The cognitive training needs of wheat farmers in Al-Mahawil district, Babylon province, and their relationship to some variables

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Abstract

This research aims To assess the training needs of wheat farmers in general, specifically in the Al-Mahawil district.To assess the training needs of wheat farmers in each of the following areas: land preparation, planting methods, fertilization, irrigation, pest control, and harvesting.To determine the correlation between training needs and the following independent variables: wheat cultivation area, type of land tenure, contribution to income, experience in cultivating the crop, agricultural inputs, sources of agricultural information, prior training, and participation. (With extension activities, average agricultural production). Diagnosing the most important problems facing wheat farmers in Al-Mahawil District, Babylon Province.to assess the training needs of wheat farmers in all aspects of its cultivation and to determine the correlation between these training needs and each of the independent variables (area cultivated with wheat, type of landholding, contribution to income, experience in cultivating the crop, participation in extension activities, sources of agricultural information, agricultural inputs, prior training, and average agricultural production). Data was collected through personal interviews using a questionnaire specifically designed to assess training needs. The first part of the questionnaire included personal, social, and economic data, while the second part comprised 42 items to measure the training needs of wheat farmers. Face and content validity were established, and reliability was calculated using the split-half method, yielding a coefficient of 0.706. After data entry and classification, the data were statistically analyzed using several statistical methods. The results showed that 68.83% of wheat farmers in Al-Mahawil have an average level of knowledge in wheat cultivation and an average training need of 43.01, indicating a moderate to high level of training requirement. The ranking of wheat cultivation areas according to training needs was as follows: fertilization, pest control, irrigation, sowing, harvesting, land preparation and soil suitability, and planting method. The results also revealed a significant correlation between wheat farmers' training needs and the type of agricultural holding, income contribution, information sources, and participation in extension activities. However, no significant correlation was found with cultivated area, years of farming experience, agricultural inputs, prior training, or average agricultural production. Based on these results, several conclusions were drawn and recommendations were proposed.

ISSN 2072-3857

Keywords: Training needs, wheat farmers, Al-Mahawil district, independent variables.

Introduction

The agricultural sector is one of the most important sectors with high added value and is a cornerstone of economic and social development for many developing and developed countries. Agriculture is a primary source of food and employs a large percentage of the workforce. It also contributes to providing raw materials and intermediate inputs for many industries and generates financial resources through export revenues or the substitution of imported agricultural goods (36). The importance of this sector has led the World Bank to prioritize it in development and emphasize increased investment in it, especially in developing countries, to enable them to achieve one of the main Millennium Development aims: halving poverty and hunger between 1990 and 2015 (38, 30). Agricultural development in the Arab world occupies a prominent place in many development and economic and social reform programs. Most Arab countries have given considerable and shared attention to this issue since the 1970s, leading to the establishment of a number of Arab institutions to support agricultural development and enhance food security. Despite the efforts made and the growing attention given to agricultural development issues, on the one hand, and despite the availability of agricultural land, human, water, and material resources, on the other, the agricultural sector still suffers from several difficulties and challenges in many Arab countries, which constitute a major obstacle to its progress and optimal development. Arab countries suffer from a food deficit that worsens over the years because their food production is insufficient to meet their consumption needs, which in turn has led to a significant increase in imports and a widening trade deficit (27, 32). The development of the agricultural sector depends on two fundamental elements: the material element, represented by the results of scientific and technological progress in fields related to agricultural production, and the human element, with its capabilities, skills, and potential to utilize the material element efficiently in achieving development (2). Human development represents the cornerstone of comprehensive development in both developed and developing countries. The human element, capable of absorbing and applying modern innovations with a high degree of skill and efficiency, has become the primary factor upon which the successful introduction and development of modern technologies depends (12, 15). Al-Hakim (10) stated that human beings, without forgetting the will of God Almighty, are the essence of any agricultural activity. Therefore, agricultural workers are the fundamental element in the advancement of any development process aimed at developing field crop cultivation, including wheat. Evidence

ISSN 2072-3857

indicates a lack of experience among agricultural workers in wheat cultivation and a deficiency in practical training, which increases the need to implement a comprehensive extension program that develops the knowledge level of these workers. Implementing effective extension programs requires planning based clearly and precisely on actual needs. Identifying needs and their levels is one of the fundamental principles upon which an efficient program is based, in terms of its impact on bringing about desirable behavioral changes in trained agricultural workers (13). Therefore, training is a crucial process aimed at equipping workers with knowledge, skills, and attitudes in wheat cultivation to improve their current and future performance. It is a component of sustainable development and one of its means (22). Training is considered a field of general individual development, as it activates the individual mentally and skillfully, preparing them to face work conditions and achieve the organization's goals. Training is defined as a planned, organized, and continuous effort aimed at changing the behaviors and performance of human resources within an organization by providing them with the skills, knowledge, abilities, and attitudes that lead to increased effectiveness and efficiency of individual and organizational performance, in line with modern performance standards (11, 4). This is what Al-Saadi and her group (18) concluded in their study, emphasizing the necessity of involving extension workers in training courses on a regular basis to enhance their performance. Al-Subaie (17) also found in his study that participation in training courses increased the efficiency of agricultural extension workers. Thus, the social progress achieved by a society does not depend solely on what is available. It depends not only on its technological capabilities, natural and human resources, but also on the efforts this society makes towards utilizing resources and what it invests in developing the knowledge, expertise and capabilities of its members (29). Developing the performance of these institutions and systems, and improving the quality of programs and services provided to farmers, especially the poor among them, is among the basic requirements necessary to improve and increase agricultural production, preserve and sustain natural resources, achieve food security, reduce rural poverty and others (19).

Agricultural extension is among the systems whose importance can be summarized by the fact that there is a direct relationship between the level of agricultural development in any country and the level of development of its extension system; that is, there is no advanced agriculture without advanced agricultural extension (20). Agricultural extension is one of the mechanisms that seeks to bring about behavioral changes in the lifestyles of rural families in general and farmers in particular. It is one of the mechanisms relied upon by many countries and international organizations concerned with disseminating modern agricultural

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technologies among farmers and preparing the necessary agricultural extension programs for farmers to adopt these technologies (25). Agricultural extension can play a major role in raising awareness and educating wheat farmers and developing their knowledge in order to increase and improve wheat production and productivity. Successful extension work is based on gaining the trust of farmers by knowing their needs and fulfilling their desires (16). Most specialists in the field of agricultural extension agree on the necessity of studying the needs of every agricultural activity and trying to satisfy them, because they are the starting point in planning extension programs so that the response of the target groups is strong and effective in those programs. Many studies have confirmed the necessity and importance of continuous planning of programs and activities directed at farmers as a successful means of improving their performance and improving the effectiveness of those programs (24, 26). Cereal crops are fundamental to human life and have played a vital role throughout history, serving as the foundation upon which civilizations around the world were built. They continue to play a crucial role in modern civilizations, providing a primary and essential food source for most of humanity. This is due to the large-scale production, ease of storage and transportation of these crops, and their status as an inexpensive source of energy and protein (3, 9). Wheat is among the most important food crops globally, and its cultivation is becoming increasingly important due to population growth in the current century. It ranks first among cereal crops in terms of both production and cultivated area. A country's food security depends on the cultivation, production, and storage of wheat to ensure optimal consumption. Approximately 60% of the world's wheat production is used for human consumption (37). In Iraq, farmers and their families, who constitute a third of the population (33), face significant and ongoing challenges. These include achieving sustainable growth in agricultural productivity and output, preserving essential natural resources such as land and water (halting their degradation and maintaining them), adapting to climate change and mitigating its effects, and improving their agricultural incomes and livelihoods. This constitutes a central challenge for agriculture in the public and official spheres of the country, in addition to other challenges such as achieving sustainable food security, improving agriculture's contribution to the gross domestic product, and enhancing its contribution to diversifying and developing the national economy (34, 35). Through his examination of the agricultural methods and techniques used in wheat cultivation in the study area, the researcher observed that the majority of farmers still employ primitive methods. It is clear that these methods and techniques are deficient in reaching modern and standard agricultural and production levels. This is the source of the research problem, which prompted the researcher to study the training

ISSN 2072-3857

needs of wheat farmers in the Al-Mahawil district. The results of this study can guide the planning of training programs based on the farmers' actual needs, thereby increasing their knowledge and skills. This research allows us to identify the real problems and attempt to overcome and address them by tailoring training courses accordingly Training is needed to address these needs, which will accelerate the implementation of development, economic, and agricultural plans. This research attempts to answer the following questions:

1. What are the general training and knowledge needs of wheat farmers in Al-Mahawil District?

2. What are the specific training and knowledge needs of wheat farmers in each of the following areas: (land preparation and suitable soil for planting, planted seeds, planting methods, fertilization, irrigation, pest control, and harvesting)?

3. What is the correlation between the training needs of wheat farmers and each of the following independent variables: (area planted with wheat, type of landholding, contribution to income, experience in cultivating the crop, agricultural inputs, sources of agricultural information, prior training, participation in extension activities, and average agricultural production)?

4. What problems do wheat farmers in Al-Mahawil District, Babylon Province, face?

The Importance of the Research

Wheat is one of the most important cereal crops, and its grains constitute an important part of the diet of all the world's peoples. Its production represents one-third of the world's grain production, amounting to 808,441,570 tons. In Iraq, the area cultivated with grains in 2022 reached 4,716,160 dunams, of which 3,990,360 dunams were planted with wheat. The total grain production reached 3,421,074 tons, of which 2,764,690 tons were wheat (31). Wheat is of great importance to the lives of both humans and animals. It is used for food, industry, and animal feed, as it occupies a large part of the basic daily diet. Its starchy grains are the most important source of carbohydrates, as approximately 60-70% of the calories generated by human food come from grains and potatoes, which are the cheapest food for generating heat energy, in addition to containing proteins, vitamins, and some salts that are involved in building the body (1, 28, 41). Storage is a cornerstone of the grain production process. Stored grains and processed foods are susceptible to infestation by various insects, leading to losses in both quantity and nutritional value (14). Iraq has a significant need for agricultural products, particularly in plant and animal production. Agricultural production in Iraq meets no more than 30% of the country's needs, while the remaining 70% is met through imports (21, 8).

Research Objectives:

ISSN 2072-3857

First: To assess the training needs of wheat farmers in general, specifically in the Al-Mahawil district.

Second: To assess the training needs of wheat farmers in each of the following areas: land preparation, planting methods, fertilization, irrigation, pest control, and harvesting.

Third: To determine the correlation between training needs and the following independent variables: wheat cultivation area, type of land tenure, contribution to income, experience in cultivating the crop, agricultural inputs, sources of agricultural information, prior training, and participation. (With extension activities, average agricultural production).

Fourth: Diagnosing the most important problems facing wheat farmers in Al-Mahawil District, Babylon Province.

Research Statistical Hypotheses

1. There is no significant correlation between the training needs of wheat farmers and the area cultivated with wheat.

2. There is no significant correlation between the training needs of wheat farmers and the type of agricultural landholding.

3. There is no significant correlation between the training needs of wheat farmers and their contribution to income.

4. There is no significant correlation between the training needs of wheat farmers and their experience in cultivating the crop.

5. There is no significant correlation between the training needs of wheat farmers and the availability of agricultural inputs.

6. There is no significant correlation between the training needs of wheat farmers and the sources of agricultural information.

7. There is no significant correlation between the training needs of wheat farmers based on prior training.

8. There is no significant correlation between the training needs of wheat farmers and their participation in extension activities.

9. There is no There is a significant correlation between the training needs of wheat farmers and the difference in average agricultural production.

Materials and Methods

Operational Definitions:

1. Training Needs: This refers to the lack of certain agricultural knowledge and information among farmers, which affects their efficiency in performing their agricultural work.

2. Experience in Wheat Cultivation: This refers to the number of years the farmer has worked in wheat cultivation.

3. Information Sources: These are the places from which the farmer obtains

ISSN 2072-3857

agricultural information on how to cultivate wheat.

4. Prior Training: This refers to the amount of training the farmer has received over the years through training courses offered by extension institutions.

Research Area

The study was conducted in the Al-Mahawil district of Babylon province, located in south-central Iraq. Al-Mahawil lies between latitudes 32°25'20" and 32°49'20"N and longitudes 44°20'5" and 45°6'40"E. The district of Al-Mahawil is located north of Babylon province, specifically in a strategic location that connects the central and southern provinces. It is about 20 km from the center of Babylon province and about 80 km from Baghdad. It is located close to the highway that connects Baghdad with the central and southern provinces, which makes it an important center for transportation and agriculture. Al-Mahawil is an important agricultural area, and its proximity to the highway facilitates the transportation of agricultural products to neighboring areas. As for the administrative boundaries of Al-Mahawil District, it is bordered to the north by Al-Iskandariya sub-district, to the south by the Central District of Al-Hillah, to the west by Al-Imam sub-district, and to the east by Sadda Al-Hindiya sub-district. Its total area is approximately 106,996 dunams, distributed across 20 districts encompassing 29 rural villages. The arable land is approximately 72,567 dunams. Al-Mahawil District is known for its irrigated agriculture. Among the most important crops grown in the district are wheat, barley, and summer and winter vegetables (cucumbers, tomatoes, squash, eggplant, peppers, and okra), as well as some fodder crops such as alfalfa and clover. The district also boasts date palm groves and some fruit trees. Livestock breeding is also prevalent, particularly cattle, buffalo, and sheep, and poultry farming for meat or egg production. Fish are raised in earthen ponds or floating cages on the river (40).The district is also known for its livestock farming, especially cattle, buffalo, and sheep, as well as poultry farming for meat or egg production, and fish farming in earthen ponds or floating cages on the river (40).

Research Population and Sample

The research was limited to wheat farmers due to the large area cultivated with this crop in the research region (Al-Mahawil). The number of wheat farmers in Al-Mahawil district reached 769, belonging to 5 cooperative societies encompassing 29 villages. A proportional random sample of 10% was taken, resulting in 77 farmers being surveyed (40).

Preparation of the Questionnaire and Test Map

To achieve the research objectives, a questionnaire was prepared, consisting of two main parts:

Part One: This included a number of questions to obtain data related to variables relevant to the training needs

ISSN 2072-3857

of wheat farmers. These variables included: the area cultivated with wheat, type of agricultural landholding, contribution to income, experience in cultivating the crop, agricultural inputs, sources of agricultural information, previous training, participation in extension activities, and average agricultural production.

Part Two: This included a number of test items to determine the knowledge level of wheat farmers. The standard score was set at 100 points by the researchers. To develop the test items, the researcher reviewed specialized literature on wheat cultivation and consulted wheat farming experts. The main areas of wheat cultivation were identified, and these seven areas were then presented to wheat cultivation specialists to assign relative weight to each area based on its importance by dividing the 100 points by these areas. The researcher then developed the items for each area of wheat cultivation and presented them again to professors specializing in wheat cultivation to determine the relative weight of each item by dividing the score allocated to each area by the items it contained. After finalizing the test items, they were presented to wheat cultivation specialists to ensure content validity, and also to agricultural extension specialists to verify face validity.

Validity

The validity condition was met in both its aspects:

1- Face validity: This was achieved by presenting the test to a group of agricultural extension specialists to determine the extent to which the test outwardly measured its intended purpose, such as the types of statements, their writing style, clarity, accuracy, and how the items were answered.

2- Content validity: This was achieved by presenting the test to specialists in wheat cultivation to evaluate each statement in light of its ability to measure the subject matter. The specialists confirmed the suitability of the form for conducting the test after minor modifications to some of the wording in the test items.

Reliability and validity: The reliability of the scales used in the study was measured and their validity established using the split-half method with Pearson's formula, which yielded a value of 0.273, representing half of the test. This was then corrected using Spearman-Brown's formula, which yielded a value of 0.428. The reliability coefficient was then 0.706, and its validity was calculated using the square root of the reliability coefficient, resulting in a validity coefficient of 0.84 (23).

Measuring the Related Independent Variables

The independent variables related to training needs were measured as follows:

ISSN 2072-3857

1. Area cultivated with wheat: This variable was measured by the number of dunams owned by the farmer.

2. Type of agricultural land tenure: This variable was measured by dividing it into three categories: (ownership, contract, lease). These levels were assigned the following weights: (3, 2, 1), respectively.

3. Contribution to annual income: This was measured by the amount of annual income the farmer earns from wheat cultivation.

4. Experience in wheat cultivation: This variable was measured by the number of years the farmer has worked in wheat cultivation.

5. Agricultural inputs: This variable was measured according to the following levels: (owns, do not own). These were assigned the following weights: (2, 1), respectively.

6. Information Sources: This variable was measured according to the following levels (always, sometimes, rarely, never contacts information sources), and these levels were assigned the following weights: 1, 2, 3, and 4, respectively.

7. Prior Training: This variable was measured using a binary scale (yes, no), and these two levels were assigned the following weights: 2 and 1, respectively.

8. Participation in Agricultural Activities: This variable was measured using a binary scale according to the following levels (participates, does not participate), and these levels were assigned the following weights: 2 and 1, respectively.

9. Average Agricultural Production: This variable was measured by the number of points obtained by the farmer. Measuring the Training Needs of Wheat Farmers: The training needs of wheat farmers were determined by subtracting their current knowledge level from the target level. To determine the current knowledge level, 42 test items were used. These items were selected based on the researcher's review of literature, extension publications, and the opinions of wheat cultivation experts. The items covered various aspects of wheat cultivation, including land preparation and soil suitability, seed selection, planting methods, fertilization, irrigation, pest control, and harvesting. Participants responded by selecting the most appropriate alternative. Weights were assigned to each item according to predetermined criteria. Data was collected in January 2025 through personal interviews. The following is an explanation of the procedures used:

First: Measuring Training Needs Across All Aspects of Wheat Cultivation: The final scores obtained by the respondents across all areas, representing their current knowledge level, were tallied and called the test score. These scores were then subtracted from a total of 100, representing the standard level. The resulting score represents the training gap or need across all aspects

ISSN 2072-3857

of wheat cultivation. Second: Identifying the training needs of wheat farmers in each area of wheat cultivation: The test score obtained by the research subject in that area, representing their current level of knowledge, was subtracted from a predetermined standard level. The resulting score represents the gap or need in that area of wheat cultivation. Results and Discussion

First Objective: To assess the training and knowledge needs of wheat farmers in the Al-Mahawil district.

The level of training need in wheat cultivation among the respondents was measured based on their existing wheat cultivation knowledge and experience, i.e., the scores they obtained on a knowledge test, according to the following equation:

Training Need = 100 - The score representing the respondent's level of wheat cultivation knowledge.

The highest numerical value for the training and knowledge need among wheat farmers in the Al-Mahawil area was 70, and the lowest was 15, on a scale consisting of 42 items with numerical values ranging from 0 to 84, a mean of 45, and a standard deviation of 14.363. 68.83% of the respondents had numerical values for their training and knowledge need within the average level, with a mean of 43.01, which is higher than the mean value of 42, as shown in Table (1).

Table (1). Distribution of respondents according to levels of training need in wheat cultivation in general in Al-Mahawil district

Training Need Categories	Degree limits	middle training needs	Number of farmers	%
Low	28 – 0	25	11	14.28
middle	56 – 29	43.01	53	68.83
High	84 – 57	70	13	16.89
Total	84 – 0	45	77	100

From Table (1), it is evident that most of the wheat farmers surveyed have a moderate level of training need in wheat cultivation. The moderate training need represented 68.83%, with 53 farmers out of the surveyed totaling 43.01. The high training need represented 16.89%, with 13 farmers out of the surveyed totaling 70. We also note the high average training need for the medium and high categories, reaching (85.72%), with 66 farmers out of the surveyed totaling 70. This clearly indicates that the vast majority of wheat farmers in Al-Mahawil district lack the agricultural knowledge and experience related to wheat cultivation. They are in dire need of training to acquire the necessary knowledge and skills in wheat

ISSN 2072-3857

cultivation. Generally, this result can be due to several reasons, including:

1. Wheat farmers' adherence to some traditional farming methods, perhaps due to the scarcity or high prices of seeds, fertilizers, and modern agricultural supplies and technologies (such as modern irrigation techniques, seed drills, laser leveling equipment, etc.), making them unaffordable for farmers. This forces farmers to rely on available agricultural supplies and maintain the same agricultural knowledge and information, with a reluctance to learn, develop, and acquire modern technologies. This has resulted in inadequate training for farmers, falling below the required level.

2. The absence or limited scope of extension activities implemented for farmers in the Mahawil region regarding the research topic. Despite the presence of an agricultural extension unit in the agricultural division, the demonstration farm in Al-Mahawil, and the agricultural research station in Al-Mahawil, the research area witnessed only three extension activities during the years 2023-2025 on the subject of wheat cultivation and service, at a rate of one extension activity per year. None of the respondents participated in any training activity on the aforementioned subject. This indicates the weakness of extension institutions in the process of raising awareness, guiding, and training farmers in wheat cultivation and service, which led to a weakness in the knowledge, information, and skills necessary for wheat cultivation among farmers, which is an important indicator of the weakness of extension training activity for farmers (39). The second objective: To assess the knowledge and training needs of wheat farmers in each of the wheat cultivation areas in Al-Mahawil District, Babylon Province.

The training needs of wheat farmers in each area were determined by subtracting their current knowledge from the desired (targeted) level of knowledge for that area, reflecting their training needs in all relevant test items for each area, as shown in Table (2).

Table (2): Highest, lowest, and average numerical values of training needs for each area of wheat cultivation

No.	field	Highest numerical	value Lowest numerical	value Middle numerical	value Standard score
1	Preparing the land and soil	15	1	7.05	16
2	Planting seeds	14	3	7.64	14
3	Planting method	4	1	2.43	4
4	Fertilization	12	2	8.59	12
5	Irrigation	15	3	8.71	16
6	Pest control	18	4	9.85	18
7	Harvesting	4	1	2.30	4

ISSN 2072-3857

The participants were distributed according to their training needs into three levels by converting the scores to standard values, as shown in Table (3:(

Table (3) Distribution of Participants According to Training Need Levels in Each Area of Wheat Cultivation

no.	Areas of Operation	Degree limits	number	%	middle training needs	arithmetic mean
1	Control	5 — 0	27	35.06	4.62	9.85
		18 — 12	18	23.38	17.22	
		11 – 6	32	41.56	10.12	
2	Fertilization Irrigation	3 — 0	22	28.57	2.63	8.59
		7 — 4	35	45.45	5.82	
		12 — 8	20	25.98	10.35	
3	Sowing Seeds	5 – 0	24	31.17	4.13	8.71
		11 — 6	31	40.26	8.46	
		16 — 12	22	28.57	14.05	
4	Harvesting Preparing the Land and Soil for Planting	4 – 0	23	29.87	3.48	7.64
		9 – 5	34	44.15	7.95	
		14 – 10	20	25.98	11.90	
5	Areas of Operation	1 – 0	28	36.36	1	2.30
		3 – 2	37	48.05	2.27	
		4	12	15.59	4	
6	Control	5 – 0	25	32.46	1.96	7.05
		11 – 6	30	38.96	7.06	
		16 – 12	22	28.57	12.81	
7	Fertilization	1 — 0	28	36.36	1	2.43
		3 — 2	30	38.96	2.77	
		4	19	24.67	4	

By calculating the relative importance of the training knowledge needs for each wheat cultivation area using the number of farmers in each area, the areas were .(distributed according to their sequential order, as shown in Table (4

ISSN 2072-3857

Table (4). Distribution of respondents according to the training needs of wheat farmers in each cultivation area

No.	topics	The relative importance of middle training needs	Number of farmers	Order
.1	Control	49.35	38	1
.2	Fertilization	45.45	35	2
.3	Irrigation	41.55	32	3
.4	Sowing	38.96	30	4
.5	Harvesting	35.06	27	5
.6	Preparing the land and soil for planting	32.46	25	6
.7	Planting methods	28.55	22	7

From table (4). It appears that pest control ranked first in training needs, with an average relative importance of 49.35%. Fertilization came in second, with an average relative importance of 45.45%, followed by irrigation in third place at 41.55%. Soil preparation ranked fourth at 38.96%, and harvesting fifth at 35.06%. Land and soil preparation for planting ranked sixth at 32.46%, and finally, planting methods ranked seventh at 28.55%. The reason pest control ranked first in training needs may be attributed to farmers' lack of awareness regarding the importance of controlling diseases, insects, and weeds, and their failure to apply scientific methods in this area. (6, 7) This process requires sufficient preparation and training for it to be practiced properly, especially since most of the farmers in this research have not entered training courses that include studying this field thoroughly, and they have not applied accurate practical and scientific practice by themselves or in partnership with agricultural specialists in this regard throughout their work in agriculture. Therefore, the need for training in this field is very high and requires attention in order to solve and address this problem. The reason fertilization ranked second may be attributed to farmers' lack of scientific knowledge in this process. They still use rudimentary methods in applying scientific recommendations for chemical fertilizers, resulting in a clear deficiency in their application (5). Furthermore, they fail to keep pace with continuous advancements in the use of chemical fertilizers in terms of type, quantity, methods, timing, and number of applications, creating a constant need for training and knowledge. Therefore, the need for training in this area is very high and requires immediate attention. The third area requiring training is irrigation. This is due to the importance and role of water in life and agriculture in general. Water is the lifeblood and the foundation of all living things; without it, there would be no life on this planet. The entire world, including Iraq, is experiencing a severe crisis of

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irrigation water scarcity. Major rivers like the Tigris and Euphrates are drying up due to rising temperatures, low rainfall, and other factors. Agriculture suffers from a lack of water resources, and farmers struggle with insufficient irrigation water, making it difficult to water their crops. The prevailing practice among most farmers is to leave their land fallow. Therefore, the need for training in this area is very high, requiring the state and officials to find appropriate solutions. These solutions include demanding Iraq's share of the water resources in the Tigris and Euphrates rivers through agreements with neighboring countries, as well as providing and supporting farmers with modern irrigation technologies that can significantly address water scarcity. The fourth area requiring training was the cultivation of seeds. This is a high ranking, perhaps due to the fact that most farmers do not understand the importance of their role in improving agricultural practices. The success of the entire agricultural process depends on the quality of the seeds used and the appropriate planting time, hence the high need for training in this area as well. The fifth area requiring training was harvesting. This is a good ranking among agricultural areas, surpassing land preparation and planting methods. This may be attributed to the fact that harvesting represents the final outcome of all agricultural operations, the total yield produced, and the revenue generated from cultivating the crop. Most farmers do not perform this process scientifically due to their limited agricultural knowledge, especially regarding... The importance of proper harvesting timing, using modern harvesters, preserving the crop, preventing grain loss or spoilage, cleaning it of impurities and harmful insects, and transporting it in vehicles that protect the harvest and prevent loss, among other things, was emphasized. Meanwhile, the field of farming methods ranked last. This does not mean that farmers do not need training in this area, but rather that their need for training in this field is minimal compared to other areas. This result is attributed to the fact that farmers consistently practice farming methods when cultivating wheat and other field crops such as barley, yellow corn, sunflowers, and others. Therefore, they have acquired sufficient experience and knowledge in farming methods, making them largely self-sufficient and requiring little training or further knowledge in this area.

Third Objective: To determine the correlation between training needs and each of the independent variables:

1. Area cultivated with wheat: The research results showed that the highest area cultivated with wheat was 55 dunams and the lowest was 4 dunams. The respondents were classified into four categories according to the area cultivated with wheat, as shown in Table (5).

ISSN 2072-3857

Table (5). Distribution of respondents according to the area cultivated with wheat and average training needs

No.	Categories of land cultivated with wheat	number	training needs	%	Simple correlation coefficient	Calculated t-value
.1	15 — 1	42	9.55	54.55	0.037	0.323
.2	30 — 16	23	21.60	29.87		
.3	45 — 31	7	38.57	9.09		
.4	60 — 46	5	54	6.49		
	Total	77		100		

The arithmetic mean = 18.67, the standard deviation = 12.728

From Table (5). It was found that the number of individuals in the wheat-cultivated area category (1-15) was 42 farmers, representing 54.55% of the total research sample. This represents more than half of the respondents, and their average training needs were 9.55. Meanwhile, the number of individuals in the (16-30) category was 23 farmers, representing 29.87% of the total, and their average training needs were 21.60. The number of individuals in the (31-45) category was 7 farmers, representing 9.09% of the total, and their average training needs were 38.57. Finally, the number of individuals in the (46-60) category was 5 farmers, representing 6.49% of the total, and their average training needs were 54. To find the correlation between training needs and wheat-cultivated area, Pearson's simple correlation coefficient was used, which was 0.037, a non-significant value. Therefore, we accept the statistical hypothesis. This indicates that there is no significant relationship between training needs and cultivated area. This may be attributed to the fact that increasing or decreasing the area cultivated with wheat does not affect the average training needs of farmers. Farmers have numerous training needs regardless of the size of the cultivated land.

2. Type of Agricultural Holding: Based on this variable, the respondents were classified into three categories. The first category included farmers who owned agricultural land, numbering (13) farmers, representing 16.88% of the total research sample, with an average training need of 45.23. The second category included (55) farmers who contracted for agricultural land, representing 71.43% of the total research sample, with an average training need of 32.80. The third category included (9) farmers who rented agricultural land, representing 11.69% of the total research sample, with an average training need of 31.88, as shown in the table. (6).

ISSN 2072-3857

Table (6). Distribution of respondents according to type of agricultural holding and average training needs.

No.	Categories of agricultural land ownership:	number	middle training needs	%	Simple correlation coefficient	Calculated t-value
.1	Ownership	13	45.23	16.88	0.110	0.965
.2	Contract	55	32.80	71.43		
.3	Lease	9	31.88	11.69		
	Total	77		100		

Arithmetic mean = 34.79, Standard deviation = 2.516

Table (6) shows that a large number of farmers contract for agricultural land, representing more than half of the farmers in the research sample. This indicates that most farmers do not own large tracts of agricultural land. To determine the correlation between the type of agricultural holding and training needs, Pearson's simple correlation coefficient was used, yielding a significant value of 0.110. This finding is significant, thus rejecting the research hypothesis that there is no significant relationship between the type of agricultural holding and training needs. This can be explained by the fact that farmers owning agricultural land provides a strong incentive to gather information and knowledge related to wheat cultivation, which positively impacts their average training needs in this area.

3. Contribution to Annual Income: The research results showed that the highest numerical value for income contribution was 90, and the lowest was 30. The respondents were classified into three categories based on income contribution: low, medium, and high, as shown in Table (7).

Table (7). Distribution of respondents according to contribution to annual income and average training needs

No.	Income contribution categories	number	middle training needs	%	Simple correlation coefficient	Calculated t-value
.1	Low (49 and below)	13	38.08	16.89	0.957	28.652
.2	Middle (50-65)	43	56.75	55.83		
.3	Large (70-100)	21	78.10	27.28		
	Total	77		100		

The arithmetic mean = 59.42, standard deviation = 19.933.

ISSN 2072-3857

From Table (7), it is evident that the number of individuals in the low-contribution category from wheat cultivation was 13 farmers, representing 16.89% of the total research sample, with an average training need of 38.08. The number of individuals in the medium-contribution category was 43 farmers, representing 55.83% of the total sample, with an average training need of 56.75. The number of individuals in the high-contribution category was 21 farmers, representing 27.28% of the total sample, with an average training need of 78.10. To determine the correlation between training needs and income contribution, the Spearman-Brown rank correlation coefficient was used, yielding a significant value of 0.957. Therefore, the statistical hypothesis stating that there is no significant relationship between training needs and annual income contribution is rejected. This may be attributed to the fact that the greater the contribution to income, providing a substantial financial return, the more farmers are encouraged to increase their training needs to acquire the necessary information and knowledge to further increase their income and cover the costs of wheat farming operations.

4. Years of Experience in Agriculture: The results showed that the longest period of experience in agriculture was 50 years, and the shortest was 5 years. The participants were classified into three categories based on this variable. The first category included farmers with 5-20 years of experience, totaling 60 farmers and representing 77.93% of the total sample. Their average training needs were 16.98. The second category included farmers with 21-35 years of experience, representing 16.88% of the total sample. Their average training needs were 30.30. The third category included farmers with 36-50 years of experience, representing 5.19% of the total sample. Their average training needs were 44.50, as shown in Table (8).

Table (8). Distribution of respondents according to years of experience in agriculture and average training needs.

No.	Categories of years of experience in agriculture	number	middle training needs	%	Simple correlation coefficient	Calculated t-value
.1	20 — 5	60	16.98	77.93	0.077	0.673
.2	35 — 21	13	30.30	16.88		
.3	50 — 36	4	44.50	5.19		
Total		77		100		

The arithmetic mean = 20.66, standard deviation = 7.674

ISSN 2072-3857

From Table (8), it is evident that the number of respondents with 5-20 years of experience in agriculture is high, representing the majority of the research sample. To find the correlation between years of agricultural experience and training needs, a simple correlation coefficient of 0.077 was used, which is not statistically significant. Therefore, we accept the statistical hypothesis stating that there is no significant relationship between training needs and years of agricultural experience. This can be explained by the fact that 77.93% of the respondents fall within the first category, meaning that most of them have similar levels of experience. It is also clear from the above that the average training needs of the third category (36-50 years old) are higher compared to the other categories. This is because older farmers have greater training needs as they adhere to traditional practices that are difficult to change, and most of them are illiterate. 5. Agricultural Supplies: The respondents were categorized according to their ownership of agricultural supplies. The study revealed that 12 farmers (15.59% of the total sample) owned sprayers, with an average training need of 17.91. Seventeen farmers (22.08% of the total sample) owned modern water pumps, with an average training need of 17.94. Nineteen farmers (24.67% of the total sample) owned agricultural equipment and machinery, with an average training need of 17.89. Twenty-five farmers (32.47% of the total sample) owned agricultural tractors, with an average training need of 17.48. Finally, four farmers (5.19% of the total sample) owned harvesters, with an average training need of 17.50. This information is shown in Table (9).

Table (9). Distribution of respondents according to their ownership of agricultural supplies and average training needs.

No.	Categories of agricultural supplies	number	middle training needs	%	Simple correlation coefficient	Calculated t-value
.1	Sprinklers	12	17.91	15.59	0.024	0.209
.2	Modern water pumps	17	17.94	22.08		
.3	Agricultural equipment and machinery	19	17.89	24.67		
.4	Tractors	25	17.48	32.47		
.5	Harvesters	4	17.50	5.19		
Total		77		100		

Arithmetic mean = 17.75, Standard deviation = 2.598

From Table (9), it is evident that the average training needs for all groups are similar. However, this does not mean that they do not need training, as

ISSN 2072-3857

training needs increase with the farmer's acquisition of agricultural supplies. To find the correlation between training needs and agricultural supplies, a simple correlation coefficient was used, which reached 0.024, a non-significant value. Therefore, we accept the statistical hypothesis stating that there is no significant relationship between training needs and agricultural supplies. This may be attributed to the fact that farmers always need training, whether or not they possess agricultural supplies, because the use of these supplies is essential in agricultural operations for crop cultivation.

6. Agricultural Information Sources: The research results showed that the highest numerical value for exposure to information sources was 40, and the lowest numerical value was 10. The respondents were classified, based on the theoretical range according to their exposure to information sources, into three categories: low, medium, and high, as shown in Table (10).

Table (10). Distribution of respondents according to agricultural information sources and average training needs

No.	Categories of information sources	number	middle training needs	%	Simple correlation coefficient	Calculated t value
.1	Low (10-20)	4	18.75	5.19	0.647	7.394
.2	Middle (21-30)	29	30.34	37.66		
.3	High (31-40)	44	33.52	57.15		
	Total	77		100		

The arithmetic mean = 31.55, standard deviation = 5.811.

From Table (10), it is evident that the number of individuals in the low exposure to information sources category (4) represents 5.19% of the total number, with an average training need of 18.75. The number of individuals in the medium exposure category (29) represents 37.66% of the total number, with an average training need of 30.34. The number of individuals in the high exposure category (44) represents 57.15% of the total research sample, with an average training need of 33.52. To find the correlation between training needs and information sources, the simple correlation coefficient (Pearson's coefficient) was used, which reached 0.647, a significant value. Therefore, we reject the statistical hypothesis stating that there is no significant relationship between training needs and information sources. This can be explained by the fact that the more information sources a farmer is exposed to and the more they learn about the latest developments related to wheat cultivation, the greater their need for training, which is a logical result. 7. Prior Training: The respondents were classified as either trained or untrained. The results showed that the number of untrained farmers

ISSN 2072-3857

was 63, representing 81.81% of the total research sample, with an average training need of 14.16. Meanwhile, the number of trained farmers was 14, representing 18.19% of the total research sample, with an average training need of 19.08, as shown in Table (11).

Table (11). Distribution of Respondents According to Prior Training and Average Training Needs

No.	Previous training categories	number	middle training needs	%	Simple correlation coefficient	Calculated t-value
.1	Trainee	14	19.08	18.19	0.027	0.237
.2	Non-trainee	63	14.16	81.81		
	Total	77		100		

The arithmetic mean is 15.06, and the standard deviation is 2.067.

From Table (11), it is evident that the majority of the sample consists of untrained farmers. This indicates a lack of training for these farmers. Therefore, all extension institutions should collaborate to provide the necessary training. Meanwhile, 14 farmers received training in wheat cultivation. To determine the correlation between training needs and prior training, a simple correlation coefficient of 0.027 was used, which is not statistically significant. Thus, we accept the statistical hypothesis that there is no significant relationship between training needs and prior training. This can be interpreted as the training process being ineffective for the trainees, resulting in no significant differences between those who received training and those who did not. Therefore, training programs should be developed for all farmers, taking into account their needs and problems, and providing effective solutions.The standard deviation is 2.06. 8.

Participation in Extension Activities: The results showed that the highest numerical value for participation in extension activities was 14, and the lowest numerical value was 4. The respondents were classified into two categories based on this variable. The first category included farmers who participated in extension activities, numbering 8 and representing 10.39% of the total research sample. Their average training needs were 10.25. The second category included farmers who did not participate in extension activities, numbering 69 and representing 89.61% of the total research sample. Their average training needs were 6.69, as shown in Table (12).

ISSN 2072-3857

Table (12). Distribution of Respondents According to Participation in Extension Activities and Average Training Needs

No.	Categories of participation in guidance activities:	number	middle training needs	%	Simple correlation coefficient	Value of t Calculated
.1	Participant	8	10.25	10.39	0.214	1.914
.2	Non-participant	69	6.69	89.61		
	Total	77	7.06	100		

The arithmetic mean = 7.06, standard deviation = 2.311

From Table (12), it is evident that the number of farmers not participating in extension activities represents the majority of the sample. This indicates a lack of training participation among these farmers. Therefore, all extension institutions should cooperate to ensure farmers' participation in various training courses tailored to their specific training needs, with the aim of raising their agricultural knowledge. To establish a correlation between training needs and participation in extension activities, a simple correlation coefficient was used, yielding a value of 0.214, which is significant at 0.01. Thus, we reject the statistical hypothesis stating that there is no significant relationship between training needs and participation in extension activities. This means that farmers' training needs increase with increased participation in extension activities aimed at promoting change. This suggests that farmers participating in extension activities have a greater need for information, knowledge, and skills, and therefore require a planned and targeted training process. 9. Average Agricultural Production: The respondents were classified into three categories based on this variable. The first category included farmers whose average production was between 500 and 999 kg/dunum of the standard production quantity. This category comprised 12 farmers, representing 15.59% of the total, and their average training needs were 34.583. The second category included farmers whose average production was between 1000 and 1499 kg/dunum of the standard production quantity. This category comprised 30 farmers, representing 38.96% of the total, and their average training needs were 35.033. The third category included farmers whose average production was between 1500 and 2000 kg/dunum of the standard production quantity. This category comprised 35 farmers, representing 45.45% of the total, and their average training needs were 36.200, as shown in Table (13).

ISSN 2072-3857

Table (13). Distribution of respondents according to average agricultural production and average training needs

No.	Middle production categories	number	middle training needs	%	Simple correlation coefficient	Calculated t value
.1	500-999 kg/dunum	12	34.583	15.59	– 0.524	– 5.363
.2	1000-1499 kg/dunum	30	35.033	38.96		
.3	1500-2000 kg/dunum	35	36.200	45.45		
	Total	77		100		

The arithmetic mean = 560.300, the standard deviation = 33.964.

Table (13) shows that less than one-third of the sample belonged to the first category (low-production farmers), with the highest average production being 2000 kg/dunum and the lowest average production being 500 kg/dunum. To find the correlation between average agricultural production and training needs, Pearson's simple correlation coefficient was used, which reached (-0.524), a non-significant value. Therefore, we accept the research hypothesis stating that there is no significant relationship between average agricultural production and training needs. This can be explained by the fact that an increase or decrease in average agricultural production does not affect the average training needs of farmers.

Third Objective: To identify the most important problems facing wheat farmers in Al-Mahawil District, Babylon Province.

It was found that the wheat farmers surveyed in Al-Mahawil District face numerous problems in the cultivation and management of the wheat crop. The most prominent problem was the scarcity of irrigation water, identified by 64 farmers, representing 83.11% of the total. The least significant problem was the impact of climate change on the quality and quantity of the wheat harvest, identified by 11 farmers, representing 14.28% of the total. These problems were ranked according to their importance to the farmers, as shown in Table 14.

ISSN 2072-3857

Table 14: Ranking of Problems Facing Wheat Farmers According to Their Importance in Al-Mahawil District

No.	Problems facing wheat farmers	Number of farmers	%
.1	Scarcity of irrigation water for wheat crops.	64	83.11
.2	Lack of agricultural machinery and equipment and their high prices.	60	77.92
.3	Lack of quantities and types of chemical fertilizers and their high prices.	57	74.02
.4	Lack of harvesters, resulting in delayed harvesting and high costs per dunam (approximately 0.25 acres) using mechanical harvesters.	54	70.12
.4	Lack of quantities and types of chemical pesticides and their high prices.	50	64.93
.5	Lack of fuel for agricultural machinery and its high prices, and high costs for plowing per dunam.	43	55.84
.6	Lack of government-subsidized improved wheat seeds provided to farmers and their high prices.	39	50.64
.7	Wheat field infestation (weeds, diseases, and insects).	34	44.15
.8	Weak and deteriorating drainage efficiency in the system, requiring maintenance.	29	37.66
.9	Insufficient government support for farmers in purchasing production inputs.	25	32.46
.10	Irregular and frequent power outages. Rivers and streams need their banks lined to conserve water and prevent loss.	22	28.57
.11	There is a lack of extension services and publications in the field of wheat cultivation and management.	21	27.27
.12	Failure in follow-up and limited field visits by relevant agricultural and extension departments.	18	23.37
.13	The marketed crop is rejected at the silo and not accepted for various reasons.	18	23.37
.14	Most agricultural soils are generally unfertile and highly saline, requiring reclamation.	16	20.77
.15	Climate change is impacting the quality and quantity of wheat produced.	14	18.18
.16	Scarcity of irrigation water for wheat crops.	11	14.28

ISSN 2072-3857

Table (14) reveals several problems faced by wheat farmers in the Al-Mahawil district, as perceived by them. These problems include the difficulty of cultivating the crop, the decline in cultivated areas, the decrease in the quantity and quality of the harvest, and infestations by insects, diseases, weeds, and other pests. The most pressing problem was the scarcity of irrigation water for the wheat crop. The second most significant issue was the shortage and high cost of agricultural machinery and equipment. The least significant problem was the impact of climate change on the quality and quantity of the wheat harvest. The remaining problems fell in between. We conclude that these problems are real and widespread, despite their varying frequency. Therefore, it is essential to investigate the root causes of these problems and find appropriate solutions. Addressing these issues will prevent financial losses and lead to increased and improved wheat production, ultimately enabling farmers, their families, the community, and the country as a whole to achieve a reasonable financial return.

Conclusions: The research findings led to several conclusions, which can be summarized as follows:

1. The training needs of wheat farmers in Al-Mahawil district varied across all areas of wheat cultivation.

2. The research on the training needs of wheat farmers in Al-Mahawil included a study of seven wheat cultivation areas and nine independent variables for the farmers.

3. The results showed that wheat farmers needed training in all areas, in the following order: (fertilization, pest control, irrigation, planting date, harvesting, planted seeds, land preparation and suitable soil for planting, and planting method).

4. The results did not show significant differences in the training needs of wheat farmers according to the following research variables: cultivated area, years of experience in farming, agricultural inputs, previous training, and average agricultural production. This demonstrates the need for training among all farmers, regardless of their differences. We conclude from this the necessity of including all wheat farmers in training programs, irrespective of their cultivated land area, years of experience, agricultural inputs, prior training, and average agricultural output.

5. The results also revealed a significant difference in the training needs of wheat farmers based on their type of landholding, contribution to income, sources of information, and participation in extension activities. The average need for training was found to be high among farmers seeking land ownership, increased income contribution, additional information on wheat cultivation from various sources, or increased participation in extension activities.

Recommendations

ISSN 2072-3857

1. In light of the varying training needs of wheat farmers in each aspect of its cultivation, it is essential to develop high-level, intensive training programs for farmers in the Al-Mahawil district, covering all aspects of wheat cultivation from planting to harvest. 2. The need to increase and focus training in all areas of wheat cultivation mentioned above by the extension services responsible for developing extension programs in Al-Mahawil District and Babylon Province in general.

3. The necessity of including all wheat farmers in the training program, regardless of their cultivated land area, years of experience in agriculture, agricultural inputs, previous training, and average agricultural production.

4. Developing training programs for wheat farmers in Al-Mahawil District based on actual needs in a scientific and objective manner, so as to increase farmers' knowledge and experience.

5. Utilizing the methodology adopted in this study as one of the approaches that can be used in identifying required training needs in other agricultural fields.

6. The necessity of repeating this study at varying intervals to identify changes in the training needs of wheat farmers in order to develop appropriate training curricula to meet those needs.

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