The Level of Application of Wheat farmers of the IPA 99 Variety of Agricultural Scientific Recommendations in the Al-Mahawil District/Babylon Province and Its Relationship to Some Factors

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Abstract

The research aims to identify the level of application of wheat farmers of the IPA 99 variety of the recommended agricultural scientific recommendations in the Al-Mahawil District/Babylon province for the agricultural season 2023/2024, and to determine the relationship between the level of application with some independent factors (agricultural experience, educational level, type of agricultural land tenure, area planted with wheat, annual income from wheat cultivation, participation in extension activities, contact with information sources on wheat cultivation). A scale was prepared consisting of 24 paragraphs distributed over nine axes, and data were collected from a random sample of 69 farmers from the wheat farming community of 575 farmers in Al-Mahaweel District by means of a questionnaire and interview method. The results showed that the overall rate of application level was average, and that there was a positive relationship between the level of application of the IPA 99 wheat farmers of the recommended scientific recommendations and each of the independent factors mentioned above at a probability level of 0.01 Accordingly, the researcher recommends that the General Authority for Agricultural Guidance and Cooperation and all its formations in the Directorates of Agriculture and Agricultural Divisions should undertake the task of disseminating knowledge, sciences and expertise related to the correct scientific recommendations among farmers in the field of wheat cultivation with approved varieties grown in Iraq, including IPA 99, in order to raise the application level of farmers with these recommendations .

Keywords: Application level, wheat farmers, IPA 99 wheat, scientific recommendations.

Introduction

The agricultural sector has a major role in the development and advancement of societies. The agricultural sector consists of two axes: the plant axis and the animal axis. Cereal crops are one of the most important pillars of the plant axis, in addition to being the main source of human food. Therefore, all countries of the world seek to pay attention to these crops because of their great importance in reducing the food gap and bridging the food deficit to reach self-sufficiency in the hope of achieving food security (13). The Food and Agriculture Organization of the United Nations considered achieving an increase in agricultural productivity as one of the basic principles of sustainable agricultural development and a crucial matter in addressing the shortage of agricultural land and limiting the increase in agricultural production (32, 42). The world today follows various approaches and strategies to achieve food security and sustainable development, foremost of which is achieving sustainable increases in productivity in the plant and animal fields, which is also one of the major challenges facing the world in agriculture (41, 48). This is to meet the many and increasing needs for food as a result of the large

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population and urban growth and the shrinking agricultural areas that necessitate the option of vertical expansion in production. Accordingly, the world has witnessed, for decades, and increasingly in the past decade, large and continuous activities in the field of scientific, technical and applied research in the field of deriving and developing agricultural systems and technologies and disseminating them in the face of these challenges (17). The use of modern agricultural technologies in the agricultural sector in most countries, especially developing ones, is an important element in vertical development and focuses on the optimal exploitation of the unit of cultivated area to maximize the domestic product. Thus, modern agricultural technologies have become an important factor in developing the reality of food security through their contribution to increasing productivity, reducing production costs, improving its quality and increasing its economic returns (31, 18). World Bank studies confirm that up to 50% of crop yield increases are due to the use of improved seeds. Therefore, farmers' access to excellent seed resources is a fundamental factor in raising food availability levels and improving nutrition in developing countries (4). Modern agriculture requires the use of modern technologies that adapt the scientific knowledge of farmers in agriculture to achieve economic development (47). One of the most important methods for accelerating food security and comprehensive economic development, which has become an important part of the strategies of many countries, is the development, adaptation and evaluation of modern agricultural technologies that can be adopted by small farmers, which leads to raising their incomes, reducing the real prices of agricultural products for consumers, increasing economic efficiency and growing the national economy (2). Modern technologies have consistently shown that they are the means to solve agricultural problems, because in many rural areas, agricultural operations are still carried out using simple means and traditional methods based on trial and error, and as a result, farmers produce little more than what is required for their families, which necessitates the need to change production methods (46). However, the impact of the transition from the traditional method of agriculture to the modern scientific and technical method represents one of the most critical and complex problems. In many countries, experience over the years has shown that modern agricultural technologies are available, however, the gap between the current level of knowledge of modern technologies and traditional technologies is not easy to narrow in farmers' fields (25). While the solution seems simple in practice, even if new technologies are available, they may not be suitable for certain agricultural areas, or cannot be easily transferred, or conflict with traditional and civilized processes (15). Wheat is the first crop in the world and the Arab world, as it represents 50% of the world's grain production and food for more than two-thirds of the world's population. It is one of the most important grain crops, and covers the largest cultivated area on the Earth's surface compared to other food crops (34). Wheat is the first strategic crop in Iraq. The area cultivated with the crop is about 8,420,000 million dunams, with a total production of about 4,248,000 million tons (9). However, Iraq faces major challenges, most notably achieving sustainable food security based on achieving increases in agricultural production to address the shortage in agricultural production in terms of quantity

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and quality and its inability to meet the population's increasing needs for plant and animal agricultural products, leading to the inability to achieve food security and dependence on importing various food commodities. These challenges are a means of pressure on the Agricultural Guidance Organization, in order to develop it and improve the quality of its services and activities with the aim of developing the agricultural sector and reducing the food production gap (26), and increasing agricultural productivity and production and improving its quality (45).and addressing the problems of importing agricultural and food commodities that represent a heavy burden on the Iraqi economy (43). In order to achieve agricultural development aims in various areas of the agricultural sector (44). Because it is one of the development organizations in the agricultural sector that aims to alleviate poverty and enhance food security, respond efficiently and effectively to the needs of farmers and address the problems of their agricultural activities and contribute to the comprehensive development of the agricultural sector (40). Countries and major organizations seek to confront these challenges facing agriculture in the world today, which were summarized by the Food and Agriculture Organization of the United Nations in achieving food security and preserving natural resources while reducing the effects of climate change (30). These challenges also come within the context of the strategic national plans of the Ministries of Agriculture and Planning, and represent a central aim for the Ministry of Agriculture and the main aim of its national plan for the years (2015-2025) (39), in addition to being a central aim in the national development plans for the years 2013-2017 and 2018-2022 (37, 38). The aforementioned deficit is attributed to many reasons, the most important of which is the low agricultural productivity. The Ministry of Agriculture considered the low agricultural productivity one of the most important challenges facing the agricultural sector in Iraq (39). The average wheat production in Iraq is 504 kg/dunum (9), while the average production in Egypt is 1801 kg/dunum, in Saudi Arabia it is 1675 kg/dunum, and in Kuwait it is 1148 kg/dunum (35). The productivity of the unit area of wheat crop in Iraq is low compared to global production or developed countries, despite the fact that this country is one of the main places for the emergence of this crop. The low productivity of wheat crop is due to several reasons, the most important of which are: poor soil service operations and crop management, as they are still limited to old methods, not following modern agricultural methods, and the lack or absence of adoption of modern technologies in crop cultivation, including the failure to adopt the cultivation of modern high-yielding varieties and not following a balanced fertilization system, and the lack or lowness in implementing modern agricultural recommendations and instructions and not taking them into account because they conflict with previous cultures, traditions or customs, and others (24). FAO reports indicate that the world's population in 2050 will reach 10 billion people and will need three times what it currently produces of food, which does not exceed 797 million tons of wheat (33). This necessitates increasing wheat production to meet this serious challenge, taking into consideration that there is no increase in cultivated areas due to the civilizational and industrial progress in the world (21). Here, the need arose to keep pace with scientific development and use modern agricultural

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methods and adopt the cultivation of new varieties characterized by high productivity to compensate for the shortage in production, such as the cultivation of the IPA 99 cultivar, which is one of the most widely used varieties among farmers and is cultivated in large areas. It is the most widespread wheat cultivar in Iraq, and is characterized by high productivity, good quality specifications, and its suitability for cultivation in irrigated and rain-fed areas with guaranteed and semi-guaranteed rainfall. Its production rate reaches (1500) kg/dunum compared to the Abu Ghraib, Latifiya, and IPA 95 varieties, which have a production rate of (1000) kg/dunum (51). Al-Hajjami and Farhan, in their study on comparing the IPA 99 cultivar with the Adna 99 cultivar imported to Iraq, stated that technical efficiency is one of the achieved resources represented by the area of cultivated land. The quantity of phosphate and nitrogen fertilizers and seeds were good for the Aba 99 cultivar, so they recommended not to import the Adna 99 cultivar and to intensify awareness raising to encourage reducing waste in the use of resources (11). However, the cultivation of these good varieties depends on the level of application of scientific recommendations proven scientifically to achieve high productivity, which is the desired aim of cultivating these varieties, such as the quantity of seeds used, planting dates, fertilization, pest control, harvesting, etc. (6.(

Al-Mahawil District is one of the agricultural areas in Babylon province , and the area planted with wheat is estimated at approximately 12,000 dunums, and faces problems of low crop productivity estimated at 475 kg/dunum (50). It is part of the low productivity situation at the level of Iraq, and on this basis this research came to indicate the following questions:

.1What is the level of application of wheat farmers of the IPA 99 cultivar of scientific recommendations in Al-Mahawil District in Babylon province?

.2What is the relationship between the level of application of wheat farmers of the IPA 99 cultivar of scientific recommendations and some independent factors (agricultural experience - educational level - annual income from wheat cultivation - area planted with wheat - type of agricultural land ownership - participation in extension activities - contact with sources of information about wheat cultivation?(

Research objectives: - The research aims to achieve the following:

.1Identify the level of application of wheat farmers of the IPA 99 cultivar of scientific recommendations in Al-Mahawil area, Babylon province.

.2Determining the relationship between the level of application of wheat farmers of the IPA 99 cultivar of scientific recommendations and some independent factors (agricultural experience - educational level - annual income from wheat cultivation - area planted with wheat - type of agricultural land ownership - participation in extension activities - contact with sources of information about wheat cultivation (

Research hypotheses

There is a correlation between the level of application of Ibaa 99 wheat cultivar farmers of agricultural scientific recommendations and each of the independent personal factors (agricultural experience, educational level, annual income from wheat cultivation, area planted with wheat, type of agricultural land ownership, participation in extension activities, contact with sources of information about wheat cultivation(

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Research methodology:- The research comes within the framework of survey research within the descriptive approach, and this approach is suitable for reaching detailed data and facts about the needs of individuals at a specific time (11, 19.(

Research area:- Al-Mahawil District which is a district affiliated with Babylon province , was chosen as an area to conduct the research for the following reasons-:

A. The district is an area specialized in growing wheat crops in the winter seasons.

B. The presence of large areas planted with IPA 99 wheat.

MATERIALS AND METHODS

The study was carried out in AL- Mahawil District in Babylon Province, located in south central Iraq, between 32.7° and 33.8° N and 43.42° and 45.50° E. Babylon Province is located in the Middle of Euphrates provinces, a sixth wheat producing province (9 .(

The population for this study consisted of 575 wheat farmers of the IPA 99 cultivar in the district. (12%), 69 wheat farmers distributed over five agricultural sectors (Babylon, Al-Faiha, Al-Thaer Al-Arabi, Al-Nasr, Al-Jihad), were randomly selected to respond to the questionnaire during December and January 2024. As shown in Table (1.(

The instrument used was a two-part questionnaire comprising socio-economic characteristics and application level of the IPA 99 cultivar recommended scientific recommendations scale. The socio-economic characteristics included agricultural experience - educational level - annual income from wheat cultivation - area planted with wheat - type of agricultural land ownership - participation in extension activities - contact with sources of information about wheat cultivation .

Content validity of the questionnaire was established by (12) a panel of experts in fields of agricultural extension and wheat cultivation. A pilot study, on 10 farmers out of the random sample, was conducted to establish reliability of the instrument. Cronbach's alpha (a reliability coefficient of (0.94) was established, indicating the instrument used was reliable and valid.

Data were analyzed using frequency, percentage, arithmetic averages, simple correlation coefficient, standard deviation and (t) test

Table 1. Distribution of wheat farmers surveyed by sector in Al-Mahaweel District

No.	Sector	Number of farmers	The number of sample individuals
.1	Babylon	115	14
2.	Al-Faihaa	50	6
.3	Althair alarabiy	120	14
.4	Alnasr	200	24
5.	Jihad	90	11
Total		575	69

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Preparing and developing the scale

In order to achieve the research objectives, a questionnaire was prepared, which is one of the means of collecting information from the respondents through a personal interview. It includes a set of questions that the respondents are required to answer. The researcher used the questionnaire as a tool to collect information related to the research topic due to its suitability to the research methodology followed. The questionnaire was prepared in a way that included a set of paragraphs, the first part of which included questions related to some personal and economic characteristics of farmers, while the second part included questions related to the level of application of wheat farmers of the IPA 99 cultivar of the recommended scientific recommendations in growing the crop. These recommendations were determined by referring to the scientific advisory recommendations included in the advisory bulletins issued by the General Authority for Agricultural Guidance and Cooperation and the General Authority for Agricultural Research. The scale included a set of fields that included a set of practices for each field. The scale for the application of wheat farmers of the IPA 99 cultivar of scientific recommendations was divided into nine axes, and each axis was defined by a number of paragraphs as follows: land preparation (2) paragraphs, planted seeds (3) paragraphs, cultivation methods (2) paragraphs, compound fertilizer (3) paragraphs, irrigation (2) paragraphs, urea fertilizer (3) paragraphs, pest and weed control (5) paragraphs, harvesting (2) paragraphs, marketing (2) paragraphs. Thus, the scale included in its initial form 42 paragraphs distributed over nine axes, as shown in Table (2 .(

Table 2. Distribution of the proposed axes and paragraphs for the scale for the level of application of wheat farmers of the IPA 99 cultivar of agricultural scientific recommendations

No.	Axis	No.	Paragraphs (Recommended Scientific Recommendations)	Number of Paragraphs
1.	Land preparation for cultivation	1.	Performing the plowing and leveling operations in an appropriate manner	2
		2.	Dividing the land into panels and at equal distances	
2.	Wheat seeds planted	1.	Receiving improved seeds from reliable production companies	3
		2.	Purifying and dusting the seeds before planting them	
		3.	Using the appropriate amount of seeds per dunum	
3.	Cultivation Methods	1.	Planting at the appropriate time	2
		2.	Using the mechanical seeder	
4.	Compound Fertilizer	.1	Receiving compound fertilizer from the recommended parties	3

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		2.	Using compound fertilizer in the recommended quantities and at the appropriate time	
		3.	Adding compound fertilizer in the recommended number of batches	
5.	Irrigation	1.	Irrigating with sufficient water according to the stages of crop growth	2
		2.	The presence of effective drainage to drain excess water in the field	
6.	Urea Fertilizer	1.	Receiving urea fertilizer from the recommended parties	3
		2.	Using urea fertilizer in the recommended quantities and at the appropriate time	
		3.	Adding urea fertilizer in the recommended number of batches	
7.	Pest and Weed Control	1.	Receiving pesticides from the recommended parties	5
		2.	Using weed control pesticide in the recommended quantity	
		3.	Using pest control pesticide in the recommended quantity	
		4.	Conducting weed control at the scheduled time	
		5.	Conducting pest control at the appropriate time	
8.	Harvest	1.	Conducting the harvesting process at the appropriate time	2
		2.	Using the harvester	
9	Marketing	1.	Purifying the wheat crop from Impurities	2
		2.	Loading the produce into trucks and marketing it to the silo	
Total		24 Paragraphs		

Tool validity

In order to verify the validity of the scale, the questionnaire was presented in its initial form to a group of 4 experts specialized in agricultural guidance to determine the apparent validity of the questionnaire (which is to measure what it was designed to measure, i.e. the extent to which the scale achieves the aim for which it was designed). As for the validity of the content, it means the extent to which the components of the scale represent the aspects of the measured aspect, i.e. the extent to which the objectives set are covered (3). It was achieved by presenting it to 8 experts specialized in wheat cultivation to indicate the extent of their agreement with the axes and paragraphs of the scale for use in the

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research. A weight (numerical value) was determined for each statement in the experts' agreement scale as follows (2 degrees for the statement "agree", 1 degree for the statement "agree with modification", 0 degrees for the statement "disagree"). A cut-off threshold of 85% of the highest score of the experts' agreement scale was set for the questionnaire's axes and paragraphs to remain in their final form. All the questionnaire paragraphs achieved the cut-off threshold or more (paragraphs 98%, and axes 100%), so all the paragraphs and axes remained in the questionnaire form. According to the opinions of the questionnaire experts, the tool (questionnaire paragraphs) is valid if it obtains a score of 75% or more (36). After making some necessary modifications in light of the observations of experts and specialists in wheat cultivation, the questionnaire is ready in its final form.

Measuring reliability

After conducting a preliminary test of the questionnaire form on a survey sample consisting of 10 farmers from outside the research sample whose names did not appear in the research sample to ensure the extent of their acceptance and understanding of the scale paragraphs. The stability of the scale was measured, which means that the scale gives similar results if it is repeated on the same individuals after a period of time and under the same conditions (22). The Person equation was used using the split-half method and the stability coefficient reached 0.89, and it was corrected using the Spearman Brown equation, so the stability coefficient reached 0.94. Accordingly, the stability values mentioned indicate the consistency of the scale paragraphs in the questionnaire, which is scientifically acceptable, as the stability coefficient is more acceptable the closer its value is to 1 (23). Data collection and analysis Data were collected from the respondents by means of a questionnaire using the personal interview method (Personal interview) during the months of December and January 2024, and percentages, arithmetic averages, frequency distributions, simple correlation coefficient, standard deviation and (t) test were used to present and analyze the results.

Measuring the level of application

After determining the recommendations related to the level of application of the IPA 99 wheat farmers for the recommended practices, the test was determined for the respondents from two test paragraphs, one correct alternative and the other incorrect, and one score was given to the farmer if his application of the practice was correct, and zero if he did not apply it, and since the number of recommendations is 24 recommendations, the level of application of the IPA 99 wheat farmers for the scientific agricultural recommendations in the Al-Mahawil district \ Babylon Province was determined through (24) paragraphs, and the highest degree of application that the respondent can obtain is 24 degrees and the lowest degree is zero, and in order to describe the respondents, this variable was distributed into three levels: (low, medium, high.(

Measuring the independent variables

•Agricultural experience: - It was measured by the number of years of practicing wheat cultivation.

•Educational level: The educational status of the respondent, where the following numerical values were given: illiterate = zero, reads and writes = 1, primary = 2, intermediate = 3, preparatory = 4, institute = 5, university = 6.

•Type of holding: The type of agricultural land owned by the farmer, where the

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following numerical values were given: Rent = 1, contract = 2, own = 3.

•Area of land planted with wheat: It was measured in dunams.

•Annual income from wheat crop: It is the amount of money the farmer obtains from wheat cultivation in the year, measured in Iraqi dinars and with three alternatives (low, medium, large.(

•Contact with extension information sources on wheat cultivation: This variable included 10 sources of information used by the surveyed farmer, which are (radio, television, internet, extension bulletins, extension magazines, universities, scientific conferences, research and studies, specialized agricultural engineers, and the experiences of pioneering farmers). It was measured through the following four levels: (always, sometimes, rarely, do not contact) and was given weights (3, 2, 1, 0) respectively. Thus, the numerical value of the surveyed farmer ranged between zero as a minimum and 30 as a maximum.

•Participation in extension activities for wheat crops: The scale included the farmer's participation in seven extension activities, which are (an extension meeting, an extension meeting, an agricultural course, an extension seminar, a training course, a field day, and a demonstration field). It was measured through the following four levels: (always, sometimes, rarely, never) and was given weights (3, 2, 1, 0) respectively. Thus, the numerical value of the farmer being studied ranged between zero as a minimum and 21 as a maximum.

Results and Discussion

First objective: The level of application of wheat farmers of the IPA 99 cultivar of agricultural scientific recommendations in the Al-Mahawil area - Babylon Province

as in at showed that the highest numerical value for the level of application of wheat farmers of the IPA 99 cultivar of agricultural scientific recommendations in the Al-Mahawil area was 19 degrees, and the lowest numerical value was 12 degrees, on an application not knowledgescale consisting of 24 paragraphs whose numerical values ranged from (0 - 24) degrees, with an average of 14.78 degrees, and a standard deviation of 12.19, and that 59.42% of the respondents had numerical values for the level of their application of those recommendations within the medium level with an average of 13.48 degrees, which is more than the average value of the scale degrees, which is 12 degrees, and there were no respondents whose level of application of those recommendations was described as low, as shown in Table (3.(

Table 3. Distribution of respondents according to the level of application of wheat farmers of the IPA 99 cultivar of agricultural scientific recommendations

Application level	Value limits	Average values	Number of farmers	%
Low	1 – 8	0	0	0
Medium	9 – 16	13.48	41	59.42
High	17 – 24	16.67	28	40.58
Total	24 – 0	14.78	69	100

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It can be concluded from Table 3 that most of the wheat farmers of the IPA 99 cultivar who were surveyed described their level of application of scientific agricultural recommendations as medium, and this result may be attributed to many reasons, including:

.1Wheat farmers follow some traditional methods in agriculture, and this may be due to the scarcity or high prices of seeds, fertilizers and various agricultural supplies, which became beyond the capabilities of the farmer, and thus led to the failure to apply these agricultural supplies at the required level.

.2Low knowledge of wheat farmers of the IPA 99 cultivar of scientific recommendations for using various agricultural supplies in the correct scientific use in terms of quantity, type and timing, which led to a lowness in applying the scientific recommendations for these supplies. 3. The delay in providing wheat farmers with the various agricultural supplies by the state made farmers resort to local markets to request their needs, and since local markets are characterized by high prices for these agricultural supplies, this led to farmers refraining from local markets and remaining in the state's delay in providing supplies, which leads to a clear lowness in the application of scientific recommendations used for these agricultural supplies. 4. Absence or limited extension activities implemented for farmers in the research area on the subject of applying scientific agricultural recommendations used in growing wheat cultivar IPA 99. Despite the presence of an agricultural extension unit in the agricultural division, and the presence of an extension farm in Al-Mahaweel, in addition to the presence of scientific research centers affiliated with the Ministry of Agriculture such the research area witnessed only three extension activities during the years 2022-2024 on the research topic at a rate of extension activity/year, and none of the respondents participated in any training activity on the aforementioned topic (49.(

.5Low interest of the farmers surveyed in the subject of applying scientific recommendations in growing wheat cultivar IPA 99, and thus the lowness of the extension institutions concerned with this, and the low level of their communication with those institutions, especially the research or extension stations and centers, which are all located in Al-Mahaweel area, and this is another indicator of the lowness of the extension activity. 6. Lowness or absence of follow-up from the concerned agricultural units in the agricultural division in particular and the agricultural departments in the research area in general for farmers' fields and for farmers while carrying out agricultural operations due to the lack of sufficient means of transportation, limited field work requirements, lack of specialized agricultural staff, etc., and thus not meeting the needs of farmers for the knowledge and skills necessary to improve their field practices, and not knowing the problems that farmers suffer from in the field in order to find solutions or address them immediately.

To know the ranking of the level of wheat farmers' application of scientific recommendations, the percentage of farmers who applied each recommendation separately was calculated and arranged in descending order as shown in Table (4.(

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Table (4) shows that the respondents' application of the practices related to the wheat crop, IPA 99 cultivar, came in the following descending order.

No	Recommended agricultural practice	Number of applied researchers	Percentage of Applicants	Descending order
.1	Receiving seeds from recommended sources	67	97	1
.2	Adding the appropriate amount of seeds per acre	65	94	2
.3	Purifying seeds before planting	63	91	3
.4	Appropriate planting date	60	87	4
.5	Planting method followed	57	82	5
.6	Plowing and leveling at the appropriate depth	55	79	6
.7	Dividing the land into equal-sized slabs	53	76	7
.8	Irrigating with sufficient irrigation at the appropriate time	51	74	8
.9	Receiving compound fertilizer from recommended sources	50	72	9
10	Receiving urea fertilizer from recommended sources	49	71	10
11	Receiving pesticides from recommended sources	47	68	11
12	Using pesticides to control weeds and in the recommended quantity	46	66	12
13	Using pesticides to control pests in the recommended quantity	44	63	13
14	Conducting weed control at the appropriate time	42	61	14
15	Conducting pest control at the appropriate time	41	59	15
16	Conducting the harvesting process at the appropriate time	40	58	16
17	Using compound fertilizer at the appropriate time	38	55	17
18	Using urea fertilizer at the appropriate time	37	53	18
19	Conducting the wheat crop purification process before marketing it	35	51	19
20	Marketing the wheat crop to the silo	32	46	20
21	Conducting the mechanical harvesting process at the	30	43	21

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	appropriate time			
22	Draining excess water from the field	28	40	22
23	Adding compound fertilizer in the recommended number of batches	25	36	23
24	Adding urea fertilizer in the recommended number of batches	22	32	24

.1The first group of practices, in which the percentage of respondents who applied each of them was more than 90% and ranged between (91% - 97%), and the application was considered excellent. The related practices included (receiving seeds, adding the amount of seeds, and carrying out the seed purification process.(

.2The second group of practices, in which the percentage of respondents who applied each of them was more than 80% and ranged between (82% - 87%), and the application was considered very good. The related practices included (appropriate planting date, followed planting method.(

.3The third group of practices, in which the percentage of respondents who applied each of them was more than 70% and ranged between (71% - 79%), and the application was considered good. The related practices included (carrying out the plowing process, dividing the land into equal-sized slabs, irrigating with sufficient irrigation, receiving compound fertilizers, and receiving urea fertilizer.(

.4Group The fourth group of practices, in which the percentage of respondents applying each of them was more than 50% and ranged between (51% - 68%) and the application was considered average, and the related practices included (receiving pesticides, using pesticides in weed control, using pesticides in pest control, weed control procedure, pest control procedure, harvesting process, using compound fertilizer, using urea fertilizer, purifying wheat crop.(

.5The fifth group of practices, in which the percentage of respondents applying each of them was less than 50% and ranged between (32% - 46%) and the application was considered low, and the related practices included (marketing wheat crop, carrying out mechanical harvesting(Note that there is no wheat by hand harvesting, and all farmers harvest wheat mechanically, including 43 farmers who harvest wheat on time (neither late nor early.(

, carrying out the process of draining excess water, adding compound fertilizer, adding urea fertilizer). In order to identify which axes received the most application of the agricultural scientific recommendations by the respondents, the percentage of farmers who applied the recommendations of each axis was calculated separately and arranged in descending order as shown in Table (5 .(

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Table (5). Descending order of the axes of agricultural scientific recommendations according to the percentage of application by the respondents

No	Axes	Percentage of Applicants	Descending order
1.	Seeds (planted seeds)	94	1
2.	Planting methods	85	2
3.	Preparing the land	78	3
4.	Control of weeds and pests	63	4
5.	Irrigation	57	5
6.	Fertilization	53	6
7.	Harvesting	50	7
8.	Marketing	48	8

The second objective: Determine the relationship between the level of application of the IPA 99 wheat farmers to the agricultural scientific recommendations and some of the following independent factors:

.1Agricultural experience (number of years of practicing wheat cultivation(

The results showed that the highest numerical value of the agricultural experience of the IPA 99 wheat farmers was 50 years and the lowest numerical value was 7 years, with an average of 31.56 years, and a standard deviation of 8.33 degrees. The respondents were distributed into three levels, as shown in Table (6.(

Table 6. Distribution of respondents according to the correlation between their level of application of the agricultural scientific recommendations for growing the IPA 99 wheat crop and agricultural experience

Agricultural experience	Numbers	Average Application	Percentage of Applicants	Correlation coefficient	Standard deviation S.D	Calculated (t) value
1 – 18	16	10.37	23.19	0.98	8.33	4.06
19 – 36	24	26.67	34.78	X = 31.56		
37 – 55	29	47.31	42.03	N = 69		
Total	69	31.56	100	Level of Significance = 0.01		

It is concluded from Table 6 that the highest percentage of respondents falls within the category (37-55) by 42.03% and an average of 47.31 degrees, and the lowest percentage of respondents falls within the category (1-18) by 23.19% and an average of 10.37 degrees. This means that the level of respondents' application of scientific agricultural recommendations in growing the wheat crop, IPA 99 cultivar, increases with increasing agricultural experience. To find out if there is

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a correlation between the two variables, the simple Pearson correlation coefficient was used, and its value was 0.98. To verify the significance of the relationship, the t-test was used, whose calculated value was 4.06, which is higher than the tabular (t) value of 1.99 at the probability level of 0.01. This indicates the existence of a significant relationship between the two variables. Therefore, the research hypothesis is accepted, which states that there is a significant relationship between the level of application of the surveyed farmers of the scientific agricultural recommendations in the cultivation of wheat cultivar IPA 99 and agricultural experience. This means that the level of application of farmers increases with increasing agricultural experience. This result is consistent with what (7) reached in their study of the agricultural knowledge level. This result may be explained by the fact that the use of modern agricultural technologies increases farmers' information and generates agricultural experience for them, which leads to an increase in their knowledge level .

.2Educational level of farmers The results showed that the largest number of educational level of the surveyed was 18, at a rate of 26.09%, for the preparatory category, and the least The number of respondents' educational level was 6, at a rate of 8.70% for the college category, with an arithmetic mean of 63.72 and a standard deviation of 52.54. The respondents were distributed as shown in Table (7 .(

Table (7). Distribution of respondents according to the correlation between their level of application of scientific agricultural recommendations for growing wheat crop, IPA 99 cultivar, and the educational level

Educational level	numbers	Average Application	Percentage of Applicants	Correlation coefficient	Standard deviation S.D	Calculated (t) value
Cannot Read or Write	11	28.63	15.94	0.28	52.54	2.40
Elementary	12	49.67	17.40	X = 63.72 N = 69 Level of Significance = 0.01		
Middle	15	63.80	21.73			
Preparatory	18	75.67	26.09			
Institute	7	85.85	14.10			
College	6	94.34	8.70			
Total	69	63.72	100			

It is concluded from Table 7 that the highest average of the respondents' knowledge was in the category (college education level) by 94.34 degrees, and the lowest average of the respondents' knowledge was in the category (Cannot read or write level) by 28.63 degrees, which means that the level of the respondents' application of the scientific agricultural recommendations in the cultivation of wheat cultivar IPA 99 is arranged ascendingly with the increase in the educational level, and to know whether there is a correlation between

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the two variables, the simple Pearson correlation coefficient was used and its value was 0.28, and to verify the significance of the relationship, the ((t) test was conducted, the calculated value of which was 2.40, which is higher than the table (t) value of 1.99 at the probability level of 0.01, which indicates the existence of a positive relationship between the variables, so the research hypothesis is accepted, which states that there is a significant relationship between the level of application of the farmers' respondents of the scientific agricultural recommendations in the cultivation of wheat cultivar IPA 99 and the educational level, which means that the level of application of farmers increases with the increase in the educational level, and this result is consistent with what was reached To (28), in their study of the agricultural the level of application. The reason for this may be attributed to the fact that the more educational opportunities increase, the more the knowledge level of farmers increases towards applying modern scientific methods and in a manner that is consistent with their mental abilities and scientific perceptions towards agricultural operations. From their point of view, agriculture is not only crop management, but rather the application of modern scientific methods to these operations.

.3Type of agricultural holding

The results showed that the highest numerical value for the type of agricultural holding is 3, which falls within the category of owned land, and the lowest numerical value is 1, which falls within the category of rented land, The respondents were distributed into three categories, as shown in Table (8.(

Table 8. Distribution of respondents according to the correlation between their level of application of scientific agricultural recommendations for growing wheat crop, IPA 99 cultivar, and the type of agricultural holding

type of agricultural holding	numbers	Average Application	Percentage of Applicants	Correlation coefficient	Calculated (t) value
Rent	13	1	18.84	0.29	2.5
Contract	25	2	36.23	1.73 =X 69 =N 0.01= Level of Significance	
Own	31	3	44.93		
Total	69	1.73	100		

It is concluded from Table 8 that the highest percentage of respondents falls within the category of owned land at 44.93%, and the lowest percentage of respondents falls within the category of rented land at 18.84% This means that the level of respondents' application in growing wheat of the IPA 99 cultivar is arranged in ascending order with the type of agricultural holding. To find out if there is a correlation between the two variables, the simple Spearman's correlation coefficient was used, and its value was 0.29. To verify the significance of the relationship, the t-test was used, whose calculated value was 2.5, which is higher than the tabular (t) value of 1.99 at the probability level of 0.01. This indicates the existence of a significant relationship between the two variables. Therefore, the research hypothesis is accepted,

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which states that there is a significant relationship between the level of application of the surveyed farmers of the scientific agricultural recommendations for growing wheat, IPA 99 cultivar, and the type of agricultural holding. This means that the level of application of farmers increases with the type of agricultural holding. This result is consistent with what was reached by (8, 20) in their study of the agricultural knowledge level. This result may be attributed to the fact that farmers who own agricultural land have a strong motivation to implement modern scientific recommendations in wheat cultivation, thus increasing their financial return and improving the quality of their land and making it productive, which leads to an increase in their the level of application, unlike farmers who own contracted or rented land, who lack motivation due to state decisions that may Terminate the contract or lease with them for the simplest reasons.

.4Area planted with wheat

The results showed that the highest numerical value of the area planted with wheat is 60 dunums, which falls within the category of 46-60 dunums, and the lowest numerical value is 5 dunums, which falls within the category of 1-15 dunums, with an arithmetic mean of 19.47 and a standard deviation of 16.06. The respondents were distributed into four categories, as shown in Table (9.(

Table 9. Distribution of respondents according to the correlation between the level of their application of the scientific agricultural recommendations for planting the wheat crop, IPA 99 cultivar, and the area planted with wheat

Categories	numbers	Average Application	Percentage of Applicants	Correlation coefficient	Standard deviation S.D	Calculated (t) value
1 – 15	40	1.60	57.98	0.78	16.06	10.29
16 – 30	19	23.68	27.53	X = 19.47		
31 – 45	6	41.67	8.69	N = 69		
46 – 60	4	55	5.80	Level of Significance = 0.01		
Total	69	19.47	100			

It is concluded from Table 9 that the highest percentage of respondents was in the 1-15 category by 57.98%, and the lowest percentage of respondents was in the 46-60 category by 5.80%, and the highest average application of respondents was in the 46-60 category by 55 degrees, and the lowest average application of respondents was in the 1-15 category by 1.60 degrees, which means that the level of respondents' application of scientific agricultural recommendations in the cultivation of wheat cultivar IPA 99 is arranged ascendingly with the increase in the area planted with wheat, and to know whether there is a correlation between the two variables, the simple Pearson correlation coefficient was used and its value was 0.78, which indicates the existence of a positive relationship between the two variables, and to

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verify the significance of the relationship, the ((t-test was conducted, the calculated value of which was 10.29, which is higher than the tabular (t) value of 1.99 at the probability level 0.01, and accordingly the research hypothesis is accepted, which states: There is a significant relationship between the level of application of the farmers surveyed with the scientific agricultural recommendations in the cultivation of wheat cultivar IPA 99 and the area planted with wheat, which means that the level of application of farmers increases with the increase in the area planted with wheat, and this result is consistent with what was reached by (5) in their study of the agricultural the level of application. This result may be attributed to the fact that large areas have a high economic return if they are used properly, which encourages their farmers to view information and experiences and use modern technologies that lead to an increase in their the level of application.

.5Annual income from wheat cultivation

The results showed that the largest number of respondents for the contribution of wheat cultivation to the annual income was 31 and at a rate of 44.93%, which falls within the category (contribution to a small degree), and the smallest number of respondents for the contribution of wheat cultivation to the annual income was 10 and at a rate of 14.49%, which falls within the category (contribution to a large degree), with an arithmetic mean of 47.53 and a standard deviation of 39.19. The respondents were distributed into three categories, as shown in Table (10.(

Table 10. Distribution of respondents according to the correlation between their level of application of scientific agricultural recommendations for growing wheat crop, IPA 99 cultivar, and annual income

Categories	numbers	Average Application	Percentage of Applicants	Correlation coefficient	Standard deviation S.D	Calculated (t) value
Annual income categories	31	42.09	44..93	0.74	39.19	9.07
Low contribution	28	57.32	40.58	X = 47.53 N = 69 Level of Significance = 0.01		
High contribution	10	73	14.49			
Total	69	47.53	100			

It can be concluded from Table 10 that the highest average application of the respondents was in the category (contributing to a large degree) by 73 degrees, and the lowest average application of the respondents was in the category (contributing to a small degree) by 42.09 degrees. This means that the level of application of the respondents of the agricultural scientific recommendations in the cultivation of the wheat crop, IPA 99 cultivar, is arranged ascendingly with the increase in the annual income of the farmers. To find out the correlation between the two variables, the simple Pearson correlation coefficient was used, and its value was 0.74, which indicates the existence of a positive relationship between the two variables. To verify the

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significance of the relationship, the t-test was conducted, the calculated value of which was 9.07, which is higher than the tabular (t) value of 1.99 at the probability level of 0.01. Accordingly, the research hypothesis was accepted, which states that there is a significant relationship between the level of application of the farmers surveyed with the scientific recommendations for growing wheat, IPA 99 cultivar, and the annual income. This means that the level of application of farmers increases with the increase in annual income. This result is consistent with what was reached by (10, 16) in their study of the agricultural knowledge level. This result may be attributed to the large economic return resulting from wheat cultivation, which was one of the strong motivations for farmers to obtain knowledge and information related to scientific agricultural recommendations in the use of modern agricultural technologies, which leads to an increase in their knowledge level .

.6Contacting sources of agricultural guidance information on wheat cultivation. The results showed that the highest expressive numerical value The respondents' exposure to information sources about wheat cultivation is 18 degrees, the lowest numerical value is 2 degrees, with an arithmetic mean of 7.97 and a standard deviation of 65.72. The respondents were distributed into three categories: low, medium and high, as shown in Table (11.(

Table 11. Distribution of respondents according to the correlation between the level of their application of scientific agricultural recommendations for the cultivation of wheat crop, IPA 99cultivar, and exposure to information sources

Exposure to information sources	numbers	Average Application	Percentage of Applicants	Correlation coefficient	Standard deviation S.D	Calculated (t) value
Low (2 - 7)	33	3.69	47.83	0.78	65.72	10.40
Medium (8 - 13)	21	9.42	30.43	X = 7.97 N = 69 Level of Significance = 0.01		
High (14 – 18)	15	15.33	21.74			
Total	69	7.97	100			

It can be concluded from Table 11 that the highest average of respondents' application was in the category (contributing to a large degree) by 15.33 degrees, and the lowest average of respondents' application was in the category (contributing to a small degree) by 3.69 degrees. This means that the level of respondents' application of agricultural scientific recommendations in growing wheat crop, IPA 99 cultivar, is arranged ascendingly with increasing exposure to information sources. To find out the correlation between the two variables, the simple Pearson correlation coefficient was used, and its value was 0.78, which indicates the existence of a positive relationship between the two variables. To verify the significance of the relationship, the t-test was conducted, the calculated value of which was 10.4, which is higher than the tabular (t) value of 1.99 at the probability level of 0.01. Accordingly, the research hypothesis is accepted, which states that there is a significant relationship between

the level of application of the respondents to the scientific agricultural recommendations in the cultivation of the wheat crop, IPA 99 cultivar, and exposure to agricultural information sources. This means that the level of application of farmers increases with increased exposure to agricultural information sources. This result is consistent with what was reached by (14, 27) in their study of the agricultural the level of application.This result may be attributed to the fact that increasing farmers' exposure to agricultural information sources provides a lot of knowledge, information and skills in using modern agricultural technologies, which leads to an increase in their knowledge level .

.7Participation in extension activities related to the wheat crop. The results showed that the highest participation of the respondents in the activities The guidance reached 15 participants, and the least participation of the respondents was 1 participant, with an arithmetic mean of 6.40 and a standard deviation of 52.82. The respondents were distributed into three categories: low, medium and high, as shown in Table (12 .(

Table 12. Distribution of respondents according to the correlation between the level of their application of scientific agricultural recommendations for growing wheat crop, IPA 99 cultivar, and participation in extension activities

Calculated (t) value	Standard deviation S.D	Correlation coefficient	Percentage of Applicants	Average Application	numbers	participation in extension activities
2.04	52.82	0.24	50.72	3.20	35	Low (1 - 5)
X = 6.40 N = 69 Level of Significance = 0.01			28.99	7.60	20	Medium (6 - 10)
			20.29	12.92	14	High (11 – 15)
			100	6.40	69	Total

It can be concluded from Table 12 that the highest average of respondents' application was in the category of (high participation) with 12.92 points, and the lowest average of respondents' application was in the category of (low participation) with 3.20 points. This means that the level of respondents' application of agricultural scientific recommendations in growing wheat crop, IPA 99 cultivar, is arranged ascendingly with increasing participation in extension activities. To find out the correlation between the two variables, the simple Pearson correlation coefficient was used, and its value was 0.24, which indicates the existence of a positive relationship between the two variables. To verify the significance of the relationship, the t-test was conducted, the calculated value of which was 2.04, which is higher than the tabular (t) value of 1.99 at the probability level of 0.01. Accordingly, the research hypothesis is accepted, which states that there is a significant relationship between the level of application of the respondents to the scientific agricultural recommendations in the cultivation of wheat, IPA 99 cultivar, and participation in extension activities. This means that the level of farmers' application increases with the increase in extension

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activities. This result is consistent with what was reached by (12, 29) in their study of the the level of application. This result may be attributed to the high economic return resulting from wheat cultivation, which encourages farmers to participate in various extension activities for the purpose of obtaining information, knowledge and modern agricultural technologies in order to apply them in their agricultural fields, which leads to an increase in their the level of application

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Conclusions

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The level of farmers' application The researchers in Al-Mahaweel area for the agricultural scientific recommendations for growing the wheat crop, IPA 99 cultivar, are described as average, and are a major reason for the low productivity and production of the wheat crop.

.2The lowness of the advisory activity provided to farmers in the field of growing the wheat crop, IPA 99 cultivar, is a major reason for the low level of application of the agricultural scientific recommendations for farmers.

.3The independent factors (agricultural experience, educational level, type of agricultural land ownership, area planted with wheat, annual income from wheat cultivation, participation in advisory activities, contact with information sources) have a direct effect on the application of the agricultural scientific recommendations for farmers of the IPA 99 cultivar of wheat, and are among the factors that have a major contribution to influencing the level of application of the scientific recommendations for farmers.

Recommendations

.1The General Authority for Agricultural Guidance and Cooperation and all its formations in the Directorates of Agriculture and Agricultural Divisions shall undertake the task of disseminating knowledge, sciences and expertise related to correct scientific recommendations among farmers in the field of wheat cultivation with approved varieties grown in Iraq, including the IPA 99 cultivar, in order to raise the knowledge and skill level of farmers with these recommendations.

.2Intensifying the efforts of the Agricultural Guidance Department in the Directorate of Agriculture in Babylon in order to involve farmers in training courses related to scientific agricultural recommendations for the cultivation of the IPA 99 wheat crop, in order to address their cognitive problems in all aspects of farm management and raise their knowledge levels, which contributes to developing the efficiency of farmers in applying the correct scientific recommendations.

.3Since the research results showed a direct correlation between the level of application of scientific recommendations and some independent factors for growing wheat crop, IPA 99 cultivar, therefore, when planning extension activities and programs, these independent factors must be taken into account

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