple target audiences with varied pesticide poisoning experiences, the survey instrument included some filters and skipped patterns as only certain items within and across the four (4) modules may be directly applicable to each.

Furthermore, the survey questionnaire was similar to the one used for Jamaica and Trinidad & Tobago in 2020, except that the Class I & II toxicity pesticides most commonly sold in Belize retail farm stores was listed rather than those of the previous countries. The Rotterdam Convention Severely Hazardous Pesticide Formulation Form was modified to produce the survey and capture all required information.

Questions include:

1. Gender and age of the respondent;
2. Name of the pesticide involved;
3. How the incident occurred;
4. What Personal Protective Equipment (PPE) was being used at the time of the incident (if any);
5. If not, why were the required PPE not being worn;
6. Route of exposure (nose, skin, eyes, mouth);
7. Acute health problems experienced as a result;
8. What treatment was given, including self-treatment or medical attention was sought.

2.3 Administration of the Questionnaire

Trained interviewers administered the structured Pesticide Poisoning Questionnaire face-to-face. Experienced interviewers were trained over two (2) days, and their performance was evaluated

before conducting the actual interviews. The training encompassed: mini-lectures related to basic interviewing techniques and specific thematic areas, step-by-step demonstration on filling out the questionnaire; role-playing and mock interviews; and live field practice. Additionally, during the fieldwork, interviewers were supported by a field supervisor with additional support and guidance from various members of the Technical Team.

In consultation with the FAO consultant, the survey instrument provided was reviewed, restructured, and adapted. There was no need to translate into Spanish because we ensured that each interviewing team consisted of a Spanish speaker since many of the farming communities within Belize are Spanish speakers.

An electronic version of the questionnaire was developed and tested on the survey teams' tablets or smartphones. The questionnaire's practical testing was completed with the survey teams, and we revised the questionnaire based on the testing results. We also conducted the training of the interviewers on the final questionnaire in collaboration with the FAO project consultant. The University of Belize (UB) recruited and trained Interviewers who were all students from the Agriculture Department to assist in conducting the survey. All persons involved in the collection and supervision of fieldwork attended the training sessions. The training enabled them to thoroughly understand the main concepts and be familiar with the questionnaire and the training manual. The training lasted for two (2) days. Attendance and punctuality at all sessions were mandatory. We prepared a training package for each person attending the training (see Figures 1 & 2).

2.4 Sampling Design and Sample Size

A nonprobability sample size technique known as convenience sampling was employed in this study. A sample size target of 150 farmers and farm workers who have been adversely affected by agricultural use of pesticides in the past three years was used based on the request of the client and financial resources constraints. Initially, a sample frame that consisted of a list of over 4,000 license pesticides holders provided by the Pesticide Control Board of Belize was used as an initial means to identify possible interviewees. We later had to re-strategize our sampling method because the sample frame was unsuccessful. We targeted the farming zone since the eight interviewers were strategically selected from the regional zone. We also formally reached out to each community leader, sharing the project's objective with them. This strategy was beneficial in identifying crop farmers in their communities. With the help of the community leader or a designate, the interviewers were able to visit the farms and homes of farmers in some instances. We also had some successful interviews at the local pesticides stores. We attended the regional training sessions hosted by the Pesticides Control Board at the end of July and August of 2021.

2.5 The Survey Team and Field Governance

The Pesticide Poisoning Survey Team was led by the Statistician (Dr. Sherlene Enriquez Savery) and supported by another Statistician (Sean Sebastian, M.Sc.) and two other field supervisors, Mrs. Zoe Zetina and Mr. Francisco Tzul. To support the Technical Team, we contracted the services of eight (8) students who were all senior agriculture majors.

To ensure that adequate Field Governance activities and quality control measures were implemented in the various stages of this survey, the following actions were conducted:

- Monitored the survey progress and the interviewer's performance daily.
- Scanned the data for missing data and inconsistency in reporting.
- We identified duplicate entries and cases. For cases where there were missing data, the interviewer contacted the interviewees for necessary corrections.
- After all the 150 persons were interviewed, a new Field Supervisor conducted a back-check exercise using a shortened version of the original survey and the telephone numbers provided.
- We compared the responses for the back-checked to the interviewee's initial responses to detect discrepancies. The Field Supervisor verified 56.7% of the total 150 interviews. The remaining had either no listed contact, provided an incorrect number, or the numerous follow-up calls were unanswered and went to voicemail.
- For cases where the farmers did not have telephones, in designing the survey team, we ensured that the group consisted of two interviewers, a field supervisor, and a driver in many instances. Even though the interviews were conducted privately, the other team members were present in the vicinity as an additional quality control measure.

2.6. Data Entry, Cleaning, Analysis & Reporting

During interviews, the survey data were collected electronically using an online survey questionnaire on smart devices (i.e., tablets and smartphones). In instances of no internet access, the data were collected manually and then later inputted electronically. Completed survey instruments from the samples (Farmers and Farmworkers) were cleared for data processing by field supervisors. Data validation, consistency checks, and data coding were performed by Statisticians, after which data processing was done.

Data were analyzed in SPSS 24.0 after the interviews were conducted using survey instruments from the non-probability samples (FFW), data entry was completed, data validation, consistency checks, and data coding were carried out. The Statisticians undertook the data analysis and prepared the draft KAP Survey Report for validation by the FAO. During this stage, Univariate analysis, a Comparative Analysis of MOHW Data and Survey Results, and analysis of key questions of interest to the Client were performed on the survey dataset.

Univariate and Comparative analyses were conducted using basic frequency tables, a summary of statistical tables, and graphs (histograms, bar charts, pie charts). These statistics were used to examine the distribution of key outcome and predictor variables. The results and analysis of specific questions of interest requested by the Client were done via cross-tabulation tables, basic frequency tables, and summary statistics tables.

In general, these analyses described the sample and variables present in the sample as well as identified certain shared or divergent traits of respondents' knowledge on pesticides, their Pesticide Poisoning Incidents, and behavioral practices. This allowed statisticians to identify pesticides that appear to be significant health hazards under the normal conditions of use. It clearly described the profiles of FFW encountered and highlighted characteristics (variables) that differed from one respondent to another (e.g., age, sex) or from one situation to another. Additionally, data obtained from the key open-ended questions were synthesized, coded, and analyzed. The combined analyses and findings addressed the study objectives or research questions and thus formed the basis for preparing the Draft Survey Study Report. Subsequently, feedback from the Client and wider stakeholders is consolidated and integrated into the Draft Survey Report, resulting in a revised

Draft Survey Report submitted to the FAO for final inputs. Subsequently, the Final Survey Report will be submitted and successfully close the assignment.

CHAPTER 3

3.0 Key Findings: Presentation and Analysis

Key findings and analysis from the 2021 Belize Pesticide Poisoning Among Farmers & Farm Workers Survey (Survey) are presented in this chapter; core survey modules organize this Section of the Report, viz: Control Variables, Demographic Information, and Pesticide Information. Within each module, the core results are presented for each of the drawn samples of Farmers & Farm Workers by selecting variables and characteristics as appropriate.

3.1 Control Variables

3.1.1 Response Rates

The survey was administered to a total of 150 Farmers and Farm Workers (FFW), representing an effective response rate of 100.0%.

3.1.2 Sample Characteristics

Of the 150 respondents, 94.0% were males, and 6.0% were females (Table 1). More than a half (54.0%) of these respondents were young adults 21-40 years of age, followed by older adults, 41-60 years of age (28.7%), seniors, 60+ years of age (10.0%), and youths, less than 21 years of age (7.3%).

In District Where the Poisoning Incident Occurred, Cayo was the predominant District accounting for 44.0% of all respondents, followed by the Toledo District at 24.7% and Orange Walk, Stann Creek, and Corozal Districts with 12.7%, 8.7%, and 2.0%, respectively. There were no respondents in the Belize District where the pesticide poisoning incident occurred. When analyzed by Place of Interview, Home was the largest group with 58.0% of respondents falling in that category,

followed by Other Group, 23.3%, farm, 11.3%, Pesticide Shop 4.0%, Meeting/Training 2.0%, and Market 1.3%.

Table 1: Distribution of Respondents by Selected Characteristics

Variables	Farmers and Farm Workers Sample	
	Frequency	Percent
Total	150	100.0
Sex		
Male	141	94.0
Female	9	6.0
Age Group		
21-40 years	81	54.0
41-60 years	43	28.7
Over 60 years	15	10.0
Less than 21 years	11	7.3
District Where the Pesticide Poisoning Incident Occurred		
Cayo	66	44.0
Toledo	37	24.7
Orange Walk	19	12.7
Stann Creek	13	8.7
Corozal	3	2.0
Place of Interview		
Home	87	58.0
Other	35	23.3
Farm	17	11.3
Pesticide Shop	6	4.0
Meeting / Training	3	2.0
Market	2	1.3

3.1.3 Univariate Analysis

In this section, we analyzed the responses of Farmers and Farm Workers respondents for each question from the 2021 survey questionnaire, which includes all the information required for completing the Rotterdam Convention Severely Hazardous Pesticide Formulation Report Form. Hence, a micro-level analysis was conducted by analyzing the frequency and percent distribution

of groups of Farmers and Farm Workers' responses to each question asked in this survey. This detailed explorative analysis revealed specific areas, issues, or factors that the Farmers and Farm Workers are experiencing concerning pesticide use.

The top 10 pesticides out of 60 pesticides most commonly sold in Belize retail farm stores that Farmers and Farm Workers respondents thought would be a health problem if it was being used on the farm were: 1) Gramoxone 20 SL, 2) 2,4-D Amine 60 SL, 3) Lannate 21, 4) Super Pro_Quat, 5) 20 SL, Mortel 20 SC, 6) Newmectin 1, 7) Sulban 48 EC, 8) Jackpot 5 EC, 9) Sulban 5 DP, and 10) Karate Zeon 5 CS (see Table 2). Note that only Lannate 21 pesticides (ranked third) from the Class I Toxicity (most toxic pesticides) group made the top 10 list of pesticides out of 60 pesticides that Farmers and Farm Workers respondents thought would be a health problem if they were being used on the farm. Other pesticides from the Class I Toxicity group: Lannate 90 SP, Vydate 24 SL, Lash 90 SP, Quickphos 56 GE, and Folater 15 GR pesticides ranked 15th, 16th, 34th, 47th, and 59th, respectively, in the list of 60 pesticides that Farmers and Farm Workers respondents thought would be a health problem if they were being used on the farm. Hence, measures need to be implemented to enhance Farmers' and Farm Workers' knowledge of all the pesticides in the list of the Class I Toxicity so that they would be aware of the most toxic pesticides available in the market.

Table 2: Distribution of Farmers and Farm Workers Sample Respondents by Pesticides and Do you think this pesticide being used on the farm is a health problem?

Pesticides	Do you think this pesticide being used on the farm is a health problem?							
	Yes		No		Not Sure		Total	
	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent
Gramoxone 20 SL	117	78.0%	12	8.0%	21	14.0%	150	100.0%
2,4-D Amine 60 SL	114	76.0%	12	8.0%	24	16.0%	150	100.0%
Lannate 21	84	56.0%	13	8.7%	53	35.3%	150	100.0%
Super Pro_Quat 20 SL	83	55.3%	11	7.3%	56	37.3%	150	100.0%
Mortel 20 SC	78	52.0%	23	15.3%	49	32.7%	150	100.0%
Newmectin 1	78	52.0%	23	15.3%	49	32.7%	150	100.0%
Sulban 48 EC	66	44.0%	11	7.3%	73	48.7%	150	100.0%
Jackpot 5 EC	65	43.3%	11	7.3%	74	49.3%	150	100.0%
Sulban 5 DP	65	43.3%	10	6.7%	75	50.0%	150	100.0%
Karate Zeon 5 CS	64	42.7%	11	7.3%	75	50.0%	150	100.0%
Avaunt 15 EC	60	40.0%	6	4.0%	84	56.0%	150	100.0%
RIMAXONE 20 SL	60	40.0%	9	6.0%	81	54.0%	150	100.0%
Tordon 30	60	40.0%	13	8.7%	77	51.3%	150	100.0%
Delta Plus 5 EC	59	39.3%	12	8.0%	79	52.7%	150	100.0%
Lannate 90 SP	59	39.3%	12	8.0%	79	52.7%	150	100.0%
Vydate 24 SL	58	38.7%	6	4.0%	86	57.3%	150	100.0%
Preglone 20 SL	54	36.0%	16	10.7%	80	53.3%	150	100.0%
Regent 20 SC	54	36.0%	16	10.7%	80	53.3%	150	100.0%
Cypermethrin 25 EC	53	35.3%	12	8.0%	85	56.7%	150	100.0%
Ixus 20 SC	53	35.3%	6	4.0%	91	60.7%	150	100.0%
Kung Fu 2	53	35.3%	4	2.7%	93	62.0%	150	100.0%
BULLGRASS 30	50	33.3%	14	9.3%	86	57.3%	150	100.0%
Elimina 60 SL	50	33.3%	8	5.3%	92	61.3%	150	100.0%
Sultan 20 SL	50	33.3%	11	7.3%	89	59.3%	150	100.0%
Amistar Top 32	49	32.7%	21	14.0%	80	53.3%	150	100.0%
Diazinon 60 EC	48	32.0%	14	9.3%	88	58.7%	150	100.0%
Elimina 72 SL	48	32.0%	9	6.0%	93	62.0%	150	100.0%
Baythroid XL 12	47	31.3%	10	6.7%	93	62.0%	150	100.0%
Lubaquat 20 SL	47	31.3%	13	8.7%	90	60.0%	150	100.0%
MURALLA DELTA 19 OD	47	31.3%	13	8.7%	90	60.0%	150	100.0%
ABAMEC 1	45	30.0%	14	9.3%	91	60.7%	150	100.0%
Rafaga 20 SC	45	30.0%	5	3.3%	100	66.7%	150	100.0%
RIMAXIL 60 SL	45	30.0%	5	3.3%	100	66.7%	150	100.0%
Lash 90 SP	42	28.0%	14	9.3%	94	62.7%	150	100.0%
Pro-Quat 20 SL	42	28.0%	11	7.3%	97	64.7%	150	100.0%
Reglone 20SL	42	28.0%	11	7.3%	97	64.7%	150	100.0%
Angloxone 20 SL	41	27.3%	4	2.7%	105	70.0%	150	100.0%
Atom 2	41	27.3%	5	3.3%	104	69.3%	150	100.0%
RIMAZI2N 60 EC	41	27.3%	4	2.7%	105	70.0%	150	100.0%
Basagran 48SL	40	26.7%	9	6.0%	101	67.3%	150	100.0%
Diaata 10 EC	40	26.7%	3	2.0%	107	71.3%	150	100.0%
Rotaprid Gold 37	40	26.7%	15	10.0%	95	63.3%	150	100.0%
Kilate 10 EC	39	26.0%	6	4.0%	105	70.0%	150	100.0%
Pikudo 20 SC	39	26.0%	6	4.0%	105	70.0%	150	100.0%
Acaramik 1	35	23.3%	11	7.3%	104	69.3%	150	100.0%
PEGASUS 50 SC	35	23.3%	6	4.0%	109	72.7%	150	100.0%
Quickphos 56 GE	35	23.3%	6	4.0%	109	72.7%	150	100.0%
Regnum 25 EC	35	23.3%	6	4.0%	109	72.7%	150	100.0%
Blindage 60 FS	33	22.0%	8	5.3%	109	72.7%	150	100.0%
Cyperkill 50 EC	33	22.0%	4	2.7%	113	75.3%	150	100.0%
Abalone 1	32	21.3%	8	5.3%	110	73.3%	150	100.0%
Emir 8	32	21.3%	7	4.7%	111	74.0%	150	100.0%
SADDLER 35 FS	32	21.3%	2	1.3%	116	77.3%	150	100.0%
Semevin 35 FS	32	21.3%	9	6.0%	109	72.7%	150	100.0%
Totem 72 SL	32	21.3%	5	3.3%	113	75.3%	150	100.0%
Cypersul 25 EC	31	20.7%	5	3.3%	114	76.0%	150	100.0%
Capture 60 SL	30	20.0%	4	2.7%	116	77.3%	150	100.0%
DMA 68	27	18.0%	7	4.7%	116	77.3%	150	100.0%
Forater 15 GR	27	18.0%	4	2.7%	119	79.3%	150	100.0%
Etocop 15 GR	26	17.3%	3	2.0%	121	80.7%	150	100.0%

When we looked at the distribution of Farmers and Farm Workers Sample Respondents by "Where on your body did the pesticide get on you, or into you?", we found that most of the respondents (61.3%) got the pesticide on their body via inhalation followed by Skin-Other Than Face with 40.0%, Skin-Face 18.7%, Eyes with 11.3% and mouth with 2.0% (see Table 3). This suggests that Farmers and Farm Workers are not wearing their Personal Protective Equipment (PPEs), especially masks when working on their farms.

Table 3: Distribution of Farmers and Farm Workers Sample Respondents by Where on your body did the pesticide get on you, or into you?

Where on your body did the pesticide get on you, or into you?	Frequency	Percent
Inhaled	92	61.3
Skin-Other Than Face	60	40.0
Skin-Face	28	18.7
Eyes	17	11.3
Mouth	3	2.0
Total	150	100.0

Note: Sum of each frequency and percent value does not equal to respective Totals shown (i.e. 150 instead of 186 and 100% instead of 124%) since a respondent can select more than one option of the position on their body where the pesticide got on them, or into them.

When we analyzed the distribution of the Exact Name of Pesticide (or Pesticides in a Mixture) Involved in the Incident, we found that the top 10 list of these pesticides is: 1) 2,4-D Amine 60 SL, 2) Newmectin 1.8 EC, 3) Gramoxone 20 SL, 4) Super Pro-Quat 20 SL, 5) Malathion, 6) Jackpot 5 EC, 7) Cypermethrin 25 EC, 8) Glyphosate, 9) Helosate and 10) Karate Zeon 5 CS (see Table 4). Noteworthy, none of these pesticides that made this top 10 list were from the Class I Toxicity (most toxic pesticides) group. The pesticides from the Class I Toxicity group involved in

the incident were: Vydate 24 SL, Lannate 21.6 SL, Lannate 90 SP, and Lash 90 SP and were ranked 17th, 19th, 20th, and 26th, respectively. Hence, farmers would need more education on the list of Class I Toxicity so that they would be aware of the most toxic pesticides available in the Belizean market. Furthermore, the data indicates that Farmers and Farm Workers respondents are seldom using pesticides in the Class I Toxicity group, which is a good farming practice for safety reasons.

Moreover, a subsequent review of the pesticides was done to identify the reported pesticides' active ingredients (see Table 29). Some 27 active ingredients were identified, with the most poisoning incidents involving 2,4-D or abamectin (15.5% each); next were glyphosate or paraquat (10.3% each), with lambda cyhalothrin (8.2%) in fifth place.

Table 4: Distribution of the Exact Name of Pesticide (or Pesticides in a Mixture) Involved in the Incident

Number	Exact Name of Pesticide (or Pesticides in a Mixture) Involved in the Incident	Frequency	Percent	Rank
Total		216	100.0%	
1	2,4-D Amine 60 SL	36	16.7%	1
2	Newmectin 1.8 EC	23	10.6%	2
3	Gramoxone 20 SL	14	6.5%	3
4	Super Pro-Quat 20 SL	10	4.6%	4
5	Malathion	10	4.6%	4
6	Jackpot 5 EC	8	3.7%	6
7	Cypermethrin 25 EC	7	3.2%	7
8	Glyphosate	7	3.2%	7
9	Helosate	6	2.8%	9
10	Karate Zeon 5 CS	6	2.8%	9
11	Avaunt 15 EC	5	2.3%	11
12	ENGEO 24.7 SC	5	2.3%	11
13	Amistar Top 32.5 SC	4	1.9%	13
14	Antracol	4	1.9%	13
15	Kung Fu 2.5 EC	4	1.9%	13
16	Tryclan 50 SP	4	1.9%	13
17	Vydate 24 SL	4	1.9%	13
18	Ridomil Gold MZ 68WP	3	1.4%	18
19	Lannate 21.6 SL	3	1.4%	18
20	Lannate 90 SP	3	1.4%	18
21	Sulban 5 DP	3	1.4%	18
22	Ixus 20 SC	2	0.9%	22
23	Delta Plus 5 EC	2	0.9%	22
24	Elimina 60 SL	2	0.9%	22
25	Elimina 72 SL	2	0.9%	22
26	Lash 90 SP	2	0.9%	22
27	Lorsban	2	0.9%	22
28	Regent 20 SC	2	0.9%	22
29	Rotaprid Gold 37.5 SC	2	0.9%	22
30	Sulban 48 EC	2	0.9%	22
31	Adama	1	0.5%	31
32	Ace 20 SP	1	0.5%	31
33	Atom 2.5 EC	1	0.5%	31
34	Bifenthrin (BIFEN I/T)	1	0.5%	31
35	Vondozeb 80 WP	1	0.5%	31
36	Bordeaux 80WP	1	0.5%	31
37	Bravo	1	0.5%	31
38	Chlorfluba 5 EC	1	0.5%	31
39	Curyom 55 EC	1	0.5%	31
40	Delthametrin (Suspend SC)	1	0.5%	31
41	Diazinon 60 EC	1	0.5%	31
42	DILIGENT 70 WP	1	0.5%	31
43	DIPRON	1	0.5%	31
44	Taurus SC	1	0.5%	31
45	Fulate	1	0.5%	31
46	Kendo 2.5	1	0.5%	31
47	Lamdex 5 EC	1	0.5%	31
48	Milagro	1	0.5%	31
49	Multimap	1	0.5%	31
50	Phyton 6.6SL	1	0.5%	31
51	Plicicario	1	0.5%	31
52	Plural 20 (Insecticide)	1	0.5%	31
53	Preglone 20 SL	1	0.5%	31
54	Rimaxato	1	0.5%	31
55	RIMAXIL 60 SL	1	0.5%	31
56	RIMAZINON 60 EC	1	0.5%	31
57	Sheildtox Spray (Imiprothrin Cypermethrin)	1	0.5%	31
58	Termidor	1	0.5%	31
59	Tordon 30.4 SL	1	0.5%	31

When we looked at the Distribution of Farmers and Farm Workers Sample Respondents by Pesticides Mixture Status, we discovered that just over two-thirds of the respondents did not mix their pesticides for farm work purposes (see Table 5). However, one-third of respondents did mix their pesticides for farm work purposes, where: 23.3% of Farmers and Farm Workers respondents mixed at least two pesticides, 7.3% mixed three pesticides, 2.0% mixed five pesticides, and 0.7% mixed seven pesticides. For further details of the mixtures reported kindly visit Table 30 in the Annex for the full list of the mixtures reported. The data also suggest that too many Farmers and farm workers combine many pesticides for farm work purposes, thereby risking contamination and poisoning by mixing multiple pesticides simultaneously. The Pesticide Control Board and the Ministry of Agriculture will need to address this problem so that mixing pesticides to do farm work will cease or at least be minimized.

Table 5: Distribution of Farmers and Farm Workers Sample Respondents by Pesticides Mixture Status

Pesticides Mixture Status	Frequency	Percent
1	100	66.7
2	35	23.3
3	11	7.3
5	3	2.0
7	1	0.7
Total	150	100.0

Upon analyzing the Distribution of Farmers and Farm Workers, Respondents by "What were the health problems you experienced and how severe (how bad) was each health problem?", we found that most of the Farmers and Farm Workers did not have a health problem or the health problem was not severe or not much of a problem after experiencing pesticide poisoning. However, for those Farmers and Farm Workers respondents who had extremely severe or very serious health

problems after experiencing pesticide poisoning, the top three (3) health problems experienced were Headache (15.3%), Skin Irritation, or Itching (14.0%), and Skin Burns (13.3%). Similarly, for those Farmers and Farm Workers respondents who had somewhat severe or somewhat of a problem after experiencing pesticide poisoning, the top three (3) health problems experienced were Headache (28.0%), Skin Irritation, or Itching (19.3%), and Sneezing (16.0%).

Table 6: Distribution of Farmers and Farm Workers Sample Respondents by What were the health problems you experienced and how severe (how bad) was each health problem?

Health Problems Experienced	How Severe (How Bad) was Each Health Problem?													
	Not a Problem		Not Severe / Not Much of a Problem		Somewhat Severe / Somewhat of a Problem		Extremely Severe / Very Serious Problem		Cannot Recall Severity		No Severity Reported		Total	
	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent
Skin Irritation/Itching	81	54.0%	18	12.0%	29	19.3%	21	14.0%	1	0.7%	0	0.0%	150	100.0%
Skin Rash	117	78.0%	10	6.7%	13	8.7%	9	6.0%	1	0.7%	0	0.0%	150	100.0%
Skin Burns	95	63.3%	18	12.0%	17	11.3%	20	13.3%	0	0.0%	0	0.0%	150	100.0%
Skin Bleeding	144	96.0%	0	0.0%	3	2.0%	1	0.7%	2	1.3%	0	0.0%	150	100.0%
Eye Irritation / Burning	114	76.0%	12	8.0%	12	8.0%	12	8.0%	0	0.0%	0	0.0%	150	100.0%
Tear Production/ Watery Eye	120	80.0%	12	8.0%	12	8.0%	6	4.0%	0	0.0%	0	0.0%	150	100.0%
Eye Twitching	138	92.0%	5	3.3%	4	2.7%	1	0.7%	2	1.3%	0	0.0%	150	100.0%
Blurred Vision	133	88.7%	8	5.3%	6	4.0%	1	0.7%	2	1.3%	0	0.0%	150	100.0%
Pinpoint Pupils	148	98.7%	0	0.0%	0	0.0%	0	0.0%	2	1.3%	0	0.0%	150	100.0%
Stomach Pain	131	87.3%	6	4.0%	7	4.7%	4	2.7%	2	1.3%	0	0.0%	150	100.0%
Nausea	112	74.7%	10	6.7%	16	10.7%	11	7.3%	1	0.7%	0	0.0%	150	100.0%
Vomiting	131	87.3%	5	3.3%	5	3.3%	7	4.7%	2	1.3%	0	0.0%	150	100.0%
Diarrhoea	145	96.7%	1	0.7%	2	1.3%	0	0.0%	2	1.3%	0	0.0%	150	100.0%
Coughing (Regular)	127	84.7%	8	5.3%	10	6.7%	4	2.7%	1	0.7%	0	0.0%	150	100.0%
Coughing Blood	148	98.7%	0	0.0%	0	0.0%	0	0.0%	2	1.3%	0	0.0%	150	100.0%
Tightness of Chest / Asthma	125	83.3%	5	3.3%	13	8.7%	7	4.7%	0	0.0%	0	0.0%	150	100.0%
Sneezing	102	68.0%	13	8.7%	24	16.0%	11	7.3%	0	0.0%	0	0.0%	150	100.0%
Runny Nose	123	82.0%	9	6.0%	11	7.3%	6	4.0%	1	0.7%	0	0.0%	150	100.0%
Excessive Sweating	130	86.7%	3	2.0%	7	4.7%	10	6.7%	0	0.0%	0	0.0%	150	100.0%
Excessive Salivation	145	96.7%	1	0.7%	2	1.3%	0	0.0%	2	1.3%	0	0.0%	150	100.0%
Headache	61	40.7%	24	16.0%	42	28.0%	23	15.3%	0	0.0%	0	0.0%	150	100.0%
Confusion	138	92.0%	6	4.0%	3	2.0%	2	1.3%	1	0.7%	0	0.0%	150	100.0%
Dizziness	98	65.3%	17	11.3%	23	15.3%	11	7.3%	1	0.7%	0	0.0%	150	100.0%
Staggering	143	95.3%	3	2.0%	3	2.0%	1	0.7%	0	0.0%	0	0.0%	150	100.0%
Tremor/Trembling/Convulsion	146	97.3%	2	1.3%	0	0.0%	1	0.7%	1	0.7%	0	0.0%	150	100.0%
Fainting	146	97.3%	2	1.3%	0	0.0%	0	0.0%	2	1.3%	0	0.0%	150	100.0%
Unconsciousness	146	97.3%	1	0.7%	0	0.0%	1	0.7%	2	1.3%	0	0.0%	150	100.0%
Other	0	0.0%	1	0.7%	2	1.3%	0	0.0%	0	0.0%	147	98.0%	150	100.0%

Upon analyzing the Distribution of Farmers and Farm Workers Respondents by "What did you do when you felt the effects of the pesticide?", we found that Self Treatment was the most

predominant action taken when respondents felt the effects of the pesticide accounting for 53.3% of all respondents while "Went to the Private Doctor" was the least predominant action taken when respondent felt the effects of the pesticide accounting for 0.7% of respondents (see Table 7). The data in Table 7 are also showing that most respondents chose not to visit a medical facility when respondent felt the effects of the pesticide (as only 5.7% of respondents visited a medical institution) but instead chose to either: a) continue to spray after they had finished washed the chemical off (40.7%), b) washed the chemical off immediately (23.3%), d) rested or stopped using the pesticide (19.3%) or e) do nothing (8.0%). This data suggests that Farmers and Farmworkers will only visit the doctor if there is a severe health problem experienced by the effects of the pesticides. The researcher believes that Farmers' and Farmworkers' reluctance to visit the doctor when they have a health problem from the effects of the pesticides may be due to the proximity of medical facilities and the medical expenses for being treated by a doctor.

Table 7: Distribution of Farmers and Farm Workers Sample Respondents by What did you do when you felt the effects of the pesticide?

Actions Taken When Respondent Felt the Effects of the Pesticide	Frequency	Percent
Self-Treatment	80	53.3%
I Continued Spraying, and After I had Finished, I Washed the Chemical Off	61	40.7%
Washed the Chemical Off Immediately	35	23.3%
Rested/ Stopped Using the Pesticide	29	19.3%
Nothing / No Action	12	8.0%
Went to Hospital	4	2.7%
Went to Health Centre	2	1.3%
Went to Private Doctor	1	0.7%
Total	150	100.0%

Note Sum of each frequency and percent value does not equal to respective Totals shown (i.e. 150 instead of 224 and 100.0% instead of 149.3%) since a respondent can select more than one action taken when respondent felt the effects of the pesticide.

When we observed the Distribution of Farmers and Farm Workers Respondents by "Describe the type of self-treatment that was performed?", we found that Other Self Treatment was the most predominant self-treatment action taken when respondents felt the effects of the pesticide accounting for 63.8% of all 80 respondents who underwent a self-treatment, followed by Pain Medication Used, Applied Alcohol to Skin, Drank Some Type of Tea, Applied Lotion/Ointment/Oil to Skin, Drank Milk accounting for 32.5%, 16.3%, 15.0%, 10.0%, and 10.0% respectively. The least predominant self-treatment actions taken when respondents felt the effects of the pesticide were Asthma Inhaler Used accounting for 0.0%, followed by Drank Alcohol with 1.3%, Eyewash or Eye drops with 3.8%, and Applied Vaseline to Skin with 6.3%. Noteworthy, within the Other Self Treatment group, Took a Bath, Drank Lime/Lime Juice, and Drank Charcoal Capsules were the most frequent types of Other Self Treatments.

The result of the analysis that looks at the respondents' responses to seven questions/statements regarding those Farmers and Farm Workers respondents who experienced Pesticide Poisoning since July of 2018 and were treated by a private doctor or at a health Centre or hospital by the name of personal doctor or health facility, Number of Visits & Doctor's Diagnosis, Pesticide/ Pesticide Mixture, the Medication & Treatment Received, Number of Days in Hospital, Number of Days Unable to Work, Other Relevant Details of Treatment Received depicted that:

- Seven (7) Farmers and Farm Workers respondents were treated by a private doctor or at a health Centre or hospital after experiencing Pesticide Poisoning (see Table 9).
- The Health Centres/Hospitals/Private Doctors/Health Facilities visited were Dr. Briceño Clinic (Chetumal), Northern Medical Plaza Hospital, Northern Regional Hospital Punta Gorda Community Hospital, Punta Gorda Health Center, San Antonio Health Centre, and San Ignacio Hospital.
- Out of the seven (7) FFW who a private doctor treated or at a health Centre or hospital after experiencing Pesticide Poisoning by the droplets and smell of the pesticide, four (4) made two (2) hospital visits, two (2) made one (1) hospital visit, and one (1) made five (5) hospital visits. The pesticides fell onto their skin, and they inhaled the toxic aroma of the pesticide while applying without the proper protective gear.
- The Doctor's Diagnosis for these seven (7) Farmers and Farm Workers respondents who were treated by a private doctor or at a health Centre or hospital after experiencing Pesticide Poisoning varied somewhat: a) being intoxicated by the usage of chemicals, b) excessive stomach pain, c) chemical affected eyes, d) throat infection due to pesticides, e) slight damages in respiratory system and dizziness, f) the chemical used caused the skin rash, irritation, and burning and g) poisoned by the droplets and smell of the pesticide which fell

on to the skin and the toxic aroma of the pesticide which was applied without the proper protective gear. Two (2) salient points that were observed here is that FFW respondents are working on the farm without the proper protective gear and that a respondent got affected by the pesticide when washing the clothing of respondent or when the farmer is in close contact with people after using pesticide at the farm. These incidents can be reduced by sharing best practice measures with the Farmers and Farm Workers.

- The pesticides or pesticide mixture used by FFW that resulted in poisoning incidents that required medical attention were: 1) Atom 2.5 EC, Bondacep (Yellow Powder) 2) 2,4-D Amine 60 SL, 3) Gramoxone 20 SL, Jackpot 5 EC, 4) Malathion, 5) Gramoxone 20 SL, 6) Elimina 60 SL, Elimina 72 SL, 7) 2,4-D Amine 60 SL, Amistar Top three (3) 2.5 SC, Diazinon 60 EC, Karate Zeon 5 CS, Kung Fu 2.5 EC. The top three (3) pesticides or pesticide mixtures that caused the FFW to miss the most days from work were Atom 2.5 EC, Bondacep (Yellow Powder) with seven (7) Days of incapacity, Gramoxone 20 SL & Jackpot 5 EC with six (6) sickness days and Gramoxone 20 SL with also six (6) sickness days. The FFW who was away from work for seven (7) days experienced a Pesticide Poisoning Symptom of Excessive Stomach pain. However, one (1) of the other two (2) FFW, who each had six (6) days of incapacity, experienced Throat Infection while the other FFW got a Skin Rash along with Irritation and Burning.

Table 9: Distribution of Farmers and Farm Workers Sample Respondents who were treated by a private doctor or at a health Centre or hospital by Selected Characteristics

Sex	Age Group	Pesticide/ Pesticide Mixture	Poisoning Symptoms	Health Facility	Number of Visits	Doctor's Diagnosis, Medication & Treatment Received, Other Relevant Details (self-reported)	Days in Hospital	Days Unable to Work
Male	Over 60	Atom 2.5 EC, Bondacep (Yellow Powder)	Excessive Stomach pain	San Ignacio Hospital	2	Injection	1	7
Male	41-60	2,4-D Amine 60 SL	Doctor stated that he was being intoxicated by the usage of chemicals.	San Antonio Health Centre	2	The doctor gave the farmer some tylenol for the headache and gave him a cream (Andi-cort 1%) for the skin burns and irritation.	1	0
Male	21-40	Gramoxone 20 SL, Jackpot 5 EC	Throat infection due to pesticides	Punta Gorda Health Center	1	Antibiotics, pills for inflammation of lungs and infection of throat	1	6
Male	Less than 21	Malathion	Doctor diagnosis was that the Farmer was poisoned by the droplets and smell of the pesticide which fell on to his skin and the toxic aroma of the pesticide which he was applying with out the proper protective gear	Punta Gorda community Hospital	1	Doctor treatment: antibiotics for the skin rashes, one injection shot to reduces swelling of the skin and to prevent further allergic reaction from the pesticide, Medication pill to clean out the lungs and to prevent swelling which can be caused by the toxic air that may have enter the lungs during application and was recommendation to drink a lot of water to clean out his system. Along with proper rest and avoid using the pesticide.	1	2
Male	41-60	Gramoxone 20 SL	The doctor told him that the chemical he used is what caused the skin rash and irritation and burning. And if he kept using it the burning could have been worse.	Northern Regional Hospital	2	The doctor gave him an ointment for the itching and irritation to use. The doctor said to use the ointment every day until his skin cleared up	1	6
Female	Over 60	Elimina 60 SL, Elimina 72 SL	The doctor found slight damages in her respiratory system and dizziness and stated that	Northern Medical Plaza	2	They gave her medication/pills for the dizziness.	1	0
Male	41-60	2,4-D Amine 60 SL, Amistar Top 32.5 SC, Diazinon 60 EC, Karate Zeon 5 CS, Kung Fu 2.5 EC	The chemical affected his eyes and to use goggles and to protect his eyes.	Dr Briceño Clinic (Chetumal)	More than 5	Doctors gave him eye drops to cleanse his eyes. He stated the eye drops really help the burning and swelling of eyes.	1	3

- Farmers and Farm Workers Respondent's Medication & Treatment Received varied as: a farmer was specifically given antibiotics and pills for inflammation of lungs and infection of the throat; another was specifically given pills for dizziness, another was given eye drops to cleanse his eyes to help the burning and swelling of eyes, while another farmer was given an Injection only, the remaining two were combinations of the former (see Table 9); where a farmer received some Tylenol for their Headache and a cream (Andi-cort 1%) for their skin burns and irritation and the last respondent was given a medication & treatment that was a combination of medication for skin rashes, injection, and lungs (i.e., antibiotics for the skin rashes, one injection shot to reduces swelling of the skin and to prevent a further allergic reaction from the pesticide, Medication pill to clean out the lungs).
- All seven (7) Farmers and Farm Workers respondents who were treated by a private doctor or at a health center or hospital after experiencing Pesticide Poisoning spent one (1) day at the hospital. However, the numbers of days that these seven (7) Farmers and Farm Workers respondents were unable to work varied; as two (2) of these respondents were unable to work for zero (0) days, another two (2) respondents were unable to work for six (6) days, while the remaining three respondents were unable to work for two (2), three (3), and seven (7) days respectively.
- There were not many responses for "Other Relevant Details of Treatment Received" provided as six (6) out of seven (7) Farmers and Farm Workers respondents had no other relevant details of treatment received. In contrast, only one Farmer or Farm Worker respondent had another relevant detail of treatment received and said that "The doctor told him to stay out of the sun because it can make the irritation and rash worse."

To assess "How the Pesticide Incident Occurred to the FFW Respondents?", the responses were synthesized and tabulated in Table 10 and Chart 1. It was found that the Inhaling Pesticide Fumes group was the primary means of how the pesticide incident occurred at the farm accounting for 32.2% of all 236 responses to how the pesticide incident occurred stated by the 150 FFW Respondents. This was followed by ways of how the pesticide incident occurred at the Farm: Wind Blowing, Mist got on Face /Skin /Eyes while Spraying, Pesticide Spilled Out of Spray Pump on Farmer's Back, Spill on Hand/Other Body Part(s) While Diluting/Mixing/Opening Pesticides, Not Wearing any PPEs, Malfunctioning of Sprayer, Spraying for Extended Period, Accidentally Sprayed on Clothing/Body Part(s), and Applying the Pesticide in a Rush accounting for 28.8%, 13.6%, 7.6%, 7.2%, 3.8%, 2.1%, 2.1%, 1.7%, and 0.8% respectively.

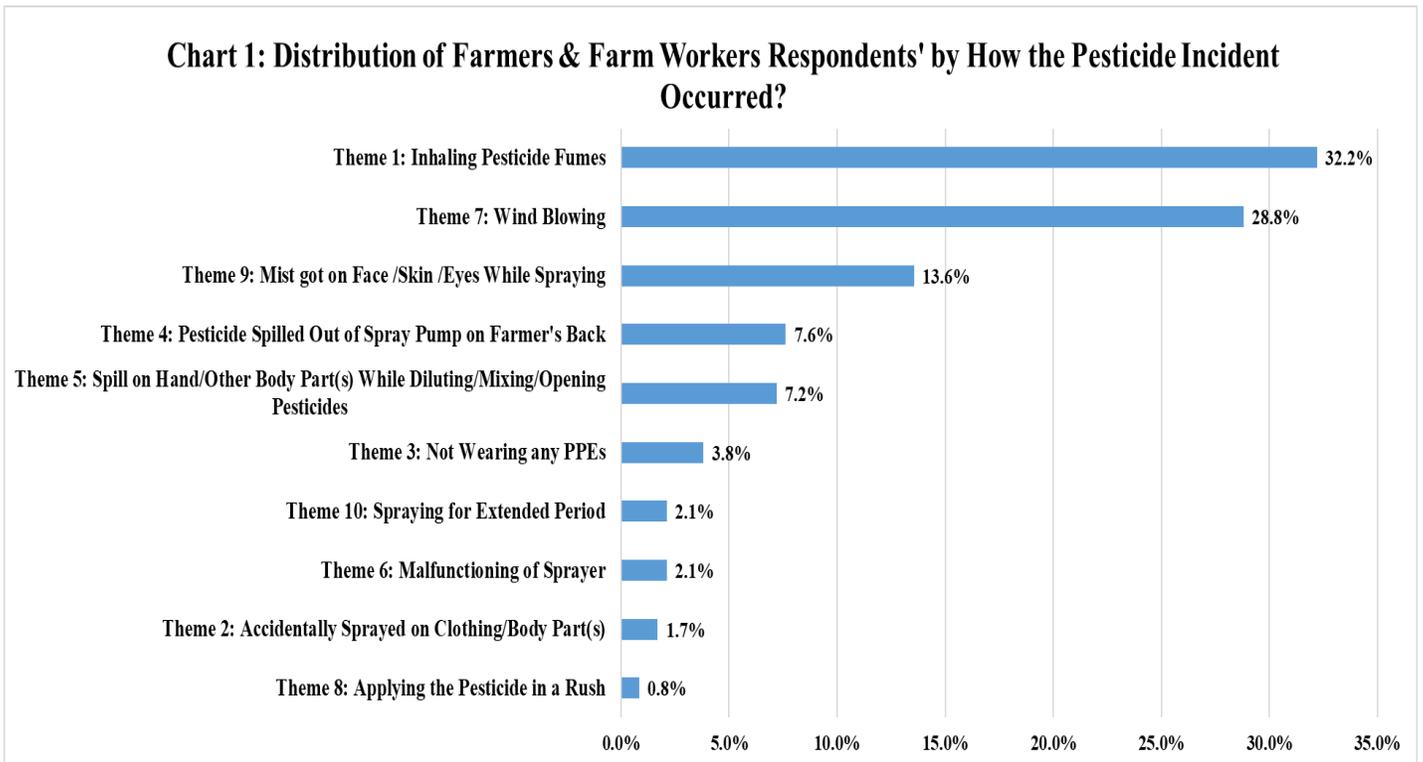


Table 10: Distribution of Farmers & Farm Workers Respondents' by How the Pesticide Incident Occurred?

Means on How the Pesticide Incident Occurred?	Frequency	Percent
Total	236	100.0%
Theme 1: Inhaling Pesticide Fumes	76	32.2%
Theme 7: Wind Blowing	68	28.8%
Theme 9: Mist got on Face /Skin /Eyes While Spraying	32	13.6%
Theme 4: Pesticide Spilled Out of Spray Pump on Farmer's Back	18	7.6%
Theme 5: Spill on Hand/Other Body Part(s) While Diluting/Mixing/Opening Pesticides	17	7.2%
Theme 3: Not Wearing any PPEs	9	3.8%
Theme 6: Malfunctioning of Sprayer	5	2.1%
Theme 10: Spraying for Extended Period	5	2.1%
Theme 2: Accidentally Sprayed on Clothing/Body Part(s)	4	1.7%
Theme 8: Applying the Pesticide in a Rush	2	0.8%

The results of analyzing the item, "Which ones of the following best summarize what caused the pesticide poisoning incident (more than one can be recorded if applicable)?" revealed that almost half (49.3%) of respondents stated that the wind blew spray mist on the spray man during field application caused the pesticide poisoning incident (see Table 11). Other causes of the pesticide poisoning incident that were reported by the FFW respondents that were still substantial but to a lesser degree than the former were: Spray mist contacted spray man during field application (Wind not involved), During application, pesticide leaked from spray equipment onto spray man, While mixing pesticide, the person was affected by pesticide vapours (fumes), Bystander not involved in pesticide use was affected during mixing, or during/after application, Splashed/spilled pesticide on self while mixing/handling that accounted for a total of 62.7% of all of the respondents. The least dominant causes of the pesticide poisoning incident that the FFW respondents reported were wind blew pesticide granules or powder on the person, hand or glove contaminated with pesticide

contacted other body parts, the skin was contaminated with pesticide when applying with a bucket that accounted for 3.3%, 1.3%, and 1.3% respectively, of all respondents. The results indicate a need for FFW to receive practical training on using a sprayer when working on a farm, especially when the weather is windy. Also, farmers need to keep track or be constantly aware of the weather and, when possible, do farm work that involves spraying pesticides during times that are not windy.

Table 11: Distribution of Farmers and Farm Workers Sample Respondents by Which ones of the following best summarizes what caused the pesticide poisoning incident

Causes of Pesticide Poisoning Incident	Frequency	Percent
Wind blew spray mist on sprayman during field application	74	49.3%
Spray mist contacted sprayman during field application (wind not involved)	27	18.0%
During application, pesticide leaked from spray equipment onto sprayman	21	14.0%
While mixing pesticide, person was affected by pesticide vapours (fumes)	18	12.0%
Bystander not involved in pesticide use was affected during mixing, or during / after application	16	10.7%
Splashed/spilled pesticide on self while mixing/handling	12	8.0%
Wind blew pesticide granules or powder on the person	5	3.3%
Hand or glove contaminated with pesticide contacted other body parts	2	1.3%
Skin was contaminated with pesticide when applying with a bucket	2	1.3%
Total	150	100.0%

Note Sum of each frequency and percent value does not equal to respective Totals shown (i.e. 150 instead of 177 and 100.0% instead of 118.0%) since a respondent can select more than one cause of pesticide poisoning incident.

When we observed the statement, "Why were you applying pesticides in windy conditions" we found that *"Not windy when I started"* was the reason with the highest frequency, at 54.9% of FFW respondents (see Table 12). This was followed by: *"The pest problem was urgent"*, *"The wind was blowing, but I did not expect it would be a problem"*, *"I was instructed to spray at that time (someone else's decision)"*, and *"Other"*, which posted 45.1%, 35.2%, 11.3%, and 5.6%

respectively. None of the FFW respondents stated that "No particular reason" was for applying pesticides in windy conditions.

Table 12: Distribution of Farmers and Farm Workers Sample Respondents by "Why were you applying pesticides in windy conditions"

Reasons for Applying Pesticides in Windy Conditions	Frequency	Percent
Not windy when I started	39	54.9
The pest problem was urgent	32	45.1
Wind was blowing but I did not expect it would be a problem	25	35.2
I was instructed to spray at that time (someone else's decision)	8	11.3
No particular reason	-	0.0
Other	4	5.6
Total	71	100.0

Note that 71 out of the 150 respondents were eligible to answer this question. Sum of each frequency and percent value does not equal to respective Totals shown (i.e. 71 instead of 108 and 100.0% instead of 152.1%) since a respondent can select more than one reason for applying pesticides in windy conditions.

Upon analyzing the question, "Which of the following protective clothing were you wearing at the time of the incident?" we found that FFW respondents were mostly wearing Long Pants, Long Sleeve Shirt and Water Boots accounting for 73.3%, 70.0%, and 67.3% of these respondents respectively (see Table 13). On the other hand, the FFW respondents mainly were **not** wearing the following at the time of the incident: Waterproof Apron, Dust Mask with Pesticide Absorbing Particles (Single Use), Eyeglasses, Respirator with Cartridges, Coverall/Overall, Goggles, Spray Mask, Rubber Gloves, as they accounted for 96.0%, 93.9%, 90.2%, 88.0%, 86.7%, 86.0%, 84.7%, and 70.7%, respectively, of the FFW respondents. Some FFW used Scarf or Cloth Over Nose & Mouth, Regular Dust Mask, and Shoes/Regular Boots, although ineffective, accounted for 71.8%, 68.5%, and 55.1%, respectively, of the FFW respondents.

These results suggest that proper training must be provided to FFW on the importance of wearing PPE when using pesticides at the farm. Moreover, the training must also be focussed on getting the FFW to experience behavioural change that conforms to best practices of wearing PPEs when using pesticides at their respective farm.

Table 13: Distribution of Farmers and Farm Workers Sample Respondents by Which of the following protective clothing were you wearing at the time of the incident?

Protective Clothing Worn at the Time of the Incident	Frequency	Percent
Long Pants	110	73.3%
Long Sleeve Shirt	105	70.0%
Water Boots	103	68.7%
Rubber Gloves	42	28.0%
Regular Dust Mask (Ineffective or Unsuitable PPE)	39	26.0%
Scarf or Cloth Over Nose & Mouth (Ineffective or Unsuitable PPE)	24	16.0%
Spray Mask	23	15.3%
Shoes/Regular Boots	21	14.0%
Coverall/Overall	20	13.3%
Goggles	20	13.3%
Respirator With Cartridges	18	12.0%
Eyeglasses	10	6.7%
Dust Mask With Pesticide Absorbing Particles (Single Use)	8	5.3%
Waterproof Apron	6	4.0%
Other	31	20.7%
T-Shirt	1	0.7%
None	30	20.0%

When we analyzed the question, "Why were Respondents NOT Wearing PPEs?" we found that most respondents (26.3%) thought that the main reason was that they believed the PPEs were Uncomfortable (see Chart 2 and Table 14). The following reasons for respondents NOT wearing PPEs were: Too Hot, Did not think that PPEs were Necessary, Bystander, and PPEs Not Available at the Time, Don't Own PPEs, and needed to complete the task quickly, hence had no time to put on PPEs which all together attributed for 80.0% of all of the FFW respondents' total comments.

Chart 2: Distribution of Farmers & Farm Workers Respondents by Why Respondents were NOT Wearing PPEs?

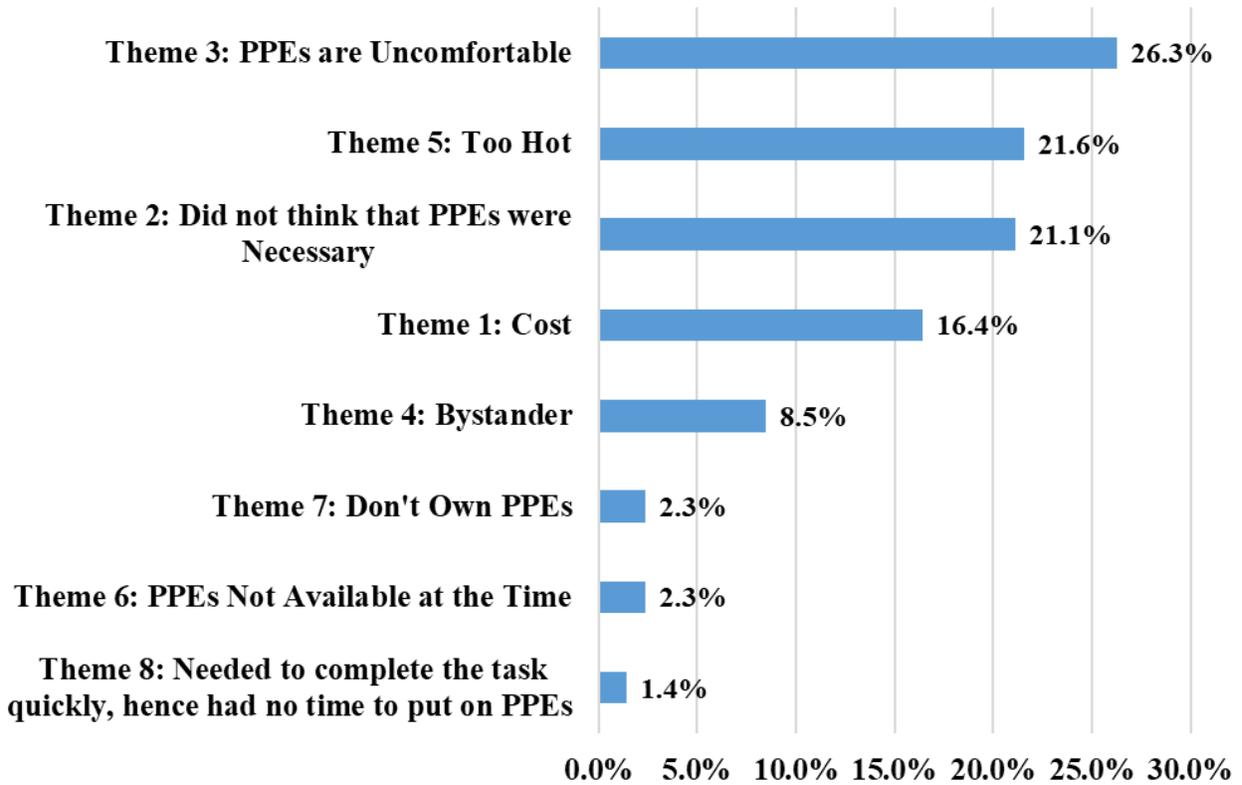


Table 14: Distribution of Farmers & Farm Workers Respondents' by Why Respondents were NOT Wearing PPEs?

Reasons Why Respondents were NOT Wearing PPEs	Frequency	Percent
Total	213	100.0%
Theme 3: PPEs are Uncomfortable	56	26.3%
Theme 5: Too Hot	46	21.6%
Theme 2: Did not think that PPEs were Necessary	45	21.1%
Theme 1: Cost	35	16.4%
Theme 4: Bystander	18	8.5%
Theme 6: PPEs Not Available at the Time	5	2.3%
Theme 7: Don't Own PPEs	5	2.3%
Theme 8: Needed to complete the task quickly, hence had no time to put on PPEs	3	1.4%

Upon analyzing the Distribution of Farmers and Farm Workers Respondents by "Year & Month of the Poisoning Incident?", we found that most of the Farmers and Farm Workers experienced the Poisoning Incident in the year 2021 and in July, May, and June (which are the windier months of the year for Belize) (see Table 15). Furthermore, in general, the incidence of pesticide poisoning in Belize has been trending upwards, and the most significant year over year increase is in the 2020 to 2021 period when the Poisoning Incidents among FFW was almost doubled (i.e., 1.8 times) from 41 cases in 2020 to 73 cases in January to August 2021 (see Chart 3). Similarly, this is also the case when looking at the average Poisoning Incident. Here we noted that the most significant year over year increase is also in the 2020 to 2021 period when the average Poisoning Incident among FFW was more than doubled (i.e., 2.7 times) from a mean number of cases of 3.4 in 2020 to 9.1 cases in January to August 2021 (see Chart 4). Kindly note that the increase in the incidence of pesticide poisoning in Belize for 2021 is even more significant as the period for 2020 was a full year while the period for 2021 was only for the period January to August.

Table 15: Distribution of Farmers and Farm Workers Sample Respondents by Year & Month of the Poisoning Incident?

Month	2018		2019		2020		2021		Total	
	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent
January	NA	NA	1	0.7	1	0.7	8	5.3	NA	NA
February	NA	NA	1	0.7	1	0.7	3	2.0	NA	NA
March	NA	NA	1	0.7	4	2.7	2	1.3	NA	NA
April	NA	NA	4	2.7	0	-	4	2.7	NA	NA
May	NA	NA	3	2.0	9	6.0	12	8.0	NA	NA
June	NA	NA	4	2.7	7	4.7	9	6.0	NA	NA
July	3	2.0	1	0.7	2	1.3	30	20.0	36	24.0
August	1	0.7	2	1.3	5	3.3	5	3.3	13	8.7
September	0	-	4	2.7	2	1.3	NA	NA	NA	NA
October	2	1.3	3	2.0	4	2.7	NA	NA	NA	NA
November	0	-	3	2.0	5	3.3	NA	NA	NA	NA
December	0	-	3	2.0	1	0.7	NA	NA	NA	NA
Total	6	4.0	30	20.0	41	27.3	73	48.7	150	100.0

Note: NA - Not Applicable

Chart 3: Farmers and Farm Workers Sample Respondents Who were Involved in a Pesticide Poisoning Incident by Period of the Pesticide Poisoning Incident

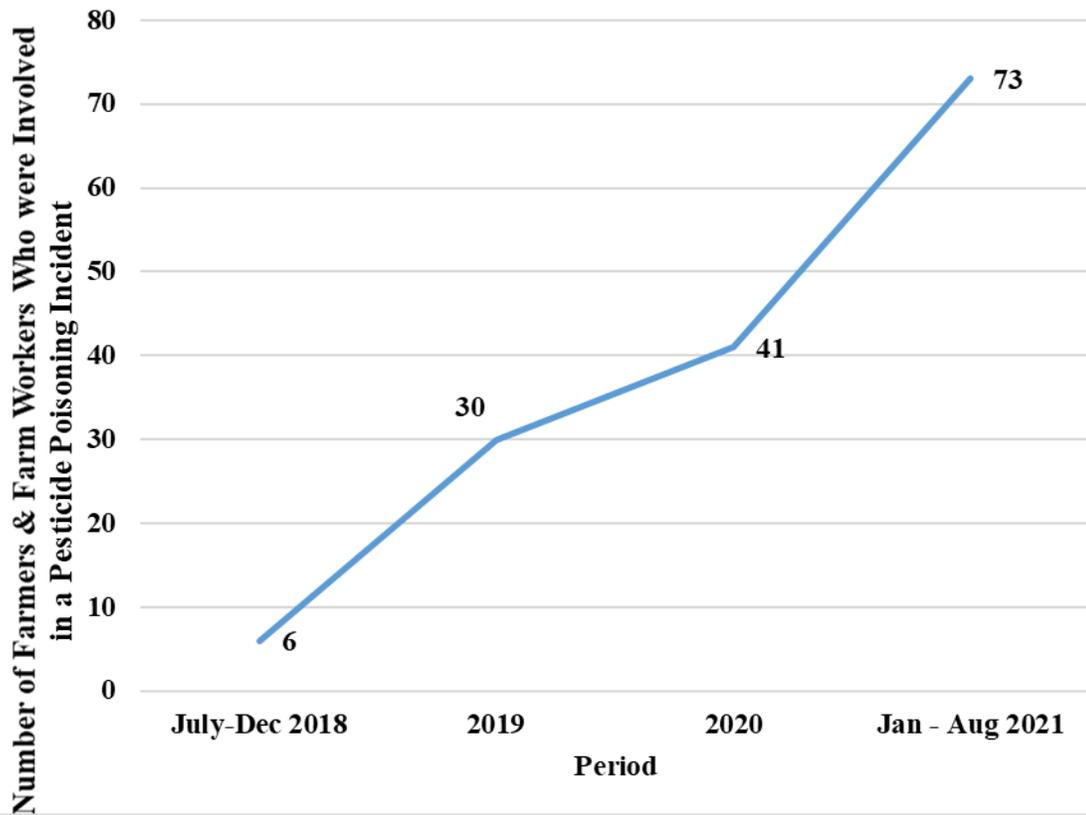
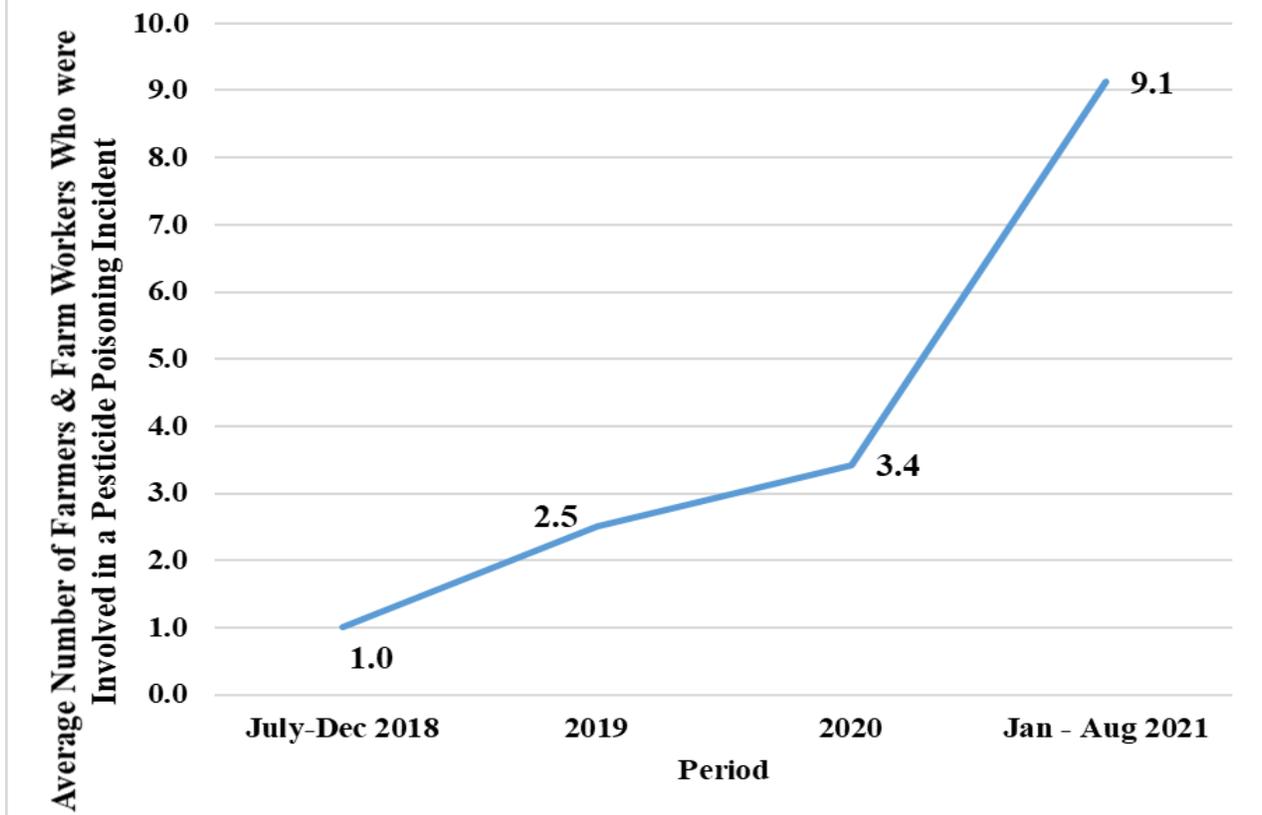


Chart 4: Average Number of Farmers and Farm Workers Sample Respondents Who were Involved in a Pesticide Poisoning Incident by Period of the Pesticide Poisoning Incident



The result of the analysis that looks at the distribution of FFW respondents' responses to three (3) questions by type of pesticide mixture or product that they were exposed to during pesticide poisoning incident, duration of the pesticide exposure period, and the length of time harmful effects were observed after exposure revealed that:

- The pesticide mixture or product that FFW respondents were exposed to during pesticide poisoning incident were predominantly the diluted mixture that attributed for 81.3% of all FFW, followed by Concentrated Commercial Product with 10.0%, both diluted mixture and Concentrated Commercial Product with 6.7% and Not Sure/Cannot Recall with 2.0% (see Table 16).

- The duration of the pesticide exposure period for the 150 FFW respondents was chiefly 1 to 2 Hours accounting for 35.3%, followed by less than an hour, half-day, one day, and more than a day with 29.3%, 24.7%, 6.0%, and 4.7% respectively.
- The length of time that harmful effects were observed after exposure was almost immediately, accounting for 53.3% of FFW. This was followed by 1 to 2 hours, at the end of the same day, half a day, and the next day that accounted for 22.7%, 14.0%, 7.3%, and 2.7%, respectively.

Table 16: Distribution of Farmers and Farm Workers Sample Respondents by Pesticide Mixture or Product that Respondents were Exposed to During Pesticide Poisoning Incident, Duration of the Pesticide Exposure Period & Length of Time Harmful Effects were Observed After Exposure.

Selected Characteristics	Frequency	Percent
Total	150	100.0
Pesticide Mixture or Product that Respondents were Exposed to During Pesticide Poisoning Incident		
Diluted Mixture	122	81.3
Concentrated Commercial Product	15	10.0
Both	10	6.7
Not Sure/ Cannot Recall	3	2.0
Duration of the Pesticide Exposure Period		
1 to 2 Hours	53	35.3
Less Than 1 Hour	44	29.3
Half Day	37	24.7
1 Day	9	6.0
More Than 1 Day	7	4.7
Length of Time Harmful Effects were Observed After Exposure		
Almost Immediately	80	53.3
1 to 2 Hours	34	22.7
At the End of the Same Day	21	14.0
Half a Day	11	7.3
The Next Day	4	2.7

When we analyzed the Distribution of FFW Sample Respondents by "Which of the following activities at the time of exposure were you involved in," it was found that the majority of FFW

were involved in the activity Application in Field at the time of exposure which accounted for 71.5% of these respondents. This was followed by Mixing Pesticide (14.5%), Other (5.2%), application Around, Near House, Including Backyard Garden (4.2%), Loading Pesticide into Sprayer Application in House (Household Pests) (1.8%), Vector Control Application (Mosquito Fogging, etc.) (0.6%) respectively. There were no FFW involved in the activities Application to Livestock (Control of Animal Ticks, etc.) and Standing/Working in or Near a Field During or After Pesticide Application at the time of exposure.

Table 17: Distribution of Farmers and Farm Workers Sample Respondents by 19.) Which of the following activities at the time of exposure were you involved in (INTERVIEWER: Record those that apply)

Activities at the Time of Exposure were Respondent Involved in (INTERVIEWER: Record those that apply):	Frequency	Percent
Application in Field	118	71.5
Mixing Pesticide	24	14.5
Application Around or Near House, Including Backyard Garden	7	4.2
Loading Pesticide into Sprayer	3	1.8
Application in House (Household Pests)	3	1.8
Vector Control Application (Mosquito Fogging, etc.)	1	0.6
Application to Livestock (Control of Animal Ticks, etc.)	0	0.0
Standing/Working in or Near a Field During or After Pesticide Application	0	0.0
Other	9	5.5
Total	165	100.0

Note: Sum of each frequency and percent value does not equal to respective Totals shown (i.e. 165 instead of 150 and 100.0% instead of 110%) since a respondent can select more than one option of the Activities that the Respondent was Involved in at the Time of Exposure.

The result of the analysis that looks at the respondents' responses to the five (5) questions regarding those FFW respondents who experienced Pesticide Poisoning since July of 2018 by "Was the label available before or at the time of the incident?", "Were you capable of reading and understanding

labels?" Pesticide Poisoning Exposure Incident Location, "What was Being Treated?" & "Were Other Individuals Affected in the Same Incident?" showed that:

- Notably, 18.0% of the pesticide poisoning incidents had two or more persons being affected (see Table 18).
- The majority (88.7%) of FFW respondents stated that the pesticide was available before or at the time of the incident. Only 1.3% of these FFW stated that the pesticide was not available before or at the time of the incident, while 3.0% were not sure or could not recall if the pesticide was available before or at the time of the incident. Lastly, this question did not apply to 8.0% of the FFW respondents.
- Most (74.0%) of FFW respondents could read and understand the label on the pesticide. In comparison, 16.0% were not able to read and understand the label on the pesticide, and 10.0% were not sure or could not recall if they were capable of reading and understanding the label on the pesticide. Kindly note that this is a double-barrelled question; hence, we cannot distinguish whether the issue is reading the label or understanding the pesticide label. Hence, a recommendation for future pesticide poisoning surveys such as this one is to split this question into two questions. That is, the first question should be "Were you capable of **reading** the label on the pesticide" and the second question should be "Were you capable of **understanding** the label on the pesticide."
- The Pesticide Poisoning Exposure Incident Location involving FFW respondents occurred principally in the field (80.7%), followed by Inside or Outside of House (12.0%), Store Room (2.7%), Home Garden (2.7%), and Other (2.0%).

- The main thing that was being treated when the pesticide poisoning incident occurred was Crops which accounted for 57.3% of FFW, followed by Weeds with 29.3%, Other with 8.0%, and this question did not apply to 4.7% of the FFW respondents.
- More than 4/5 of FFW respondents said that other individuals were **not** affected in the same pesticide poisoning exposure incident.

Table 18: Distribution of Farmers and Farm Workers Sample Respondents by Was the label available before or at the time of the incident?, Were you capable of reading and understanding label?, Pesticide Poisoning Exposure Incident Location, What was Being Treated? & Were Other Individuals Affected in the Same Incident?

Selected Characteristics	Frequency	Percent
Total	150	100.0
Was the label available before or at the time of the incident?		
Yes	133	88.7
No	2	1.3
Not Applicable	12	8.0
Not Sure / Cannot Recall	3	2.0
Were you capable of reading and understanding label?		
Yes	111	74.0
No	24	16.0
Not Applicable	15	10.0
Pesticide Poisoning Exposure Incident Location		
Field	121	80.7
Inside or Outside of House	18	12.0
Store Room	4	2.7
Home Garden	4	2.7
Other	3	2.0
What was Being Treated?		
Crops	86	57.3
Weeds	44	29.3
Not Applicable	7	4.7
Other	13	8.7
Were Other Individuals Affected in the Same Incident?		
No	123	82.0
Yes	27	18.0

3.2 Comparative Analysis of MOHW Data and Pesticides Poisoning Survey Results

3.2.1 A Review of The Ministry of Health and Wellness BHIS data

The Coordinators Team reviewed the medical record and contacted the Ministry of Health and Wellness (MOHW) for information on pesticide poisoning cases during the survey period. The potential data sources included only the public health clinics and hospitals (including six district public hospitals). A standardized form for medical record abstraction was completed for all identified cases.

Eleven (11) cases were reported within the study period that met the criteria (see Table 19). Of the total, nine (9) were males, accounting for 81.8%, and two (2) were female, accounting for 18.2%. The majority of the reported incidents were persons between 21-40 years (63.6%). This is followed by older persons 60+ years of age (27.3%) and middle-aged people 41-60 years of age (9.1%).

In the District Where the Poisoning Incident Occurred, Stann Creek was the predominant District accounting for 36.4% of reported incidents, followed by the Orange Walk District at 27.3% and Cayo, Toledo, Belize, and Corozal Districts with 9.1%. When analyzed by Health Centre/Hospital/Private Doctor/Health Facility, Northern Regional Hospital had the most reported incidents, with 36.4% of incidents falling in that category, followed by Southern Regional Hospital and Independence Polyclinic, 18.2%. Punta Gorda Community Hospital, San Ignacio Community Hospital and Karl Heusner Memorial Hospital, 9.1%.

Table 19: Distribution of Farmers & Farm Workers From Ministry of Health & Wellness BHIS Database by Selected Characteristics

Year	Health Facility	Sex	Age Group	Pesticide/ Pesticide Mixture	Poisoning Symptoms	Days in Hospital	Description of Pesticide Poisoning Incident
2018	Northern Regional Hospital	Male	21-40	2-4D Herbicide	Nausea, vomiting, painful swallowing	2	Accidental poisoning by and exposure to pesticides, farm, during unspecified activity
2019	Independence Polyclinic	Male	Over 60	Gramoxone	Vomiting blood	5	Accidental poisoning by and exposure to pesticides, farm, during unspecified activity
2020	Southern Regional Hospital	Male	21-40	Gramoxone	Vomiting, Burning sensation in throat, abdominal pain	2	Accidental poisoning by and exposure to pesticides, unspecified place, during unspecified activity
2020	Punta Gorda Hospital	Male	21-40	Helosate	Vomiting	0	Accidental poisoning by and exposure to pesticides, home, during unspecified activity
2020	Northern Regional Hospital	Male	Over 60	Methylsulfinyl Pyrazol	Vomiting, Gastric discomfort, Shortness of Breath, Nausea	2	Accidental poisoning by and exposure to pesticides, home, while engaged in leisure activity
2019	Northern Regional Hospital	Male	Over 60	Paraquat	Mild tongue discomfort	0	Accidental poisoning by and exposure to pesticides, farm, while working for an income
2020	San Ignacio Community Hospital	Female	21-40	Unspecified herbicide, not ingested, neighbor was spraying yard and fumes caused reaction	Dizziness, Nausea, Vomiting	0	Accidental poisoning by and exposure to pesticides, home, during unspecified activity
2018	Southern Regional Hospital	Female	21-40	Unspecified pesticide	Weakness, burning sensation in stomach	1	Accidental poisoning by and exposure to pesticides, home, while engaged in other specified activities
2018	Independence Polyclinic	Male	21-40	Unspecified pesticide	Vomiting	0	Accidental poisoning by and exposure to pesticides, farm, while engaged in other specified activities
2019	Karl Heusner Memorial Hospital	Male	21-40	Unspecified pesticide	Unspecified	1	Accidental poisoning by and exposure to pesticides, other specified places, while engaged in other types of work
2018	Northern Regional Hospital	Male	41-59	Unspecified pesticide, not ingested, reaction after skin contact after fumigation	Itchiness	1	Accidental poisoning by and exposure to pesticides, farm, during unspecified activity

In analyzing the distribution of the reported symptoms or health problems experienced in Table 19, the top three symptoms were Vomiting (63.6%), Nausea (27.3%), and Stomach pain (27.3%). Many other symptoms were reported, such as dizziness, skin irritation, shortness of breath, and burning sensation in the throat but these were only reported once. When analyzing the distribution of pesticides, notably, the majority of the reported cases did not specify the name of the pesticides (45.5%), followed by Gramoxone (18.2%) and 2-4 D Herbicide, which we believe to be the 2,4-D Amine 60 SL, Helosate, Methylsulfinyl Pyrazol, Paraquat all at 9.1% or with only one reported incident. The Active ingredients reported in Belize pesticide poisoning incidents are listed in Table 29 in the Annex. For the incident that reported Paraquat as the pesticide used, kindly note that Paraquat is the active ingredient in two (2) pesticides named Gramoxone Supper 20SL and Super Pro-Quant 20 SL. Therefore, we cannot conclude which one (1) of the two (2) pesticides caused the incident.

Ten (10) of the total 11 poisoning patients were given treatments for symptoms for the reported period. Table 19 reported four (4) incidents in 2018, three (3) in 2019, and four (4) in 2020. In further reviewing the MOHW BHIS Database, the researcher noted that three (3) persons had to be hospitalized for one (1) day, three (3) persons had to be hospitalized for two (2) days while one (1), person was hospitalized for five (5) days. The remaining four (4) persons were not kept overnight and were treated and released the same day during the study period.

The most frequent description of Pesticide Poisoning Incident was "Accidental poisoning by and exposure to pesticides, farm, during unspecified activity" (27.3%), followed by "Accidental poisoning by and exposure to pesticides, home, during unspecified activity" (18.2%), and

"Accidental poisoning by and exposure to pesticides, Farm, while working for an income" (9.1%).

Table 19 lists many other forms of accidental poisoning; however, these were not farm-related.

Eleven reported cases from the BHIS Database were treated by a Private Doctor or at a Health Centre or Hospital. Of those, 81.8% were male, and 18.2% were female. Of the 11 who sought medical attention, 63.6% were between 21 and 40 years of age inclusive. In reviewing the type of medical facilities where treatment was sought, 36.4% (4) were reported in the north, and 45.5% (5) sought medical attention in the south, while the remaining 18.2% (2) were in the western and central regions.

Among the many reported symptoms, Vomiting, Nausea, Stomach pain, dizziness, and skin irritation were the common reporting symptoms for the BHIS database. Regarding the reported name of the pesticide, five (5) of the 11 reported cases did not specify the type of pesticide that caused the incident. In contrast, two (2) were caused by Gramaxone and 2,4-D Amine 60 SL, Helosate, Methylsulfinyl Pyrazol, and Paraquat, and all others had one reported case.

3.2.2 Comparative Analysis of the Ministry of Health & Wellness BHIS Database and Pesticides Poisoning Survey Results

Similar gender distribution was observed in the BHIS Database and Pesticides Poisoning Survey Results (see Table 20a). There was a difference in the age distribution for the reported incidents in the BHIS Database compared to the Survey results. The majority (71.5%) of the reported incidents in the BHIS Database were people over 40 years, while for the survey data, the majority (63.6%) were young adults between the ages of 21-40 years inclusive, in comparing the distribution of persons who use the different health facilities. For the survey result, private health facilities were

used, and 42.9% sought medical attention in the north, and 42.9% sought medical attention in the south. In comparing the result to the BHIS Database, most of the reported cases were from the north (36.4%) and south (45.5%).

Table 20a: Distribution of Farmers and Farm Workers Sample Respondents that were Treated by a Private Doctor or at a Health Centre or Hospital & Farmers & Farm Workers From Ministry of Health & Wellness BHIS Database that were Treated by a Private Doctor or at a Health Centre or Hospital by Selected Characteristics

Variables	Farmers and Farm Workers Sample that were Treated by a Private Doctor or at a Health Centre or Hospital		Farmers & Farm Workers From Ministry of Health & Wellness BHIS Database that were Treated by a Private Doctor or at a Health Centre or Hospital	
	Frequency	Percent	Frequency	Percent
Total	7	100.0	11	100.0
Sex				
Male	6	85.7	9	81.8
Female	1	14.3	2	18.2
Age Group				
21-40	1	14.3	7	63.6
41-60	3	42.9	1	9.1
Over 60	2	28.6	3	27.3
Less than 21	1	14.3	0	0.0
Health Centre/Hospital/Private Doctor/Health Facility				
Dr Briceño Clinic (Chetumal)	1	14.3	0	0.0
Northern Medical Plaza Hospital	1	14.3	0	0.0
Northern Regional Hospital	1	14.3	4	36.4
Punta Gorda Community Hospital	1	14.3	1	9.1
Punta Gorda Health Center	1	14.3	0	0.0
San Antonio Health Centre	1	14.3	0	0.0
Southern Regional Hospital	0	0.0	2	18.2
San Ignacio Community Hospital	0	0.0	1	9.1
Karl Heusner Memorial Hospital	0	0.0	1	9.1
Independence Polyclinic	0	0.0	2	18.2

There were many reported symptoms for the survey data because each of the seven farmers was asked whether they had experienced any of the listed symptoms (see Table 20b). Therefore, the result for each symptom is the total number of people who had experienced that symptom. The BHIS database only records specific symptoms the person reported and might feel necessary. The

most common symptoms to both the survey and the BHIS database were Stomach Pain, Nausea, and Vomiting, followed by Skin Irritation/Itching and Dizziness.

In analyzing the reported pesticide used, only Gramoxone and 2-4 D Herbicide were noted in both the survey and the BHIS database. In the BHIS database, five (5) of the 11 reported incidents had an unspecified pesticide listed; hence we don't know which pesticide caused the poisoning incident. On the other hand, for the survey data, the name of the pesticide was a requirement of the survey.

Table 20b: Distribution of Farmers and Farm Workers Sample Respondents that were Treated by a Private Doctor or at a Health Centre or Hospital & Farmers & Farm Workers From Ministry of Health & Wellness BHIS Database that were Treated by a Private Doctor or at a Health Centre or Hospital by Selected Characteristics

Variables	Farmers and Farm Workers Sample that were Treated by a Private Doctor or at a Health Centre or Hospital		Farmers & Farm Workers From Ministry of Health & Wellness BHIS Database that were Treated by a Private Doctor or at a Health Centre or Hospital	
	Frequency	Percent	Frequency	Percent
Symptoms Reported				
Skin Irritation/Itching	3	42.9	1	9.1
Skin Rash	4	57.1	0	0.0
Skin Burns	4	57.1	0	0.0
Skin Bleeding	0	0.0	0	0.0
Eye Irritation / Burning	4	57.1	0	0.0
Tear Production/ Watery Eye	3	42.9	0	0.0
Eye Twitching	2	28.6	0	0.0
Blurred Vision	2	28.6	0	0.0
Pinpoint Pupils	0	0.0	0	0.0
Stomach Pain	1	14.3	3	27.3
Nausea	1	14.3	3	27.3
Vomiting	2	28.6	7	63.6
Diarrhoea	0	0.0	0	0.0
Coughing (Regular)	2	28.6	0	0.0
Coughing Blood	0	0.0	0	0.0
Tightness of Chest / Asthma	3	42.9	0	0.0
Sneezing	3	42.9	0	0.0
Runny Nose	1	14.3	0	0.0
Excessive Sweating	3	42.9	0	0.0
Excessive Salivation	0	0.0	0	0.0
Headache	5	71.4	0	0.0
Confusion	2	28.6	0	0.0
Dizziness	3	42.9	1	9.1
Staggering	1	14.3	0	0.0
Tremor/Trembling/Convulsion	1	14.3	0	0.0
Fainting	1	14.3	0	0.0
Unconsciousness	0	0.0	0	0.0
Other	0	0.0	6	54.5

In **Table 20c**, the distribution on the number of hospital days was different for all seven farmers who sought medical attention. They all spend one (1) day at the hospital, while for the BHIS database, the number of days varied from one (1) to four (4) days with a 1.3 mean number of days. Also, for both the survey data and the BHIS database, almost all the persons who visited the medical facilities were treated.

In summary, there were many similarities in the results obtained in the survey data for the farmers who sought medical attention and that of the results observed in the BHIS database.

Table 20c: Distribution of Farmers and Farm Workers Sample Respondents that were Treated by a Private Doctor or at a Health Centre or Hospital & Farmers & Farm Workers From Ministry of Health & Wellness BHIS Database that were Treated by a Private Doctor or at a Health Centre or Hospital by Selected Characteristics

Variables	Farmers and Farm Workers Sample that were Treated by a Private Doctor or at a Health Centre or Hospital		Farmers & Farm Workers From Ministry of Health & Wellness BHIS Database that were Treated by a Private Doctor or at a Health Centre or Hospital	
	Frequency	Percent	Frequency	Percent
Pesticide				
Unspecified Pesticide	0	0.0	5	45.5
Gramoxone	2	28.6	2	18.2
2-4D Herbicide	2	28.6	1	9.1
Helosate	0	0.0	1	9.1
Methylsulfinyl Pirazol	0	0.0	1	9.1
Paraquat	0	0.0	1	9.1
Amistar Top 32.5 SC	1	14.3	0	0.0
Diazinon 60 EC	1	14.3	0	0.0
Karate Zeon 5 CS	1	14.3	0	0.0
Kung Fu 2.5 EC	1	14.3	0	0.0
Atom 2.5 EC	1	14.3	0	0.0
Elimina 60 SL	1	14.3	0	0.0
Elimina 72 SL	1	14.3	0	0.0
Jackpot 5 EC	1	14.3	0	0.0
Bondacep (yellow powder)	1	14.3	0	0.0
Malathion	1	14.3	0	0.0
Number of Days in Hospital				
0	0	0.0	4	36.4
1	7	100.0	3	27.3
2	0	0.0	3	27.3
5	0	0.0	1	9.1
Any Treatment Given				
Yes	7	100.0	10	90.9
No	0	0.0	0	0.0
None Specified	0	0.0	1	9.1

3.3 Results and Analysis to Specific Questions Requested by Client

3.3.1 How did pesticide poisoning affect females regarding pesticide, symptoms, severity, and treatment?

We looked at all pesticide poisoning cases involving females by pesticide, symptoms, severity, and treatment to answer this question. It was found that nine (9) females were affected by pesticide poisoning in Belize for the period July 2018 to August 2021 (see Table 21). Most (55.6%) of the nine (9) females were 40 years old or younger (usual child-bearing age), while 44.6% were over 40 years old. The majority of the female pesticide incidents occurred via inhalation when these females were around the farmers or farm workers while spraying the farmyard. The pesticides that affected these nine (9) females more often were Malathion and 2,4-D Amine 60 SL pesticides; each of these pesticides affected two (2) females.

Furthermore, none of these pesticides that affected the females involved in the pesticide poisoning cases were from the Class I Toxicity group. The most common symptoms that these nine (9) females who were affected by pesticide poisoning experienced were dizziness and headaches. The most common type of treatment that these nine (9) females received were: Self Treatment (4) followed by Nothing/No Action (3), Went to a Private Doctor (1), and Washed the chemical off immediately (1).

Table 21: Distribution of Female Farmers and Farm Workers Sample Respondents by Incidents of Females Reported to have Experienced Pesticide Poisoning

Age Range	No.	How Incident Occurred (Response to # 11)	Pesticide Involved (Response to # 7)	Severity Level of Symptoms Reported (Responses to # 8)**	Treatment (Responses to # 9a)
Up to 40 years old (usual child-bearing age)	1	"I was around when my husband sprayed the pesticide and I got a instant headache."	ENGEO	1) Headache - Somewhat Severe / Somewhat of a Problem	Nothing / No Action
	2	The pesticide incident has occurred more than once whenever the neighbor would spray in front for his yard using Gramoxone the wind would blow the smell right across from his yard into the yard causing the contamination. Does incidents are not bad too sever for the person the effects would be coughing and headaches. The more serious incidents are the ones when the mosquito truck comes around and spray for mosquitoes. The truck would be parked about 3 minutes warming up the machine and would be spraying into the air (malathion) and the strong smell from the pesticide would start taking effect almost right away from the lost of taste ..smell numbness of the lips and very serious headaches are all what affects the individual. However she had made an observation from when the pandemic started no truck has come around to spray for mosquitoes. Which she wish would continues because she is not affect but has a lot told the person the last time he was spraying to skip the yard because it not good for her health.	Gramoxone 20 SL & Malathion	1) Sneezing - Extremely Severe / Very Serious Problem, 2) Runny Nose - Extremely Severe / Very Serious Problem, 3) Headache - Extremely Severe / Very Serious Problem 4) Dizziness - Extremely Severe / Very Serious Problem 5) Skin Irritation/Itching - Not Severe / Not Much of a Problem, 6) Eye Irritation/Burning - Somewhat Severe / Somewhat of a Problem, 7) Tear Production/ Watery Eye - Somewhat Severe / Somewhat of a Problem 8) Nausea - Somewhat Severe / Somewhat of a Problem 9) Coughing (Regular) - Somewhat Severe / Somewhat of a Problem 10) Other (Lose Sense of Taste) 11) Other (Person lips would be numb)	Self-Treatment
	3	The pesticide incident occurred due to the inhalation of intoxicated air from Malathion which was being sprayed by the mosquito truck from the Ministry of Health. The incident occurred in the evening at about 6:30 pm when the mosquitoes were most out.	Malathion	1) Nausea - Extremely Severe / Very Serious Problem, 2) Tightness of Chest / Asthma - Somewhat Severe / Somewhat of a Problem, 3) Dizziness - Somewhat Severe / Somewhat of a Problem 4) Coughing (Regular) - Somewhat Severe / Somewhat of a Problem 5) Tightness of Chest / Asthma - Somewhat Severe / Somewhat of a Problem,	Self-Treatment
	4	The person stated that the yard of the house was sprayed with 2, 4-D Amine 60 SL since the weeds were high and when she came out of the house she smelled the chemical and immediately started to feel a slight headache and started sneezing. She drank some tylenol and continued with her chores.	2,4-D Amine 60 SL	1) Sneezing - Not Severe / Not Much of a Problem, 2) Headache - Somewhat Severe / Somewhat of a Problem	Self-Treatment
	5	The grass was really high, I was around when the man sprayed glyphosate on the grass which the wind blew on my face and I inhaled it.	Glyphosate	1) Sneezing - Not Severe / Not Much of a Problem, 2) Runny Nose - Not Severe / Not Much of a Problem, 3) Sleepy	Nothing / no action
Over 40 years old	6	When her husband arrives from spraying his farm he always spill chemicals on his clothes and the scent is strong and she inhales it and gets headache and dizziness almost immediately or even when she washes his clothes and the water sprinkle on her she gets a bit dizzy.	Elimina 60 SL, Elimina 72 SL	1) Headache - Extremely Severe / Very Serious Problem, 2) Dizziness - Extremely Severe / Very Serious Problem, 3) Confusion - Not Severe / Not Much of a Problem 4) Fainting - Not Severe / Not Much of a Problem	Went to private doctor
	7	Her husband just harvested watermelon and they placed the watermelons on the veranda of the house and when she got close she inhaled the Newmectin chemical coming from the watermelons. She immediately moved from there however she was exposed to the chemical for almost 2 days since the watermelons were there for that time period.	Newmectin 1.8 EC	1) Other (Swollen Throat) - Somewhat Severe / Somewhat of a Problem 2) Other (Numb Lips) - Somewhat Severe / Somewhat of a Problem	Nothing / No Action
	8	The lady stated that her son was spraying 2, 4-D Amine 60 SL in the yard around the house to control the weeds growing and the scent of the chemical was very strong that she smelled it way inside her house and she immediately started to get ill by having headaches and tightness in her chest. She went to bathe and drank some lime juice to feel better.	2,4-D Amine 60 SL	1) Skin Burns - Extremely Severe / Very Serious Problem, 2) Eye Irritation / Burning - Extremely Severe / Very Serious Problem, 3) Tightness of Chest / Asthma - Extremely Severe / Very Serious Problem 4) Headache - Extremely Severe / Very Serious Problem 5) Dizziness - Somewhat Severe / Somewhat of a Problem 6) Tear Production/ Watery Eye - Somewhat Severe / Somewhat of a Problem 7) Runny Nose - Somewhat Severe / Somewhat of a Problem	Self-Treatment
	9	Was spraying the plants with her mask on and the fumes bothered her.	Ixus 20 SC	1) Stomach Pain - Somewhat Severe / Somewhat of a Problem	Washed the chemical off immediately

** put in this column, any symptoms reported as "extremely severe", and any symptoms reported as d, l - m, o - p, w - aa, regardless of severity.

3.3.2 What Personal Protective Equipment were FFW victims of inhalation pesticides poisoning wearing when working with pesticides on the farm?

Because the reported major route of pesticide poisoning was by inhalation, there was a review of the PPE being worn to protect from inhalation at the time of those incidents (see Table 22). The relevant items reported were:

- (i) Those recommended for inhalation protection - (a) “respirator with cartridges”, of which 10 inhalation incidents still occurred (11%), or (b) “dust mask with pesticide absorbing particles (single use)” with 4 incidents (4%).
- (ii) Those providing some protection - spray mask, with 14 incidents (15%) reported.
- (iii) Those not recommended/not effective against inhalation - (a) “regular dust mask” had 22 incidents (24%); (b) scarf or cloth over nose and mouth had 17 incidents (19%).

Kindly note that 15 or 16.3% of the 92 FFW victims of inhalation poisoning were wearing “No PPE”. In general, it seems that FFW victims of inhalation poisoning were wearing more ineffective PPEs than effective PPE when working with pesticides on the farm. It is alarming that 15% of the cases occurred although recommended inhalation protection was being used; this needs to be addressed.

Table 22: Distribution of Farmers and Farm Workers Sample Respondents by Personal Protective Equipment Worn During Pesticide Poisoning Incidents Involving Inhalation

Protective Clothing Worn at the Time of the Incident	Frequency	Percent
*Long Pants	71	77.2%
*Long Sleeve Shirt	64	69.6%
Water Boots	64	69.6%
Rubber Gloves	24	26.1%
*Regular Dust Mask	22	23.9%
*Scarf or Cloth Over Nose & Mouth	17	18.5%
Spray Mask	14	15.2%
*Shoes/Regular Boots	12	13.0%
Goggles	12	13.0%
Coverall/Overall	10	10.9%
Respirator With Cartridges	10	10.9%
*Eye Glasses	8	8.7%
Dust Mask With Pesticide Absorbing Particles (Single Use)	4	4.3%
Waterproof Apron	1	1.1%
*Other	16	17.4%
*T-Shirt	1	1.1%
* None	15	16.3%
Total	92	100.0%

Note 1: * - Ineffective/Unsuitable PPE

Note 2: Sum of each frequency and percent value does not equal to respective Totals shown (i.e. 92 instead of 349 and 100% instead of 379.3%) since a respondent can select more than one (1) option of the PPE Worn During Pesticide Poisoning Incidents Involving Inhalation.

3.3.3 Does suitable Personal Protective Equipment always work for FFW when they work with pesticides?

We seek to answer this question by analyzing data on:

- The number and percentage of poisoning incidents occurred although the victim said they were wearing all the Personal Protective Equipment (question 13a): respirator, goggles, gloves, water boots, and coverall or long sleeve shirt with long pants.

Table 23 tells us that the PPEs are working well as there were only 2 or 1.3% of all 150 pesticide poisoning victims were wearing all the PPE (i.e., Rubber Gloves, Coverall / Overall, Goggles, Respirator with Cartridges, Water Boots, Long Sleeve Shirt & Long Pants). For a future study, it would be good to determine how these two victims were still affected by the pesticides when they wore all PPEs. Perhaps it may be due to improper use of PPEs or a defect in the PPEs. Notable was the fact that 14 persons reportedly were poisoned by inhalation despite wearing their recommended respirator with cartridges (10) and dust masks with pesticide-absorbing particles (4). This requires further investigation by the authority.

Table 23: Distribution of Farmers and Farm Workers Sample Respondents by Poisoning Incidents that Occurred although the Victim said that they were wearing all the Personal Protective Equipment (i.e. Rubber Gloves, Coverall / Overall, Goggles, Respirator with Cartridges, Water Boots, Long Sleeve Shirt & Long Pants)

Poisoning Incidents	Frequency	Percent
Victim said that they were wearing all the Personal Protective Equipment	2	1.3
Victim said that they were NOT wearing all the Personal Protective Equipment	148	98.7
Total	150	100.0

3.3.4 Did the pesticides from the Class I toxicity group (most toxic pesticides) affect Farmers and Farmworkers in Belize?

To determine whether the most toxic pesticides (Class I toxicity) that affected Farmers and Farmworkers in Belize for the period July 2018 to August 2021, we looked at the number and percentage of incidents involving the following Class I toxicity pesticides: Folater, Lannate (2 products), Lash, Quickphos, and Vydate. We found that each pesticide within the Class I toxicity pesticides group except for Folater and Quickphos affected Farmers and Farm Workers. The predominant pesticide from the Class I toxicity pesticides group that affected Farmers and Farmworkers in Belize was Vydate 24 SL, followed by Lannate 21.6 SL, Lannate 90 SP, and Lash 90 SP (see Table 24).

Table 24: Distribution of Farmers and Farm Workers Sample Respondents by Selected Class I Toxicity (Most Toxic) Pesticides or Pesticides in a Mixture Involved in the Incident

Exact Name of Selected Class I Toxicity Pesticide (or Pesticides in a Mixture) Involved in the Incident	Frequency of Incidents	Percent of Incidents
Class I Toxicity Pesticide	12	5.6
Vydate 24 SL	4	1.9
Lannate 21.6 SL	3	1.4
Lannate 90 SP	3	1.4
Lash 90 SP	2	0.9
Folater	-	0.0
Quickphos	-	0.0
Other Toxicity Pesticides that are NOT in Class I	204	94.4
Total	216	100.0

3.3.5 What are the incidents of the Farmers and Farmworkers in Belize victims experiencing pesticide poisoning symptoms "extremely severe / very serious problem" but they did not seek medical attention in terms of pesticide, symptom, the treatment used rather than medical attention?

There were 96 of the 150 FFW in Belize who were victims experiencing pesticide poisoning symptoms "extremely severe / very serious problem." Of these 96 victims, self-treatment was the primary treatment used rather than seeking medical attention when respondents felt the effects of the pesticide, accounting for 34.4% of these victims (see Table 25). Treatments followed this: "I continued spraying, and after I had finished, I washed the chemical off," "I washed the chemical off immediately," "Rested / Stopped Using the Pesticide," and "Nothing / No Action" accounting for 34.4%, 26.0%, 17.7%, 14.6%, and 7.3% respectively.

Table 25: Distribution of Pesticide Poisoning Incidents Involving Farmers and Farm Workers Sample Respondents who were Victims Experiencing Symptoms "Extremely Severe / Very Serious Problem" (question 8a) but they did not seek medical attention by Treatment Used Rather than Medical Attention When Respondent Felt the Effects of the Pesticide

Treatment Used Rather than Medical Attention When Respondent Felt the Effects of the Pesticide	Frequency	Percent
Self-Treatment	33	34.4
I Continued Spraying, and After I had Finished, I Washed the Chemical Off	25	26.0
Washed the Chemical Off Immediately	17	17.7
Rested / Stopped Using the Pesticide	14	14.6
Nothing / No Action	7	7.3
Total	96	100.0

In terms of symptoms, the top 10 most common symptoms are Headache, Skin Irritation/Itching, Skin Burns, Eye Irritation / Burning, Nausea, Sneezing, Dizziness, Excessive Sweating, Skin Rash, Vomiting, and Tightness of Chest / Asthma (see Table 26). On the other hand, no FFW reported experienced symptoms were Pinpoint Pupils, Diarrhoea, Coughing Blood, Excessive Salivation, Fainting, and Other symptoms where no Farmers and Farmworkers experienced these health issues.

In terms of pesticides, the top five (5) most common pesticides that were being used during the pesticide exposure incidents by the Farmers and Farmworkers who did not seek medical attention but experienced

extreme or severe symptoms were 2,4-D Amine 60 SL, Gramoxone 20 SL, Newmectin 1.8 EC, Pro-Quat 20 SL, Karate Zeon 5 CS (see Table 27). Thankfully, none of these chemicals belonged to the Class I Toxicity group. Nevertheless, 24 pesticides were the least common pesticides used during the pesticide exposure incidents by the Farmers and Farmworkers who did not seek medical attention but experienced extreme or severe symptoms.

Table 26: Distribution of Pesticide Poisoning Incidents Involving Farmers and Farm Workers Sample Respondents who were Victims Experiencing Symptoms "Extremely Severe / Very Serious Problem" (question 8a) but they did not seek medical attention by Health Problems Experienced

Health Problems Experienced (Symptoms)	How Severe (How Bad) was Each Health Problem?					
	Extremely Severe / Very Serious Problem		Other Levels of Severity		Total	
	Frequency of Incidents	Percent of Incidents	Frequency of Incidents	Percent of Incidents	Frequency of Incidents	Percent of Incidents
Headache	23	13.5	42	2.5	65	16.1
Skin Irritation/Itching	21	12.4	44	2.7	65	15.0
Skin Burns	20	11.8	45	2.7	65	14.5
Eye Irritation / Burning	12	7.1	53	3.2	65	10.3
Nausea	11	6.5	54	3.3	65	9.7
Sneezing	11	6.5	54	3.3	65	9.7
Dizziness	11	6.5	54	3.3	65	9.7
Excessive Sweating	10	5.9	55	3.3	65	9.2
Skin Rash	9	5.3	56	3.4	65	8.7
Vomiting	7	4.1	58	3.5	65	7.6
Tightness of Chest / Asthma	7	4.1	58	3.5	65	7.6
Tear Production/ Watery Eye	6	3.5	59	3.6	65	7.1
Runny Nose	6	3.5	59	3.6	65	7.1
Stomach Pain	4	2.4	61	3.7	65	6.0
Coughing (Regular)	4	2.4	61	3.7	65	6.0
Confusion	2	1.2	63	3.8	65	5.0
Skin Bleeding	1	0.6	64	3.9	65	4.5
Eye Twitching	1	0.6	64	3.9	65	4.5
Blurred Vision	1	0.6	64	3.9	65	4.5
Staggering	1	0.6	64	3.9	65	4.5
Tremor/Trembling/Convulsion	1	0.6	64	3.9	65	4.5
Unconsciousness	1	0.6	64	3.9	65	4.5
Pinpoint Pupils	0	0.0	65	3.9	65	3.9
Diarrhoea	0	0.0	65	3.9	65	3.9
Coughing Blood	0	0.0	65	3.9	65	3.9
Excessive Salivation	0	0.0	65	3.9	65	3.9
Fainting	0	0.0	65	3.9	65	3.9
Other	0	0.0	65	3.9	65	3.9

Table 27: Distribution of Pesticide Poisoning Incidents Involving Farmers and Farm Workers Sample Respondents who were Victims Experiencing Symptoms "Extremely Severe / Very Serious Problem" (question 8a) but they did not seek medical attention by Pesticides Involved (or Pesticides in a Mixture) in the Incident

Pesticides Involved (or Pesticides in a Mixture) in the Incident	Frequency	Percent
2,4-D Amine 60 SL	14	14.0
Gramoxone 20 SL	11	11.0
Newmectin 1.8 EC	7	7.0
Pro-Quat 20 SL	5	5.0
Karate Zeon 5 CS	5	5.0
Cypermethrin 25 EC	4	4.0
Kung Fu 2.5 EC	3	3.0
Vydate 24 SL	2	2.0
Jackpot 5 EC	2	2.0
Elimina 72 SL	2	2.0
Elimina 60 SL	2	2.0
Super Pro_Quat 20 SL	1	1.0
Sulban 5 DP	1	1.0
Sulban 48 EC	1	1.0
Rotaprid Gold 37.5 SC	1	1.0
Preglone 20 SL	1	1.0
Lash 90 SP	1	1.0
Lannate 90 SP	1	1.0
Lannate 21.6 SL	1	1.0
Diazinon 60 EC	1	1.0
Delta Plus 5 EC	1	1.0
Avaunt 15 EC	1	1.0
Atom 2.5 EC	1	1.0
Amistar Top 32.5 SC	1	1.0
Other	30	30.0
Total	100	100.0

3.3.6 Did Farmers and Farmworkers know the health hazards of Class I toxicity pesticides and those pesticides in incidents that caused "extremely severe / very serious" symptoms used on the farm?

To determine whether Farmers and Farmworkers know pesticide health hazards, data on the breakdown of **"Do you think this pesticide being used on the farm is a health problem?"** (with options **"Yes / No / Not Sure"**) for the Class I toxicity pesticides and those pesticides in incidents that caused "extremely severe / very serious" symptoms were analyzed. It was found that most (54.9%) Farmers and Farmworkers either did not know (7.0%) or were not sure (47.9%) whether the 26 pesticides that belonged to the Class I toxicity pesticides group and those pesticides in incidents that caused "extremely severe / very serious" symptoms used on the farm were a health problem. Only 45.1% of Farmers and Farmworkers thought that the 26 pesticides that belonged to the Class I toxicity pesticides group and those pesticides in incidents that caused "extremely severe / very serious" symptoms used on the farm were a health problem. This tells us that majority of Farmers and Farmworkers still do not know enough of the health hazards of the pesticides that are used on their farms.

The top three (3) pesticides that Farmers and Farmworkers were **most** knowledgeable of in terms of pesticides belonging to the Class I toxicity pesticides group and pesticides that were in incidents that caused "extremely severe / very serious" symptoms used on the farm were Gramoxone 20 SL, 2,4-D Amine 60 SL and Lannate 21 with scores of 80.0%, 78.5%, and 69.2% respectively. On the other hand, the top three (3) pesticides that Farmers and Farmworkers were **least** knowledgeable of in terms of belonging to the Class I toxicity pesticides group and pesticides that were in incidents that caused "extremely severe / very serious" symptoms used on the farm were Folater 15 GR, Rotaprid Gold 37 and Quickphos 56 GE with 21.5%, 24.6%, and 26.2% respectively. It is alarming to see that Farmers and Farmworkers had very poor knowledge of two (2) of the most toxic pesticides (Folater 15 GR and Quickphos 56 GE) being a health problem on the farm even after being a victim of an incident involving the use of these pesticide(s) at the farm which caused them to suffer from "extremely severe / very serious" symptoms. NGOs and GOB must

educate and raise Farmers' and Farmworkers awareness of the health hazards of the pesticides available at the market, especially the most toxic pesticides and the pesticides that are causing "extremely severe / very serious" symptoms.

Table 28: Distribution of Farmers and Farm Workers Sample Respondents by "Do you think this pesticide being used on the farm is a health problem?", Class I Toxicity Pesticide Being Used on the Farm & Pesticides that Caused Symptoms that are "Extremely Severe / Very Serious Problem"

Class I Toxicity Pesticides Being Used on the Farm & Pesticides that Caused Symptoms that are "Extremely Severe / Very Serious Problem"	Rank	Do you think this pesticide being used on the farm is a health problem?							
		Yes		No		Not Sure		Total	
		Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent
Total		762	100.0%	118	100.0%	810	100.0%	1,690	100.0%
Class I Toxicity Pesticide		181	23.8%	16	13.6%	193	23.8%	390	23.1%
Lannate 21	3	45	5.9%	2	1.7%	18	2.2%	65	3.8%
Lannate 90 SP	4	44	5.8%	1	0.8%	20	2.5%	65	3.8%
Lash 90 SP	7	35	4.6%	6	5.1%	24	3.0%	65	3.8%
Vydate 24 SL	13	26	3.4%	1	0.8%	38	4.7%	65	3.8%
Quickphos 56 GE	24	17	2.2%	4	3.4%	44	5.4%	65	3.8%
Folater 15 GR	26	14	1.8%	2	1.7%	49	6.0%	65	3.8%
Pesticides in Incidents that Caused "Extremely Severe / Very Serious" Symptoms		581	76.2%	102	86.4%	617	76.2%	1,300	76.9%
Gramoxone 20 SL	1	52	6.8%	5	3.3%	8	1.0%	65	3.8%
2,4-D Amine 60 SL	2	51	6.7%	7	4.7%	7	0.9%	65	3.8%
Pro-Quat 20 SL	5	42	5.5%	10	6.7%	13	1.6%	65	3.8%
Super Pro_Quat 20 SL	6	38	5.0%	7	5.3%	20	2.5%	65	3.8%
Newmectin 1.8 EC	8	32	4.2%	8	5.3%	25	3.1%	65	3.8%
Jackpot 5 EC	9	31	4.1%	6	4.0%	28	3.5%	65	3.8%
Karate Zeon 5 CS	10	29	3.8%	3	2.0%	33	4.1%	65	3.8%
Kung Fu 2	10	29	3.8%	3	2.0%	33	4.1%	65	3.8%
Sulban 48 EC	12	28	3.7%	6	2.0%	31	3.8%	65	3.8%
Avaunt 15 EC	13	26	3.4%	3	2.0%	36	4.4%	65	3.8%
Delta Plus 5 EC	13	26	3.4%	7	4.7%	32	4.0%	65	3.8%
Sulban 5 DP	13	26	3.4%	6	0.7%	33	4.1%	65	3.8%
Ixus 20 SC	17	24	3.1%	1	0.7%	40	4.9%	65	3.8%
Preglone 20 SL	17	24	3.1%	4	2.7%	37	4.6%	65	3.8%
Diazinon 60 EC	19	23	3.0%	5	3.3%	37	4.6%	65	3.8%
Elimina 60 SL	20	22	2.9%	2	1.3%	41	5.1%	65	3.8%
Elimina 72 SL	20	22	2.9%	2	1.3%	41	5.1%	65	3.8%
Cypermethrin 25 EC	22	21	2.8%	7	4.7%	37	4.6%	65	3.8%
Atom 2	23	19	2.5%	3	2.0%	43	5.3%	65	3.8%
Rotaprid Gold 37	25	16	2.1%	7	4.7%	42	5.2%	65	3.8%

3.4 Limitations

- Sampling Error – tell us how representative the population is of the group being surveyed. A convenience sample was used since a random sample of FFW was not obtained, and an inadequate sample size of only 150 FFW respondents was used in this study, which is too small given that Belize has a large farming community. Hence, the inherent bias in convenience sampling means that the sample is unlikely to be representative of the population being studied. As a result, we may have high sampling errors, which will undermine the researchers' ability to make generalizations and inferences from the sample to the population of this study.
- Response Errors – result when data is incorrectly requested, provided, received or recorded. These errors may occur because of inefficiencies with the data collection instruments (i.e., questionnaire), the interviewer, the respondent, or the data collection process. One of the issues, in this case, was a double-barrelled question in the questionnaire that was found in Question 35, which states, "Whether the label was available and whether the respondent could have read and understood the label is a double-barrelled question"); hence, researcher(s) could not distinguish whether the issue is reading the label or understanding the label of the pesticide. To rectify this issue for future pesticide poisoning surveys such as this one, it is recommended to split Question 35 into two questions. That is, the first question should be "Were you capable of **reading** the label on the pesticide" and the second question should be "Were you capable of **understanding** the label on the pesticide." This revision to the questionnaire will allow researchers to capture data for both and thus distinguish whether the issue is reading the label or understanding the pesticide label.
- Response Errors – The other issue is the questionnaire should have included a "Not Applicable" option along with the Yes/No/Not Stated options for Question 5, "Do you think this pesticide being used on the farm is a health problem?" so that only pesticides that were

at their respective farm would be responded to. Consequently, the FFW respondents were asked to respond to Question 5 of the questionnaire for the entire list of 150 pesticides instead of only pesticides that were at their farm.

- Response Errors – The final issue is question 8b (i.e. "What were the health problems you experienced and how severe (how bad) was each health problem? OTHER Specify") should have included the four (4) level of severity options (i.e. Not A Problem, Not Severe / Not Much of a Problem, Somewhat Severe / Somewhat of a Problem, Extremely Severe / Very Serious Problem and Cannot Recall Severity) as it did for questions 8a – 8ab. As a result of not including these level of severity options, the respondent only indicated the other type of symptom or health problem as oppose to specifying both the level of severity for each other symptom or health problem and the other type of symptom or health problem.

CHAPTER 4

4.0 Conclusion

The survey revealed that the farmers interviewed had experienced mild to severe reactions from pesticide usage in the field. Hence, measures need to be implemented to enhance farmers' and farm workers' knowledge of all the pesticides in the list of the Class I Toxicity so that they would be aware of the most toxic pesticides available in the market.

From the list of pesticides reported by the farmers, none of these pesticides that made this top 10 list were from the Class I Toxicity (most toxic pesticides) group. The pesticides from the Class I Toxicity group involved in the incident were: Vydate 24 SL, Lannate 21.6 SL, Lannate 90 SP, and Lash 90 SP and were ranked 17th, 19th, 20th, and 26th respectively. Hence, farmers would need more education on the list of Class I Toxicity so that they would be aware of the most toxic pesticides available in the Belizean market. Furthermore, the data indicates that FFW respondents are not frequently using pesticides in the Class I Toxicity group, which is a good farming practice for safety reasons.

The data also suggest that too many FFW combined many pesticides for farm work purposes, thereby risking contamination and poisoning by mixing multiple pesticides simultaneously. The Pesticide Control Board (PCB) and the Ministry of Agriculture (MOA) will need to address this problem so that mixing pesticides to do farm work will cease or be minimized.

The study found that Self Treatment was the most predominant action taken when respondents felt the effects of the pesticide accounting for 53.3% of all respondents, while "Went to the Private Doctor" was the least predominant action taken when respondents felt the effects of the pesticide accounting for 0.7% of respondents. This data suggest that Farmers and Farmworkers will only visit the doctor if the effects of the pesticides experience a severe health problem. The researcher believes that Farmers' and Farmworkers' reluctance to visit the doctor when they have a health problem from the effects of the pesticides may be due to the proximity of medical facilities and the medical expenses for being treated by a doctor.

The survey revealed that FFWs are not wearing their Personal Protective Equipment (PPEs), especially masks when working on their farms. A respondent got affected by the pesticide when washing the respondent's clothing or when the farmer was in close contact with people after using pesticide at the farm. These incidents can be reduced by sharing best practice measures with the Farmers and Farm Workers.

The least dominant causes of the pesticide poisoning incident that the FFW respondents reported were wind blew pesticide granules or powder on the person, hand, or glove contaminated with pesticide contacted other body parts, the skin was contaminated with pesticide when applying the pesticide with a bucket.

The results indicated a need for FFW to receive practical training on using a sprayer when working on a farm, especially when the weather is windy. Also, farmers need to keep track or be constantly aware of the weather and, when possible, do farm work that involves spraying pesticides during times that are not windy.

Furthermore, in general, the incidence of pesticide poisoning in Belize has been trending upwards, and the most significant year over year increase is in the 2020 to 2021 period when the Poisoning Incident among FFW was almost doubled (i.e., 1.8 times) from 41 cases in 2020 to 73 cases in 2021 (see Chart 3). Kindly note that the increase in the incidence of pesticide poisoning in Belize for 2021 is even more significant as the period for 2020 was a full year while the period for 2021 was only for the period January to August.

The majority of FFW respondents stated that they could read and understand the label on the pesticide. In comparison, 16.0% were not able to read and understand the label on the pesticide, and 10.0% were not sure or could not recall if they were capable of reading and understanding the label on the pesticide.

4.1 Recommendations

- The Pesticide Control Board (PCB) and the Ministry of Agriculture (MOA) must ensure that measures are implemented to enhance farmers' and farm workers' knowledge of all the pesticides in the list of the Class I Toxicity so that they would be aware of the most toxic pesticides available in the market.

- The PCB and the MOA will need to educate FFW on mixing pesticides practices (e.g., acceptable vs. harmful or wasteful practices). This can certainly address the problem of harmful and wasteful mixing of pesticides practices to do farm work in Belize.
- The results indicate a need for FFW to receive practical training on using a sprayer when working on a farm, especially when the weather is windy. Also, farmers need to keep track or be constantly aware of the weather and avoid spraying on windy days. Hence, the PCB and the MOA need to educate FFW on planning their workdays using weather and climate information from various sources.
- The PCB and the MOA must educate the FFW on the importance of PPE use to protect FFW health. Moreover, training must also be focussed on getting the FFW to experience behavioural change that conforms to best practices of wearing PPEs when using pesticides at their respective farms.
- The PCB and the MOA must educate the FFW on the importance of PPE use to protect FFW health. Moreover, training must also be focussed on getting the FFW to experience behavioural change that conforms to best practices of wearing PPEs when using pesticides at their respective farms.
- The PCB and MOA must aggressively advocate for OSH standards to be adopted by Belize and ensure that employers and Farmers comply with OSH's general PPE requirements.
- The PCB and MOA must compel employers or Farmers to always provide PPEs to their workers and ensure its proper use when work practice and administrative controls are not feasible or do not provide sufficient protection.
- The PCB and the MOA must train the FFW on the proper use of PPE to know:
 - When it is necessary;
 - What kind is necessary;
 - How to properly put it on, adjust, wear and take it off (If the personal protective equipment does not fit properly, it can make the difference between being safely covered or dangerously exposed);
 - The limitations of the equipment and
 - Proper care, maintenance, useful life, and disposal of the equipment

- The PCB and MOA must implement a PPE program that should address:
 - the hazards present;
 - the selection, maintenance, and use of PPE;
 - the training of employees;
 - and monitoring of the program to ensure its ongoing effectiveness.
- The Pesticide Control Board needs to review all pesticides identified by the survey to determine if poisoning incidents warrant restricting or banning the most toxic ones.
- The PCB and the MOA need to constantly urge or compel FFW to report poisoning incidents and seek medical attention. This could be done using technology (e.g., apps software).
- To change the behavioural practice or habit of FFW to only visit the doctor if the effects of the pesticides experience a severe health problem due to the proximity of medical facilities and high medical expenses for being treated by a doctor, the clinic must go to the FFW patients if the patients cannot come to the clinic. Hence, the PCB and the MOA will need to partner with the MOH, Pan American Health Organization, Social Security Board, and other NGOs to adapt best practices in digital health or eHealth or telemedicine and related methods of providing health care such as:
 - mobile clinics where medical practitioners or Floating Doctors travel to remote communities with poor access to care to provide primary care and emergency care services,
 - Telehealth where medical care is provided at a distance which means people in remote areas with limited access to healthcare can get the medical attention they need. This also saves time, money and travel for both doctors and patients,
 - Having mobile apps dedicated to health turns our smartphones into personal trainers, sleep monitors, diagnostic, devices and more, with apps for both healthcare professionals and patients,
 - Wearable technology or the well-known term wearables, includes smart clothing and accessories such as wristbands, glasses and watches to monitor and collect information on our health and physical condition). These digital health or eHealth services can provide

effective and quality medical care to FFW patients in remote settings who have been poisoned by pesticides among other injuries or illnesses that occur while working at the farms.

- To eliminate or at least minimize pesticides poisoning incidents in Belize investments must be made in Agriculture Technology solutions such as:
 - Autonomous agriculture robots that can work for 24 hours a day. Using agriculture robots will help reduce the time FFW spend labouring out in the harsh conditions of the field which include the pesticides spraying among many other labour intensive and dangerous tasks at the farm.
 - Smart vehicles (e.g. automated tractors, harvesters, rice transplanters, etc.) that harness the advantages of data to schedule the daily, weekly, and seasonal tasks necessary to keep a working farm operating among other valuable benefits. A useful application would be using past planting season's data to inform this year's planting schedule, right down to spraying the exact amount of pesticides and herbicides required – reducing time and wastage on chemicals and other resources. \
 - Industrial drones that can provide end-to-end surveillance solutions for monitoring crop growth and other agriculture monitoring needs. For example, Industrial Drones can be used by FFW to spray pesticides at the farm especially at hard to reach places. Kindly note that the latter three (3) recommendations can eliminate pesticides poisoning incidents in Belize altogether since machines instead of FFW will be out in the farm spraying the pesticides doing so at a significantly more effective and efficient manner.

Annexes

A1: Survey Instrument

BEGIN INTRODUCTION OF YOURSELF AND THE SURVEY

Hello (Good day). I am _____ an interviewer working with the University of Belize who the Food Agriculture Organization hired to conduct a survey on pesticide poisoning among Farmers and Farmworkers in Belize. Here is my ID card.

With your kind permission, I would like to ask you some questions on pesticides poisoning and health problem(s) you experienced after coming into contact with pesticide(s). The survey is being conducted to determine the pesticide poisoning situation in Belize, and data collected will be used to reduce pesticide poisoning incidents in Belize.

I will use a phone to record the information for this interview and take approximately 20 minutes. The UB assures you that the information collected will be treated with the greatest level of confidentiality and in no way will be able to identify you or your farm or household.

END OF INTRODUCTION

Pesticide Survey Introduction

This survey determines if persons have had a health problem from a pesticide. If you have inhaled a pesticide or it went in your eyes or on your skin, and it caused you a health problem, will you be willing to answer some questions about the incident?

* Required

Skip to question 4

Participant Details

Name of Participant: *

Home Address:

Cell Phone Number(s)

Demographic Info

1.) Gender

Mark only one oval.

Male

Female

2.) Age (years)

Mark only one oval.

- Less than 21
- 21-40
- 41-60
- Over 60

3.) Place of Interview

Mark only one oval.

- Farm
- Pesticide Shop
- Meeting / Training
- Home
- Market
- Other: _____

4.) District where the pesticide poisoning incident occurred:

Mark only one oval.

- Belize
- Cayo
- Corozal
- Orange Walk
- Stann Creek
- Toledo

Pesticide Information

Please tell me the names of ALL pesticides used on the farm and which ones you think can be a health problem. (For EACH pesticide named, ask if the person thinks the pesticide is a health problem).IMPORTANT: If no chemicals are used on the farm, or the person is not sure or does not know the names of what is used, END the interview, and thank the person. This will not count as an interview and must be cancelled.

5.) Do you think this pesticide being used on the farm is a health problem?

Mark only one oval per row.

	NO	YES	NOT SURE
2,4-D Amine 60 SL	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Aballone 1.8 EC	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
ABAMEC 1.8 EC	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Acarramiik 1.8 EC	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Amiistarr Top 32.5 SC	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Anglloxone 20 SL	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Attom 2.5 EC	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Avauntt 15 EC	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Basagrran 48SL	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Baythtroiid XL 12.5 SC	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Blliindage 60 FS	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
BULLGRASS 30.4 SL	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Capturre 60 SL	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Cypermetthriin 25 EC	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Cyperkiilll 50 EC	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Cypersull 25 EC	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Delltta Plus 5 EC	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Diiatta 10 EC	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Diiaziinon 60 EC	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Elliimiina 72 SL	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Emiirr 8.8 EC	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Ettocop 15 GR	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Forratterr 15 GR	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Grramoxone 20 SL	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Iixus 20 SC	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Jackpott 5 EC	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Karratte Zeon 5 CS	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Kiillatte 10 EC	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Kung Fu 2..5 EC	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Lannatte 21..6 SL	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Lannatte 90 SP	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Lash 90 SP	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Lubaquatt 20 SL	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Mortteli 20 SC	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
MURALLA DELTA 19 OD	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Newmectiin 1..8 EC	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
PEGASUS 50 SC	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Piikudo 20 SC	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Regllone 20SL Regnum	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
25 EC	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
RIIMAXIIL 60 SL	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
RIIMAXONE 20 SL	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
RIIMAZIINON 60 EC	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Rottapriid Gollid 37.5 SC	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
SADDLER 35 FS	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Semeviin 35 FS	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sullban 48 EC	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sullban 5 DP	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sullttan 20 SL	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Superr Prro_Quatt 20 SL	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Torrdon 30.4 SL	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Tottem 72 SL	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Vydatte 24 SL	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

6.) Where on your body did the pesticide get on you, or into you? (What was the exposure to the pesticide): (INTERVIEWER: record multiple responses if applicable)

Check all that apply.

- Eyes
- Inhaled
-

Skin-Face

Skin-other than face

Mouth

7a.) Exact name of pesticide (or pesticides in a mixture) involved in the incident:

Check all that apply.

- 2,4-D Amine 60 SL
- Abalone 1.8 EC
- ABAMEC 1.8 EC
- Acaramik 1.8 EC
- Amistar Top three (3)2.5
- SCAngloxone 20 SL
- Atom 2.5 EC
- Avaunt 15 EC Basagran
- 48SL Baythroid XL 12.5
- SCBlindage 60 FS
- BULLGRASS 30.4 SL
- Capture 60 SL
- Cypermethrin 25 EC
- Cyperkill 50 EC
- Cypersul 25 EC
- Delta Plus 5 EC
- Diata 10 EC
- Diazinon 60 EC
- DMA 68.3 SL
- Elimina 60 SL
- Elimina 72 SL
- Emir 8.8 EC
- Etocop 15 GR
- Forater 15 GR
- Gramoxone 20 SL
- Ixus 20 SC
- Jackpot 5 EC
- Karate Zeon 5 CS
- Kilate 10 EC
- Kung Fu 2.5 EC
- Lannate 21.6 SL
- Lannate 90 SP
- Lash 90 SP
- Lubaquat 20 SL
- Mortel 20 SC

- MURALLA DELTA 19 OD
- Newmectin 1.8 EC
- PEGASUS 50 SC
- Pikudo 20 SC
- Preglone 20 SL
- Pro-Quat 20 SL
- Quickphos 56 GE
- Rafaga 20 SC
- REGENT 10
- Regent 20 SC
- Reglone 20SL
- Regnum 25 EC
- RIMAXIL 60 SL
- RIMAXONE 20 SL
- RIMAZINON 60 EC
- Rotaprid Gold 37.5 SC
- SADDLER 35 FS
- Semevin 35 FS
- Sulban 48 EC
- Sulban 5 DP
- Sultan 20 SL
- Super Pro_Quat 20 SL
- Tordon 30.4 SL
- Tordon 30.4 SL
- Totem 72 SL
- Vydate 24 SL

7b.) Exact name of pesticide (or pesticides in a mixture) involved in the incident:OTHER Specify

8a.) What were the health problems you experienced and how severe (how bad) was each health problem?

Mark only one oval per row.

	Extremely severe / very serious problem	Somewhat severe / somewhat of a problem	Not severe / not much of a problem	Cannot recall severity
a) Skin Irritation/itching	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
b) Skin Rash	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
c) Skin Burns	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
d) Skin bleeding	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
e) Eye Irritation / burning	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
f) Tear production/ watery eye	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
g) Eye Twitching	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
h) Blurred Vision	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
i) Pinpoint pupils	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
j) Stomach pain	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
k) Nausea	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
l) Vomiting	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
m) Diarrhea	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
n) Coughing (regular)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
o) Coughing blood	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
p) Tightness of Chest /asthma	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
q) Sneezing	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
r) Runny nose	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

s) Excessive sweating	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
t) Excessive salivation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
u) Headache	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
v) Confusion	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
w) Dizziness	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
x) Staggering	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
y)) Tremor/trembling/convulsion	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
z) Fainting	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
a) Unconsciousness	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

8b.) What were the health problems you experienced and how severe (how bad)was each health problem?

OTHER Specify

9a.) What did you do when you felt the effects of the pesticide? (INTERVIEWER:Skip to question 11 if the respondent was not medically treated.)

Check all that apply.

- Nothing / no action
- Rested/ stopped using the pesticide Washed
- the chemical off immediately
- I continued spraying, and after I had finished, I washed the chemical offWent
- to private doctor
- Went to Health Centre
- Went to Hospital
- Self-treatment (INTERVIEWER go to Question 9b)

9b.) Describe the type of self-treatment that was performed. (INTERVIEWER: Probe for detail of Self-treatment type. Record multiple responses if applicable)

Check all that apply.

- Asthma inhaler used
- Applied Vaseline to skin
- Applied alcohol to skin
- Applied lotion/ointment/oil to skin
- Drank Milk
- Drank alcohol
- Drank some type of tea
- Eyewash / eyedrops
- Pain medication used

Other: _____

10a.) If treated by a private doctor or at a health Centre or hospital, state the name of private doctor or health facility.

11.) Describe exactly HOW the pesticide incident occurred / what happened that resulted in the contamination (record every detail; prompt the person if needed)

12a.) FOR INTERVIEWER: based on details of the response given to Question 11, which ones of the following best summaries what caused the pesticide poisoning incident (more than one can be recorded if applicable): (If option A is selected go to question 12b, else SKIP to question 13)

Check all that apply.

- a.) wind blew spray mist on sprayman during field application
- b.) Spray mist contacted sprayman during field application (Wind not involved)
- c.) Splashed/spilled pesticide on self while mixing/handling
- d.) During application, pesticide leaked from spray equipment onto sprayman
- e.) Hand or glove contaminated with pesticide contacted other body parts
- f.) Bystander not involved in pesticide use was affected during mixing, or during / after application
- g.) While mixing pesticide, person was affected by pesticide vapours (fumes)
- h.) Skin was contaminated with pesticide when applying with a bucket
- i.) wind blew pesticide granules or powder on the person

12b.) IF INTERVIEWER SELECTS 12a) "Wind blew spray mist on sprayman during field application", ask the person being interviewed "why were you applying pesticides in windy conditions?" (INTERVIEWER: Record multiple responses if applicable)

Check all that apply.

- Not windy when I started
- The pest problem was urgent
- Wind was blowing but I did not expect it would be a problem
- I was instructed to spray at that time (someone else's decision)
- No particular reason

Other: _____

13a.) Which of the following protective clothing were you wearing at the time of the incident?

(INTERVIEWER: Read EACH item in the list to the person being interviewed and record all that were being worn):

Mark only one oval per row.

	Yes	No	Not Sure / Cannot Recall
a.) Rubber Gloves	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
b.) Coveralls / overall	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
c.) Spray mask	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
d.) Goggles ((if goggles – yes,, go to f)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
e.) Eyeglasses	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
f.) Respirator with cartridges ((if respirator –yes,, go j)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
g.) Dust mask with pesticide absorbing particles (single use) ((if this,, skip to j)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
h.) Regular dust mask ((if dust mask -- yes,,go to j))	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
i.) Scarf or cloth over nose and mouth	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
j.) Water boots ((if water boots – yes,, go to l)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
k.) Shoes / regular boots	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
l.) Long sleeve shirt	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
m.) Long pants	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
n.) Waterproof apron	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

13b.) Which of the following protective clothing were you wearing at the time of the incident? (If OTHER, please specify.)

Mark only one oval.

- Not applicable - Bystander incident
- Not sure/can't recall anything of what was being worn
- Other _____

14.) If you were not wearing rubber gloves, goggles, or respirator, explain why. (INTERVIEWER: Record multiple responses if applicable)

Check all that apply.

- Too hot
- Too expensive to buy
- Did not think it was necessary
- Uncomfortable
- Not applicable – bystander incident
- Other:

15.) What year and month was the incident?

Example: January 7, 2019

16.) Were you exposed to:

Mark only one oval.

- Concentrated commercial product
- Diluted mixture
- Both
- Not sure/ cannot recall

17.) How long were you exposed to the pesticide (duration of the exposure period)?

Mark only one oval.

- Less than one hour
- to 2 hours
- Half day
- 1 day
- More than one day

18.) How soon after exposure were the harmful effects observed?

Mark only one oval.

- Almost immediately
- to 2 hours
- Half a day
- At the end of the same day
- The next day
- Longer time than the next day

19.) Which of the following activities at the time of exposure were you involved in (INTERVIEWER: Record those that apply):

Check all that apply.

- Application in field
- Mixing pesticide
- Loading pesticide into sprayer
- Application to livestock (control of animal ticks, etc.)
- Application in house (household pests)
- Application around or near house, including backyard garden
- Vector control application (mosquito fogging, etc.)
- Standing/working in or near a field during or after pesticide application

Other: _____

20.) Was the label available before or at the time of the incident?

Mark only one oval.

- Yes
- No
- No Applicable
- Not Sure / cannot recall

21.) If yes, were you capable of reading and understanding label?

Mark only one oval.

- Yes
- No
- Not Applicable

22.) What was the application method (How the pesticide was being applied)?

Mark only one oval.

- Backpack / knapsack sprayerMist
- blower / motor blower Hand
- sprayer
- Tractor mounted sprayer
- Aerial spraying (plane) Not
- applicable
- Other: _____

23.) Where did the exposure occur?

Mark only one oval.

- Field Storeroom
- Home Garden
- Inside or outside of house
- _____

Other:

24.) What was being treated?

Mark only one oval.

- Not Applicable
- Crops
- Animals (livestock / pet)Stored
- products
- Weeds
- Other: _____

25.) Were other individuals affected in the same incident?

Mark only one oval.

- Yes
- No
- Not Sure / Cannot Recall

Data Collector details

Name of data Collector: *

Mark only one oval.

- Gabriel Campos
- Shantel Sutherland
- Amsi Moralez
- Marleny Dominguez
- Dale Pech
- Dyrin Leon
- Melvin Requena
-

ID Number *

Date: *

Example: January102

A2: Active Ingredients Reported in Belize Pesticide Poisoning Incidents

Table 29: Active Ingredients Reported in Belize Pesticide Poisoning Incidents

Active Ingredient	Pesticide Products Reported*	Incidents*	%
2,4-D **	2,4-D Amine 60 SL, RIMAXIL 60 SL	15	15.5%
Abamectin **	Newmectin 1.8 EC	15	15.5%
Chlorfluazuron	Chlorfluba 5 EC	1	1.0%
Chlorothalonil	Bravo	1	1.0%
Chlorpyrifos	Sulban 5 DP, Sulban 48 EC	4	4.1%
Cypermethrin	Cypermethrin 25 EC	3	3.1%
Deltamethrin	Delta Plus 5 EC	1	1.0%
Diazinon	Diazinon 60 EC, RIMAZINON 60 EC	2	2.1%
Dursban	Lorsban	2	2.1%
Fipronil	Ixus 20 SC, Regent 20 SC	3	3.1%
Glyphosate **	Glyphosate, Helosate 35.6 SL	10	10.3%
Imidacloprid	Plural 20 OD	1	1.0%
Indoxacarb	Avaunt 15 EC	2	2.1%
Lambda Cyhalothrin **	Jackpot 5 EC, Karate Zeon 5 CS, Kendo 2.5 EC, Kung Fu 2.5 EC, Lamdex 5 EC	8	8.2%
Lambda Cyhalothrin + Imidacloprid	Rotaprid Gold 37.5 SC	1	1.0%
Lambda Cyhalothrin + Thiamethoxam	ENGE0 24.7 SC	3	3.1%
Malathion **	Malathion	6	6.2%
Mancozeb + Metalaxyl	DILIGENT 70 WP, Ridomil Gold MZ 68WP	3	3.1%
Oxamyl	Vydate 24 SL	1	1.0%
Paraquat **	Gramoxone Super 20 SL, Super Pro-Quat 20 SL	10	10.3%
Profenofos + Lufenuron	Curyom 55 EC	1	1.0%
Propineb	Antracol	1	1.0%
Thiocyclam Hydrogen Oxalate	Tryclan 50 SP	3	3.1%
TOTAL	27	34	97
			100%

* Poisoning incidents involving mixtures of 2 or more pesticide products are not included

** Active ingredients involved in more than 5% of incidents are highlighted.

A3: Mixtures Reported in Belize Pesticide Poisoning Incidents

Table 30: Mixtures Reported in Belize Pesticide Poisoning Incidents

Incident Number	Pesticide Mixture Involved in Incident	Mixture Status	Frequency
1	2,4-D Amine 60 SL, Amistar Top 32.5 SC	2	1
2	2,4-D Amine 60 SL, Amistar Top 32.5 SC, Diazinon 60 EC, Karate Zeon 5 CS, Kung Fu 2.5 EC	5	1
3	2,4-D Amine 60 SL, Avaunt 15 EC	2	1
4	2,4-D Amine 60 SL, Glyphosate	2	2
5	2,4-D Amine 60 SL, Gramoxone 20 SL	2	1
6	2,4-D Amine 60 SL, Gramoxone 20 SL, Lannate 21.6 SL, Lannate 90 SP, Pro-Quat 20 SL	5	1
7	2,4-D Amine 60 SL, Gramoxone 20 SL, Pro-Quat 20	3	2
8	2,4-D Amine 60 SL, Helosate	2	1
9	2,4-D Amine 60 SL, Jackpot 5 EC	2	1
10	2,4-D Amine 60 SL, Milagro	2	1
11	2,4-D Amine 60 SL, Pro-Quat 20 SL	2	3
12	2,4-D Amine 60 SL, Tordon 30.4 SL, Rimaxato	3	1
13	2,4-D Amine 60 SL, Vydate 24 SL	2	1
14	Atom 2.5 EC, Vondacep 80 WP	2	1
15	Avaunt 15 EC, Newmectin 1.8 EC, Vydate 24 SL	3	1
16	Avaunt 15 EC, Plicicario, Fulate	3	1
17	Cypermethrin 25 EC, Delta Plus 5 EC	2	1
18	Cypermethrin 25 EC, ENGEO 24.7 SC	2	1
19	Cypermethrin 25 EC, Jackpot 5 EC	2	1
20	Cypermethrin 25 EC, Sheildtox fish spray	2	1
21	Delta Plus 5 EC, Newmectin 1.8 EC	2	1
22	Elimina 60 SL, Elimina 72 SL	2	1
23	Elimina 60 SL, Elimina 72 SL, Ixus pesticide	3	1
24	Fipronil (Taurus), Bifenthrin (BIFEN I/T), Delthametrin (Suspend SC)	3	1
25	Gramoxone 20 SL, Jackpot 5 EC	2	1
26	Gramoxone 20 SL, Jackpot 5 EC, Karate Zeon 5 CS, Kung Fu 2.5 EC, Lannate 21.6 SL, Lannate 90 SP, Newmectin 1.8 EC	7	1
27	Gramoxone 20 SL, Malathion	2	1
28	Gramoxone 20 SL, Newmectin 1.8 EC	2	1
29	Gramoxone 20 SL, Super Pro-Quat 20 SL	2	2
30	Jackpot 5 EC, Multimap	2	1
31	Karate Zeon 5 CS, Antracol	2	1
32	Karate Zeon 5 CS, Preglone 20 SL	2	1
33	Karate Zeon 5 CS, Rotaprid Gold 37.5 SC	2	1
34	Lannate 21.6 SL, Lannate 90 SP	2	1
35	Lash 90 SP, Malathion	2	1
36	Lash 90 SP, Newmectin 1.8 EC, Ace 20 SP	3	1
37	Newmectin 1.8 EC, Antracol	2	1
38	Newmectin 1.8 EC, Antracol and ENGEO 24.7 SC	3	1
39	Newmectin 1.8 EC, ENGEO 24.7 SC	2	1
40	Sulban 5 DP, Malathion, Phytan 6.6SL, Ridomil Gold MZ 68WP and Bordeaux 80WP	5	1
41	Tryclan 50 SP, ENGEO 24.7 SC	2	1