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## **The level of tomato growers' application of scientific recommendations in the district of Al-Alam / Salah Al-Din Governorate and relationship with some variables**

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**Abstract**--The research aims to measure the level of application of tomato growers of scientific recommendations in the district of Al-Alam / Salah Al-Din Governorate, as well as to find a correlation between the level of farmers' application of scientific recommendations and personal variables, namely (age, ownership of agricultural equipment, participation in extension activities, and the purpose of cultivating the crop, And sources of information about the tomato crop) as well as identifying the problems faced by the tomato crop growers in the district of Al-Alam, the research community included all the (454) farmers of the tomato crop in the district of Al-Alam. After excluding the exploratory sample of (30) farmers, a random sample of (30%) was selected, thus bringing the total number of the research sample to (127) farmers. It included a test consisting of 40 items distributed over seven areas (land preparation, planting date, method, variety selection, fertilization, irrigation, pest control, maturity, and harvesting. Several statistical methods were used to analyze the data (range, Pearson and Spearman's law, and T-test). The results showed that the level of application of the scientific recommendations by the tomato crop growers was high, tending to the average, and the problem of low crop prices at the peak of production ranked first. The researchers concluded that farmers need more extension activities that would train them on how to apply techniques for growing tomatoes. The researchers recommend that the extension system and the responsible authorities implement activities to provide farmers with the necessary information and expertise to ensure that farmers know how to apply scientific recommendations in the field of crop service, in addition to government support for tomato growers in the research area.

**Keywords**---level tomato growers' application, scientific recommendations, agricultural.

## Introduction

The agricultural sector is considered one of the most important economic and social development pillars for many developing and developed countries. Agriculture is a major source of food and provides raw materials and inputs for many industries. (Lazaar, 2015: 2). Modern agricultural techniques have played an important role in developing food security conditions, by contributing to increasing production, improving quality, and reducing production costs. These modern innovations include the use of seeds, agricultural mechanization, fertilizers, chemical pesticides, and improved animal breeds, as well as plant and animal genetic improvement, and the use of modern systems in The field of diagnosing plant and animal diseases as well as developing methods of combating them (Arab Organization for Agricultural Development, 2000: 22). The permanent shortage of food and agricultural products is often blamed on the ineffectiveness of agricultural research or poor communication between research centers, agricultural extension and farmers, because agricultural extension workers are responsible for delivering agricultural innovations to farmers (Adesoji 2012:25), and it is located on It is the responsibility of agricultural extension to identify the problems and obstacles facing farmers, identify them and transfer them to scientific research institutions and centers in order to be studied and to determine the appropriate methods to solve these problems and obstacles, as the delivery of modern technologies to producers and providing them with scientific solutions to the obstacles they face is the central goal that agricultural research bodies seek (Naseef , 2005: 1), as well as working to encourage farmers to use modern agricultural practices and adopt these agricultural practices that suit their economic and social levels (Khrshid ,2015: 164).

The production of vegetable crops has many advantages, as it is fast-growing and has a high-profit value that achieves a large and quick return, and one of the most prominent factors that increase the importance of its cultivation is giving it a product within a relatively short period from (45-120) days from the date of its cultivation, which helps to raise the level of cultivation Producers' income, and its absorption of the surplus from agricultural work during the growing season because it needs many labors (Al-Aswadi, 2013: 1).

The tomato crop is one of the main vegetable crops grown in the country because the crop is a staple food for the consumer and has a high nutritional value (Yuan *et al.*, 2001: 149-154). Tomato provides a wide range of nutrients and many health benefits to the body (Willcox *et al.*, 2003: 18). It is noted that there is a global trend to increase the area cultivated with tomatoes, as the Food and Agriculture Organization of the United Nations (2020) indicates in its statistics to increase the productivity of the unit area, as the total area of land cultivated with tomatoes worldwide is about 4.8 million hectares, with an estimated production of (162) million tons (FAOSTAT, 2020) while the production in Iraq of the tomato crop reached (123611) tons. When comparing the productivity of the crop in Iraq, with production in the world, we find that there is a significant decrease in the

productivity of the unit area and this decrease is due to several reasons, including the unfamiliarity of the farms. The Iraqi farmer used modern methods of production and the correct use of agricultural processes such as fertilization or irrigation, as well as the lack of experience of the Iraqi farmer, by choosing hybrid seeds suitable for the region and that can resist physiological and other damages (Abdulrahman, 2011: 1) as well as the abundance of the crop and its accumulation during the ripening season. The harvest and the failure to follow the correct methods of internal and external marketing, which leads to a decrease in its prices and the loss of economic farms between demand and supply, and the disparity in prices and the prolongation of their appearance in the markets (Al-Bamarti, 2008: 3). Therefore, raising the production capacity of the unit of the cultivated area can be achieved by following the correct scientific methods, in all agricultural operations to obtain the best economic return from the unit of the cultivated area (Al-Zobaie, 1985: 1). Iraq is a vegetable in general, and tomatoes, in particular, are not considered sufficient to meet the country's need for it, which is forced annually to import large and increasing quantities, from neighboring countries until Iraq became a popular and continuous market for neighboring countries, where these are attributed to many and varied factors.

For these reasons, the current research has been devoted to identifying the level of application of tomato crop growers to the scientific recommendations in the district of Al-Alam accordingly, the research problem is represented in the following questions:

1. What is the level of application of tomato crop growers to the scientific recommendations in growing the crop in Al-Alam District \ Salah Al-Din Governorate?
2. What is the correlation relationship between the level of application of scientific recommendations in the cultivation of the tomato crop and each of the agricultural variables represented in (age, possession of agricultural equipment and machinery, participation in extension activities, the purpose of cultivating the crop, sources of information when planting the crop)?
3. What are the problems that tomato crop growers suffer from in the district of Al-Alam?

### **The objectives of the research**

1. Determining the level of application by tomato growers of scientific recommendations in growing the crop in the district of Al-Alam.
2. Determining the correlation relationship between the level of application of scientific recommendations in the cultivation of the tomato crop and each of the agricultural variables represented in (age, possession of agricultural equipment and machinery, participation in extension activities, the purpose of cultivating the crop, sources of information when planting the crop).
3. Arranging the problems that tomato crop growers suffer from in Al-Alam District, Salah Al-Din Governorate.

### **Statistical hypotheses**

1. There is no significant correlation between the level of application of tomato crop growers to the scientific recommendations in the district of Al-Alam and age.
2. There is no significant correlation between the level of application of tomato growers of scientific recommendations in the district of science and the possession of agricultural equipment and machinery.
3. There is no significant correlation between the level of application of tomato growers of scientific recommendations in the district of science and participation in the extension activities of the tomato crop.
4. There is no significant correlation between the level of application of tomato crop growers of scientific recommendations in the district of science and the purpose of tomato cultivation.
5. There is no significant correlation between the level of application of tomato crop growers to the scientific recommendations in the district of science and the sources of information.

### **Definitions**

1. Application level: It is evidence that expresses the level of adoption of the recommendations and modern practices issued by the General Authority for Agricultural Extension related to the cultivation of the tomato crop to improve production in quantity and quality.
2. Scientific recommendations: They are the results of scientific research and a set of indicative recommendations that reach the tomato growers by one of the extension methods of communication, which would raise production and improve its quality.
3. Tomato crop growers: They are the farmers who cultivate the tomato crop by the open method in Al-Alam district, Salah Al-Din Governorate.

### **Materials and Methods**

#### **Search area**

Al-Alam district in Salah al-Din Governorate was chosen as an area to conduct the research, due to the presence of a large number of tomato growers, and due to the environmental conditions, that the district possesses suitable for growing the crop.

#### **Community and sample research:**

The research included all farmers of the tomato crop in the district of Al-Alam who are officially registered in the Al-Alam cultivation division, and their number is (454)<sup>12</sup> farmers. A 30% sample was randomly selected, bringing the number of respondents who were subjected to the research test (127) to farmers.

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<sup>1</sup> Division of Agriculture District Knowledge.

For the purpose of achieving the objectives of the research, a questionnaire was designed as a tool for data collection consisting of two parts. The first part included a set of personal questions related to the respondents, namely: (age, ownership of agricultural equipment, participation in extension activities, purpose of cultivating the crop, and sources of information). The second part included a test consisting of (40) paragraphs of the type of multiple tests (a test of several answers) distributed over seven main areas related to tomato cultivation, namely (land preparation, variety selection, planting date and method, irrigation, fertilization, pest control, ripening, and Genie), where the paragraphs were distributed on the research areas, respectively (5, 3, 4, 5, 8, 12, 3).

### **Measurement of search variables:**

Measurement of Independent Factors: The independent factors were measured as follows:

- 1- Age: It was measured by the number of years of age of the respondent when collecting the data.
- 2- Ownership of agricultural equipment: This variable was measured by identifying six types of agricultural equipment and machinery and putting in front of each type the alternatives (I own, I do not own) and the values were given (1, zero), and thus the values expressing this variable are limited to (zero - 6).
- 3- Participation in the extension activities for the tomato crop: It was measured through the alternatives (participant, non-participant) and the values were given (1, 0) respectively.
- 4- The purpose of cultivating the crop: This variable was measured by identifying three alternatives (home consumption, sale, and both), and the values (1,2,3) were given, respectively.
- 5- Sources of information about the tomato crop: This variable was measured by identifying (8) sources of communication through which the respondent could obtain information related to tomato production. Each source was placed in front of a graduated scale that includes four levels of communication: (always, sometimes, rarely, never call), and the following weights were given to these levels (4, 3, 2, 1) respectively, and thus the level of communication ranges between (8-32) degrees.

### **Application-level measurement**

The level of farmers' application was measured through (40) paragraphs, each of which represents a scientific recommendation in the field of tomato crop production. Three test alternatives were placed in front of each paragraph, where two degrees were given for the correct answer, one degree for the answer close to the correct one, and zero for the wrong answer or not applied and distributed the grades are on the fields of study, and thus the values that express the level of application are limited between (zero - 80).

### Measuring size problems

(11) problems have been identified that may face the tomato crop growers in the district of Al-Alam, and five alternatives have been placed in front of each of them (very large, large, medium, few, very few) and the values (5, 4, 3, 2, 1) were given on Consecutively, the size of the problem was determined through the farmers' answers by extracting the arithmetic mean for each problem.

### Statistical means

To reach the desired study objectives, many statistical methods and means were used to analyze the data, including (range, frequency distribution, percentages, Pearson and Spearman's law).

### Results and Discussion

The results were presented and discussed according to the research objectives as follows:

The first objective: is to determine the level of application of the tomato crop growers to the scientific recommendations in the district of Al-Alam / Salah Al-Din Governorate.

The results showed that the level of farmers' application of scientific recommendations in tomato cultivation was 30 - 71 degrees, with an average of (51,16), the respondents were distributed according to the range into three categories and as shown in Table (1).

Table (1): Distribution of respondents according to the level of application of scientific recommendations in the cultivation of the tomato crop

No.	Categories	Number	Percentage%	Average application
1	Low (30-43)	21	16.53	39.76
2	Medium (44-57)	82	64.57	50.69
3	High (58-71)	24	18.90	62.75
4	Total	127	100%	

It can be seen in Table (1) that almost two-thirds of farmers fall into the middle category in applying scientific recommendations. The reason may be the farmers' need for training in the use of modern technologies and knowledge of how to apply scientific recommendations in the cultivation of the tomato crop in the research area.

The second objective: Determine the correlation relationship between the level of application of the tomato crop growers to the scientific recommendations and each of the following independent variables:

1. Age: The ages of the respondents were limited to (26-55) years, they were distributed according to the range into three categories as shown in Table (2).

Table (2): Distribution of respondents by age

No.	Categories	Number	Percentage%	Average application	r
1	Juniors (26 - 35)	46	36.22	50.95	0.12
2	Middle-aged (36-45)	57	44.88	50.15	
3	Seniors (46 - 55)	24	18.90	53.95	
4	Total	127	100%		Not significant

It is clear from Table (2), that the middle-aged group constitutes the largest proportion of the respondents, and the highest level of application is in the third category. To find the correlation relationship between the two variables, Pearson's correlation law was used, and the value of the correlation coefficient was (0.12), and to test the significance of the correlation, the (t) law was used, and it was found that the relationship is not significant. Thus, we accept the statistical hypothesis that states (there is no significant correlation between the level of application of tomato crop growers to the scientific recommendations in the district of Al-Alam and Age). This result is consistent with the findings of (Ghadib, 2010) and (Al-Qaisi, 2016).

2. Ownership of agricultural equipment: The values expressing farmers' ownership of equipment were limited to (1-6). The respondents were distributed as shown in Table (3).

Table (3): Distribution of the respondents according to their possession of agricultural equipment

No.	Categories	Number	Percentage%	Average application	r
1	low (1-2)	77	60.62	50.29	0.21
2	Medium (3-4)	9	7.08	49.55	
3	High (5-6)	41	32.30	53.17	
4	Total	127	100%		Not significant

It can be seen in Table (3), that the low category constitutes the largest number of farmers and that the highest level of application of scientific recommendations is in the third category. To find the correlation between the two variables, Pearson's law was used, as the value of the correlation coefficient was (0.21). To test the significance of the correlation relationship, the law (t) was used and it was found that the relationship is not significant. Thus, we accept the statistical hypothesis that states (there is no significant correlation between the level of application by tomato growers of scientific recommendations in the district of Al-Alam and the ownership of agricultural equipment and machinery). This result is consistent with the findings of (Ghadeeb, 2010) and (Al-Qaisi, 2016).

3. Participation in the extension activities for the tomato crop: The respondents were distributed according to their participation in the extension activities as shown in Table (4):

Table (4): Distribution of respondents according to participation in extension activities

No.	Categories	Number	Percentage%	Average application	r
1	Participant	38	29.92	55.69	0.34
2	Not participating	89	70.08	49.23	
4	Total	127	100%		

\*\* indicates that the relationship is significant at the 0.01 level.

Notes from Table (4), the non-participant category constitutes the largest proportion of the respondents and the highest level of application of scientific recommendations is in the participant category. In order to find the correlation relationship between the two variables, Spearman's correlation law was used, as the value of the correlation coefficient was (0.34), and to test the significance of the correlation, the law (t) was used and it was found that the relationship was significant at the level (0.01), and thus we reject the statistical hypothesis that states (there is no A significant correlation relationship between the level of application of tomato crop growers of scientific recommendations in the district of Al-Alam and participation in extension activities for tomato crop) and this may be the reason that participation in extension activities increases agricultural information, which is reflected positively on increasing the level of their information and knowledge and thus increases the level of their application of scientific recommendations related to tomato cultivation. This result does not agree with the findings of (Al-Qaisi, 2016) and (Al-Jumaili, 2017).

4. The purpose of cultivating the crop: the respondents were distributed according to the categories of the purpose of cultivating the tomato crop, as shown in Table (5).

Table (5): Distribution of the respondents according to the categories of the purpose of cultivating the crop

No.	Categories	Number	Percentage%	Average application	r
1	Home consumption	9	7.08	44.55	0.38
2	Sale	38	29.92	47.76	
	Both together	80	63	53.52	
4	Total	127	100%		

\*\* indicates that the relationship is significant at the 0.01 level.

It can be seen in Table (5), that the third category constitutes the largest percentage of the respondents, and the highest level of application of scientific recommendations is in the third category. In order to find the correlation relationship between the two variables, Spearman's correlation law was used, as the value of the correlation coefficient reached (0.38), and to test the significance of the correlation relationship, the law (t) was used and it was found that the

relationship was significant at the level (0.01), and thus we reject the statistical hypothesis that states (there is no A significant correlation between the level of application of tomato crop growers of scientific recommendations in the district of Al-Alam and the purpose of growing tomato crop) and this may be the reason that the farmer who grows tomato crop to meet family needs and sale makes him more interested in increasing productivity for the purpose of achieving the highest profit, which makes him try to apply scientific recommendations in Cultivation of the crop and this result does not agree with the findings of (Al-Qaisi, 2016) and (Al-Jumaili, 2017).

5. Sources of information on the tomato crop: The results showed that the values expressing the level of farmers' contact with information sources were confined between (12-28), and the respondents were distributed according to the range into three categories as shown in Table (6).

Table (6): Distribution of respondents according to contact with information sources

No.	Categories	Number	Percentage%	Average application	r
1	Low (12-17)	21	16.53	47.09	0.19
2	Medium (18 - 23)	77	60.62	51.83	
	High (24-more than)	29	22.85	52.34	
4	Total	127	100%		

\*\* indicates that the relationship is significant at the 0.05 level.

It can be seen from Table (6). The second category constitutes the largest proportion of the respondents, and the highest level of application of scientific recommendations is in the third category. In order to find the correlation relationship between the two variables, Spearman's law was used, as the value of the correlation coefficient reached (0.19), and to test the significance of the correlation relationship, the law (t) was used and it was found that the relationship was significant at the level (0.05), and thus we reject the statistical hypothesis that states (there is no relationship Significant correlation between the level of application of tomato crop growers of scientific recommendations in the district of Al-Alam and sources of information) and the reason may be that farmers are exposed to more than one source that makes them realize the importance of each agricultural process and know the application of most of the scientific recommendations in the service of the tomato crop. This result is consistent with the findings of (Al-Jumaili, 2014), (Al-Qaisi, 2016) and (Al-Jumaili, 2017). This result does not agree with his findings (Ghadeeb, 2010).

Third Objective: Arrange the problems faced by the tomato crop growers in the district of Al-Alam in descending order:

The problems experienced by the tomato crop growers in Al-Alam district were arranged in descending order according to the mean, and the results were as in the Table (7).

Table (7): Arranging the problems that tomato crop growers suffer from in the district of Al-Alam

NO.	The problem	Mean	Rank
1	Low crop prices at peak production	4.26	1
2	competition with imported crops	4.21	2
3	Lack of state-supported production requirements	3.95	3
4	High yield seed prices	3.62	4.5
5	High prices of chemical fertilizers	3.62	4.5
6	Fuel price high	3.53	6
7	Lack of electric power supply	3.37	7
8	Poor quality of some types of chemical fertilizers	3.32	8
9	Many pests of tomato	3.18	9
10	lack of irrigation water	3.03	10
11	Low efficiency of imported pesticides	2.78	11

Max value: 5

Table (7) shows the multiplicity and diversity of problems faced by tomato growers in the district of Al-Alam, and the problem of (low crop prices at the peak of production) ranked first among those problems. This may be due to the lack of refrigerators to preserve the crop and the absence of tomato canning plants close to the research area, in addition to opening the borders and flooding the market with the imported crop. As for the problem of (the lack of efficiency of imported pesticides), it came in the last rank and the reason for this may be due to the effect of those pesticides in eliminating pests that affect the crop.

### Conclusions

1. The results showed that the level of application of the scientific recommendations by the tomato crop growers was high, tending to the average. We conclude from this that they need more extension activities that would train them on how to apply techniques for the cultivation of the tomato crop and introduce the farmers to the scientific recommendations in the field of tomato service.
2. The results showed a significant correlation between the level of application of tomato crop growers and participation in extension activities. We conclude from this the importance of implementing agricultural activities in the farmers' adoption of modern technologies in the research area.
3. The results showed a significant correlation between the level of application of tomato crop growers and sources of information. We conclude this the importance of diversifying and increasing information sources in raising the level of respondents' application of scientific recommendations.
4. The results showed that the problem of low crop prices at the peak of production is one of the most important problems that farmers suffer from.
5. The results showed an increase in production costs due to the high prices of production requirements. We conclude from this the importance of

government support for the cultivation of the tomato crop in the research area.

### **Recommendations**

1. The necessity for the extension apparatus and the responsible authorities in Salah Al-Din Governorate to implement activities to provide farmers with the necessary information and expertise to ensure that farmers know how to apply scientific recommendations in the field of crop service.
2. Diversifying and increasing the sources of information by carrying out extension campaigns related to the tomato crop in the research area and benefiting from the Salah Al-Din satellite channel in broadcasting extension programs that are concerned with the cultivation of the tomato crop.
3. Maintaining the price of the crop by finding marketing outlets or making refrigerators to preserve the crop at the peak of production and to prevent the import of the tomato crop.
4. Providing production requirements by the Agricultural Equipment Company at subsidized prices and providing farmers with production requirements.

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