



ISSN 1313 - 8820 (print)
ISSN 1314 - 412X (online)
Volume 10, Number 2
June 2018

AGRICULTURAL SCIENCE AND TECHNOLOGY

2018

An International Journal Published by Faculty of Agriculture,
Trakia University, Stara Zagora, Bulgaria

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This issue is printed with the financial support by Contract No. DNP 06-41/20.12.2017, financed from Fund 'Scientific Research' grant Bulgarian scientific periodicals.

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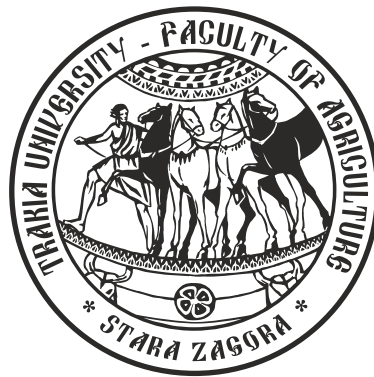
Agricultural Science and Technology
Faculty of Agriculture, Trakia University
Student's campus, 6000 Stara Zagora
Bulgaria
Telephone: +359 42 699330
+359 42 699446
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Nely Tsvetanova
Telephone: +359 42 699446
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ISSN 1313 - 8820 (print)
ISSN 1314 - 412X (online)

Volume 10, Number 2
June 2018



AGRICULTURAL SCIENCE AND TECHNOLOGY

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An International Journal Published by Faculty of Agriculture,
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Perception of rural farmers on pesticide use in vegetable production

M. Naznin¹, M. S. I. Afrad^{1*}, M. E. Haque¹, M. Zakaria², A. A. Barau¹

¹Department of Agricultural Extension and Rural Development, Bangabandhu Sheikh Mujibur Rahman Agricultural University, Gazipur, Bangladesh

²Department of Horticulture, Bangabandhu Sheikh Mujibur Rahman Agricultural University, Gazipur, Bangladesh

(Manuscript received 20 March 2018; accepted for publication 21 May 2018)

Abstract. In rural areas of Bangladesh, farmers use various types of pesticides without thinking about the effects of these pesticides on deteriorating and polluting the environment. As a result, the present study examined the rural farmers' perception on pesticide use for vegetable production. The study was conducted in four villages of Narsingdi district, Bangladesh. A total of 110 vegetable farmers were selected as sample for the study. Interview schedule was employed for collection of primary data. Simple statistics was used for analysis, viz. frequency, percentage, mean and standard deviation, while correlation was employed to test the relationship between the selected socioeconomic characteristics and perception of the farmers on pesticide use in vegetable cultivation. Findings revealed that most of the respondents were over 35 years old, had high literacy level, 7 or less family members, contacted various information sources, received training (64.55%), earned low (78.2%) income annually and slightly above half (52.73%) participated in organizations. A greater majority of the respondents had favorable to highly favorable perception on pesticide use in vegetable production. Also, most of the respondents faced myriad of difficulties in dealing with pesticide, especially eye and skin difficulties. Organizational participation ($r = 0.220$) showed significant relationship with perception on pesticide use in vegetable production. Therefore, information dissemination should be improved by the government in order to increase awareness on safe use of pesticides, as well as establish centres for surveillance, prevention, and management of difficulties associated with dealing with pesticides.

Keywords: agriculture, rural farmers, perception, pesticides, vegetable

Introduction

Agriculture is the major economic activity practised in Bangladesh, which contributes about one third to the country's gross domestic product (GDP) and 80% of the people depend on agriculture for their livelihood (Bhattacharjee et al., 2012). Like many other developing countries, pesticides are used extensively in Bangladesh to increase crop yield per acre (Chowdhury et al., 2012). As agricultural production is being increased every year to meet the growing demand of the people, uses of pesticides also rise up. Bangladesh has experienced a fivefold increase in agricultural pesticide use between 1990 and 2010 (Pretty and Bharucha, 2015). With regards to vegetable production, farmers have been using pesticides frequently in order to have higher yield, although widespread use of pesticides contaminates the environment as well as foods, which may create a health problem. In fact, pesticide related problems have also led other countries to consider restricting vegetable imports from Bangladesh (Rahman, 2016).

For more food production farmers are indiscriminately using agricultural inputs like pesticides. However, a rapid increase in pesticide consumption raises concern about its potential impact on farmers' health as well as on the environment (Rahman, 2013). Therefore, only proper and judicious application of these pesticides could be effective for sustainable agricultural production and development. In the rural area, farmers use various types of pesticides without thinking about the effects of these pesticides on deteriorating and polluting the environment. It has been reported that some of the pesticides are being used in vegetables where no pre-harvest timeframe after application is maintained, because of high demand for farm produce and poor perception of the toxic effects of pesticides in food, which results from residues in

vegetables (Darko and Akoto, 2008).

Be that as it may, the primary function of perception is to make sense of the information taken in by the process of sensation. The study of perception is therefore, expected to reveal how farmers make sense of the effects of using pesticides in vegetable production. Considering this fact, the present study was conducted to examine the perception of farmers on pesticide use in vegetable production in selected rural areas of Narsingdi district of Bangladesh.

Material and methods

The descriptive and diagnostic research designs were used in the present study because descriptive research design helps in stating characteristics of a particular situation, group or individuals and is used for fact finding with appropriate interpretation. On the other hand, diagnostic or analytical research design was applied in testing a hypothesis and specifying and interpreting relationship among variables. The study was conducted in four villages, namely Dewaner char, Char Ujilab, Amlaba and Baroicha under Belabo upazila in Narsingdi district, Bangladesh. The reasons behind the selection of this district include high level of pesticide use, easy accessibility of the area to the researcher and cooperation of the villagers in conducting the study. A total of 110 vegetable farmers were selected as sample respondents taking 30 from each of the three villages, except Baroicha where 20 were taken due to the smaller number of vegetable farmers. Respondents in these villages were selected following disproportionate random sampling technique. For collection of primary data, an interview schedule was used through face-to-face contact.

* e-mail: afrad69@gmail.com

Farmers' perception towards pesticide use in vegetable production was measured using a summated rating (Likert-type) scale. The scale was prepared with larger number of items initially, which were subjected to editing and screening in the light of the pre-test so as to include only the relevant items reflecting both positive and negative statements on a five-point continuum. The items covered all aspects related to perception of pesticide use in vegetable production. Thus, respondents' perception on pesticide use in vegetable production scores were computed and categorised into unfavourable, favourable and highly favourable.

The Statistical Package for Social Sciences was used to perform the data analysis. Descriptive statistical measures such as frequency, mean, percentage and standard deviation were used to describe and interpret the data, while Spearman's correlation was employed to explore the relationship between selected socioeconomic characteristics of the respondents and their perception on pesticide use in vegetable production.

Results and discussion

Age of the respondents

The age of the respondents ranged from 20 to 70 years and the average age was 41.66 years with standard deviation of 11.64. Based on age, the respondents were classified into three categories as shown in Table 1.

Table 1. Distribution of the respondents according to age

Category	Frequency	Percent (%)	Mean	SD
Young age (<35 years)	21	19.1	41.66	11.639
Middle age (35-50 years)	51	46.4		
Old age (>50 years)	38	34.5		
Total	110	100.0		

Table 2. Distribution of the respondents according to literacy level

Categories	Respondents	
	Number	Percent (%)
Illiterate	8	7.3
Can read	1	0.9
Can read and write	59	53.6
Can sign	42	38.2
Total	110	100.0

The information displayed in Table 1 revealed that the highest portion of the respondents (46.4%) were middle age category of 35-50 year, while the young age category was low (19.0%). Kabir et al. (2012) reported similar findings. It implies limited presence of age below 35 in vegetable production in the area.

Literacy

Literacy of the respondents was measured in terms of the UNESCO (2004) proposed definition "Literacy is the ability to identify, understand, interpret, create, communicate and compute using printed and written materials associated with varying contexts". Distribution of the respondents according to their level of literacy is presented in Table 2.

Information in Table 2 reveals that the category of the respondents who 'can read and write' constituted the highest proportion (53.6%), 38.2% 'can sign' while 7.3 percent were found 'illiterate'. On the other hand, 0.9% of the respondents 'can read'. Appreciable level of literacy among the vegetable farmers signifies their ability to make meaning out of ideas communicated to them. Conversely, Sultana (2013) reported dissimilar results where great majority of the respondents (86.4%) were illiterate.

Family size

The number of family members of the respondents ranged from 2-12 with an average of 5.25 members which is higher than the national average household size of 4.4 (BBS, 2011). The distribution

of farmers according to their family size is shown in Table 3.

The results shown in Table 3 reveal that half (50.0%) of the respondents belonged to medium size family of 5-7 members, while only 10 percent had large family size. Therefore, a very big majority of the respondents (90.0%) were under small to medium family size categories. It indicates that the family planning campaign of the government might not have worked properly as it was envisaged because of the currently obtained situation. Hossain (2007) found similar findings, but Farhad (2008) reported dominance of large to medium sized families in his study.

Farm size

The farm size of the respondents ranged from 0.01 to 2.69 ha with an average of 0.2574 ha and standard deviation of 0.30. The

Table 3. Distribution of the respondents according to family size

Categories	Respondents		Mean	SD
	Number	Percent (%)		
Small (up to 4 members)	44	40.0	5.25	1.88
Medium (5-7 members)	55	50.0		
Large (above 7 members)	11	10.0		
Total	110	100.0		

Table 4. Distribution of the respondents according to farm size

Categories	Respondents		Mean	SD
	Number	Percent (%)		
Small farm size (0.02-1.01 ha)	109	99.1	0.2574	0.30
Medium farm size (1.01-3.03 ha)	1	0.9		
Large farm size (<3.03 ha)	0	0.0		
Total	110	100.0		

respondents were classified into three categories based on their farm size as shown in Table 4.

The information presented in Table 4 indicates that almost all (99.1%) of the respondents had small farm size, while only 0.9% respondents had medium farm size. The proportion of large farm size was zero. It is interesting that all (100.0%) of the respondents belonged from small to medium farm size categories. However, the national average of land holding in Bangladesh is 0.81 ha (BBS, 2009), while the average farm size of the respondents is 0.2574 ha. This might be due to the fact that with the growing population of Bangladesh and the increasing needs in various sectors, land use patterns are undergoing a qualitative change in which the areas under the net cropped land and forest land is generally shrinking. Akter (2015) reported similar findings.

Source of information

The use of information sources is one of the main important components that creates awareness amongst farmers in respect to various pesticides use in vegetable production. Generally, it is said that the higher the access to the information media, the higher the awareness. Use of different information sources and extent of use by the respondents are presented in Table 5.

The results shown in Table 5 hint that majority of the respondents always get their agricultural information from

friends/family/relatives (82.9%), followed by fellow farmers (78.4%) and television (49.5%). A total of 49.5% of the respondents depend on extension workers occasionally as an information source. Radio, leaflet, posters and newspapers were rarely used as an information source by 56.8%, 53.2%, 43.2%, 41.4% respondents, respectively. Posters, newspapers and leaflets were never used as an information source by 38.7%, 36.9%, and 32.4% respondents, respectively.

Annual income

The annual income of a respondent was determined on the basis of his total earning from his/her major occupation and other sources. The average annual income was \$ 2234.23, which is equivalent to 186330 Taka (Bangladesh currency). Distribution of annual income of the respondents was classified into 3 categories according to Yasmin (2014) and presented in Table 6.

The results contained in Table 6 indicate that the highest proportion (66.4%) of the respondents fall under low income category of ≤\$1805.59 (≤150000 Taka). On the other hand, (23.6%) were medium income category of 151000 to 300000 Taka (\$ 1817.62), while 10.0% were high income category of above 300000 Taka (above \$3611.17). Thus, a great majority (90.0%) were found under low to medium income categories of ≤ 300000 Taka (≤\$3611.17). The majority of the high income category of above 300000 Taka (above \$ 3611.17) respondents were involved in some

Table 5. Distribution of the respondents according to use of information sources

Information source	Nature of use (% of the respondents)			
	Never	Rare	Occasionally	Always
NGO worker	30.6	25.2	28.8	14.4
Extension worker	14.4	21.6	45.9	17.1
SAAO	17.1	31.5	38.7	11.7
Television	8.1	19.8	21.6	49.5
Radio	25.2	56.8	12.6	3.6
Poster	38.7	43.2	13.5	2.7
Leaflet	32.4	53.2	9.0	4.5
Newspaper	36.9	41.4	16.2	3.6
Friends/Family/Relative	0	4.5	11.7	82.9
Fellow farmers	0	4.5	16.2	78.4

Table 6. Distribution of the respondents according to annual income

Categories	Frequency	Percent (%)	Mean	SD
Low (≤ \$ 1805.59)	73	66.4	186.330	17.092
Medium (\$ 1817.62 – 3611.17)	26	23.6		
High (Above \$ 3611.17)	11	10.0		
Total	110	100.0		

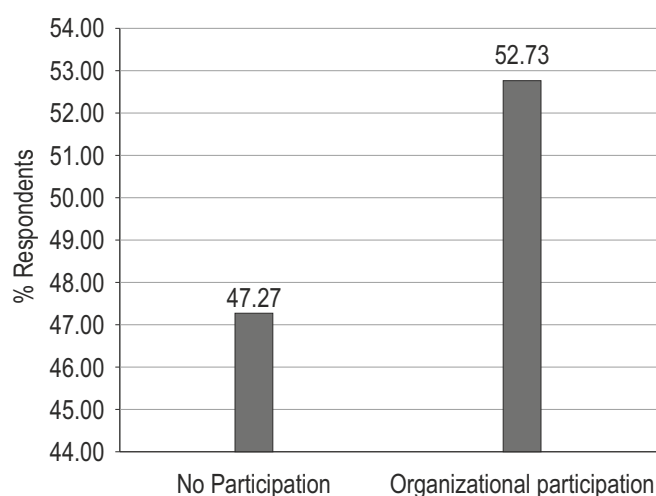


Figure 1. Distribution of the respondents according to organizational participation

other business activities that include petty trading, etc. This suggests that the bulk of the vegetable farmers in the area are resource-poor farmers. The findings are in line with those of Khan (2017), but Akter (2015) found the contrary.

Organizational participation

Organizational participation broadens the viewpoint of an individual and builds favorable attitude towards modern agricultural practices.

The information contained in Figure 1 shows that more than half (52.7%) of the respondents participated in organizations, while 47.3% did not participate. The importance of farmers' participation in organisations cannot be overemphasized. Indeed, Orozco et al. (2014) reported that organisations are social structures that enable the acquisition and exchange of information which can affect the adoption of practices that have potential health impacts.

Training received

Training plays vital role for the development of knowledge, skill and attitude of a person, which make them more capable and competent. Training helps an individual to participate more in the development process more cheerfully, with confidence. On the basis of training the respondents were classified into two categories which are shown in Figure 2.

The information presented in Figure 2 shows that more than half of the respondents (64.54%) had received training, but 35.45% had not received any training. Khan (2017) found similar results. On the contrary, Prodhon and Afrad's (2015) results were dissimilar to the present findings.

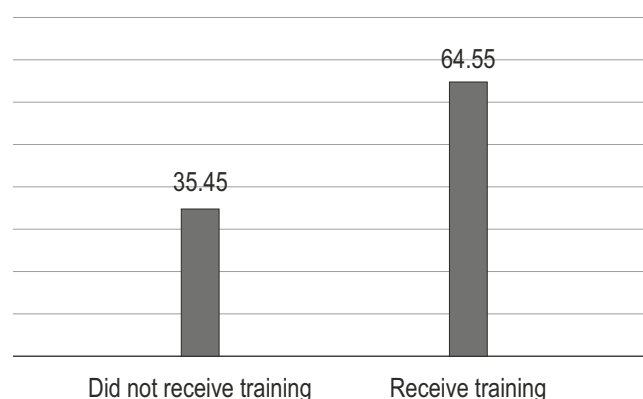


Figure 2. Distribution of the respondents according to training

Perception on pesticide use in vegetable production

From the responses of the respondents, their perception on pesticide use in vegetable production was computed. Based on the perception score, the respondents were classified as shown in Table 7. The computed perception score ranged from 29 to 44 and averaged 35.02 with standard deviation 2.91.

The results contained in Table 7 indicate that the majority (48.2%) of the respondents had favorable perception, while 31.8% of the respondents had highly favorable perception on pesticide use in vegetable production. Nonetheless, 20.0% had unfavorable perception on pesticide use in vegetable production. Having large proportion with favourable to highly favourable perception on pesticide use in vegetable production denotes that most of the farmers are aware of the effects of pesticides on pest, vegetables, humans and the environment. Abubakar et al. (2015) reported similar data for Borno state, Nigeria.

Difficulties faced during pesticide use in vegetable production

In the study area most of the farmers do not read instructions given in the pesticide safety manual. Most of the time they do not take any protection measures during pesticide application as well as preservation and transportation, selection of pesticides, dosage and mode of application. Pesticides were largely handled based on agro-chemicals dealers' suggestions. In most of the cases, dealers are not well educated and their knowledge is not sufficient on the rational use of pesticides. It was found that considerable proportions of the respondents were smoking or consuming other edible items during pesticide application. For this reasons, farmers faced different difficulties during pesticide application. The results are presented in Table 8.

Table 8 reveals that a large proportion of 89.2% of the total number of respondents reported having eye difficulties such as redness of the eyes and 40.5% of the respondents reported having

Table 7. Distribution of the respondents according to perception on pesticide use for vegetable production

Categories	Respondents		Mean	SD
	Number	Percent (%)		
Unfavorable perception (below 32 score)	22	20.0	35.0273	2.91613
Favorable perception (32-36 score)	53	48.2		
Highly favorable perception (above 36)	35	31.8		
Total	110	100.0		

Table 8. Distribution of the respondents according to difficulties faced during pesticide use in vegetable production

Difficulties	% of the respondents
Redness of eyes	89.2%
Burning sensation	36.0%
Dizziness	13.5%
Itching	75.7%
Burning of eyes	40.5%
Skin diseases	31.5%
Vomiting	27.0%
No difficulty	2.7%

burning on the eyes. 36.0% of the respondents reported having burning sensation, 13.5% reported having dizziness, and 75.7% reported itching difficulty. Also, 31.5% reported suffering from skin diseases, including irritation, rashes and itching, 27.0% reported having vomiting. Nevertheless, 2.7% of the respondents reported that they experienced no difficulty.

Relationship between respondents' socioeconomic characteristics and their perception on pesticide use for vegetable production

To explore the relationship between respondents' selected socioeconomic characteristics and their perception on pesticide use in vegetable production, Spearman's correlation was used. The relationship was tested on the basis of null hypothesis that states: "There is no significant relationship between farmers' selected socioeconomic characteristics and their perception on pesticide use in vegetable production." The result of the test is presented in Table 9.

The findings presented in Table 9 indicate that the organizational participation had positive significant ($r = 0.220$) relationship with the respondents' perception on pesticide use in vegetable production. It indicates that the respondents who participated in organizations had favourable increase in perception on pesticide use in vegetable production, but on a low scale, given their number. Singh et al. (2011) observed similar results. On the other hand, no significant relationship was found between age, literacy, family size, farm size, income, source of information and training experience with farmers' perception on pesticide use in vegetable production.

Conclusion

Based on the major findings and their logical interpretation, it has been established that the majority of the respondents in the study area were middle aged, had high literacy level, medium family size, small farm size, low annual income, received training on pesticide use and obtained information from people within their circle (family, friends and relative). More significantly, most of the respondents had favorable to highly favorable perception on pesticide use in vegetable production. As a result, information dissemination through extension workers and other relevant media should be improved upon by the government, concerning proper dose of pesticide use as well as the detrimental effects of pesticide use in vegetable cultivation. Almost all the respondents faced one difficulty or the other in dealing with pesticides. Most importantly

Table 9. Relationship between respondents' selected socioeconomic characteristics and their perception on pesticide use in vegetable production

Sl#	Independent variables	Coefficient of correlation (r)	P value
1	Age	0.050	0.607
2	Literacy	-0.033	0.735
3	Family size	-0.151	0.116
4	Farm size	-0.030	0.754
5	Source of information	0.002	0.983
6	Income	-0.015	0.874
7	Organizational participation	0.220*	0.021
8	Training experience	0.132	0.170

*P < 0.05%

were eyes and skin related difficulties. Therefore, the government should establish various centres for the prevention and management of difficulties associated with dealing with pesticides, and for enhanced surveillance and training. Perception on pesticide use in vegetable production was found significantly related to organizational participation ($r=0.220$). Consequently, with increase in organizational participation there will be increased favourable perception on pesticide use in vegetable production. Pesticide formulation and distribution companies may undertake research in vegetables farmers' fields. Perhaps, farmers could learn practical knowledge better and acquire more skills on pesticide use in vegetable cultivation.

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Instruction for authors

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The manuscript should be structured as follows: Title, Names of authors and affiliation address, Abstract, List of keywords, Introduction, Material and methods, Results, Discussion, Conclusion, Acknowledgements (if any), References, Tables, Figures.

The title needs to be as concise and informative about the nature of research. It should be written with small letter /bold, 14/ without any abbreviations.

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The names of the authors should be presented from the initials of first names followed by the family names. The complete address and name of the institution should be stated next. The affiliation of authors are designated by different signs. For the author who is going to be corresponding by the editorial board and readers, an E-mail address and telephone number should be presented as footnote on the first page. Corresponding author is indicated with *.

Abstract should be not more than 350 words. It should be clearly stated what new findings have been made in the course of research. Abbreviations and references to authors are inadmissible in the summary. It should be understandable without having read the paper and should be in one paragraph.

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Material and methods: The objects of research, organization of experiments, chemical analyses, statistical and other methods and conditions applied for the experiments should be described in detail. A criterion of sufficient information is to be possible for others to repeat the experiment in order to verify results.

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Todorov N and Mitev J, 1995. Effect of level of feeding during dry period, and body condition score on reproductive performance in dairy cows, IXth International Conference on Production Diseases in Farm Animals, September 11-14, Berlin, Germany.

Thesis:

Hristova D, 2013. Investigation on genetic diversity in local sheep breeds using DNA markers. Thesis for PhD, Trakia University, Stara Zagora, Bulgaria, (Bg).

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AGRICULTURAL SCIENCE AND TECHNOLOGY

Volume 10, Number 2
June 2018



Journal web site:
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