



AWARENESS OF HEALTH IMPLICATIONS OF AGROCHEMICALS USE AMONG CROP FARMERS IN BAUCHI AND TORO LOCAL GOVERNMENT AREAS OF BAUCHI STATE, NIGERIA.

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ABSTRACT

The study assessed the awareness on health implication of agrochemical usage among crop farmers in Bauchi State. Multistage stage sampling techniques was used in selecting 156 farmers for the study. Primary data were obtained through the administration of questionnaires and data analyzed using both descriptive and inferential statistics. The results reveal that most (96.2%) of the farmers were male, middle-aged (76.3%) with relatively small household size (64.8%). Similarly, majority (66%) of the respondents engaged into trading as other forms of occupations besides farming. The result also shows that farmers used fungicides (49%), fertilizers (12.8%) and insecticides (12.2%). The primary reasons for using agrochemical were to increase yield (96.8%) and extension agents' advice (87.2%). The result further shows that farmers mainly relied on self-experience (92.3%), affordability (92.3%) and extension agents' advice (71.2%) to determine the types of agrochemical to be use. The result further shows that access to extension services, frequency of training received, and types of agrochemical usage were negative and significant influencing the use of agrochemical at (P<0.01), while access to credit sources was positive and significant at (P<0.05) influencing farmers use of agrochemicals. Furthermore, majority of the farmers reported experiencing various health challenges like eye problems (92.9%) and stomach irritation (87.2%). The study concluded that the farmers were aware of agrochemical usage in crop production, despite its documented effects on human health. It is recommended that farmers should form cooperatives and pull down resources to sponsor private extension services to improve access to extension and also increase their access to media channels to promote alternative information channels on the use of agrochemical in the study area.

Keywords: Assessment, Awareness, Health, Agrochemical, Implication

INTRODUCTION

Agriculture is the major source of livelihood in developing countries especially among the rural residents. Olukunle (2021) noted that farming is the main occupation of the rural people. Agriculture is the major occupation of people in Nigeria and it employing over 70% of the active labour force Adesina *et al.* (2023). It is pertinent to state that role of agriculture in boosting the economy of a nation is enormous. Agriculture provides food, employment and even raw materials for other industries. Agriculture is defined as term generally used in the broad sense including all activities directly related to cultivating, growing, harvesting and primary processing of agricultural products, animal and livestock breeding including aquaculture and agroforestry. Agricultural extension service played a significant role in





improving production in Nigeria through adequate access to information, advisory services and demonstration on improved techniques of production to farmers. Farmers with higher experience appear to have often full information and better knowledge and are able to evaluate the advantage of a technology considered. Therefore, it was found that farming experience has a positive influence on perception of accessibility of technologies (Bello *et al.*, 2022). These farmers in effort to ensure increased agricultural productivity and control pests/weeds have resulted to use of agrochemical.

Agrochemical are substances used to control weeds, kill pests and also help to improve agricultural production. Mokwunye, *et al.* (2021) defined agrochemical as a generic term for the various chemical products, such as fertilizers, hormone, fungicides, insecticides or soil treatment that improves the production of crop. The source of pesticides used by the farmers includes agrochemical retailers, input traders, and Agricultural Development Programme (ADP). Awad *et al.* (2018) noted that pesticides are widely used by farmers to protect crops from insects and diseases. The extensive and indiscriminate use may be worst with inadequate knowledge of the agrochemical and the safety practices. Jean *et al.* (2019) stated that the population (farmers) ignored the health risks linked to pesticides applications.

In recent times, there is a growing concern for increase in the quantity of pesticides consumed for the control of pests and diseases of vegetable crops among farmers in Nigeria. In fact, pesticides use among farmers in the country has proven to be indispensable tool in combating damage from pests. The reason for this has been the improvement in yield which is attributed to the ability of pesticides to eliminate pests of vegetables crops. In respond to the government-initiated policies that have also in ways encouraged a phenomenal increase in the usage of agrochemical to control and curb the devastating effect of these insect pest (Alimi, 2022). In this regard smallholder farmers are more than ever before invigorated to use agrochemicals as the best available option to protect their crops and increase their productivity. This has led not only to an increase chemical use but also an indiscriminate application of synthetic agro-chemicals aimed at boosting production, controlling pest, weed, and disease on their farms. However, over reliance on agro-chemicals would result in unsustainable crop production and possible health challenges (Fernie and Yan, 2019). The increased use of agrochemicals and in inappropriate methods may be harmful to human and the environment. Hence, the need to assess awareness of health implications on agrochemicals usage among crop farmers in Bauchi state. The study will provide a guiding policy document on the use of agrochemicals among crop farmers for both policy makers, stakeholders, farmers and also add to the existing body of literature and guide further research in the subject matter. The specific objectives of the study are to:

- i. Identify the socio-economic characteristics of crop farmers
- ii. Identify the sources of awareness on Agro-chemicals among the farmers
- iii. Identify the type of health challenges associated with agro-chemical use among the farmers

METHODOLOGY

The Study Area

Bauchi State lies between Latitude 9.3° and 12.3° North of the Equator and Longitude 8.5° and 11° East of the Greenwich Meridian. Bauchi State covers a total land Area of 49,259.01km² which is about 5.3% of the total land mass of Nigeria. Bauchi state shares a boundary to the east with Adamawa, Yobe, and Gombe state. To the south it equally shares a boundary with Plateau and Taraba state, while to the North with Kano and Jigawa state, and to west with Kaduna state and has a total of 20 Local Government Areas (LGAs; fig 1). The





estimated population of Bauchi state is 6.5m people according to the population census (NBS, 2021). The area experiences both dry and rainy seasons, during the month of April, the temperature of 40^oC is recorded in which is the hottest and in November to January, the temperature of 17.11^oC is recorded being the coolest month of the year and as well the time when Hamatan is experienced in the area. The mean annual rainfall ranges from 460mm in the North part of the state to 1300mm in the south and south-western part. The relative humidity decreases from 94% in August to less than 10% during *hamatan* (dry season). The topography includes hilly areas in the south and low land in the north among others. The vegetation type is Sahel Savanna and Sudan Savanna in the North t and Guinea Savanna in the south. Thus, the choice of the area is based on the fact that, it is typical representation of diverse socio-economic, cultural and rural urban setting obtained with the majority of them being farmers (BSADP, 2022).

Sampling Procedure

Multi-stage sampling technique was used in selecting the respondents. The first stage, a purposive sampling was used to select the LGAs in the study zone. The second stage entails the stratification of crop farmers across the villages and wards the major crop cultivation areas. In the final stage, a total of 156 farmers were randomly selected out of the 3060 farmer's population who indicated interest to participate in the study using the sample size technique at 5 percent precision and 95% confidence levels (Table 1).

S/N	LGAs	Districts	Villages	Population	Sample size (5%)
1	Bauchi	Bauchi	Dan Iya	250	13
			Dawaki	300	15
			Makama	200	10
		Zungur	Liman katagun	350	18
			Yamrat	230	12
			Zungur	200	10
2.	Toro	Jama'a	Mara	150	8
			Zaranda	300	15
			Jama'a	250	13
		Lame	Wonu North	180	9
			Wonu South	300	15
			Tama	350	18
Total	2	4	12	3060	156

Table 6: Sample Frame and Sample Size Selection

Source: Field Survey, 2022

Data Collection Procedure

Primary data were collected through the use of structured questionnaire. The data collected includes: Section (a) Information on socio-economic characteristics of the crop farmers. Section (b) Level and sources of awareness on the adoption of agro-chemical used among the crop farmers. Section (c) Factors influencing the use of agro-chemicals among the crop farmers in the study area. Section (d) Challenges associated with agro-chemical application among the crop farmers. Section (e) factors associated with awareness, adoption and health challenges among the crop farmers. The questionnaire was pre tested and was administered by extension staff in the area.





Method of Data Analysis

The data for the study were analyzed using both descriptive statistics and inferential statistics. The descriptive statistics used were frequency, percentage, mean, and mean score, range, variance and standard deviation. The inferential statistics used was logistic regression. The explicit of the model is written as:

 $Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + \dots + \beta_{10} X_{10} + \varepsilon$ The detailed model is explained below.

Where;

Y =	A	Awareness on	agrochemical	usage b	by the farmer.
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- X_1 = Age of farmer (years)
- X_2 = Education Level
- $X_3 = Household size (No)$
- $X_4 = Access to extension (No)$
- X_5 = Frequency of extension visit (No)
- $X_6 = Type of agrochemical use$
- X_7 = Extension contact (number of contacts with extension agents in a year)
- $X_8 =$ Secondary occupation
- $X_9 = Sex (1 = male, 0 = female)$
- X_{10} = Source of credit

 $e = random \ error$

RESULTS AND DISCUSSION

Socioeconomic Characteristics of the Farmers

The result from Table 2 reveals the socioeconomic characteristics of the farmers. The findings show that most (96.2%) of the farmers were male, only 3.8% of the farmers were female. This implies that farming activities were dominated by the male which could be attributed to the religious and cultural believes of the farmers which hinders women from participating in tedious agricultural activities in the study area. The result further shows that 43.6% and 32.7% of the farmers were within the ages of 28-34 years and 35-41 years, while 14.7% of the farmers were within the age bracket of 42-48 years. Only 5.8% and 3.2% of the farmers were within the ages of 21-27 years and 49 years and above. This implies that majority of the farmers were within their active ages of production in agriculture in the study area. This agrees with the findings of Jibrin et al. (2021) about 34% the farmers where within the age range of 41-50 while their mean age was 43 years and Jibrin et al. (2019) reported that maize farmers were within the age of 31 - 40 years. 76.24% of the maize farmers sampled in Niger State where male while their female counter part accounted for 23.75%. The findings further revealed that majority (66%) of the farmers were into various forms of business apart from farming, while 21.2% and 12.8% of the farmers were civil servants and farmers as other form of occupation. This implies that most of the farmers were not primarily farmers only but were also engaged in other forms of occupation so as to increase their level of income and improve their standard of living in the study area. The result also shows that 46.8% of the farmers had attended adult level of education, while 26.9% and 25% of the farmers had attended secondary and non-formal levels of education. Only 1.3% of the farmers had attended tertiary levels of education. This implies that majority of the farmers had attended one form of education or another which help to increase their level of awareness and adoption of technologies and innovations in agricultural production. This is in line with Mustapha et al. (2017) revealed that about 73.9% of the maize farmers have one form of education or the other.





Variables	Frequency	Percentage
Sev	requirey	i ci contrage
Male	150	96.2
Female	6	3.8
	0	5.0
Age 21_27	0	5.8
21-27 28 34	7	J.0 13.6
20-34 25 41	00 51	45.0 20.7
33-41 40-49	J1 22	52.1 14 7
$42-4\delta$	23 5	14.7
47 and ADOVE	3	3.2
Other Occupation	20	12.0
Farmer	20	12.8
Business	103	00.U
Civil servant	55	21.2
Educational level	20	25.0
Non-tormal	39	25.0
Secondary school	42	26.9
Adult education	73	46.8
Tertiary education	2	1.3
Household size	1.6	10.2
1-3	16	10.3
4-6	51	32.7
7-9	50	32.1
10-12	31	19.9
13 and Above	8	5.1
Types of agrochemical used		
Fertilizer	20	12.8
Insecticides	19	12.2
Fungicides	77	49.4
Herbicides	40	25.6
Years of farming experience		
2-5	48	30.8
6-9	63	40.4
10-13	17	10.9
14-17	6	3.8
18 and Above	22	14.1
Crops		
Cereal	99	63.5
Legumes	44	28.2
Plantation crops	13	8.3
Farm size		
0.5-1.0	34	21.8
1.1-1.5	1	.6
1.6-2.0	49	31.4
2.1-2.5	2	1.3
2.6 and Above	70	44.9





Access to extension servic	es		
Yes	50	32.1	
No	106	67.9	
Frequency of extension se	ervices		
None	106	67.9	
Monthly	41	26.3	
Regularly	9	5.8	
Sources of credits			
Personal savings	48	30.8	
Government loan	19	12.2	
Inheritance	77	49.4	
Borrowing	12	7.7	

Source: Field survey, 2024

It further shows that 32.7% and 32.1% of the farmers had a household size of 4-6 persons and 7-9 persons, while 19.9% and 10.3% of the farmers had a household size of 10-12 persons and 1-3 persons. Only 5.1% of the farmers had a household size of 13 persons and above. This implies that most of the respondent had relatively small household size which shows that farmers had less responsibilities and mouth to feed with little family labour available in the study area. Issa and Kagbu (2020) opined that size of the family help to boost family labor their study revealed that 87% of the farmers were married.

The result also revealed that almost half (49.4%) of the farmers used fungicides, while 25.6% of the farmers used herbicides. Only 12.8% and 12.2% of the farmers used fertilizer and insecticides. This implies that most of the farmers were faced with problems of fungi infestation and weeds/herbs growth and development of their crops in the study area. The result also shows that 40.4% and 30.8% of the farmers had 6-9 years and 2-5 years of farming experience, while 14.1% and 10.9% of the farmers had a farming experience of 18 years and above and 10-13 years. Only 3.8% of the farmers had 14-17 years of farming experience. This implies that most of the farmers had a good number of years in farming which helps in farmers' willingness and ability to adopt innovations with good knowledge on the use of agrochemical in the study area. The result further shows that majority (63.5%) of the farmers cultivates legumes. Only 8.3% of the farmers cultivates plantation crops. This implies that majority of the farmers were cereal producers which is attributed to the high demand of cereals and been the staple food for most households in the study area.

The result also showed that 44.9% of the farmers had a farm size of 2.6ha and above, while 31.4% and 21.8% of the farmers had a farm size of 1.6-2.0ha and 0.5-1.0ha. Only 1.3% and 0.6% of the farmers had a farm size of 2.1-2.5ha and 1.1-1.5ha. This implies that majority of the farmers had relatively large farm size which indicates that farmers were not small scale farmers in the study area. The result further revealed that majority (67.9%) of the farmers had no access to extension, while 32.1% of the farmers had access to extension. This implies that majority of the farmers had no access to extension which is a vital component in agricultural production farmers who do not have access to extension tends to operate at traditional levels with little or no access to improve production technologies which ultimately increases farmers yield and improve their standard of living in the study area.

The result also showed that only 26.3% and 5.8% of the farmers had monthly and regularly extension contacts, which implies that the few farmers who had access to extension had only occasional contact with extension agents in the study area which could have negative impact on their production level and income. The result further revealed that 49.4% and 30.8%





of the farmers had inheritance and personal savings as their major sources of credits, 12.2% of the farmers had access to government loan as source of credit. Only 7.7% of the farmers had their sources of credit through borrowing. This implies that farmers had good sources of credits with little or no interest in the study area.

Sources of Information

Sources of knowledge on agrochemical use

Table 3 shows the farmers primary sources of knowledge on agrochemical. The finding indicates that the major sources of knowledge on agrochemical by the farmers were television, social media and radio which were ranked 1st, 2nd and 3rd respectively. This implies that agrochemical manufacturers have over the years increase their level of advertisement especially via television as they among the sponsors of some television programs which entertain and educate the farmers at their comfort zones of their homes, it is also connected to the cheap and available free to air satellites which includes star times in the study area. It also shows that agrochemical manufacturers were also exploring the opportunities of internet, social media and radio programme which spreads information and adverts faster and covers a large number of people in the study area

Source	Frequency	Percent	Rank
Television	142	91.0	1 st
Social media	140	89.7	2^{nd}
Radio	128	82.1	3 rd
Agrochemical dealers	113	72.4	4^{th}
Other farmers	111	71.2	5 th
Extension officers	44	28.2	6 th
Researchers	28	17.9	7 th
Newspapers	12	7.7	8 th

Table	8 :	Distribution	of	Farmers	According	to	Primary	Sources	of	Knowledge	on
Agroch	nem	ical Usage (n=	=156	5)							

Source: Field survey, 2024

These were followed by agrochemical dealers, other farmers and extension officers which were ranked 4th, 5th and 6th respectively, others were researchers and newspapers which were ranked 7th and 8th by the Farmers. This implies that agrochemical dealers, other farmers and extension officers plays a vital role in advertising the significant importance of agrochemical in crop production, Farmers reveals that there is little or no much advertisement from researchers and newspapers on agrochemical in the study area.

Health Challenges Associated with Agrochemical Use

Table 4 shows the human ill health symptoms experienced by the farmers in the study area. The finding revealed that the major symptoms of human ill health experienced by the farmers were eye and stomach irritation which were ranked 1^{st} and 2^{nd} , while respiratory and skin irritation were ranked 3^{rd} and 4^{th} by the farmers. This implies that most of the farmers had experienced one form of human ill health symptoms or another which will help to increase their willingness to use protective tools to avoid re occurrence of such human ill health symptoms which over the years had claim several lives in the study area. Ahmed *et al.* (2018) showed that farmers were experiencing different kinds of health problems due to use of pesticides, including dizziness, headache, and nausea or vomiting. Yassin *et al.* (2020) found





that most farm workers had knowledge of a burning sensation in the eyes/face, watering of eyes, old/breathlessness/chest pain, itching/skin irritation, headache, and dizziness.

Tuble 1 : Distribution of Furniers Recording to Health Chantenges Experienced (1–150)						
Challenge	Percentage	Rank				
Eye irritation	92.9	1 st				
Stomach upset	87.2	2^{nd}				
Respiratory issues	84.6	3 rd				
Skin irritation	83.3	4 th				

Table 4: Distribution of Farmers Acco	ording to Health Chall	lenges Experienced (n=156)
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Source: Field survey, 2024

Factors Influencing Awareness Level of Agrochemical

Table 5 shows the factors influencing awareness of farmers on agrochemical use in the study area. The finding revealed that access to extension was significant at (P<0.01) which implies that as awareness level increases access to extension tends to decrease on the use of agrochemical. The significance of extension in dissemination of information and technologies to farmers cannot be over emphasized in agriculture, hence decrease in access to extension could lead to several issues regarding farmers' production methods and levels in the study area. The results also showed that frequency of training was significant (P<0.01) which implies that as awareness level increases among farmers on the use of agrochemical frequency of training will decrease. This cannot be unconnected to the facts as farmers acquire the skill and knowledge of agrochemical application there will be less or no need for frequent training on the use of agrochemical in the study area.

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Variables	Coef.	Std. Err.	Z	P z
Age	.0131149	0284139	0.49	0.644
Educational level	.012861	1795251	0.07	0.943
Years of farming experience	0346667	.0381783	-0.91	0.364
Household size	.0752296	.0657554	1.14	0.253
Access to extension	-6.799633	2.544624	-2.67	0.008***
Frequency of extension training	-2.89992	1.11906	-2.59	0.010***
Types of agrochemical	-1.837897	.5036573	-3.65	0.000***
Sex	-1.774974	1.280523	-1.39	0.166
Secondary Occupation	-1.11911	.5986187	-1.87	0.062
Sources of credit	.6056377	.2647604	2.29	0.022**
Constant	21.51374	5.621103	3.83	0.000
Prob > chi2 = 0.0000				
Log likelihood = -67.054535				
Pseudo $R^2 = 0.3036$				

Table 5: Factors Influencing Awareness of Agrochemical among Farmers

Source: Field survey, 2024

The result also shows that types of agrochemical was negative and significant (P<0.01) which implies that the level of the use of agrochemical decreases with the types of agrochemical and vice versa. This may not be unconnected to the facts that farmers will over time identify the best agrochemical needed for their agricultural production hence they will adopt a particular manufacturer and dealer and ignore other types of agrochemical in the study area. The result further reveals that source of credit was positive and significant (P<0.05) which





implies that increase in the use of agrochemical increases with increase in the sources of credit in the study area. This may be connected to the fact that as awareness level increase yield and production level of farmers increases, making them more financial stable. In Nigeria, the level of adoption of recommended practices for handling of agrochemical is low, and research has shown the need to have a better understanding regarding the attitude, perception, and knowledge of the agrochemical as this will help in a better education on safe agrochemical handling (Issa and Kagbu, 2020).

CONCLUSION AND RECOMMENDATION

The study concluded that farmers had adopted the use of agrochemical despite its obvious effect on human health and access to extension, frequency of training, types of agrochemical and access to credit were the factors that influences the use of agrochemicals among crop farmers in the study area. Major health challenges associated with un professional handling of agrochemical among the farmers were eye problems, respiratory issues, skin irritation and stomach upset.

Based on the findings of the study the following recommendations were made;

- i. Farmers should form cooperatives and pull down resources to sponsor private extension services to improve access to extension
- ii. Farmers should increase their access to media channels to promote alternative information channels on the use of agrochemical in the study area
- iii. Government and agrochemical manufacturers should subsidize prices of agrochemical and spraying tools to farmers in the study area.

REFERENCES

- Adesina, A. A., Mbila, C., Nkamleu, G., B. and Endamana, D. (2023). Analysis of the determinants of adoption of alley farming by farmers in the forest zone of Southwest Cameroon. *Agriculture, Ecosystems & Environment,* **80**: 255-265.
- Ahad, K., Mohammad, A., Mehboob, F., Sattar, A. and Ahamd, I. (2022). Pesticide residues in Rawal Lake, Islamabad, Pakistan. Bull. *Environ. Contam. Toxicol*, **76**(3): 463-70.
- Alimi, T. (2022). Agricultural Chemical pesticides users' perception of safety measures. Journal of Agricultural Extension publications of AESON, **3**(1): 97-103.
- Awad, O. M., Adam, A.M., Ahmed, M.A., Abd-Elaziz, S.A., and Ishag, A.M.E. (2018). Knowledge, Attitudes, and Practices of farmers towards pesticide use and handling in Greenhouse farms, Sudan. *International Journal of Research*, 6(9): 520-534.
- Bello, M., Ibrahim, H., I., Salau, E., S., Kaura, A., G. and Age, A., I. (2022). Factors influencing the adoption of agro-chemical technology by small-scale farmers in Kwali Area Council of Abuja FCT, Nigeria. *Journal of Environmental Issues and Agriculture in Developing Countries*, 2(1): 176-190.
- BSADP, (2022). Annual Report on Agricultural zones of Bauchi State. Bauchi State Ministry of Agriculture and Rural Development. 113-128.
- Fernie, A. R., and Yan, J. (2019). De Novo domestication: An alternative rout toward new crops for the future. Molecular plants. 12:615–631. https://doi.org/10.1016/j.molp.2019.03.016.
- Issa, F., O. and Kagbu, J., H. (2020). Institutional Factors Influencing Crop Farmers Adoption of Recommended Agrochemical Practices in Nigeria. *Journal of Agricultural Extension* 21(1): 1 – 6.





- Jean, S., Emmanuel, F., Edouard, A., and Brownlinda, S. (2019). Framerss' knowledge, attitude and practices on pesticide safety: a case study of vegetable farmers in Mount-Bamboutos Agricultural Area, *Cameroon. Agricultural Sciences*, **10**: 1039-1055.
- Jibrin, S., Tanko, L., Ibrahim, F. D., Jirgi, A. J. and Umar, I. S. (2019). Effects of Socio Economic Characteristics of Farmers on Maize Production in Chanchaga Local Government Area of Niger State. *International Journal of Agriculture and Development Studies*, 2(1): 72-78.
- Jibrin, S., Ajayi, O. J., Salihu, I. T., Bello, L. Y. and Loko, A. I. (2021). Factors Affecting Awareness of Maize Farmer on Health Risk of Agrochemical Usage in Niger State, Nigeria. *Journal of Agripreneurship and Sustainable Development* (JASD). 4(2): 154-167.
- Mokwunye, I., U., Babalola, F., D., Ndagi, I., Idrisu, M., Mokwunye, F., C., and Asogwa, E., U. (2021). Farmers' compliance with the use of approved cocoa pesticides in cocoa producing States of Nigeria. *Journal of Agriculture and Social Research* (JASR) 12(2): 44 – 60.
- Mustapha, F., A., Jallow, D., G. Awadh, M. S., Albaho, V. Y. D. and Binson, M. T. (2017). Pesticide Knowledge and Safety Practices among Farm Workers in Kuwait: Results of a Survey. *International Journal of Environmental Research, Public Health*, 14(4): 340-351.
- NBS, (2021) National Bureau of Statistics Annual Report.
- Olukunle, O. T. (2021). Challenges and prospects of agriculture in Nigeria: the way forward. *Journal of Economic and Sustain Development*, **13**(4): 37-45. Available from: http://pakacademicsearch.com/pdf-files/ech/520/37-5%20Vol%204,%20No%2016%20.
- Yassin, M., Abu, M., and Safi, J. (2020). Knowledge, attitude, practice, and toxicity symptoms associated with pesticide use among farm workers in the Gaza Strip. *Occupational and Environmental Medicine*, **59**(6): 387–393. doi: 10.1136/oem.59.6.387.