Factors Affecting Citrus Farmers' Knowledge of Climate Change and Its Effects on Citrus Trees in Qalyubia Governorate

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ABSTRACT

The research mainly aims to determine the total level of knowledge of citrus farmers about climate change, sources of knowledge and their effects on citrus fruits and the relationship of this level to some independent variables studied, as well as determining the contribution ratios of some independent variables with a significant relationship in explaining the total variation of citrus farmers' knowledge of climate changes, sources of knowledge and effects, in addition to identifying the most important information needed by a farmer citrus fruits to reduce the impact of climate change, and their most preferred sources of obtaining that information.

To achieve the objectives of this research, data were collected from a random sample of 308 farmers using a questionnaire form in the personal interview that was initially pre-tested during July 2023.

To analyze the research data statistically, simple correlation coefficient, stepwise regression analysis, percentages, arithmetic mean, range and standard deviation were used.

The most important results were summarized as follows:

- **There is a relative decline in farmers' knowledge of the effects of various climate changes that have occurred and been witnessed.**
- **There is a diversity and multiplicity of extension sources from which the surveyed farmers derive their knowledge about climate changes affecting citrus production. They rely heavily on local sources when compared to government guidance sources.**
- **There is a multiplicity of effects on citrus fruits amounting to fifty-five effects resulting from physiological, fungal and insect diseases, in addition to the multiplicity of the form of effect, most of which was negative.**
- **The research found a correlation and significant between the degree of total knowledge of citrus farmers of climate change and nine variables of the independent variables studied included in the analysis. It was also found that there are eight variables that explain about 64.5 of the total variation in the total knowledge of citrus farmers in Qalyubia.**
- **The vast majority of respondents believe that the information they need in the face of climate change is related to pesticides and fertilizers developed to combat diseases, and that the most important sources of their preferred access to this information are pesticide dealers and specialists from university professors and research centers.**

Keywords: factors, influence, knowledge, farmers, climate, changes, species.

RESEARCH INTRODUCTION AND PROBLEM

The agricultural sector is one of the sectors most affected by climate change, due to the weak features of plants and their direct contact with the climate all the time daily, seasonally and annually, where the rise in temperatures by only two degrees will cause a decrease in the productivity of the corn crop by 47%, and the high humidity in summer will reduce the productivity of the rice crop by 30%, and if the temperature increases in winter, especially during the months of January and February, the productivity of the wheat crop will decrease by 20Climate change also leads to an increase in salinization of agricultural soils, due to the increase in evaporation rates from the soil surface, which threatens salt-sensitive crops, and makes them over time unable to produce, in addition to that there are some crops such as citrus, grapes, guava and apples, which may not face a crisis in the amount of productivity as much as they face a crisis in quality due to climatic fluctuations, and the resulting damage to agricultural soil and the spread of pests, and the lack of volume and quality of water resources, as agricultural crops become less mature, and more vulnerable For damage and disease, especially during storage and transportation operations. (Amna Fayed, 2021, p. 14).

Due to the presence of the banker ranked ninety-sixth globally among all countries of the world in terms of the severity of its vulnerability to climate change according to the Jane scale in 2013 with an average of 8.2 degrees (ND-Gain Index Ranking), and this was caused by a set of factors, the most important of which is the nature of Egypt's geographical location, and the

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increase in gas emissions resulting from various agricultural and industrial activities, which caused high temperatures and change in the dates of rain or its rarity in the winter season, and the occurrence of frost or snow sometimes in recent years. In this context, adaptation to the negative effects of climate change is an imperative necessity, and from this point of view, Egypt prepared its first national strategy for climate change adaptation and disaster reduction in 2011, as well as the low-risk development strategy (LEDS) in 2018, which was prepared to be in line with the Sustainable Development Strategy (SDS) - Egypt Vision 2030. For all sectors in the country, the National Council for Climate Change (NCCC) requested the development of the first comprehensive national climate change strategy (NCCS) for Egypt until 2050. (Al-Tanoubi, 2022, p. 113).

Therefore, the Ministry of Agriculture and Land Reclamation has adopted multiple policies, procedures, programs and activities to reduce the negative effects of climate change, it has adopted several axes, including: banning the cultivation of water-hungry crops, developing varieties with low water consumption, providing early-maturing seeds, developing field irrigation, issuing guidance bulletins, conducting extension programs specialized in plant diseases and how to treat them, conducting awareness programs on the dangers of climate change, and organizing extension seminars in villages and fields on the impact of climate change on agricultural productivity. Publishing guidance recommendations that address non-traditional new practices, and working to convince farmers of the need to adopt and apply them to overcome the negative effects of climate change, especially the spread of some diseases and pests, and work to activate the role of non-traditional agricultural extension and the application of digitization in agriculture. (Al-Shazly and Asma Muhammad, 2020, p. 395).

The importance of the role of agricultural extension in this field is increasing, especially in light of the recent results and studies that resulted in a decline in the level of agricultural innovation and development due to climate change and its effects, in addition to some effective effects in combating insects and fungal and physiological diseases in fruit production, especially citrus fruits and berries, as in the studies of Abdul Salam (2015), Turki and Khattab (2016), Omran (2016), and Al-Banna (2024).

This is in addition to what the results of some studies and research indicate that there is a significant and direct relationship between farmers' knowledge of climate change and its effects as a dependent variable, and each of the following independent variables: the number of years of experience in agricultural work, the area planted withcitrus, the degree of formal social participation, the degree of informal social participation, the degree of orientation towards agricultural extension, the degree of education of the respondent, the degree of readiness for change, the degree of exposure to agricultural information sources. (Al-Banna et al., 2024). According to the above, this research was conducted to achieve the following objectives.

RESEARCH OBJECTIVES

1. Determine the total level of knowledge of citrus farmers about climate change, sources of knowledge about it, its impact and type of impact on citrus trees in Qalyubia Governorate.
2. Identify the nature of the correlation between the total degree of knowledge of citrus farmers about climate change and its effects, sources of knowledge about it, its impact, the type of impact on citrus trees in Qalyubia Governorate and the independent variables studied.
3. Identify the variables affecting the overall variation explained by the degree of total knowledge of citrus farmers about climate change, its effects, type and sources of knowledge in the study area.
4. Identify the most important information that farmers need to address climate change and their preferred sources of obtaining that information in the future.

MATERIALS AND METHODS

First: Operational Definition:

Total degree of knowledge of citrus farmers of climate changes observed This research means farmers' knowledge of the types of climate changeswitnessed, their sources of knowledge, the effects they cause, and their type on citrus trees in the study area.

Second: Research hypotheses.

To achieve the objectives of the second and third research, two general theoretical hypotheses were formulated to be mentioned in their statistical or zero form.

1. There is a significant correlation between the overall degree of knowledge of citrus farmers about climate change, sources of knowledge about it, its effects and quality on citrus trees, and among the independent variables studied (age, degree of education of the respondent, area of agricultural holding, area of tenure planted with citrus, number of years of experience in citrus cultivation, degree of formal social participation, degree of informal social participation, degree of exposure to different sources of knowledge, degree of readiness for change, The degree of orientation towards agricultural extension).

2. The studied variables with significant correlation contribute to explaining the overall variation in citrus farmers' knowledge of climate change, sources of knowledge about it, and the quality of its impact on citrus fruits. In the field of research, the corresponding statistical hypotheses were developed in their zero form to test the research hypotheses.

Third: Type and Methodology of Research:

The current research is one of the types of descriptive social studies in which a sample of the social survey method was used.

Fourth: Research Areas:

1. **Geographical Area:**

The study was conducted in Qalyubia Governorate as it is one of the main governorates producing fruit crops in general and citrus fruits in particular. Toukh was identified as a geographical area for the study, since it is the largest district in the governorate in terms of area planted with fruit as well as area planted with citrus. This was followed by the random selection of three villages: Kafr El-Gamal, Kafr Abed, and Kafr Mansour among the ten citrus producing villages, according to data from the Qalyubia Agriculture Directorate in 2023.

2. **Human scope of the study:**

Including the research and its sample The study population represented all 2275 citrus farmers in the three randomly selected villages, the size of the study sample was determined according to the Krejcie and Morgan equation, representing 13.54% of their total number, and they were distributed proportionally, i.e. in the same proportion in the three selected villages, they were selected in those villages in a systematic and random manner from the farmers' possession records in the register2 The services in the selected associations were distributed according to the above-mentioned percentage on The Three Villages.

Firstly: The development of Egypt's strawberry exports.

A- Development of the exports quantity from the strawberry crop in Egypt during the period (2005-2022):

Data in table (1), shows that the export quantity from the strawberry crop in Egypt during the study period ranged between a minimum limit amounted about to 3.08 thousand tons in 2005 and a maximum limit amounted about to 74.98 thousand tons in 2011, with an annual average of about 27.11 thousand tons during the period (2005-2022).

3. Time Scope:

The data was collected through a questionnaire collected using a personal interview for the research sample, after conducting an pre test on (30) individuals from citrus farmers, to ensure that the respondents understood the questions and phrases contained therein, and some incomprehensible phrases and words were modified or added. It was confirmed that the questionnaire achieved the purpose for which it was prepared, which is to achieve the objectives of the research, and the data was collected during three months from September until the end of November 2023.

The questionnaire consists of three parts: the first part includes measuring the independent variables that characterize the farmers surveyed in terms of personal, economic, social and communication characteristics.

The following is a description of the research sample according to the independent variables: personal characteristics such as age, education, years of experience in citrus cultivation, economic characteristics such as citrus cultivated area, formal social participation, informal social participation, readiness for change, orientation towards agricultural extension, and communication characteristics such as exposure to agricultural information sources, and the following table illustrates this.

The second part includes a measure to measure the dependent variable related to citrus farmers' knowledge of climate change and their source of knowledge of it, as well as their knowledge of the resulting effects and the type of effects resulting from it, in order to obtain from it a total degree of knowledge about climate change, the third part includes several questions to determine the types of information that respondents need to reduce the effects of climate change and the sources they prefer to obtain that information.

Table 1. Distribution of Sampling Framework and Number and Percentages of the Three Randomly Selected Villages in Toukh Center

center	Selected villages	Study population	sample	%
Toukh	Kafr al, Jamal	681	92	29.9
	Kafr Abed	715	96	31.2
	Kafr Mansour	889	120	38.9
sum		2275	308	100

Source: Lists of holdings of agricultural associations in the three selected villages.

Table 2. Personal, Economic, Social and Communication Characteristics According to the Arithmetic Mean, Standard Deviation, Upper and Lower Limits of Surveyed Farmers

Studied characteristics	Actual range		Arithmetic mean	Standard deviation	Categories	N	%
	Bottom line	Upper limit					
Age	18	65	46.61	19.69	Junior (under 34 years old)	31	10.1
					Middle Age (34-50 years)	153	49.7
					Elderly (50 years and above)	124	40.2
Number of years of education	1	12	4.71	3.99	Low education (less than 5 years)	152	49.4
					Intermediate Edu. (5 - 9 years)	125	40.6
					Higher Edu. (9 years and above)	31	10.0
Size of agricultural holding	2	16	7.91	3.98	Small tenure (less than 7 acres)	110	35.7
					Medium tenure (7 -12 acres)	167	54.2
					Large Holding (12 and above)	31	10.1
Area planted with citrus fruits	2	33	14.46	7.94	Low tenure (less than 12 units)	113	36.7
					Medium possession (12 - 22 units)	114	46.8
					Higher tenure (22and above)	51	16.5
The number of years of news with citrus fruits	5	34	20.36	7.32	Low experience (less than 15 years)	84	27.3
					Medium experience (15 - 25 years)	142	46.1
					High experience (25 and above)	82	26.6
The degree of formal social participation	11	21	16.04	2.55	Low engagement (less than 14 mar.)	52	16.9
					Medium participation (14-17 marks)	193	62.7
					High Participation (17 and above)	63	20.4
Degree of informal social participation	9	23	15.71	3.69	Low engagement (less than 14 mar.)	62	20.1
					Medium participation (14 - 19 mar.)	175	56.8
					High exposure (16 and above)	71	23.1
Degree of exposure to information sources	6	20	12.07	3.91	Low exposure (less than 11)	213	69.2
					Medium exposure (11 - 16)	70	22.8
					High exposure (16 and above)	25	8
Degree of readiness for change	10	24	16.15	7.77	Low readiness (less than 15°)	125	40.6
					Medium readiness (15 - 20 marks)	143	46.4
					High readiness(20 and above)	40	13.0
The degree of orientation towards agricultural extension	13	29	20.44	4.15	Opposite direction (less than 18 deg.)	82	26.6
					Neutral direction (18 - 23 degrees)	175	56.8
					High direction (23 and above)	51	16.6

Source: Compiled and calculated from the questionnaire.

Here is an overview of the measurement of these types of independent variables:

The first type: questions that give numerical answers, such as questions related to the age of the respondent, the number of years of education, the size of the total area of farms, the size of the area planted with citrus, and the number of years of experience in growing citrus fruits.

The second type: which are the questions that were answered by a participant as a member (board of directors - committee - ordinary) and non-participant, and grades of 4, 3, 2, and 1 were given respectively.

The third type: They are the questions that included answers to a set of phrases, where a three-degree scale was prepared for them (agree, neutral, disagree), and the grades (3), (2), and (1) were given as a pair for each of them, respectively, in order to measure thetrend towards agricultural extension.

The fourth type: These are the questions that included answers to a set of statements, where a scale of four points was prepared for them (always, sometimes, rarely, never), where scores (4), (3), (2) and (1) were given as a comparison for each of them respectively, such as informal social participation, exposure to information sources, and willingness to change.

Type V: These are the questions that included answering the group's statements, where a three-point scale was prepared for them (implement it immediately, wait to try it first, do not implement it) and the scores (3), (2) and (1) were given as a comparison for each of them respectively, such as preparing for change.

Type VI: Questions that include answering a set of statements representing six types of diverse information that farmers need to limit climate change and the sources they prefer to obtain. A measure was prepared for her needs and gave her (2), did not need and gave (1), the preferred sources are arranged according to the percentages mentioned by the respondents.

The seventh type is the measurement of the dependent variable, the overall degree to which citrus farmers know about climate change.

It included a number of questions for the respondents about a number of twenty-five climate changes and the extent of their knowledge of them or not, the researcher was given two marks in the event of his answer indicating his knowledge of any kind of change in advance, and one mark in the case of lack of knowledge.

To determine the source of knowledge about these changes: the researcher was asked about the source of his knowledge for each type of change,

Three marks were given if the sources of knowledge were government extension sources affiliated with the Ministry of Agriculture, two marks if the sources of knowledge of the surveyed farmers were government extension sources not affiliated with the Ministry of Agriculture, and one mark was given to the respondent if their sources of knowledge were other extension sources. The scores obtained from the response of the surveyed farmers were collected and a score was obtained expressing their sources of knowledge about the types of climate change on citrus fruits.

To measure the farmer's knowledge of the effects of climate change on citrus, it was measured by asking the farmer about the impact of each type of climate change, and two response marks were given indicating his knowledge of the impact, and one mark in the case of lack of knowledge, and by collecting the researcher's marks according to his answer to the impact, an overall score was obtained that reflects the effects of climate change, as for the type of impact, three degrees were given in the case ofHis response indicates a positive effect, two degrees in the case of his response indicates a negative effect, and one degree in the case of his response indicates no effect. According to these responses, a score was obtained expressing the effect and its shape.

Using the sum of the data values obtained from the responses of the surveyed farmers on each of the above knowledge components, it was possible to obtain an overall score that reflects the researcher's knowledge of the observed climate changes, the sources of knowledge about them, their impact, and the form of impact.

A number of statistical methods were used to analyze the data: range, mean, standard deviation, average score, simple correlation, and multiple regression analysis through the Statistical Analysis Program for the Social Sciences (SPSS).

RESULTS AND DISCUSSION

The first is to determine the overall degree of knowledge of citrus farmers about climate change, sources of knowledge, resulting impacts, and the type or form of impact:

To achieve this goal, which was done by asking the respondents about a number of climate changes, twenty-five of the climate changes that they observed during the four seasons of the year (winter - spring - summer - autumn), as stated in the research methodology.

Using the sum of the data values obtained from the responses of the surveyed farmers, on each component of knowledge, it was possible to obtain an overall score that reflects the researcher's knowledge of the observed climate change and its impact. The overall knowledge scores were limited to a maximum of 392 points, a

minimum score of 206 with an arithmetic mean of 7.2 points and a standard deviation of 5.26. The citrus farmers surveyed in terms of their knowledge were divided into three categories, and it was found that: 31.5% of the farmers surveyed fell into the low-knowledge category, 22.8% of them fell into the medium knowledge category, and 45.7% of them fell into the highly knowledgeable category. More than two-thirds of the farmers in the study sample (about 68.4%) were of medium and high knowledge.

The above results show the following: There is a relative decrease in the average knowledge of farmers about the effects of the various climate changes that have occurred and witnessed.

There is a diversity and multiplicity of extension sources from which the studied farmers derive their knowledge about the types of climate changes that affect citrus production, relying largely on local sources when compared to government extension sources.

This may be due to their high confidence in these sources due to their proximity to them, in the sense that they can be met at times when farmers want information, and the apparent lack of the role of government agricultural extension as a source of knowledge for farmers, who bear the brunt of developing and improving crop productivity, including citrus.

Second Objective: Determine the correlation between the total degree of knowledge of citrus farmers about climate change and its effects on the citrus crop in the study area and the independent variables studied, and determine the percentage of contributions of independent variables that have a significant relationship to them in explaining the total variation explained by them:

A. Determine the relationship between the overall degree of knowledge of citrus farmers about climate change and its effects on citrus yields in the study area and the independent variables studied:

The results of the research contained in Table (4) showed a significant correlation at the level of significance (0.01) and (0.05) between the total degree of farmers' knowledge of climate change, sources of knowledge about it, its impact and type on citrus trees, and the independent variables studied, namely: the degree of education of the respondent, the field of agricultural tenure, the area of tenure planted with citrus, the number of years of experience in citrus cultivation., the degree of formal social participation, the degree of informal social participation, the degree of exposure to various sources of knowledge, the degree of readiness for change, the degree of orientation towards agricultural extension. The results also showed that there was no statistically significant relationship with the age variable only.

Accordingly, it can be said that the statistical hypotheses of the following independent variables cannot be accepted: which states that there is no significant correlation between the total degree of knowledge of farmers about the climate changes observed during the four seasons on the citrus crop and both: the degree of education of the respondent, the field of agricultural holding, the area of citrus cultivation, the number of years of experience in citrus cultivation, the degree of formal social participation, The degree of informal social participation, the degree of exposure to different sources of knowledge, the degree of readiness for change, and the degree of attitudes towards agricultural extension. The possibility of accepting the statistical hypothesis related to the age variable to prove that there is no statistically significant relationship between it and the total degree of the total variable of farmers' knowledge of climate change.

Table 3. Numerical and Relative Distribution of Citrus Farmers Surveyed According to Their Knowledge Categories on Climate Change, Its Effects and Quality on Citrus Fruits

Knowledge level of climate change and its effects	number	%	Standard deviation	Average Arithmetic
Low (less than 268)	97	31.5	7.2	5.26
Medium (268-less than 330)	70	22.8	Theoretical range	
High (Greater than 330)	141	45.7	Limit lower	Limit Upper
Total	308	100	206	392

Source: Field study sample.

Table 4. Correlation coefficients between the total degree of knowledge of the surveyed farmers with climate change and its effects in the study area and the independent variables studied

Num.	Independent variables	Simple correlation coefficient
1	Age	0.428**
2	Number of years of education	0.322**
3	Size of agricultural holding	0.330**
4	Area of the powder planted with citrus fruits	0.181*
5	Number of years of news Barzagha citrus	0.447**
6	Degree of formal social participation	0.185*
7	Degree of informal social participation	0.370**
8	Degree of exposure to information sources	0.318**
9	Degree of readiness for change	0.364**
10	The degree of orientation towards agricultural extension	0.398**

Source: Field study sample. * Significant at 0.05. ** Significant at 0.01.

From the above it is clear the extent of the relationship and influence of the degree of education of the respondent, the area of the agricultural holding, the area of the holding cultivated with citrus fruits, the number of years of experience in citrus cultivation, the degree of formal social participation, the degree of informal social participation, the degree of exposure to different sources of knowledge, the degree of readiness for change, the degree of tendency toward guidance. Agricultural relationship with the degree of citrus growers' knowledge of climate change, this is what will be shown by the results of the correlational and multiple regression analysis in determining the contribution rates of these variables in explaining the total variance of the dependent variable.

B. Estimating the contribution of the studied independent variables to the total variance shown by the total degree of knowledge of farmers studied about climate change, sources of knowledge about it, its quality and its effects on citrus trees, to estimate the contribution of the studied independent variables in explaining the total variance of the dependent variable, the method of multiple gradient upward regression was used to estimate the percentage contribution of the independent variables studied collectively in explaining the total variance of the first dependent variable (Y1).

To validate the statistical hypothesis that the total degree of knowledge of the farmers studied about climate change and its effects is not affected by the combined effect of the independent variables studied, multiple gradient ascending regression was used.

The results of the statistical analysis presented in Table (5) indicate the significance of the statistical model in the eighth step, where the ratio of F (70.726) is significant at the probability level 0.01, and the value of the coefficient of determination was 0.654. This means that eight variables of the total number of independent variables studied explain 64.5% of the variation in farmers' overall knowledge of climate change and its effects, and the remaining 34.5% are explained by other variables that were not included in the study.

To determine the percentage of the contribution of each of the eight variables in explaining the variation in the total degree of agricultural vulnerability to climate change, based on the percentage of total change explained by each variable as shown in the table, where the number of years of experience in agricultural work is explained by 20%, the area planted with citrus fruits is explained by 17.4%, the degree of formal social participation is explained by 9.4%, the degree of informal social participation is explained by 5.4%, the degree of orientation towards agricultural extension is explained by 4.6%, and the degree of education of the researcher 4%, the degree of readiness for change explains 3.9%, and the degree of exposure to agricultural information sources shows 7%.

Given the above, it can be said that the statistical hypothesis was rejected for the eight variables included in the model, while it was not rejected for independent variables that were not included in the analytical model.

The third objective is to identify the types of information farmers involved need to mitigate the effects of climate change and their preferred sources of access to it:

The results shown in Table (6) indicated that the information was arranged, where the need for more effective fungicides ranked first, then the second place is the information they need to adapt to the observed climate changes, and the third place was the need for farmers to obtain indicative information to deal with climate change.

Table 5. Results of the Aggregate Effect of the Independent Variables Studied on the Total Degree of Knowledge of Farmers Surveyed with Climate Change and its Effects on Citrus Fruits

Steps Analysis	Independent variable	Multiple Correlation	R squared	% Explained variance	Coefficient Regression	value of "F"
First step	Number of years of experience in farm work	0.447	0.200	20.0	0.197	76.286**
Step Two	Citrus cultivated area	0.611	0.374	17.4	0.370	90.981**
Step Three	Degree of formal social participation	0.684	0.468	9.4	0.462	88.989**
Step Four	Degree of informal social participation	0.722	0.522	5.4	0.516	82.709**
Step Five	Degree of orientation towards counseling	0.754	0.568	4.6	0.561	79.383**
Step Six	Education Degree	0.780	0.608	4	0.600	77.899**
The seventh step	Degree of readiness for change	0.804	0.647	3.9	0.639	78.681**
Step Eight	Degree of exposure to information sources	0.809	0.654	0.7	0.645	70.726**

Source: Field study sample. * Significant at 0.05. ** Significant at 0.01.

Table 6. Numerical and Relative Distribution of the Types of Information Needed by Citrus Farmers Surveyed to Confront Climate Change and Arrange Their Preferred Sources

N.	Types of information	Extend to a need				Preferred Sources									
		Needs		It doesn't need		Agri. Ext. & Res. in Univ.&Inst		Confused and friends		Pesticide Dealers		Citrus Meteorology		Means Social Media	
		N.	%	N.	%	N.	%	N.	%	N.	%	N.	%	N.	%
1	More resistant pesticides to fungal pests	296	96	12	4	120	39	-	-	123	40	30	10	35	11
2	Guidance information for dealing with climate change during the different seasons	268	87	40	13	165	54	-	-	115	37	49	16	28	9
3	New methods and methods to resist physiological tree degradation diseases	222	72	86	28	117	38	-	-	92	30	62	20	37	12
4	Daily weather information	172	56	136	44	-	-	-	-	-	-	139	45	169	55
5	Information on salt and limited analysis and sampling methods for analysis	154	50	154	50	141	45	79	26	88	29	-	-	-	-
6	New ways to resist heat stress	108	35	200	65	277	90	-	-	31	10	-	-	-	-

Source: Field study sample.

In fourth place is their need for guidance information to deal with climate changes during the different seasons, and the last place is their need for daily information on weather conditions and their need for new methods and methods to resist physiological diseases and tree degradation, in addition to their need to use new methods to resist heat stress.

As for the preferred sources of information on the application of practices to overcome climate change, the results of Table 6 indicate that farmers reported in their responses that they wanted to obtain their agricultural information, especially related to the use of pesticides, fertilizers and micronutrients for trees, from pesticide traders by 40%, while they wished to obtain indicative information to deal with climate change. During the different seasons, new methods and methods to resist physiological tree degradation diseases, information on salt analysis, sampling and analysis methods, and new methods of resisting heat stress from agricultural extension and research bodies in faculties of agriculture and research institutes by 38%, 54%, 45%, and 90% respectively, while social media was one of their favorite sources of obtaining daily weather information by 55%.

CONCLUSION

1. According to the results of the research showed a relative increase in farmers' awareness of climate change and its effects on citrus trees during the four seasons of the year, the study believes that extension work should be given a clear and specific role to raise awareness of the nature of climate change in the agricultural sector through meetings, seminars, and workshops.
2. According to the results of the research regarding the importance of agricultural information in general and related to climate change, especially the urgent need and to provide agricultural extension agencies with the latest meteorological data on a regular and timely basis.
3. In view of the results of the research, agricultural extension agencies of various names, whether researchers specializing in horticultural crops, were among the most important sources that farmers resorted to as sources of knowledge about the observed climate changes and their effects.
4. Therefore, the study believes that it is necessary for planners and those in charge of implementing extension programs at the Ministry of Agriculture to take into account that the extension workers of the Ministry of Agriculture have a clear role in developing methods and programs and benefiting from the tremendous development in information and communication technology in disseminating and adopting knowledge and practices related to overcoming climate change and the importance of receiving information about weather and climate conditions promptly in the form of guidance messages in coordination with the authorities responsible for climate, whether in the study area or other regions. similar.

According to the results of the research on the importance of information needed by citrus farmers with regard to fertilizers and pesticides, especially non-traditional ones, the research sees the need to hold seminars, extension activities and guidance bulletins for the information that the study has proven their need for, in addition to information related to resistance to viral diseases and tree stress in terms of high and low temperatures and fluctuations during the different seasons of the year.

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الملخص العربي

العوامل المؤثرة على معرفة مزارعي الموالح بالتغيرات المناخية وأثرها على أشجار الموالح بمحافظة القليوبية

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يستهدف البحث بصفة رئيسية تحديد المستوى الكلي لمعارف مزارعي الموالح بالتغير المناخي ومصادر المعرفة وآثارها على الموالح، وعلاقة هذا المستوى ببعض المتغيرات المستقلة المدروسة، وكذلك تحديد نسب مساهمة بعض المتغيرات المستقلة ذات العلاقة المعنوية في تفسير التباين الكلي لمعارف مزارعي الموالح بالتغيرات المناخية ومصادر المعرفة بها والآثار الناتجة عنها، بالإضافة إلى التعرف على أهم المعلومات التي يحتاجها مزارعي الموالح للحد من تأثير التغير المناخي، وأهم المصادر المفضلة لديهم في الحصول على تلك المعلومات.

ولتحقيق أهداف هذا البحث، تم جمع البيانات من عينة عشوائية مكونة من ٣٠٨ مزارعا بإستخدام إستمارة إستبيان في المقابلة الشخصية التي تم إختبارها مسبقاً بشكل مبدئي خلال شهر يوليو ٢٠٢٣.

ولتحليل بيانات البحث إحصائيا، تم إستخدم معامل الإرتباط البسيط وتحليل الإنحدار المتعدد الصاعد Step Wise Regression، والنسب المئوية والمتوسط الحسابي والمدي والإنحراف المعياري.

وتلخصت أهم النتائج على النحو التالي:

- أن هناك إنخفاض نسبي في معرفة المزارع بآثار التغيرات المناخية المختلفة التي حدثت وتمت مشاهدتها.
- أن هناك تنوع وتعدد في المصادر الإرشادية التي يستمد منها الزراع المبحوثين معارفهم حول التغيرات المناخية المؤثرة على إنتاج الموالح. وأنهم يعتمدون بدرجة كبيرة على المصادر المحلية إذا ما قورنت بالمصادر الإرشادية الحكومية.
- أن هناك تعدد في الآثار الحادثة على الموالح بلغت خمسة وخمسون أثراً ناتجا عن الإصابة بالأمراض الفسيولوجية والفطرية والحشرية، بالإضافة إلي تعدد شكل التاثير وكان معظمه سلبيا.
- وقد توصل البحث إلي وجود علاقة إرتباطية ومعنوية بين درجة المعرفة الكلية لزراع الموالح بالتغيرات المناخية وتسعة متغيرات من المتغيرات المستقلة المدروسة الداخلة في التحليل. كما تبين أن هناك ثماني متغيرات تفسر نحو ٦٤,٥ من التباين الكلي الحادث في المعرفة الكلية لمزارعي الموالح بالقليوبية.
- أن الغالبية العظمى من المبحوثين يرون أن المعلومات التي يحتاجونها في مواجهة تغير المناخ تتعلق بالمبيدات والأسمدة المطورة لمكافحة الأمراض، وأن أهم مصادر وصولهم المفضل إلى هذه المعلومات هم تجار المبيدات والمختصون من أساتذة الجامعات ومراكز البحوث.

الكلمات المفتاحية: العوامل ، التأثير، المعرفة، المزارعون، المناخ، التغيرات، الأنواع.