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Factors influencing farmers practices in using pesticide for vegetable cultivation at sadar upazila of Gazipur district in Bangladesh

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Abstract

The focus of the study was to determine the pesticide control measures practiced by the farmers in Sadar Upazila of Gazipur district of Bangladesh. Data were collected through personal interview during the period of November 2016 to March 2017. Total numbers of 90 respondents were selected as the sample of the study. Safety measures were not taken by most of the respondents. Education, training, experience, extension contact and knowledge towards practices of pesticide use had significant positive relationships (at 1% level) with the pesticide use for vegetable cultivation. Age, farm size, family size, farming experience and annual income of the respondents had no significant relationships with the pesticide use for vegetable cultivation. "Hand sprayers are used for pesticide application in your plot" was identified as the first highest scores (PPI = 296) and "Use of appropriate pesticide" was the second highest scores (PPI = 287) and "Use Knapsack Sprayer for pesticide application" achieved the lowest scores (PPI = 2) about their use of recommended pesticides and methods. The above findings suggested that the farmers did not use knapsack sprayer. Applicators usually spray their field with different types of hand sprayer machine for vegetable cultivation. In this regard "Take bath right after spraying" (PPI = 299) was the highest and "Use Shoes/Head cover/Glasses when applied pesticide" (PPI =73) was the lowest scores. Majority of the farmers were aware about safety measures about 'after using pesticide they took bath', but most of the farmers were not aware of using of shoes, head cover and glasses while using pesticide in their field.

Key words: Vegetable, pesticide, practice, safety measures

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Introduction

Vegetables are the most important **component** of human diets for the safeguard of fitness and hindrance of diseases, it is also very important group of crops and they constitute a major part of the diet contributing nutrients and vitamins. The cereal consumption of the country is the highest position whereas vegetable consumption is in the lowest position but it provides more return than other field crops, so itself here vegetable gives 350% higher monthly net return than rice (Hasan, 2005). Profound malnutrition, as well as less disease protecting the capacity of the human body, is prevailing among the rural people in Bangladesh. Being a poor nation, it is difficult to defeat such a big malnutrition problem by eating fish, meat, egg, butter, ghee etc. Hence, vegetable production is a vital area of agriculture. However, vegetables can play a very significant role to improve the nutritional level of the rural people in the country that is almost unnoticed.

Insects, pests and diseases pose serious threat to vegetable production and these problems have been the major to the goal of our realization of self-sufficiency vegetable production (Adeniji, 2008).

Vegetables play a vital role in our body because of its high nutrient balanced status. However, most of our people do not have enough vegetable for their everyday consumption. So, vegetable cultivation area needs to be increased for increasing average per capita consumption. Due to lack of adequate knowledge on nutrient status of vegetables and unfavorable adoption towards vegetable cultivation, there is less vegetable production in the locality. Most of the farmers do not know how pesticide should be used in their vegetables field. For more vegetable production, farmers are indiscriminately using pesticides. Improper and non-judicious application of these pesticides could be harmful for vegetable production. Pesticides are toxic in nature and do not differentiate between target and non-target species of plants and animals, and hence should essentially be subject to safe and judicious use. Due to noncompliant and indiscriminate use of pesticides, many accidents have occurred in different parts of the world, and presence of pesticides in foods, fruits, vegetables, and environment and even in mother's milk is a matter of great concern (FAO, 2005).

There is a dearth of investigation to find out if farmers maintain safety measures awareness while spraying pesticide in their vegetable field. Hence, the present study dealt with the practices of pesticide use. The present study was undertaken to know the socio-economic characteristic of the farmers, problems facing in vegetable production, if farmers use correct pesticide to save their vegetable and safety measures taken by the farmers while spraying pesticides. It was assumed that an assessment on practices of pesticide use in the vegetables field by the respondents could be helpful to formulate policy and program for the augmentation of sustainable vegetable production.

However, uses of pesticides must be controlled and users should be aware of possible undesirable effects on human health and the natural environment. Many study revealed that improper and indiscriminate application of pesticides reduces agricultural sustainability, create environmental problems and causes harmful effects on human health of both farmers and consumers. Now a day, using a small land area, yield can double or even triple with the combination of pesticide use, improved planting methods, using advance machineries and others. Therefore, promoting sustainability in agricultural production requires critical consideration of agricultural technologies and identification of best practices. Keeping the above facts in view, the investigators undertake the study to determine the pesticide control measures practiced by the farmers and to explore the relationship between the selected characteristics of the farmers and their practices on pesticide use.

Materials and Methods

***Locale, population and sampling of the* study**: The study was conducted in two villages namely Dagari and Kanjanul of Mirzapur union of Gazipur Sadar upazila of Gazipur district. Total land area of Mirzapur union 1950 ha and total cultivated land is 1200 ha. In these areas, amount of vegetable production is 3550 Mt. in 110 ha of land and other crops are produced in rest amount of land. Mirzapur was purposively selected as the locale of the present study because most of the people of Mirzapur union are vegetables farmers. Every year they usually cultivate Brinjal in 3 ha of land, Okra in 6 ha of land, Papaya in 7 ha of land, Cauliflower in 15 ha of land, Cabbage in 12 ha of land, Sweet gourd in 7 ha of land, Stem amaranth in 5 ha of land and Tomato in 8 ha of land etc. A total of 600 populations were selected from two villages namely Dagari and Kanjanul. Fifteen (15%) of the population was selected randomly and proportionately from each of the selected villages. Thus, 90 farmers constituted the sample size for the study.

***Variables and their measurement*:** Farmers' practice on pesticide use for vegetable cultivation was the major focus (dependent variable) of the study. The independent variables of the study were respondent's selected characteristics namely age, education, family size, farm size, farming experience, annual income, extension media contact, training experiences, knowledge of pesticide use. The independent variables were measured by the traditional procedures of scores and scale. Farmers practices on pesticide use in vegetable cultivation have been determined by using two indicators, namely use of recommended pesticides and methods, precaution measures taken by farmers during pesticide use. For getting information of each item, the respondents were asked to point out their status against a 4-point rating scale. It was categorized as frequently, occasionally, rarely and not at all with corresponding scores 3, 2, 1 and 0 respectively.

***Data collection method and analysis*:** Data were collected during the period of November 2016 to March 2017 with the help of structured interview schedule. Data gathered through direct interviewing were coded for processing and analysis. After collection of data, all the information were edited, checked, compiled, coded, and analyzed using SPSS program. Qualitative data were converted into quantitative form by means of suitable scoring. Statistical measures like number, range, mean, standard deviation and correlation value (r) were calculated for describing the population characteristics and variables.

Results and Discussion

Socio-demographic characteristics of the farmers: The age of the respondents was from 17 to 70 years and the average was 39.63 years. The highest proportion 57% of the respondents was in medium aged groups as compared to 31 % who were old and 12. % of the respondents was young. Educational scores ranged from 0 to15 with the mean of 6.84 and 4.78 standard deviation. Highest proportion 46 % respondent had secondary level education, compared to 23 % were illiterate. It is very important to note that a large portion of respondents (77%) were educated but a significant portion of the respondents (23%) were illiterate. More than half of the respondents 55% had small farms as compare to 37 % medium size farms. More than four-fifth of the respondents 63.3 % had low to medium duration farming experience. A greater part of the respondents 75.5% belonged to medium to high income categories. Most of the respondents had medium (57 %) contact group followed by (34 %) low contact group. In the study area very few respondents take part in training program. Although about 19% of the respondents had high training experience about related issues and a major portion (64.4) % had no adequate training. Categorically data show that highest proportions of the respondents fell in medium knowledge (53.3 %) category as compared to low knowledge category (46.7%).

Farmers practices on pesticide use in vegetable cultivation:

Use of recommended pesticides and methods: A number of 14 statements regarding use of recommended pesticides and methods were asked and indexed. Farmers' had different recommended practices and methods of spraying pesticide in their field. It was categorized as frequently, occasionally, rarely and not at all with corresponding scores 3, 2, 1 and 0 respectively.

Data contained in Table 1 indicates that "Hand sprayers are used for pesticide application in your plot" was found the first highest scores (PPI = 296) and "Use of appropriate pesticide" was found the second highest scores (PPI = 287) and "Use Knapsack Sprayer for pesticide application" achieved the lowest scores (PPI = 2) about their use of recommended pesticides and methods. The above findings suggested that the farmers did not use knapsack sprayer. Applicators usually spray by different types of hand sprayer machine for spraying pesticide in vegetable cultivation.

***Precaution measures were taken by farmers during pesticide use*:** About a million people are being poisoned by pesticides annually with 20, 000 cases

resulting in death. Most of these toxicities and fatal consequences are happening through pesticides used by small-scale farmers without adequate knowledge acquired through formal training and failure to wear appropriate clothing (WHO, 1996).

Table 2 showed six statements regarding precaution measure taken by farmers while using pesticide. In this regard "Take bath right after spraying" (PPI = 299) achieved the highest and "Use Shoes/Head cover/Glasses when applied pesticide" (PPI =73) achieved the lowest scores. Majority of the farmers were aware about safety measures in case after using pesticide they took bath, but most of the farmers were not aware of using of shoes, head cover and glasses while spraying pesticide in their field. Ugwu et al. (2015) found majority (95.3%) of the respondents claimed that they use personal protective equipment during pesticide application. The personal protective equipment reportedly used by the farmers were rubber gloves (95.3%), nose guard (85.3%), overall (83.3%), cap (62.7%) and face mask (60%),while the use of other personal protective equipment(PPE) like rubber boot and long sleeves rated below 45%.

Table1. Distribution of the respondents according to their use of recommended pesticides and methods.

Practices of pesticides use	Extent of use				PPI
	F	O	R	NA	
1. Soil treatment before vegetable cultivation	17.8	42.2	37.8	2.2	176
2. Practices biological control to reduce the need for using pesticides	14.4	32.2	45.6	7.8	153
3. Use Knapsack Sprayer for pesticide application	0	0	2.2	97.8	2
4. Use Ridomil Gold MZ 68WG to control mosaic diseases of papaya	55.6	35.6	6.7	2.2	245
5. Use Ripcord 10EC to control insect in your plot	37.6	50.0	10.0	3.3	223
6. Clean cultivation for controlling insects pests	50.0	33.3	16.7	0	233
7. Dursban 20EC are use to control ant in your plot	53.3	44.4	1.1	1.1	250
8. Spraying insecticide and pesticide in own hand in your field	62.2	35.6	1.1	1.1	259
9. Use of different brands of pesticide before application	3.3	1.1	28.9	66.7	41
10. Hand sprayers are used for pesticide application in your plot	97.8	1.1	0	1.1	296
11. Use pesticide to control virus diseases of okra	44.4	50.0	4.4	1.1	238
12. Practices cultural control to reduce the need for using pesticides	23.3	37.8	36.7	2.2	182
13. Use of insecticide as a preventive measure in your spinach field	2.2	4.4	53.3	40.0	69
14. Use of appropriate pesticides	90.0	7.8	2.2	0	287

PPI=Pesticide Practices Index, F=Frequently, O=Occasionally, R=Rarely, NA=Not at all

***Use of sources of information on pesticide use*:** It was also scored how farmers were practicing pesticides which ranged from 37 to 57 against the possible range of 30 to 60. Based on respondents' pesticide practicing scores, the score was classified into three categories, such as low practice, medium practice, and high practice categories. Distribution of farmers accordingly to their pesticide practice has been presented in Table 3.

Data contained in Table 4 indicates that the highest proportion 70.0 % of the farmers were in medium pesticide use category compared to 15.6 % in high and 14.4 % in low pesticide practice category. The findings reveal that only 15.6 % farmers in the study area had high practices about pesticide use in vegetables cultivation. Almost 84.4 % of the respondents had medium to low practice towards the pesticide use. This may have an impact on proper practice pesticide use for vegetables cultivation.

Table 2. Behavior regarding precaution measures practiced by the respondents during pesticide use.

Precaution measures practiced during pesticide use	Extent of use				PPI
	F	O	R	NA	
1. Dispose of the container after use (burning or buying, throwing away randomly, Throwing into rubbish	17.8	67.8	14.4	0	203
2. Take bath right after spraying	98.9	1.1	0	0	299
3. Change cloth right after spraying	96.7	3.3	0	0	297
4. Use Shoes/Headcover/Glasses when applied pesticide	4.4	12.2	35.6	47.8	73
5. Use Protective Cloth/ Mouth mask /Head gloves when pesticide application in your plot	81.1	17.8	1.1	0	280
6. In the time of morning, you select your appropriate time for spraying	16.7	77.8	5.6	0	211

PPI=Pesticide Practices Index, F=Frequently, O=Occasionally, R=Rarely, NA=Not at all

Table 3. Distribution of the respondents according to their use of sources of information on pesticide use.

Use of sources of information on pesticide use	Extent of use				PPI
	F	O	R	NA	
1. Following instruction of product label for handling and application of the product / read the label of instruction	64.4	34.4	1.1	0	263
2. Use of mobile to get information about the pesticide	40.0	54.4	5.6	0	234
3. Use pamphlets or folder or instruction to get information about the pesticide	2.2	4.4	16.7	76.7	32

Table 4. Distribution of the respondents according to their overall practices of pesticide use.

Category	Frequency	%	Mean	SD
Low practice (37-49)	13	14.4	53.71	4.19
Medium practice (above 49 - 57)	63	70.0		
High practice (above 57)	14	15.6		
Total	90	100.0		

***Relationships between selected characteristics of the respondents and their practices of pesticide use for vegetables cultivation*:** To find out the relationship between selected characteristics of the respondents and their practices of pesticide use for vegetable cultivation, correlation of coefficients (r) was computed. The relationships between selected characteristics of respondents and their practices of pesticide use for vegetable cultivation were examined by testing the following null hypothesis: "There is no relationship exists between selected characteristics of the respondents and their practices of pesticide use for vegetable cultivation".

The findings presented in Table 5 indicated that education, training experience, extension media contact, and knowledge of pesticide use of the

respondent's pesticide practice had significant positive relationships (at 1% level) with their practice of pesticide use for vegetable cultivation. It indicates that if there is increase in education, training, extension contact and knowledge of the respondents towards pesticide practice than these had significant positive relationships with their practice of pesticide use for vegetable cultivation.

Table 5. Relationships between the dependent and independent variables.

Independent Variables	Dependent Variable	Coefficient of correlation (r)
Age	Practice of pesticide Use	- 0 .210
Education		0.413**
Family size		- 0.126
Farm size		0.125
Farming		- 0.192
Annual income		0.027
Extension		0.281**
Training		0.418**
Knowledge of		0.563**

** Correlation is significant at the 0.01% level of probability

***Relationships between education of the farmers and their practices on pesticide use for vegetable cultivation*:** An educated person enlarges mental horizon of an individual, which ultimately increases his/her knowledge and skill. The null hypothesis was "There is no relationship between education and practice of pesticide use of the respondents". The computed value of 'r' was 0.413** (Table 5). So the null hypothesis was rejected and there was a significant relationship between education and practice of pesticide use for vegetables cultivation of the respondents. It can be said that increased practices of pesticide use for vegetables cultivation of the respondents depends on their education. Arefin (2013) reported similar results in their respective studies.

***Relationships between training of the farmers and their practices on pesticide use for vegetable cultivation*:** It is usual that trained persons learn more and their practicing system is high. If a respondent has high training he may have opportunity of proper practice and taking safety measures while using pesticide in their field. According to Table 5, the training of the responsdents was found to be singnificant as the coefficient value was 0.418. The null hypothesis was "There is no relationship between practice of pesticide use and training of the respondents". The null hypothesis was rejected and there was a significant relationship between training and practice of pesticide use for vegetables cultivation of the respondents. Hossain (2001) found similar type of result.

***Relationship between extension media contact of the farmers and their practices on pesticide use for vegetable cultivation*:** Extension contact helps a respondent to be well informative including familiarity about the varieties of vegetables and their practices of pesticide use. A respondent having high extension contact becomes up to date about any practices related information, i.e., proper safety measures, refraining from smoking and discriminate use of pesticide etc. Thus, respondents having higher extension contact showed higher pesticide practices. Muttaleb (1995) reported similar results in their respective studies.

***Relationship between knowledge of the farmers and their practices on pesticide use for vegetable cultivation*:** Knowledge is the mental disposition that may allow one to do something or restrict one not to do anything. A respondent with high knowledge towards pesticide practices may go forward for collecting information regarding taking safety measures, consult with someone knowledgeable about practices of pesticide use, fake pesticide and banned pesticide are not use. But a respondent with low knowledge towards the same may not advance in such way, proper safety measures are not taken and use of banned and fake pesticide. Hence, favorable knowledge of the respondents towards vegetable cultivation was significantly and positively related to their practice of pesticide use.

On the other hand, age, family size, farm size, farming experience and annual income of the respondents had no significant relationship with their practices of pesticide use for vegetable cultivation. Similar type of findings was also obtained by Ali (2007).

Problems confronted by the farmers

Problem refers to the difficulties that the farmers encounter in their practical life for production of vegetable with properly practices in pesticide use and want to the solution of the same. In order to develop strategies for improvement of farmers' livelihood, identification of the problems and its solution is the crucial aspects. So, the purpose of this section is to find out the problems and their probable solution. In this regard, the respondents were asked to mention the problems faced by them due to practices of pesticide use for vegetable production. The responses were weighted as 3 for the very high problem, 2 for the high problem, 1 for the medium problem and 0 for no problem. Problem confrontation index (PCI) of vegetable cultivation was computed for each problem by summing the weights from the responses of all the respondents against that problem. PCI of a problem indicated the extent of the problem faced by the respondents. The higher the PCI of a problem, the greater was the severity of that problem. After compiling their responses, a problem confrontation index (PCI) was computed and ranked according to the importance given by the respondents. The problems as mentioned by the respondents along with their rank were presented in Table 6.

Data presented in Table 6 show that among the enlisted problems "Lack of adequate information about pesticide use" ranked first, "use of fake pesticide" ranked second, "lack of training facilities ranked" third and "Lack of communication facility" ranked fourth.

Most of the respondents in the study area depend on vegetable production for their livelihood. Due to the inefficient extension service farmers are rarely got the opportunity of being informed about pesticide use. On the other hand, low educational qualification also creates obstacles in disseminating information regarding pesticide use for vegetable cultivation. And so, "lack of adequate information about pesticide use'' was the first most important problem.

Table 6. Rank order of the problems faced by the respondents according to their problem.

Problem statements	Rank order	
1. Lack of adequate information about pesticide use	226	1
2. Use of fake pesticide	179	2
3. Lack of training facilities	143	3
4. Lack of communication facility	118	4
5. Transport problem	76	5
6. Excessive rainfall	70	6
7. Equipment is not available	57	7
8. Market price are not appropriate	56	8
9. Lack of agricultural knowledge	30	9
10. Storage facilities are not available	18	10

It has also found that most of the pesticide that was available on the market is fake. Therefore, "use of fake pesticide" came as the second important problem. It is well known to all that training makes anyone up to date in respect of knowledge, skill, and attitude about any aspect of life. Respondents had no training experience are unable to know the practices of pesticide use etc. They do not find any justification properly safety measures awareness. As a result, 'lack of training facilities' might be ranked as third important problems. Respondents also suffer from communication problem as they faced various problems due to different information sources. They do not contact with any officer due to lack of communication. Thus, it becomes another important problem ranking fourth.

Conclusions

Most percentages of the respondents of the study area were middle-aged' having a maximum level of education, medium family size, small farm size,

medium income, medium extension contact, low farming experience. Most of the respondents had medium knowledge of pesticide use. Seventy percent of the farmers had a medium practice of pesticide use for vegetable cultivation. A considerable proportion of the farmers had no enough training exposure, moderate use of the source of information and medium extension contact. It can be concluded that vegetable farmers in the study area were not taking good measures in their pesticide handling practices. Therefore, efforts to increase farmers' knowledge on pesticide use through improved training are important and should be encouraged by the relevant stakeholders. In addition, to increase farmer's capacity on safety issues, there should be authoritarian enforcement of the regulations on the sales of pesticides. It is also recommended that proper approaches such as Integrated Pest Management (IPM), which has the potential to decrease the quantity of pesticide use and exposure to chemicals, should be executed for vegetable production.

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