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Raising Farmers Environmental Awareness in the Use of Pesticides and Agriculture Machinery

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ABSTRACT

The study was mainly to determine the farmers awareness in the use of pesticides and agricultural machinery used to spray pesticides in East Tripoli, Libya. Quantitative methods were used with questionnaires administered to 300 respondents as farmers and the result was statistically analyzed using Statistical Package for Social Science SPSS. From 8 research questions considered, the results showed that in East Tripoli the farmers earn 50% of their income by selling their farm products in the market which are mainly vegetables. Most of the farmers own a store to keep and protect their chemicals under lock in the chemical original packs. For the farmers to know the hazards associated with the chemicals or pesticides to be used they read the instructions before use and they wear protective clothes while preparing the solution. The types of protective clothes the farmers in East Tripoli majorly wear are gloves and this type of PPE has been used for the past 11 years and above. There is a statistically significant and linear combination of independent factors significantly related to PPE's that protect the farmers from danger and farmers' knowledge about safe use of PPE's. There is a statistically significant difference between male and female farmers influence on the awareness of spraying plant and vegetal plants. Therefore, gender influences the awareness of spraying plants and vegetal products. There is no correlation or relationship between farmer's education level and purchasing of agricultural products. Therefore, farmer's education level affects purchasing agricultural products. There is also no correlation or relationship between application of PPE and type of sprayer. The result suggested that monthly income does not have any significant positive difference in the use of machineries associated with pesticide application. The farmers are aware of modern machinery for spraying of pesticides and they also use irrigation system during the process of spraying which indicates that they make use.

Keywords: pesticides, farmers, machinery, personal protective equipment, misapplication, spraying

INTRODUCTION

Agriculture practices address a basic constituent of Libyan economy where it uses around 5 % of the work problems and gives around 9% of the Gross Domestic Product (GDP). Animal husbandry is so far a colossal development, depends vivaciously on imported feed. The unsustainable use of these benefits assets to an extraordinary long-term natural and money related hazard to Libya's cultivating lands. As the world moves towards the next century, direction and getting ready for the best usage of pesticides to control pest, diseases and weed issues in cultivation, will expect a reliably expanding significance [1].

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To nourish a total populace, forecast to grow from 5300 million out of 1990 to 10200 million by 2075, from existing area region zones, using reasonable production frameworks, with irrelevant hostile results for people and the environment, is an overwhelming undertaking. The issue is around the world. Finding its answer presents government authorities, financially related organizations, agriculturists and the agrochemical business a gigantic test. Propel increment of world horticulture, particularly in Asia, Africa, Latin America and the Caribbean, is an unavoidable objective. Extension of the total populace is centered on these zones [2].

PROBLEMS OF RESEARCH

How to raise the efficiency of farmers to improve environmental awareness in the use of pesticides and agricultural machinery used to spray pesticides in Tripoli Libya.

Does farmers' knowledge about safe use of personal protective equipment PPEs protect them from ealth effect?

1. Does gender influence the awareness of spraying plant and vegetal products?
2. Are the farmers sensitive to the misapplication of protective products?
3. Does the farmers' education level affect purchasing agricultural chemicals?
4. Does PPEs use related with the type of sprayer use?
5. Does monthly income make any difference in the use of machineries associated with pesticide application?
6. Are farmers aware of the machineries associated with pesticide application?
7. Do farmers use agricultural machinery during control operations?

THE IMPORTANCE OF THE STUDY

Since the 1940s, agrochemicals have been heavily used in agriculture around the world to control diseases that affect a variety of pests and plants. Pesticide is a mixture of substances used to prevent, reduce any harmful substances or fungi (fungi, moss or bacteria) (2014 FAO insects (insecticides), rodents (rodenticides) and weeds (herbicides) [3]. Damages and diseases can reach 78%, 54% and 32%, respectively, because the pesticides from the pests are the incentives to use pesticides in agricultural production without the application of fruit and vegetables and cereals [4,5]. Thus, the use of pesticides is increasingly recognized as an indispensable practice for adequate food production in arable land boundaries for the world population [6,7]. Other advantages of the use of pesticides, sorting and other tasks are needed to free the storage of product life and less labor to improve [8].

The use and number of different pesticides vary by region. For example, the rate of pesticide consumption has increased by 48% in 2005 and by 20% in 1960 [6,9]. Moreover, with herbicides in Western Europe and North America, chemical weed control is more prevalent than East Asia, Latin America or Africa because of high labor costs. However, insects are also used in large quantities in both small farms and industrial plantations, and insect pests and plant diseases are common in many tropical regions. Countries have developed the use of natural enemies of pests, as well as less chemicals and less toxic substances, as is the case for the current use of pesticides, for example in the US and EU countries.

METHODOLOGY

In this research the details of different methods used in this study will be examined in terms of data collection, application of the collected data tools, and data analysis which is carried out to assess the raising efficiency of farmers to improve environmental awareness in the use of pesticides and agricultural machinery used to spray pesticides and their environmental impact in the east of Tripoli, Libya.

This study mainly focuses on determining the efficiency of farmers to improve environmental awareness in the use of pesticides and agricultural machinery used to spray pesticides and their environmental impact in the east of Tripoli, Libya. This study is based on field study carried out in East Tripoli, Libya in 2018. The method applied in this study to make it more reliable is quantitative method by use of research questionnaire adopted from Amber et al. (2017) and from sources like articles, textbooks, and studies on the subject and internet source [10].

PARTICIPANTS AND SAMPLE

The study was carried out in the East part of the Tripoli. The study is a cross-sectional one among 300 farmers dwelling in the community of Tripoli district of Libya. This study concentrated on the adult population. An eligible criteria used in this study include The farmer being above 18 years, a permanent resident in the study area and the respondent's willingness to be obliged to the study protocols and complete the study. Every farmer was given an organized questionnaire. The questionnaire focused on gender, age, education, information about the type of crop

sprayer, purchasing agricultural chemicals storing protective chemicals, personal Protective Equipment PPE, spraying plants and vegetal products, misapplication of protective products and quality of machinery for spraying.

DATA GATHERING TOOLS

In this study the data collection tools used were personal information, environmental awareness, knowledge and behavior scale test and information test.

SCORING SCALE AND CLASSIFICATION OF THE SUBSTANCE

The efficiency of farmers to improve environmental awareness in the use of pesticides and agricultural machinery used to spray pesticides and their environmental impact in the East of Tripoli, Libya were revealed according to the interpreted based on the survey questions.

DATA ANALYSIS

The data were encoded and statistical analyses were accomplished using SPSS statistical software. Percentages were based on the number of respondents rather than using the total sample. The efficiency of farmers improved environmental awareness in the use of pesticides and machineries used to spray pesticides were determined statistically by means of t-test, ANOVA and descriptive statistics.

VALIDITY AND RELIABILITY

For the research to be reliable, validity and scientific process research ethics were considered. The participants were give direct questions. The researcher actually demonstrated an objective attitude during the research by demonstrating a good work behavior in order not to influence the study.

RESULTS AND DISCUSSION

A quantitative research approach was used to achieve the aims of the study. This research includes the general information and the statistical analysis of the data collected according to the research procedures described.

Table 1. Distribution of Product, Market and district

Selling production in market	**Frequency**	**Percentage**
No	176	58.7
Yes	124	41.3
50% of annual income	**Frequency**	**Percentage**
Yes	178	59.3
No	122	40.7
Plant and vegetable product	**Frequency**	**Percentage**
Orchards	17	5.7
Potatoes	19	6.3
Vineyard	54	18.0
Vegetables	114	38.0
Cereal	96	32.0

In **Table 1**, 176 (58.7%) of the farmers reported that they sold their products in market, but 124 (41.3%) expressed that they did not sell the product in the market. Furthermore, the farmers were asked whether the income from the agricultural selling product was 50% equal to their annual income. 178 (59.3%) responded as "yes", less than half of them 122 (40.7%) said "no". Also, 17 (5.7%), 19 (6.3%), 54 (18.0%), 114 (38.0%) and 96 (32.0%) of the farmers dealt with orchards, potatoes, vineyard, vegetable and cereal products respectively.

Table 2. Information about the Type of Crop Sprayer

Type of sprayer	**Frequency**	**Percentage**
Backpack sprayer	52	17.3
Skid-mounted sprayer	109	36.3
Irrigation boom sprayer	139	46.3
Total	**300**	**100**
Type of nozzle sprayer you use	**Frequency**	**Percentage**
Hollow cone nozzle (HC)	43	14.3
reflex nozzle	23	7.7
Adjustable nozzle	39	13.0
Other	195	65.0
Total	**300**	**100**
How long have you been using sprayer	**Frequency**	**Percentage**
< 5	70	23.3
6 - 10 year	74	24.7
11 - 20 years	86	28.7
> 20 years	70	23.3
Total	**300**	**100**
Do experts do maintenance	**Frequency**	**Percentage**
Yes	154	51.3
No	146	48.7
Total	**300**	**100**
How often do you calibrate	**Frequency**	**Percentage**
Every year	176	58.7
Every two years	124	41.5
Total	**300**	**100**
Who applies the spray	**Frequency**	**Percentage**
Myself	144	48.0
Servant	110	36.7
An expert or company	46	15.3
Total	**300**	**100**

Table 2 displayed information about the spraying of the crops. 52 (17.3%), 109 (36.3%), 139 (46.3%), 43 (14.3%), 23 (7.7%), 39 (13.0%), and 195 (65.0%) of the farmers reported that they used backpack, skid-mounted, irrigation boom, reflex nozzle, adjustable nozzles sprayers and others respectively. The farmers were asked how long they have applied the sprayers. 70 (23.3%) have used the sprayer less than 5 years, 74 (24.7%) have used between 11 to 20 years, 70 (23.3%) have applied the sprayers for more than 20 years. In addition, they were asked whether experts did maintenance. 154 (51.3%) agreed that experts did maintenance. But 146 (48.7%) disagreed that they did maintenance. Also, 176 (58.7%) said that they calibrated every year and 124 (41.5%) calibrated every two years. 144 (48.0%) applied the spray themselves and 110 (36.7%) employed servants to do it. Only 46 (15.3%) relied on an expert or company to spray the products for them.

Does Farmers' Knowledge about Safe Use of Personal Protective Equipment (PPE's) protect them from Health Effect?

Table 3. Purchasing agricultural chemicals

Where do you buy the chemicals?	**Frequency**	**Percentage**
Licensed retail shops	154	51.3
Others	146	48.7
Total	**300**	**100**
How do you identify vegetal diseases?	**Frequency**	**Percentage**
I get help from the Office of Agriculture	43	14.3
I get help from Chemical sellers	41	13.7
I prepare myself	50	16.7
Others	166	55.3
Total	**300**	**100**
How do you select protective chemicals?	**Frequency**	**Percentage**
I get help from the Office of Agriculture	156	52.0
I prepare myself	110	36.7
Others	34	11.3
Total	**300**	**100**

Table 3 shows the result of purchasing agricultural chemicals. The farmers were asked where they bought the chemicals. 154 (51.3%) reported that they bought it from licensed retail shops, while 146 (48.7%) in other shops. Also, 43 (14.3%) suggested that they identity vegetal diseases by the help of the office of Agriculture, 41 (13.7%) from chemical sellers and 50 (16.7%) prepared by themselves while 166 (55.3%) used other options.

Table 4. Storing Protective Chemicals

Do you have a store?	**Frequency**	**Percentage**
Yes	211	70.3
No	89	29.7
Total	**300**	**100**
Do you keep the chemicals under lock?	**Frequency**	**Percentage**
Yes	235	78.3
No	65	21.7
Total	**300**	**100**
Do you keep chemicals in their original packs	**Frequency**	**Percentage**
Yes	201	67.0
No	99	33.0
Total	**300**	**100**

Table 4 displayed the result of storing protective chemicals. 211 (70.3) had stores to store their chemicals. Only 89 (29.7) did not have. In addition, 235 (78.3) reported that they kept the chemical under lock. Only 65 (21.7) did not keep it under lock. The farmers were also asked their kept chemicals in their original packs. 201 (67%) said "yes" while 99 (33%) indicated that they did not kept the chemical in their original pack.

Table 5. Preparing the solution

Do you read the instructions before preparing the solution?	**Frequency**	**Percentage**
Yes	201	67
No	99	33
Total	**300**	**100**
Do you wear protective cloths while preparing the solution?	**Frequency**	**Percentage**
Yes	236	78.7
No	64	21.3
Total	**300**	**100**

Table 5 displayed how the farmers prepared the solution. 201 (67.0%) of the farmers reported that they read the instructions before preparing the solution, while 99 (33%) said they did not read the instructions. In addition, 236 (78.7) said that they wore protective clothes while preparing the solution. Only 64 (21.3%) did not wear protective clothes while preparing the solution.

Table 6. Personal Protective Equipment PPE

Do you wear protective clothes?	**Frequency**	**Percentage**
Yes	207	69
No	93	31
Total	**300**	**100**
If you do, what type of protective clothes do you wear?	**Frequency**	**Percentage**
Fully protective	53	17.7
Filter face mask	31	10.3
Boots	53	17.7
Gloves	116	36.7
Others	34	11.3
Total	**300**	**100**
Length of use (yrs)	**Frequency**	**Percentage**
<3	43	14.3
4-5	41	13.7
6-10	50	16.7
11 above	166	55.3
Total	**300**	**100**

In **Table 6**, the farmers were asked about personal protective equipment. 207 (69%) said they wore protective clothes while 93 (31%) did not. Furthermore, they were asked to indicate the types of protective clothes they wore, 53 (17.7%), 31 (10.3%), 53 (17.7%), 116 (36.7%), 116 (36.7%) and 34 (11.3%) of the farmers wear fully protective, filter face mask, boots, gloves, and others cloths respectively. Furthermore 43 (14.3%), 41(13.7%), 50 (16.7%) and 166 (55.3%) of the farmers indicated that they have used the protective equipment for < 3, 4-5, 6-10 and 11 years above respectively.

Table 7. Model Summary[b]

Model	**R**	**R Square**	**Adjusted R Square**	**Std. Error of the Estimate**	**Change Statistics**					**Durbin-Watson**
					R Square Change	**F Change**	**df1**	**df2**	**Sig. F Change**	
1	.645[a]	.416	.412	.37823	.416	105.757	2	297	.000	2.219

a. Predictors: (Constant), PS, SPC
b. Dependent Variable: Personal Protective Equipment (PPE's)?

The standard regression model summary (**Table 7**) indicates the value of the regression coefficiency (R =.645). This show how well all independent factors combined related with the dependent factor (Personal Protective Equipment). Additionally, the Adjusted R^2 = .412 shows that all the factors combine contributed 41.2% of the variances in the dependent factor personal protective equipment PPEs.

Table 8. ANOVA[a]

Model		**Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**
1	Regression	30.259	2	15.129	105.757	.000[b]
	Residual	42.488	297	.143		
	Total	72.747	299			

a. Dependent Variable: Personal Protective Equipment (PPE's)
b. Predictors: (Constant), PS, SPC

Table 9. Coefficients[a]

Model		**Unstandardized Coefficients**		**Standardized Coefficients**	**t**	**Sig.**	**Correlations**			**Collinearity Statistics**	
		B	**Std. Error**	**Beta**			**Zero-order**	**Partial**	**Part**	**Tolerance**	**VIF**
1	(Constant)	.311	.079		3.938	.000					
	SPC	.474	.108	.364	4.405	.000	.623	.248	.195	.288	3.472
	PS	.392	.105	.307	3.721	.000	.615	.211	.165	.288	3.472

a. Dependent Variable: PPEs protect?

From **Table 8**, Factor 1 (SPC) was statistically significant (B = -.364, t = 4.405; p = .000 < .05) and Factor 2 (PS) was also statistically significant (B = -.307, t = 3.721; p = .000 < .05) relate personal protective equipment PPEs. Therefore, farmers' knowledge about safe use of personal protective equipment PPEs protects them from health effect.

Does Gender Influence the Awareness of Spraying Plant and Vegetal Products?

Table 10. Independent Samples Test

	Levine's Test for Equality of Variances		t-test for Equality of Means						
	F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
								Lower	Upper
Equal variances assumed	62.933	.000	-45.218	298	.000	-.92537	.02046	-.96565	-.88510
Equal variances not assumed			-40.610	133.000	.000	-.92537	.02279	-.97044	-.88030

The independent sample t-test was used to test the hypothesis at a p = 0.05. The results are provided in **Table 10**. The t-test results, however, showed that there was statistically significant difference (t (298) = 40.61, p < 0.05) between male and female farmers' influence on the awareness of spraying plant and vegetal products. Therefore, gender influences the awareness of spraying plant and vegetal products.

Are the farmers' sensitive to the misapplication of protective product?

Table 11. Result of Misapplication Chemical Protective?

Phytotoxiciy on plants	**Frequency**	**Percentage**
Yes	192	64.0
No	72	24.0
I have no ideal	36	12.0
Total	**300**	**100**
Leftover on agricultural products?	**Frequency**	**Percentage**
Yes	150	50.0
No	105	35.0
I have no ideal	45	15.0
Total	**300**	**100**
Soil pollution?	**Frequency**	**Percentage**
Yes	158	52.7
No	96	32.0
I have no ideal	46	15.3
Total	**300**	**100**
Weed and harmful disease become durable against chemicals?	**Frequency**	**Percentage**
Yes	152	50.7
No	102	34.0
I have no ideal	46	15.3
Total	**300**	**100**
Acute, chronic poisoning in human?	**Frequency**	**Percentage**
Yes	156	52.0
No	85	28.3
I have no ideal	59	19.7
Total	**300**	**100**

Table 11, shows the results of misapplication of protective product. 192 (64%) of the farmers said they knew the results of misapplication of Phytotoxic Protective Products on plants, 72 (24%) did not know while 36 (12%) had no idea about it. Also, for leftover on agricultural products, 150 (50.0%) of the farmers knew the cause whilst 105 (35.0) did not know. Only 45 (15.3%) had no idea of leftover on agricultural products. In addition, 158 (52.7%) of the farmers indicated that they knew misapplication of chemical cause soil erosion, 96 (32.0%) did not know that. Only 46 (15.3%) had no idea. 152 (50. 7%) of the farmers knew that the weed and harmful disease become durable against chemicals. 102 (34.0%) did not know. Only 46 (15.3%) had no idea. Lastly, 156 (52.0%) of the farmers indicated that they knew misapplication of chemical cause Acute, chronic poisoning in human while 85 (28.3%) did not know that. Only 59 (19.7%) had no idea. From the above results, the majority of the farmers are aware of the cause of misapplication of chemical protective. Therefore, the farmers' are sensitive to the misapplication of protective product.

Does the Farmers' Education Level Affect Purchasing Agricultural Chemicals?

Table 12. Correlations

		What is your education level	Where do you buy the chemicals?
What is your education level	Pearson Correlation	1	.000
	Sig. (2-tailed)		.993
	N	300	300
Where do you buy the chemicals?	Pearson Correlation	.000	1
	Sig. (2-tailed)	.993	
	N	300	300

Pearson Correlations of bivariate was used to examine any relationships between farmer educational level and the purchasing of agriculture chemicals. From **Table 12**, shows no correlation or relationship between farmers' educational level and purchasing of agricultural products. Therefore, the farmers' education level affects the purchasing agricultural chemicals.

Is PPEs Use Related With the Type of the Sprayer Used?

Table 13. Correlations

		Type of sprayer?	Do you wear protective clothes?
Type of sprayer?	Pearson Correlation	1	-.027
	Sig. (2-tailed)		.642
	N	300	300
Do you wear protective clothes?	Pearson Correlation	-.027	1
	Sig. (2-tailed)	.642	
	N	300	300

Person Correction of bivariate (**Table 13**) was used to see if the PPE application was related to the type of sprayer used. **Table 13**, shows no correlation or relationship ($p > 0.05$) between farmers' application of PPE and the type of sprayer. Hence, PPEs use is not related with the type of sprayer.

Does Monthly Income Make Any Difference in the Use of Machineries Associated With Pesticide Application?

Table 14. Monthly Income on Machineries

	Frequency	Percent	Valid Percent	Cumulative Percent
Weak	144	48.0	48.0	48.0
Medium	110	36.7	36.7	84.7
Excellent	46	15.3	15.3	100.0
Total	**300**	**100.0**	**100.0**	

Table 14 displayed information on how much savings in the amount of pesticide during use of machinery. 144 (48.0%) of the formers indicated that the monthly saving they used on pesticide was small or weak which did not affect their monthly income. 110 (36.7%) reported medium whilst 46 (15.3%) said excellent. This result suggested that monthly income does not make any difference in the use of machineries associated with pesticide application.

Are Farmers Aware of the Machineries Associated With Pesticide Application?

Table 15. Modern Machinery For Spraying Methods?

	Frequency	Percent	Valid Percent	Cumulative Percent
Yes	176	58.7	58.7	58.7
No	124	41.3	41.3	100.0
Total	**300**	**100.0**	**100.0**	

Table 15 reveals farmers' awareness of modern machinery for spraying method. 176 (58.7%) of the formers reported that they were aware of modern machinery whilst 124 (41.3%) said they were not aware. This result suggested that the majority of the farmers are aware of the modern techniques and the machineries associated with pesticide application.

Do Farmers' Use Agricultural Machinery during Control Operations?

Table 16. Irrigation System During The Process of Spraying?

	Frequency	Percent	Valid Percent	Cumulative Percent
Yes	200	66.7	66.7	66.7
No	100	33.3	33.3	100.0
Total	**300**	**100.0**	**100.0**	

As it can be seen in **Table 16**, farmers use irrigation systems during the process of spraying. 200 (66.7%) of them reported that they used irrigation systems during the process of spraying, whilst 100 (33.3%) said they do not use that application. This suggested that the majority of the farmers use irrigation system for sprayings process. This is the indication that farmers use agriculture machinery during control operations.

Table 17. Quality of Machinery for Spraying

What is the effect of machinery used in spraying on the surrounding environment?	Frequency	Percentage
Weak	144	48.0
Good	110	36.7
Very Good	46	15.3
How much savings in the amount of pesticide during use of machinery?		
Weak	144	48.0
Medium	110	36.7
Excellent	46	15.3
Are you using modern machinery for spraying methods?		
Yes	176	58.7
No	124	41.3
Are you using an irrigation system during the process of spraying?		
Yes	176	58.7
No	124	41.3
How bad is using the machines in spray process?		
Yes	144	48.0
No	110	36.7

Table 17 displayed information about the quality of the machinery for spraying. 144 (48.0%), 110 (36.7%), and 46 (15.3%) showed the effect of machinery used in spraying on the surrounding environment. The farmers were asked How much savings in the amount of pesticide during use of machinery, 144 (48.0%) were weak, 110 (36.7%) were medium, and 46 (15.3%) were excellent. In addition, they were asked whether modern machinery were used for spraying methods or not 154 (51.3%) agreed that experts did maintenance. 146 (48.7%) disagreed that they did maintenance. 176 (58.7%) said "yes" and 124 (41.3%) said "no" to the of use method. 176 (58.7%) used irrigation system during the process of spraying and 124 (41.3%) did not use irrigation system during the process of spraying. 144 (48.0%) said using the machines in spraying process was bad and 110 (36.7%) said it was not bad.

CONCLUSION AND DISCUSSION

In this study, the farmers in the East part of Libya earn 50% of their income by selling their farm products in the market which are mainly vegetables. In the East of Tripoli the sprayer use is adjustable nozzle sprayers and the majority of the farmers have used the sprayer for 11 - 20 years and they spray the pesticides themselves. This sprayer is maintained by experts, though its calibration of the sprayer is not done every year but every two years.

The research reveals that most of the farmers own a store to keep and protect their chemicals under lock in chemical original packs. For the farmers to know the hazards associated with the chemicals or pesticides to be used, the farmers read instructions before use and they wear protective clothes for the solution preparation which is similar to the study by Osei-Boadu (2014) [11]; Yeboah et al. (2004) [12]; Mensah et al. (2004) [13]; Sosan et al. (2008) [14]; Sosan and Akingbohungbe (2009) [15]; Ogunjimi and Farinde (2012) [16] and Antwi-Agyakwa (2013) [17] who reported that cocoa farmers interviewed wore protective clothing when spraying pesticides. The type of protective clothes the farmers in East Tripoli mostly wear are gloves and these type of PPE has been used for the past 11 years and above. There is a statistically significant and linear combination of independent factors significantly related to PPE's that protect the farmers from health effect and farmers' knowledge about safe use of PPE's protects them from health effect and this corresponds with the study conducted by Saowanee et al. (2010) [18] which states that the associations between knowledge and attitude, knowledge and practice, and attitude and practice of farmers using pesticide demonstrated statistical significance. There is a statistically significant difference between male and female farmers influence on the awareness of spraying plant and vegetal plant and therefore gender influences awareness of spraying plant and vegetal products.

The majority of the farmers' have an idea of misapplication of pesticide product and this may result in soil erosion, weed and harmful disease may resist the chemical due to its misapplication and therefore, farmers knowledge affects misapplication of pesticide products. The farmers are sensitive to the misapplication of these products and according to FAO (2008), which states that there is a tendency of negative impact of every chemical substance or pesticides used in agriculture to the environment if improperly applied or used at high rates. This can be as a result of prolonged use of the same pesticide which can cause problems like pesticide resistance, a phenomenon consisting in the selection of resistant population of a weed. As specified by Pal and Gupta (1996) [19], it is imperative for farmers to have skillful dispersal methods and knowledge of the most susceptible stage of the pest thereby this will help them decide on the time of pesticide application.

There is no correlation or relationship between farmers' education level and purchasing of agricultural products. Therefore, farmer's education level affects purchasing agricultural products as cited by Croppenstedt and Muller (1998) [28]. Similar to this study Ethiopia Rural Household Survey (ERHS) indicates that there is no relationship between their level of education and agricultural output.

There is no correlation or relationship between application of PPE and type of sprayer. Therefore, PPE's use is not related with the type of sprayer. According to Ohayo-Mitoko et al. (1999) [20], there is a significant positive relationship between awareness and use of protective level in the sprayer type used and then suggested that this may be due to discomfort associated with PPE while using sprayer. Some studies showed that although most of the farmers are aware of the importance of the use of protective measures when applying pesticides, there is still no significant positive relationship [21]. The result suggested that monthly income does not have any difference in the use of machineries associated with pesticide application.

The farmers are aware of modern machinery for spraying of pesticides and other researchers pointed out those farmers' and application equipment administrators' knowledge of the activity standards of pesticides and the right strategy for application is generally lacking or non-existing [22]. Much of the time they do not get any preparation/training on this issue [23]. As of now at University level the theme is frequently ignored. In this manner, augmentation benefits regularly do not have experts with a specific knowledge of utilization of the technology. In numerous nations the main experts offering practical advice or consultancy to farmers on application technology, dealing with and adjustment of their equipment are delegates of pesticide organizations. However, they regularly do not have a characteristic enthusiasm for demonstrating to the farmer the proper methodologies to save real amounts of the item (pesticide). There are a few results of this absence of knowledge. Beginning with the choice of equipment, a farmer without specialized criteria will more often not pick the least expensive equipment, potentially the most strong. Parts of operator security, ease or effectiveness are of lesser significance, particularly if the equipment is not operated or handled by the farmer himself but by employed worker. Farmers use irrigation system during the process of spraying which indicates that they make use of agricultural machinery during control operations.

Application volumes of 6,000 l/ha in flowers and 10,000 l/ha in orchards have been reported [24] causing run off of product and thus contaminating soil and probably groundwater resources. It is common that farmers and spray equipment operators still believe in high volumes, high pressure and high doses being perceived as the most appropriate ways for pesticide application thereby causing a run-off to the environment. A report from the Philippines demonstrates that a high number of farmers never show signs of change or fixing washers in their equipment which is related with the information of the working equipment [25]. Accordingly, most spray equipment spills. An investigation done in Indonesia detailed that 58% of manual spray equipment released [26]. Information from Nicaragua affirm this perception, saying pesticide spills from operator has returned from spilling knapsack sprayers, being a common source of intoxications to the irrigation system [27].

RESULTS

The result suggested that monthly income does not have any significant positive difference in the use of machineries associated with pesticide application. The farmers are aware of modern machinery for spraying of pesticides and they also use irrigation system during the process of spraying which indicates that they make use. The types of protective clothes the farmers in East Tripoli majorly wear are gloves and this type of PPE has been used for the past 11 years and above. There is a statistically significant and linear combination of independent factors significantly related to PPE's that protect the farmers from danger and farmers' knowledge about safe use of PPE's. There is a statistically significant difference between male and female farmers influence on the awareness of spraying plant and vegetal plants. Therefore, gender influences the awareness of spraying plants and vegetal products. There is no correlation or relationship between farmer's education level and purchasing of agricultural products. Therefore, farmer's education level affects purchasing agricultural products. There is also no correlation or relationship between application of PPE and type of sprayer.

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