

Determinants of environmental behavior for farmers from the needed knowledge for the sustainability of the rural ecosystem through the safe use of agricultural pesticides in Salah al-Din Governorate / Iraq

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ABSTRACT

The research aimed to identify the level of Determinants of environmental behavior for farmers from the needed knowledge for the sustainability of the rural ecosystem through the safe use of agricultural pesticides in Salah al-Din Governorate / Iraq as a dependent variable, as well as on the characteristics of the studied personality variables of the respondents (age, some educational qualification, agricultural holding area, social participation, exposure to sources Information, participation in agricultural extension activities), determining the relationship between them and the dependent variable, as well as identifying the level of knowledge needs according to the fields of research, which is a method for an idea appropriately when preparing them, preventing the risk of pesticides being damaged when used, and how to store pesticides appropriately upon receipt. The field survey was used using the questionnaire form after ensuring its consistency and validity in achieving the research objectives and collecting data through a personal interview, and the number of registered farmers was 1,146 farmers to grow multiple crops, and a regular random sample of 10% of the comprehensive research was taken, so the research sample reached 115 respondents, and data were collected. During December 2021, the researchers used some statistical tools in analyzing the data, such as the arithmetic mean, the standard deviation, and the tabular display in frequencies and percentage to display the results, as well as the "t" test, the chi-square test, and the concordance coefficient. The most important results of the research were that there are high knowledge needs that accounted for 59.13% in determinants of environmental behavior for farmers in the sustainability of the ecosystem in the countryside through the safe use of agricultural pesticides in Salah al-Din Governorate / Iraq. There are knowledge needs in the fields of research when using the safe use of agricultural pesticides. The problems faced by farmers from weak control and control of pesticides in the areas studied, and the research recommends the need for attention by the concerned state agencies regarding agricultural pesticides in their use, circulation, import, sale, and locally manufactured safely by all users due to their effects on human health and environmental pollution.

Keywords: environmental behavior of farmers, knowledge needed, for agricultural pesticides, Iraq.

Introduction

Development is one of the goals that all state agencies strive to achieve to reach a better future to contribute to the welfare of citizens. The concept of sustainable development is the optimal

utilization of agricultural resources, human and material energies, including information, data, and knowledge that residents have on the agricultural development process, including dealing with the rural family with the agricultural environment to get rid of agricultural waste polluting the environment and its containment of agricultural chemical pesticides residues and to convert and recycle them from a neglected amount. A value for him, to an added value that increases the agricultural income (Al-Emadi, 2019). And that the issue of protecting the rural environment is one of the most important issues that emerged in the modern era, and it occupied a prominent place among the issues of sustainable development, as a result of the constant pursuit of agricultural development in both its horizontal and vertical parts. And chemical fertilizers) and the rational use of irrigation water, and the wrong method for disposing of agricultural waste, which leads to pollution of the environment in general and the rural environment in particular, in addition to the deterioration of its resources (Al-Hamdany and Amin, 2021). Interest in the problem of environmental pollution has increased after the increase and diversity of pollution sources, and the effects of pollution on human health, animal and natural resources are revealed, and then develop that emphasizes environmental aspects has become a modern trend, and a logical alternative to development in its traditional sense, which focuses on economic aspects. Without taking into account the environmental aspects and the needs and aspirations of the present and future generations, while stopping the irrational depletion of renewable or non-renewable natural resources (Zarqa and Amal, 2009). And that the agricultural sector has a great impact in the field of environmental pollution through organic waste caused by fields and farms in the form of animal waste, materials for washing animals and their residues, as well as plant waste, fertilizers and chemical pesticides, and that the use of chemical pesticides in developing and developed countries alike is a major and dangerous source in The events of a part of the problem of environmental pollution and its exacerbation during the last five decades in particular, as the human being will be the main target of being infected with various and dangerous diseases and this is a necessity that is of exceptional importance to develop solutions and treatments and reduce these toxins and reduce their impact on the person and his vital environment (Al-Qurayshi, 2015). Agricultural pollutants such as pesticides that are used for crops by spraying or washing water and the composition and toxicity of these complex materials lead to major contamination of water sources. Moreover, the difficulty of their decomposition or disintegration increases the risk of these materials, and the use of water in old ways also leads to Or conventional, such as flooding or excessive use of water, with the misuse of agricultural pesticides and fertilizers, to increase its concentration in groundwater, if a scientific agricultural drainage system is not available (Arslan et al., 2016).The agricultural extension can have a major role in preserving the environment from pollution, as it is one of the educational bodies operating in the countryside through its role that is not limited to increasing agricultural production, but also to the development, maintenance, and good independence of natural resources, including preserving the agricultural environment from pollution. This is done by spreading sound environmental awareness among rural people by providing them with sound environmental concepts, knowledge, practices, skills, and values that enable them to make good use of environmental resources (Zidan, 2010).The environmental

behavior of farmers is human behavior with its three cognitive, attentional, skillful, or executive components in the field of protecting the rural environment with its three components: land, water, and air from pollution (Al-Hamdany, 2020). He pointed out that in the tremendous development in industrial technology and the competition between countries to join the development of civilization, environmental changes occurred and changes in human behavior and food habits that he inherited from his ancestors, which made the current human being surrounded by a set of risks that affect him and his food, including the risks resulting from environmental pollution resulting from extravagance. On the unsafe use of agricultural pesticides (Abd al-Salam, 2012). There is a multiplicity of opinions about pesticides, as some considered them one of the pillars of agricultural production and the preservation of all environmental health. We find that some see them as a frightening ghost that has cast a fatal delusion on the environment and people, and thus pesticides remain a "double-edged sword" that needs more research to benefit from their advantages and avoid their dangers (Al-Ahram Agricultural Journal, 2009). Therefore, the use of pesticides has become an important issue that occupies the minds of many specialists in pest control and has taken great importance due to its harmful effects on the environment and human health (Al-Hamdany, 2020). And that all agricultural pesticides are toxic compounds to humans and animals, and that they varied in their degree of toxicity, but it is mentioned that because the pests cause severe losses to crops, which may reach more than 30% of production, the excessive use of pesticides has been carried out in unsafe ways (Abdel Aal, 2012). In achieving its objectives, agricultural extension depends on planning programs and implementing extension programs based on identifying the actual knowledge needs of the farmers' public, using extension methods appropriate to them (Omar and Marzban, 2017). Cancer kills more than half a million Americans every year, and this disease comes in second place among the causes of death there, what do you think in developing countries, the wrong agriculture, and the unsafe agricultural product in its components because it contains a high percentage of toxic and harmful chemicals to health Wrong food behavior, poor selection of food foods due to their unfitness and the nature of the energy they contain, all of this is behind the spread of cancer and other diseases that are no less dangerous (Keshta, 2013). Human behavior is the main factor that determines the method and method of dealing with the environment and the exploitation of its resources, and accordingly, human well-being and achieving a measure of development depend primarily on his good handling and management of the environment and it's various systems (Suleiman, 2013). Pesticides have certain conditions when they are used so that there is no harm to crops and thus a human injury, which is to store the pesticides far from food and the reach of humans and animals, and to keep the pesticides in the original packages and to be tightly sealed and to have the name of the pesticide clear on it, and in the case of excrement Of the pesticide residues, it must be poured away from the crops, and the empty containers should be buried, and adherence to the instructions when using pesticides according to the quantities, dates, and number of times scientifically recommended (Ghaylan, and others, 2018). Given that the farmer is the one who deals directly with pesticides in all agricultural operations and crops, as well as inside the greenhouse, his education and rationalization of correct use methods, and his training in safe handling and awareness of how to

avoid its dangers is one of the vital and effective matters in the field of avoiding the harmful effects of pesticides as much as possible on humans. And animal and environment, and that agricultural extension can play an effective role to educate and educate farmers and persuade them to practice the correct methods and determine their behavioral needs with the cognitive aspect of the correct use of agricultural pesticides (Sukar, and Abu Al-Khair, 2015). From here, the problem of this research is centered in an attempt to determine the level of determinants of environmental behavior in the knowledge needs of farmers when using the safe use of agricultural chemical pesticides for the sustainability of the ecosystem in the countryside.

OBJECTIVES

The first objective: To describe the independent variables studied for the respondents in the determinants of the environmental behavior of farmers from the knowledge needs for the sustainability of the rural ecosystem through the safe use of agricultural pesticides.

The second objective: To identify the level of determinants of environmental behavior for farmers from the knowledge needs for the sustainability of the rural ecosystem through the safe use of agricultural pesticides.

The third objective: To identify the level of determinants of environmental behavior for farmers from the knowledge needs for the sustainability of the rural ecosystem through the safe use of agricultural pesticides according to the research fields.

Fourth Objective: Determine the relationship between the level of determinants of the environmental behavior of farmers from the cognitive needs of the sustainability of the ecosystem in the countryside through the safe use of pesticides and between each of the personal variables studied (age, educational qualification, agricultural holding area, social participation, exposure to information sources, and participation in extension activities Agricultural).

Fifth Objective: Identify exposure to information sources that have an impact on the determinants of the environmental behavior of farmers from the knowledge needs for the sustainability of the rural ecosystem through the safe use of agricultural pesticides.

Sixth Objective: Identify the most important problems that face the respondents when using agricultural pesticides safely.

Statistical hypothesis:

There is no significant relationship between the determinants of the environmental behavior of farmers from the cognitive needs of the sustainability of the rural ecosystem with the safe use of agricultural pesticides and between personal variables (age, educational qualification, agricultural holding area, social participation, exposure to information sources, and participation in extension activities Agricultural).

MATERIALS AND METHODS OF WORK:

1. Search area

The governorate of Salah al-Din, which is geographically located in the center of Iraq north of Baghdad, was chosen to conduct the study, due to the distinctive features that this governorate

bears in terms of the cultivation of various crops. A year of agriculture, and it ranks first among the Iraqi provinces in terms of wheat production, as well as all kinds of fruits and crops are grown in it. 24,363 km², containing 7 agricultural divisions.

2. Form numbers

A questionnaire form was prepared to achieve the objectives of the research (Bassiouni, 2010). It consisted of two parts. The first part was to measure the independent variables of farmers (personal variables) as follows:

1-Age: It was measured by the number of years to the nearest year at the time of the research.

2-Educational qualification: This variable was measured by asking the respondent about the number of years of his education, and a score of zero was given to those who were illiterate, and 2 scores were given to those who read and write, and 3 degrees for primary, 4 degrees for intermediate, and 5 degrees for intermediate education, 6 degrees for post-intermediate education, and 7 Degree for higher education.

3-Area of agricultural holding: It was measured by the crude number of the area owned by the farmer (the one surveyed in dunums).

4-Degree of social participation: This variable was measured by asking the respondents about the extent of its participation in six social organizations present in the governorate, which are the local municipal council, the rural youth club, the school parents' council, the political party, the social development association, and the religious association, as scores were given (0, 1, 2, and 3) respectively according to their following answers: non-participant, ordinary member, board member, and chairman of the board of directors, and these scores were collected to express the degree of social participation of the respondent, which ranged between 0-18 degrees.

5-Exposure to sources of agricultural information: This variable was measured by asking the respondents about the sources from which they derive their information regarding the best and safe use of pesticides, and a score was given to each source and there were nine sources: radio programs and television program, the College of Agriculture, the Agricultural Research Department, and the Extension Center, The internet, friends and neighbors, the agricultural association, the agricultural guide, and the demonstration farm.

6-Participation in extension activities: This variable was measured by asking the respondents about participating in the activities organized by the extension organization and in the terms of extension activities. Participation values were given(0, 1, 2, 3) participation code in participation in the postcode participation in the postal code, and the attendance of days, The symbol distributes extension programs, attendance, attendance, and agricultural conferences.

The second part of the questionnaire was to measure the dependent change by asking the respondents 36 questions related to the extent of their need to know the correct, correct, and safe use of agricultural pesticides, in three areas and the first area was the method of using pesticides appropriately when preparing them. It was measured with 14 scientific recommendations and was given a score One is for the respondent who knows and zeroes for the respondent who does not know. Thus, the theoretical extent of this field has a higher degree of 14 degrees and a lower one at zero. Either the second field is the prevention of danger or harm by pesticides upon use and it

was measured with 15 scientific recommendations and one score was given to the respondent who knows and zero for the respondent who does not. It is known and thus the theoretical range of this field has an upper degree of 15 degrees and a lower degree of zero. Concerning the third field, it is the method of storing pesticides appropriately upon receipt, and it was measured with 7 scientific recommendations, and one score was given to the respondent who knows and zeroes to the respondent who does not know. Its upper grade is 36 degrees and the lowest is zero.

3-Data collection and statistical analysis tools

A field or diagnostic survey was used in carrying out the research, which is one of the branches of the descriptive approach in scientific research to access data and facts about the knowledge needs of the target at a specific time (Al-Asadi, 2008). The number of registered farmers was 1146 farmers to cultivate multiple crops, and it took a regular random sample of 10% of the comprehensive research, so the research sample reached 115 respondents. The research data was collected using the questionnaire form that was prepared and in the personal interview that had been previously tested and appropriate modifications made to it after the initial test on 20 farmers from outside the research sample to ensure its stability and validity in achieving research objectives (Kawagha, 2010).

Results

The first objective: To describe the independent variables studied for the respondents in the determinants of the environmental behavior of farmers from the knowledge needs for the sustainability of the rural ecosystem through the safe use of agricultural pesticides.

The results showed that 39.1% of the respondents fell within the age group of 46-60 years, and that 30.4% of the respondents fell within the illiterate academic qualification, and that 54.8% fell within the category of their possession of land from 2 to 5 dunums, and that 83.5% fall into low social participation, and 64.4% fall within the category of low exposure to information sources, and 87.8% fall into the category of low participation in extension activities. It is concluded that the number of elderly respondents has a high percentage and this is negatively reflected in the cognitive aspect through illiteracy is high among farmers, and social participation is low compared to the area owned by farmers, and this indicates poor communication with information sources, as well as the apparent decrease in participation in extension activities, and this indicates a weakness in the performance of the extension organization through the difficulty of identifying the knowledge needs for the sustainability of the ecosystem in the research area, as shown in Table 1.

Table 1. Distribution of respondents according to the independent variables studied in Salah al-Din Governorate.

Variables	Categories	The number and percentage of cognitive need	
		NO	N=115 %
Age	45 years old or younger	29	25.2
	46-60 years	45	39.1
	61 years and older	41	35.7
Study's Qualifications	illiterate	35	30.4

	literate	21	18.2
	Primary	5	4.3
	secondary	17	14.8
	High school	3	2.6
	universal	4	3.5
Area of agricultural holding	2 dunums or less	30	26.1
	2-5 dunams	63	54.8
	More than 5 acres	22	19.1
Social sharing	As low as 6 degrees or less	96	83.5
	Medium 7-12 degrees	11	9.6
	Elevated 12 or more	8	7.9
Exposure to agricultural information sources	Low exposure 6 degrees or less	74	64.4
	Average exposure 7-12 degrees	22	19.1
	High exposure 13 degrees or more	19	16.5
Participation in agricultural activities	Low 6 degrees or less	101	87.8
	Average 7-12 degrees	11	9.6
	Elevated 13 degrees or more	3	2.6

The second objective: To identify the level of determinants of environmental behavior for farmers from the knowledge needs for the sustainability of the rural ecosystem through the safe use of agricultural pesticides.

The results showed that the respondents' scores ranged between 12-36 degrees on the upper-level 36- and lower-zero scale, with an average of 19.23 degrees, and a standard deviation of 2.97 degrees, and 59.13% of the respondents fell into an average level of cognitive needs in Determinants of the environmental behavior of rural farmers. This result indicates the need for the extension organization to prepare indicative programs and plans directed to farmers in the field of the correct and safe use of agricultural pesticides to determine their knowledge needs in the incorrect use of agricultural pesticides, which causes harm to human health such as cancer diseases, congenital anomalies, and environmental pollution, as shown in Table 2.

Table 2. The distribution of the respondents according to the level of determinants of farmers' behavior for the cognitive needs of the sustainability of the ecosystem and its preservation from environmental pollution.

The level of cognitive need	the number	The percentage% n = 115
Low 12 degrees or less	17	14.78
Average from 13 to 24 degrees	30	26.09

High 25-36 degrees	68	59.13
Total	115	100

The third objective: To identify the level of determinants of environmental behavior for farmers from the knowledge needs for the sustainability of the rural ecosystem through the safe use of agricultural pesticides according to the research fields.

The results showed that the level of the environmental behavior determinants of the respondents from the cognitive needs for the sustainability of the environmental system in the countryside through the safe use of agricultural pesticides, that 33.14% of the respondents were at a low level in the field of using agricultural pesticides safely and appropriately when preparing them, as for 48.53% of the respondents. The respondents were at a medium level in the field of prevention of the risk of being damaged by pesticides when using, Either in the field of the method of storing pesticides appropriately upon receipt, the percentage of respondents was 52.85% at a medium level, and these results generally indicate that the level of environmental behavior determinants of farmers from the knowledge needs for the sustainability of the rural ecosystem through the safe use of agricultural pesticides was moderate, and this requires The planners of agricultural extension programs to take into account those indicators regarding how to properly store agricultural pesticides, as well as how to prevent the risk of poisoning with these pesticides, as shown in Table 3.

Table 3. Distribution of respondents according to the level of farmers' behavior determinants of the cognitive needs for the sustainability of the ecosystem and its preservation from the environmental pollution in the fields of pesticide use.

Domains	The highest degree of cognitive needs	Average cognitive needs	%Of average cognitive needs	Reality of the value of the level of cognitive needs
how can we use the pesticides in the true way when it provided	14	4.64	33.14	Low
How can we prevent the risk of the pesticides when we use it	15	7.28	48.53	medium
how can we stores the pesticides in the positive way when we receive it	7	3.70	52.85	medium
total	36	15.62	44.84	medium

Fourth Objective: Determine the relationship between the level of determinants of the environmental behavior of farmers from the cognitive needs of the sustainability of the ecosystem in the countryside through the safe use of pesticides and between each of the personal variables studied (age, educational qualification, agricultural holding area, social participation, exposure to information sources, and participation in extension activities Agricultural).

Values from the statistical hypothesis The value of the chi-square was calculated, and the correlation relationship with each other was measured, and between the dependent variable and the personal variables, and the significant relationship 0,01, and accordingly, the statistician was presented for the personal variables of the respondents, and the hypothesis accepted the alternative research whose content (there is A significant relationship between the level of determinants of the environmental behavior of farmers from the cognitive needs for the sustainability of the rural ecosystem with the safe use of pesticides and between each of the personal variables studied are(Age, educational qualification, area of agricultural tenure, social participation, exposure to information sources, and participation in agricultural extension activities), and this reflects the research perspective. There would be a benefit for farmers to reduce the gap between reality and their knowledge, as shown in Table 4.

Table 4. Calculated chi-square values and the coefficient of coexistence for the relationship between the level of cognitive needs of the respondents and the independent variables. Distribution of respondents according to the level of determinants of the environmental behavior of farmers from the cognitive needs of the sustainability of the rural ecosystem with the safe use of agricultural pesticides.

Independent variables	The value of the Calculated chi	The value of Tabular chi the	The value of the coefficient of compatibility
Age	88.098**	13.277	0.662
Educational qualification	32.766**	23.209	0.614
Area of agricultural holding	127.441**	13.277	0.720
Social sharing	54.807**	13.277	0.557
Exposure to sources of information	65.828**	13.277	0.616
Participate in agricultural extension activities	37.695**	13.277	0.509

** Significance at 0.01

Fifth Objective: Identify exposure to information sources that have an impact on the determinants of the environmental behavior of farmers from the knowledge needs for the sustainability of the rural ecosystem through the safe use of agricultural pesticides.

The results show that the number of sources of information that farmers are exposed to and which they benefit from through increasing their knowledge and skills in the safe use of agricultural pesticides. 8% of the pesticide dealer, it is clear that farmers derive their information and knowledge from informal sources, so the agricultural extension organization must try to take care of these sources and facilitate them for farmers to benefit from them, as shown in Table 5. Table 5. Sources of information that the respondents benefit from due to their knowledge need when using agricultural pesticides safely.

Information sources	the number	percentage%
Agricultural guide	43	37.4
Personal experience	48	41.7
Friends and neighbors	21	18.2
The Agricultural Society	17	14.8
Pesticide specialist	8	6.9
Informational flyers	2	1.7
Agricultural Extension Journal	5	4.3
Agricultural Research Department	7	6.1
Pesticide dealer	40	34.8

Sixth Objective: Identify the most important problems that face the respondents when using agricultural pesticides safely.

The results showed that there are some problems faced by the researched farmers when they use the safe use of agricultural pesticides, as the problem was the import of pesticides from an unknown source and there are no instructions for use, and its percentage was 93,5%, and that the problem of the presence of pesticides not suitable for use in the market by traders came second. In terms of importance, its percentage was 90.4%, and the rate of 89.6% is the problem of the lack of demonstration farms to establish demonstration fields that educate farmers about the field of pesticides use, prevention, and storage, The rate of 86.1% is the problem of the lack of agricultural brochures and magazines that are concerned with agricultural pesticides, as evidenced by the absence of regulatory bodies in the process of importing, producing, and testing pesticides and knowing their suitability for use, their pests from environmental pollution and pathogens to humans, and the weakness of the extension organization on the other hand, As shown in Table 6. Table 6. The problems that respondents face when using agricultural pesticides safety.

the problems	the number	%N = 115
Lack of experience with agricultural extension agents in using pesticides	67	58.3
Lack of agricultural extension programs that deal with agricultural pesticides	93	80.9

Lack of agricultural brochures and magazines that deal with agricultural pesticides	99	86.1
Weakness in the radio and television extension programs that work to educate farmers who use pesticides	90	78.1
The lack of demonstration farms to establish demonstration fields that educate farmers about pesticides	103	89.6
Weak agricultural awareness campaigns on the dangers of pesticides when used incorrectly	72	62.6
Lack of knowledge among farmers of indicative recommendations when using pesticides	88	76.5
The presence of pesticides that are not suitable for use in the market by traders	104	90.4
Import pesticides of unknown source and do not have instructions for use	107	93.5
The extension work focuses on the initiators of the farmers (large farmers.)	69	60.0

Conclusions

1- There are high knowledge needs that accounted for 59.13% in determinants of environmental behavior for farmers in the sustainability of the rural ecosystem through the safe use of agricultural pesticides in Salah al-Din Governorate / Iraq.

2- There are knowledge needs in the fields of research when using the safe use of agricultural pesticides, and the average specific knowledge needs for environmental behavior of farmers was 15.62 with a rate of 44.84%, which indicates that there is a knowledge need for farmers.

3- Determining reliance on informal methods in terms of benefiting from information sources and relying on what is circulated outside official institutions such as merchants, neighbors, and friends.

4- There are some problems that farmers suffer from, from which there is a lack of real control by the agencies that monitor importers of some of these pesticides and are not subject to quality control tests in state institutions, as well as a weakness in providing agricultural instructions through the availability of agricultural publications and magazines related to agricultural pesticides.

: Recommendations

The need for attention by the concerned state agencies about agricultural pesticides in their uses, circulation, import, sale, and locally manufactured safely by all users because of their effects on human health and environmental pollution, especially their use in all agricultural fields, plant and animal, and which cause cancerous diseases of all kinds for humans.

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