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Agricultural Environment Pollution Factors and Methods of Treatment them from the Viewpoint of Agricultural Employees in Tikrit District, Salah Aldin Governorate

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Abstract. The research aimed to determine the size of agricultural pollution environment from the point of view of agricultural employees in Tikrit district Salah al-Din Governorate and determining the difference in the respondents' viewpoints about the size of the agricultural environment pollution according to the personal factors of agricultural employees represented in (age, gender, educational attainment, number of years' service, work location, contact with information sources communication). After that arranging ways to deal with the pollution of the agricultural environment from the point of view of the respondents in descending order. The research included all agricultural employees working in the agricultural departments in the district of Tikrit, whose number is (68) employees. A simple random sample of 75% was taken, and thus the number of respondents became (51) respondents. A questionnaire was prepared to collect the data required for the research. Which included three sections. The first section included the personal factors of the respondents. The second section included (20) factors representing that caused the pollution in the agricultural environment, while the third section included (15) paragraphs representing methods of treatment the pollution of the agricultural environment. Several statistical methods were used to achieve the goals such as (ssps program, range, average and frequencies). The results showed that the size of the pollution of the agricultural environment is large and tends to average from the point of view of the respondents, as it was found that there is a significant difference in the averages of the categories of most of the studied factors. The researcher concluded the importance of treatment the causes of pollution and reducing its impact to maintain the growth and productivity of cultivated crops, and the need for the respondents to be exposed to modern sources of information about the risks of environmental pollution and methods to treat it, to enable them to take appropriate measures to reduce the impact of pollution in their work area. The researcher recommends reducing the activities that cause pollution of the agricultural environment and increasing the sources of information for agricultural extension workers to familiarize them with the causes and risks of environmental pollution and methods to treat it.

Keywords. Environment, Pollution, Agricultural Employees.

1. Introduction

Humans are the most important production factor in bringing about environmental change and biological natural disturbance. The environmental imbalance factors in ecosystems lie in the presence of pollutants. Global data show that they have taken upon themselves [1]. And he has modern man



rushed feverishly towards satisfying his needs with the available technical means, which led to confusion of the ecosystem at the local and global levels by the depletion of resources and wealth and threatened with the most dangerous consequences as a result of the accumulation of residues and waste, which prompted scientists, researchers and thinkers to ring alarm bells loudly, so that man slows down His impulsiveness, and his preservation of natural resources [2]. Despite the benefits of the industrial revolution, it came at the expense of man, as it caused air pollution. Because of the escalation of harmful gases and toxic fumes, due to car exhausts, which causes significant air pollution, and with the increase in population, we find that the water has become polluted to a large extent, as the wrong habits of man such as dumping factory waste, sewage waste, and hospital waste in Water and soil pollution occurs because farmers use fertilizers, hormones and pesticides in abundance [3].

The present time is characterized by scientific and technological development, but it is afflicted with serious environmental problems due to the environmental crisis arising from the environmental deterioration resulting from several forms of pollution, the depletion of natural resources due to the rapid rate of energy consumption and environmentally harmful, the loss of families due to industrial, urban and agricultural expansion, and the loss of environmental communities due to Excessive use of toxic pesticides and herbicides, loss of many plant species and deforestation [4].

Air, water and soil pollution has become a threat to human, animal and plant life in the living space of the world in general and Iraq in particular. Given the relationship of human well-being with the surrounding environmental factors, and based on the need to optimally develop and exploit nature's resources, it is necessary to reconsider how to deal with the environment and develop sound planning for its exploitation. its resources in a studied manner, and that wasting or depleting it in the future is more dangerous to growth and sustainable development, and then the disruption of the ecosystem and the consequent negative effects on the living world [5].

Agriculture has, at present, turned into a complex industry in which multiple forces interact, the first of which is the man who practices agriculture, and the second is related to nature and the factors affecting it, such as land, water, air, etc. [6] quoting [7].

Studies indicate that most of the agricultural risks occur due to climatic changes in addition to the human impact on the form of land exploitation, such as increasing the use of pesticides and chemical fertilizers beyond the recommended rates, cutting down forest trees, and other forms of changing the natural environment of the earth [8].

Where man causes negative changes in the environment through misuse and management of natural environmental resources, such as causing poisoning of agricultural products by excessive use of both pesticides and fertilizers, and the occurrence of water scarcity as a result of bad use of environmental resources [9].

The issue of exposing the agricultural environment to risks and crises is one of the most important issues at the present time, such as food shortages, water scarcity, misuse of available resources, and environmental pollution. Developed and developing countries of the world have begun to pay special attention to agricultural risks and the damage they cause to the environment and the national economy since the second half of the twentieth century. So local and international organizations held seminars and conferences in order to protect the environment and humans from these dangers to increase the degree of their damage, as they became a threat to the life of all living creatures on the planet, especially humans [10].

For this reason, many conferences and seminars on agricultural extension were held, which emphasize diversifying the areas of agricultural extension work to include, in addition to agricultural production, both plant and animal, other fields, including farm management and environmental extension.[2 previous source].

In the field of protecting the rural environment from pollution, agricultural extension uses many extension methods with the aim of disseminating new information and ideas among farmers to bring about desired behavioral changes in farmers' knowledge, skills, attitudes, and abilities. And their attitudes and abilities [11].

One of the most important duties of agricultural extension to deal with agricultural risks and crises is to provide the planning requirements of information, accurate statistical data, extension devices and

aids, determine an adequate budget, set priorities among the goals to be achieved, predict difficulties, prepare for problems and crises before they occur, and how to deal with them when they occur ,[12].

Most important problems that hinder the work of the agricultural extension system from facing agricultural risks are the lack of agents and experts in the field of facing agricultural crises and risks, and the lack of visits of the extension to the agricultural field to provide advice on ways to deal with agricultural risks [6 previous source].

It has been shown that field clarification is the most effective method for farmers' knowledge of methods of protecting the rural environment. One of the most important suggestions of farmers to protect their environment from pollution is the state's assistance to farmers in getting rid of agricultural and household waste, limiting the use of pesticides, and not burning agricultural waste in the ground [13]. Important role of agricultural extension is to educate farmers and raise their interest in environmental issues and their expected effects on both water resources and the natural properties of the land and increase water and environmental awareness to maximize the use of soil and water resources at the field level and solve environmental problems and sources of pollution that affect water quality, soil quality and agricultural production [14].

The problems that the Iraqi environment suffers from were due to natural, human and technological pollutants that came after several wars that it was exposed to, as it is necessary to raise citizens' awareness of the importance of preserving the environment and protecting it from pollution through environmental awareness and treatment of pollutants of all kinds, including commercial, industrial, medical and agricultural [15]. And count the disaster of the fire of the General Company for Al-Mishraq Sulfur, which occurred on 23/6/2003 and lasted for about a month, is considered the largest incident of abnormal emission of SO₂ gas that is harmful to humans and the environment. Iraq to a number of countries, including Syria, Turkey, Iran and Azerbaijan, and to the farthest point in the Arabian Gulf, at a distance of approximately 1350 km [16].

Agricultural environment in Salah al-Din governorate is exposed to many pollution factors, including the spread of desertification, lack of rain, uprooting trees for use as fuel, and overgrazing, which caused soil erosion from vegetation and made the governorate exposed to many dust storms, and air pollution by gases from oil refineries and industries Chemicals and the frequent fires that occur in the oil fields of Ajil and Alas, located in the east of the governorate, negatively affect the agricultural environment.

To find out the size and causes of pollution of the agricultural environment in the district of Tikrit Salah al-Din Governorate and ways to treat it from the point of view of agricultural employees. The problem of the research was to answer the following research questions:

- What is the extent of pollution of the agricultural environment from the point of view of the respondents in Tikrit district | Salah addin province?
- Is there a significant difference in the respondents' viewpoints according to the personal factors represented in (age, gender, academic achievement, number of years of service, work location, information sources communication)?
- What are the ways to treat the pollution of the agricultural environment from the point of view of the respondents ?

1.1. The Objective Research

- Determining the size of the agricultural environment pollution from the point of view of the respondents in Tikrit district.
- Determining the difference in the respondents' viewpoints about the pollution of the agricultural environment according to the personal factors represented in (age, gender, educational attainment, number of years of service, work location, information sources communication).
- Arrangement of methods treat the pollution of the agricultural environment from the point of view of the respondents in descending order.

1.2. Statistical Hypotheses

- There is no significant difference between the averages of the categories of respondents according to age.
- There is no significant difference between the averages of the respondents according to gender.
- There is no significant difference between the averages of the categories of respondents according to academic achievement.
- There is no significant difference between the averages of the categories of respondents according to the number of years of service.
- There is no significant difference between the averages of the categories of respondents according to the work location.
- There is no significant difference between the averages of the categories of respondents according to the sources of information on pollution.
- Procedural definitions: Pollution: It is the introduction of polluting materials into the environment that cause disturbances in the form and nature of air, water and soil. Pollutants may also include chemicals or natural substances that have been transformed into substances that harm the environment.
- The agricultural environment: it is the space in which the plant lives and obtains the elements for its growth and survival from it. It is known that the agricultural environment depends on three components: water, air and earth. Agricultural employees: employees who work in the agricultural departments in Tikrit district and hold an agricultural scientific qualification.

2. Materials and Methods

2.1. Research Methodology

The descriptive approach used to achieve the objectives of the research, and one of its advantages is that it gives accurate real information that helps explain social phenomena accurately [17].

2.2. Research Area

Tikrit district was chosen as an area to conduct the research because there are a number of agricultural departments in the district and a large number of agricultural employees work in it, and the agricultural environment is exposed to many factors that cause pollution of the agricultural environment.

2.3. Research Community and Sample

The research community included all agricultural employees working in the agricultural departments in Tikrit district. The research sample included 75% of the total number of employees, as shown in Table 1.

Table 1. Shows the research community and sample.

N	The Office	The research community	The research sample
1	Directorate of Agriculture Salah al-Din	44	33
2	Agricultural Research Center	12	9
3	Division of Agriculture Tikrit	8	6
4	Guidance center	4	3
	Total	68	51

2.4. Preparing the Questionnaire

After examining the sources and research related to the subject of pollution, a questionnaire consisting of three sections was prepared. The first section included the personal factors of the employees represented in (age, gender, educational attainment, number of years of job service, place of work, and sources of information about pollution). The second section included the causes of

environmental pollution, and it included (20) factors that could cause pollution to the agricultural environment. The third section included (15) phrases that could constitute a solution to the pollution of the agricultural environment in the research area.

After preparing the form in its initial form, it was presented to experts in the field of agricultural extension, soil and protection at the University of Tikrit, and experts in agricultural extension at both the University of Mosul and Kirkuk. The wording of some paragraphs has been modified in the light of the experts' opinions.

2.5. Measuring Search Variables

- Age: It was measured by the number of years of age of the respondent when collecting data.
- Gender: It was measured through the two alternatives (male and female), and the values (2 and 1) were given, respectively.
- Education attainment: It was measured through the alternatives (Agricultural Preparatory School, Agricultural Institute, College of Agriculture, Master of Agriculture, PhD in Agriculture), and values were given (1, 2, 3, 4, 5), respectively.
- Number of years of service: It was measured by the number of years that the respondent spent in the job.
- Place of work: It was measured through the alternatives (Agricultural Division, Directorate of Agriculture, 5-Extension Center, Agricultural Research Department). The values (1, 2, 3, 4) were given, respectively.
- Sources of information about pollution: It was measured through (6) sources from which the respondent could obtain information about the pollution of the agricultural environment. Alternatives were placed in front of each of them (always, sometimes, rarely, never contact). Values were given (0, 1, 2, 3). Thus, the values expressing this variable are limited between (0 - 18).

2.6. Statistical Means

The SSPS program for social sciences and some other statistical methods such as range, frequency and percentages were used.

3. Results and Discussion

3.1. The First Objective: Determine the Extent of Pollution of the Agricultural Environment from the Point view of the Respondents in Tikrit District

3.1.1. Financial Data

A value expressing the size of the pollution of the agricultural environment from the point of view of the respondents is (56), and the highest value is (89), with an average of (76.73) and a standard deviation of (7.20). The respondents were divided according to their point of view on the size of pollution, and these results were presented as in Table 2.

Table 2. The respondents according to their view of the size of environmental pollution.

Class	Number	Percentage	Average volume of pollution
Few (56 - 66)	5	9.80	61.83
Medium (67 - 77)	20	39.22	73.15
Large (78 and over)	26	50.98	82.35
Total	51	100	

Table 2 shows that more than half of the respondents believe that the amount of pollution of the agricultural environment is large, followed by the average category. Therefore, the amount of pollution of the agricultural environment is described from the respondents' point of view as large and tends to be average. The reason may be the large number of pollutants in the agricultural environment and the feeling of most of the respondents of their impact on plants in the search area.

3.2. The Second Objective: Determining the Difference in the Respondents' Viewpoints about the Pollution of the Agricultural Environment According to the Personal Factors

3.2.1. Age

The ages of the respondents were between (27-60) years, and they were distributed according to the range into three categories, and to show the significant differences in the averages of the groups according to their views on the size of the agricultural environment pollution, one-way analysis of variance was used, and the results were as in Table 3.

Table 3. The results of the analysis of variance according to age.

N	Groups	Number	Percentage	Arithmetic mean	F value	P .v Value	Statistical significance
	Categories						
1	Young people (23-34)	26	50.98	76.46			
2	middle age (35-46)	22	43.14	76.77	0.122	0.885	N. S
3	The elderly (47 and over)	3	5.88	78.67			
	Total	51	% 100				

It is clear from Table -3- that ($50.0 > p.v$) therefore we accept the null hypothesis which states (there is no significant difference between the averages of the categories of respondents according to age).

3.2.2. Gender

The respondents were distributed according to gender into two categories to show their point of view on the extent of pollution of the agricultural environment in the district of Tikrit, and the category of males got the highest average, and to test the significance of the differences between the averages of the two categories, the T-test was used, and the results were as in Table 4.

Table 4. T-test results for gender categories.

N	Groups	Number	Percentage	Arithmetic mean	t value	P .v Value	Statistical significance
1	Mal	39	76.47	78.79			
2	Female	12	23.53	70.00	3.490	0.004	Sig
	Total	51	100				

It is clear from Table -4- that ($p.v < 0.05$), therefore we reject the null hypothesis and accept the alternative hypothesis which states (there is a significant difference between the average categories by gender) and in favor of the male category, and the reason for this may be that male employees go out to the fields more of females, which makes them feel the pollution of the agricultural environment and its impact on plants.

3.2.3. Educational Attainment

The respondents were distributed according to their educational attainment into five categories, and to identify the differences in their views on the size of the agricultural environment pollution. One-way analysis of variance. The results are as shown in Table 5.

Table -5- shows that ($p.v < 0.05$) as it reached (0.000), so we reject the null hypothesis which states (there is no significant difference between the averages of the categories of respondents according to academic achievement). The doctorate has the highest average volume of pollution. The reason may be that the employees who have a high scientific qualification have more knowledge of the sources of pollution of the agricultural environment and are aware of the dangers of that pollution, which makes them feel the large size of the problem of pollution on the agricultural environment.

Table 5. The results of the analysis of variance according to the categories of academic achievement.

N	Groups	Number	Percentage	arithmetic mean	F value	P .v Value	Statistical significance
1	Agriculture preparatory	7	13,725	67.00	8.916	0.000	Sig
2	agricultural institute	3	5.882	75.33			
3	College of agriculture	20	39.215	75.95			
4	Master of Agriculture	13	25.49	79.31			
5	Agriculture Ph.D	8	15.686	83.50			
	Total	51	% 100				

3.2.4. Number of Years of Service

The years of functional service for the respondents were confined between (3-25) years, and they were distributed into three categories. To demonstrate the significant differences between the averages of the categories of years of service, one-way analysis of variance was used, and the results were as shown in Table 6.

Table 6. Shows the results of the variance analysis according to the years of service.

N	Groups	Number	Percentage	Arithmetic mean	F value	P .v Value	Statistical significance
1	Few (3-10) years	24	47.05	76.29	0.252	0.778	N . S
2	Medium (11-18) years	20	39.22	77.60			
3	long (19-26) years	7	13.73	75.71			
	Total	51	% 100				

It appears from Table -6- that ($50.0 > p.v$) therefore we accept the null hypothesis which states (there is no significant difference between the averages of the categories of respondents according to the years of functional service).

3.2.5. Work Location

The respondents were distributed according to the work site into four categories, and to show the significant differences in the average volume of pollution of the agricultural environment in the research area, one-way analysis of variance was used, and the results were as shown in Table 7.

Table 7. shows the results of the variance analysis by job site categories.

N	Groups	Number	Percentage	Arithmetic mean	F value	P .v Value	Statistical significance
1	Tikrit Agriculture Division	6	11.77	68.83	4.549	0.007	Sig
2	Saladin Agriculture Directorate	33	64.70	76.82			
3	Extension Center in Salah al-Din	3	5.88	77.00			
4	Agricultural Research Department	9	17.65	81.56			
	Total	51	% 100				

Table 7 shows that ($p .v < 0.05$), reaching (0.007), so we reject the null hypothesis, which states (there is no significant difference between the averages of the categories of respondents according to the work location). The reason may be that the employees in the Agricultural Research Department grow some crops to conduct research on them and the impact of those crops on pollutants in the environment, especially dust, which makes them feel the magnitude of this phenomenon more than other employees in other agricultural departments.

3.2.6. Information Sources Communication

The values expressing contact with information sources were limited to (7-17) numerical values. The respondents were divided into three categories according to their contact with information sources. To show the significant differences between the averages of the groups, one-way analysis of variance was used, and the results were as shown in Table 8.

Table 8. Shows the results of the variance analysis according to the categories of communication information sources.

N	Groups	Number	Percentage	Arithmetic mean	F value	P .v Value	Statistical significance
1	Few (7-10)	15	29.41	69.87	21.303	0.000	Sig
2	Middle (11-14)	16	31.37	76.81			
3	Large (7 - 17)	20	39.22	81.80			
	Total	51	% 100				

It is clear from Table -8- that ($p .v < 0.05$) as it reached (0.000), therefore we reject the null hypothesis which states (there is no significant difference between the averages of the categories of respondents according to the sources of information on pollution. The reason may be that the employees who have more contact With the sources of information on environmental pollution, they can know the causes of pollution of the agricultural environment and note its effect on plants.

3.3. Third Objective: Arranging Ways to Address the Pollution of the Agricultural Environment from the Point of View of the Respondents in Descending Order

Pollution treatment methods were arranged from the point of view of the respondents in descending order according to the arithmetic mean, and the results were as shown in Table 9.

Table 9. Shows the order of ways to treat pollution in descending order.

N	Paragraph	Average	Rank
1	Burning waste in incinerators	3.46	1
2	Reducing industrial activities that cause pollution	3.41	2
3	Using solar energy instead of diesel fuel to operate irrigation pumps	3.40	3
4	Afforestation and increase green spaces	3.39	5.5
5	Throwing waste in designated places	3.39	5.5
6	Use organic fertilizers instead of chemical fertilizers	3.36	6
7	Plant pest-resistant crop varieties	3.34	7
8	Fire control and treatment of its causes	3.27	8
9	Use natural pest control	3.21	9
10	Preserving environmental diversity	3.10	10.5
11	Recycling agricultural and industrial waste	3.10	10.5
12	Treating wastewater before using it for irrigation or returning it to rivers or ponds	2.90	12
13	Use paper bags instead of plastic	2.81	13
14	Bury excess pesticides in the soil	2.60	14
15	Do not leave plastic containers in the field	2.56	15

Max value = 4

Fire control and treatment of its causes

Table 9. shows that the averages of the paragraphs indicate that all the paragraphs reduce the impact of pollution on the agricultural environment, and that the paragraph (burning waste in incinerators)

ranked first with an average of (3.56). divorce, while the paragraph (not leaving plastic containers in the field) ranked last with an average amount(2.56), The reason may be that the farmers feel the danger of leaving the containers in the field, which makes them collect these containers or bury them because they affect the agricultural operations in the next season and not leave them in the field, which reduces the risk of their impact on the pollution of the agricultural environment.

Conclusions

- The results showed that the amount of pollution of the agricultural environment is large and tends to be moderate from the point of view of the respondents. We conclude from this the importance of treatment the causes of pollution and reducing its impact to maintain the growth and productivity of crops grown in the research area.
- The results showed that there is a significant difference in the views of the respondents according to the sources of information. We conclude from this the need for the respondents to be exposed to modern sources of information about the risks of environmental pollution and methods to treat it, to enable them to take appropriate measures to reduce the impact of pollution in their work area.
- The results showed that there was a significant difference in the viewpoints of the respondents according to the work location. We conclude from this the importance of conducting research experiments in the demonstration farms to clarify the impact of pollution of the agricultural environment and for the farmers to visit those pilot farms to witness the impact of pollution on agricultural crops in their work area.
- The results showed that the paragraph (burning waste in incinerators) ranked first in ways to address the pollution of the agricultural environment from the point of view of the respondents in the research area. We conclude from this the importance of controlling gases and smoke clouds that cover the research area due to burning waste in the open air.

Recommendations

- Reducing activities that pollute the agricultural environment.
- Increasing the sources of information for agricultural extension agents to inform them of the causes and risks of environmental pollution and methods to treat it.
- Reducing the causes of environmental pollution in agricultural operations, such as using solar energy instead of diesel fuel, and reducing the use of pesticides and chemical fertilizers.
- Collecting waste in designated places and burning it in incinerators to reduce the withdrawal of gases into the atmosphere

References

- [1] Gharaibeh ,Khalif Mustafa ,(2010), Environmental pollution: its concept, forms, and how to reduce its danger, Journal of Environmental Studies, Volume 3: 121-133. June. 2010.
- [2] Awad, Abdel-Aziz Abdel-Hamid, (2022), Environmental Extension, Omar Al-Mukhtar Al-Bayda University – Libya..
- [3] Abdel Hamid, Randa, (2021), environmental pollution and its types. <https://mqaall.com/research-environmental-pollution/>
- [4] Appannagar, Ramamohana reddy,(2017) ,Environmental pollution causes and consequences , North Asian International Research Journal of Social Science & Humanities ISSN: 2454-9827 Vol.(3), Issue (8), 2017.
- [5] Al-Yasiri, Ahmed Jassim and Ibrahim Jassim Al-Yasiri, (2021), environmental pollution in Iraq after a year (2003), challenges and ways of treatment, Al-Huda Foundation for Strategic Studies.
- [6] Abu Al-Anein, Mustafa Abdel-Hamid, Abu Muslim Ali Shehata, and Abu Zaid Al-Qarqari, (2019), Evaluation of the role of agricultural extension in facing agricultural risks from the point of view of farmers in Ismailia Governorate.
- [7] Omar, Ahmed Mohamed, (1992), Contemporary Agricultural Extension, Egypt for Scientific Services, Cairo.

- [8] Abu Hadid, Ayman Farid, (2010) Climate Change and its Impact on the Agricultural Sector in Egypt, Gaining Confrontation, General Administration of Agricultural Culture, Technical Administration of Agricultural Culture, Technical Bulletin No. (9) 2010.
- [9] Abu Zaid, Muslim Ali Shehata, (2014), the role of agricultural extension programs in facing agricultural risks, the twelfth conference of the Scientific Association for Agricultural Extension for the period (11-14, 12, 2014), Cairo.
- [10] Fadlallah, Salah Ali, (2001), environmental pollution and its impact on agricultural economic development, Assiut Journal of Environmental Studies, No. (20). Assiut 2001.
- [11] Al-Shawadfi, Mahmoud Attia, (2003), recent research trends for agricultural extension in the field of environment, Faculty of Agricultural Sciences, Arish, Suez Canal University.
- [12] Al-Qarali, Hassan Abdel-Rahman, (2006), Indicative planning to face the risks of birds, a symposium on the bird flu crisis, Ismailia.
- [13] Rakha, Wissam Gamal Ahmed, Ibrahim Muhammad Shalaby, Muhammad Muhammad Khader Al-Sayed, and Magda Abdullah Abdel-Al. (2019), the effectiveness of some extension methods on farmers' knowledge of methods to reduce pollution of the rural environment in Sharkia Governorate.
- [14] Saqr, Islam Hassan Ibrahim, (2014), Farmers' adoption of some agricultural innovations to counter the effects of climate change in some villages of the new lands in Nubariya, Beheira Governorate, PhD thesis, college of Agriculture, Alexandria University.
- [15] Razouqi, Ibtihaj Majid, and Raed Saleh Ali, (2022), Environmental Pollution in Iraq, Journal of Governmental Legal Sciences, Diyala University, Volume 11, Number 1. DOI: <https://doi.org/10.55716/jjps.2022.11.1.2.3>
- [16] Abdul-Jabbar, Musab and Abdul-Baqi Tamr ,(2019), The environmental effects resulting from the sulfur burning disaster in the General Company for Al-Mishraq Sulfur in Mosul, Iraq, Iraqi Administrative Sciences Journal, Volume 3, Issue 2, 2019.
- [17] Al-Mahmudi, Muhammad Ali Sarhan, (2019), Scientific Research Methods, 3rd Edition, Dar Al-Kutub, Republic of Yemen, Sana'a.