Level of application of extension recommendations by farmers producing certified wheat seeds in Kurdistan Region / Iraq

Shaimaa Mohammed Osman Al-Salhi 1 AHMED AWad talb AL-talb 2
shaymaasalayee85@gmail.com ahmed_altalb@uomosul.edu.iq
Department of agricultural extension and Technologies Transfer, College of Agriculture and foresty / University of Mosul, Iraq

Abstract

The research aimed to identify the level of application of extension recommendations by wheat seed producers in the Kurdistan Region/Iraq in general at each stage of wheat production and cultivation and to identify the correlation between the level of application of extension recommendations and some independent variables The questionnaire was used as a tool to collect the research data through personal interview, the questionnaire included two parts : The first part is It included a number of personal variables related to the cultivation of certified wheat. The second part consisted of a 63-item scale to measure the level of application. The research population consisted of (369) farmers distributed in three governorates of Erbil, Dohuk and Sulaymaniyah, asample of (30) respondents is taken from them to verify the reliability of the measurement tool, bringing the total number to (339) farmers The research sample was selected in a simple random manner with 40% of the number of certified wheat seed producers from each of the three governorates, bringing the sample size to (136) farmers. Data analysis using SPSS showed that farmers' application of extension recommendations was generally moderate to high, with high adherence in areas such as variety selection, land preparation, planting practices, irrigation, fertilization, pest and disease control, harvesting, and storage. Significant correlations were found with land size, participation in training courses, and sources of agricultural information, while no correlation appeared with education level, land ownership, or years of receiving certified seeds. The study recommends providing inputs like fertilizers, pesticides, and improved seeds, enhancing extension strategies, and offering real-time support through hotlines or digital platforms.

Introduction & Research Problem

Agriculture is one of the oldest professions practiced by humans throughout the ages. Since creation, God gave man the ability to benefit from plants, so he recognised them and used them for food, housing and treatment, and man gradually discovered the geographical areas suitable for a particular agricultural crop (12). The production of wheat in the world accounts for more than a quarter of the production of small grain crops (7). Wheat is one of the oldest agricultural crops in Mesopotamia and archaeological studies based on the research and excavation of the ruins of Tell Jarmo in Kirkuk Governorate in northern Iraq and based on genetics research indicate that the wild origins of the most important current wheat varieties came from that region (9). The reasons for the success of wheat cultivation in the northern regions of Iraq are due to the large agricultural area, lack of salinity in the soil and favourable climatic conditions, especially when rainfall rates are good and sufficient for wheat cultivation and production (8). Harvest

ISSN 2072-3857

residues such as straw, plant stems and hay are a source of feed and fodder for animals (1). There is a need to strengthen seed systems by building capacity to release and propagate good varieties, establish a seed conservation system, encourage public and private sector investment to increase seed production, and adhere to the national policy on improved seed production (13). Seeds These formal seed systems consist of a series of interconnected activities from genetic resources management, breeding and crop improvement research, seed multiplication, marketing and distribution to seed utilization by farmers (16). Therefore, it has become necessary to pay attention to the reality of its production and raise its productivity by improving the quality of seeds and the need to preserve and maintain improved and certified high-yielding varieties to ensure a safe and reliable source of these seeds and the use of good varieties of seeds that increase production efficiency and minimum inputs and also reduce crop loss (4). If the farmer cultivates varieties recommended by agricultural institutions, this leads to increased production and meets the food needs of the population without relying on imports from international markets (5). In the past few years, technological progress has witnessed a tremendous revolution in the field of biotechnology, which has entered the field of application and use and obtained interest in biological resources and resources, which provided the opportunity to discover new genes from seeds and ways to isolate them and exploit them in the creation of new plant varieties (10).). It is the oldest used food crops and an essential factor for the emergence and development of human societies because its cultivation is characterized by the ease of large-scale production and the possibility of storing it throughout the year (15) The seed production process is a specialized technical work and requires an organized and continuous effort based on scientific foundations and the aim is not to waste the quality of the seeds and is supervised by the certification bodies and the support of the seed producers (2). (In 1994, as a result of the expansion of its functions, a General Authority for the Inspection and Certification of Seeds was formed by the decision of the dissolved Revolution Command Council No. 181 (1994/10/11) (17) Seeds have an important role in the production of field crops and the quantity and quality of production depends on the qualities of the seeds that are planted. Scientific studies in many countries have shown that improved seeds have a greater share in raising the productivity of agricultural crops, as certified seeds have contributed during the past century more than (60%) of the increase in the production of plant crops (6). Scientific research has also recorded great success in raising agricultural production in terms of quantity and quality through the use of improved seeds and developing the production of these seeds based on valuable plans with the participation of farmers in agricultural institutions with the aim of reaching the stage of self-sufficiency and avoiding dependence on imported seeds (11). The agricultural sector is one of the main sectors to achieve the welfare and progress of society by exploiting the results of scientific achievements in the axes of agricultural sciences and the use of contemporary methods and techniques to reach maximum productivity and this clarifies the most important roles played by the agricultural sector in facing the food crisis (3) The governorates of Kurdistan Region were chosen to conduct the research due to the existence of the certified wheat seed production program

ISSN 2072-3857

and to answer the following questions what is the level of application of farmers producing certified wheat
seed to the extension recommendations in general, what is the level of application of farmers to the extension recommendations in each area of the research, and what is the correlation between the level of application and the independent variables included in the research

Research Objectives

The study aimed to assess the overall level of application of extension recommendations by certified wheat seed producers and to evaluate their adherence at each stage of wheat cultivation, including variety selection, land preparation, planting timing and depth, seeding methods and rates, irrigation and fertilization, pest and weed control, and post-harvest practices. Additionally, the study examined the relationship between application levels and several independent variables: academic achievement, land ownership type, cultivated area size, years of obtaining certified seeds, participation in training programs, and sources of agricultural information .

Research Materials and Methods

The provinces of Kurdistan Region (Erbil, Duhok, Sulaymaniyah) with its districts, suburbs and villages were selected as the research area, which is a fertile agricultural environment for the cultivation and production of wheat, as there is a certified seed production project in the provinces of the region .
Research population and sample: The research population included all farmers producing certified wheat seed officially registered in the Ministry of Agriculture and Water Resources in the Kurdistan Region / Iraq, which amounted to (369) farmers distributed in three governorates of Erbil , Dohuk and Sulaymaniyah The research sample was randomly selected by 40% of the number of certified wheat seed producers from each of the three governorates, bringing the sample size to (136) farmers As shown in table (1. (

Table (1) the population and sample of the research

Governorate	Total population	Pilot sample size	Main sample size	40% of sample size
Erbil	247	13	234	94
Dohok	57	7	50	20
Sulaymaniyah	65	10	55	22
total	369	30	339	136

The questionnaire was prepared for the purpose of collecting the research data, which included the following parts: The first part: It included data related to the respondents' personal independent variables: The second part: included the dependent variable measuring the degree of farmers' application of extension recommendations in the production of certified wheat seeds and included (7) domains with (63). The questionnaire was checked by a group of specialists in the Department of Field Crops and specialists in the certified wheat seed production programme to ensure the validity of the items and how they were formulated, and the opinions of the specialists showed the

validity of the test with some amendments to some items and were modified. to measure the reliability of scale, Cronbach alpha was used and its value was (0.80). To analyzed the data of research, spss program was used. The data collection process lasted from (1/11/20241) to (1/3/2025(

Results and Discussion

Objective One: To Determine the Overall Level of Adoption of Extension Recommendations by Certified Wheat Seed Producers

The analysis showed that respondents' scores ranged from a minimum of 136 to a maximum of 243, with an average score of 201.933 and a standard deviation of 18.942. Based on these results, the participants were grouped into three categories reflecting their level of implementation of extension recommendations related to certified wheat seed production in the Kurdistan Region. The classification is presented in Table (2(

The table (2) Illustrates the level of implementation of the certified seed plan by the surveyed wheat producers in general.

Application Level	Range	Frequency	Percentage (%)	Mean
Low	163–189	40	29.41%	180.268
Medium	190–216	61	44.85%	202.426
High	217–243	35	25.74%	227.235
Total		**136**	**100%**	

Table (2) shows that the medium category (190-216) had the highest percentage of respondents (44.85 per cent), while the low category (163-189) had the lowest percentage (29.41 per cent). The low category (163 - 189) was (29.41%) while the high category (217 - 243) was (25.74%), the lowest percentage among the three categories. This result shows that the level of application of the extension recommendations by the certified wheat seed producer farmers is average and tends to be high and this is due to the experience and knowledge possessed by the farmers participating in the certified wheat seed production programme as a result of their positive motivation and participation in this programme and their desire to apply all the extension recommendations for the production of certified wheat seed to reach acceptable results

Second Objective: Identifying the Extent to Which Certified Wheat Seed Producers Apply Extension Recommendations at Various Stages of Wheat Cultivation

First Domain : Selection of Wheat Varieties

Upon analyzing the data related to this aspect, it was found that the maximum score recorded by the producers was 48, while the minimum was 28. The mean score stood at 41.852. Based on these figures, the respondents were grouped into three levels according to how extensively they followed the extension recommendations regarding variety selection. Table (3) illustrates the distribution of farmers across these levels.

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Table (3): Distribution of Respondents Based on Their Level of Adherence to Extension Recommendations in Variety Selection

Categories	Range	Frequency	Percentage (%)	Mean
Low	28–34	16	11.76%	30.625
Medium	35–41	33	24.26%	38.818
High	42–48	87	63.98%	45.092
Total		**136**	**100%**	

It is clear from Table 8 that the highest percentage of the respondent farmers was in the high category (42-48) (63.98%), the medium category (35-41) (24.26%) came second, while the low category (28-34) (11.76%) was the lowest percentage among the categories. It is clear from the above result that the level of application of the respondents participating in the wheat certified seed production programme of the extension recommendations in this field is high, and this is the result of the information possessed by farmers in selecting suitable wheat varieties .

The second Domain : Preparation of land for agriculture:

The data presented in Table (4) indicates that farmers' scores in the area of land preparation ranged from a minimum of 15 to a maximum of 32, with an average score of 23.801. Based on these results, the farmers were classified into three distinct groups according to the degree to which they applied extension recommendations related to land preparation. The detailed distribution is presented in Table (4.(

Table (4): Distribution of Respondents by Their Level of Implementation of Extension Recommendations in the Domain of Land Preparation for Cultivation

Categories	Range	Frequency	Percentage (%)	Mean
Low	15–20	28	20.59%	18.250
Medium	21–26	75	55.15%	23.800
High	27–32	33	24.26%	28.576
Total		**136**	**100%**	

As shown in Table (4), the largest proportion of respondents fell into the middle category (21-26), accounting for 55.15%, while the lowest proportion was in the low category (15-20), with 20.59%. The high category (27-32) represented 24.26% of the respondents. These results indicate that the level of application of extension recommendations related to soil preparation, such as ploughing, levelling, smoothing the soil, determining ploughing depth, and the number of ploughs before planting, is generally average but tends to be high among farmers participating in the certified wheat seed production program.

Third Domain : Optimal Seed Planting Date and Sowing Depth

ISSN 2072-3857

The analysis revealed that the highest value achieved by the respondents was 36, while the lowest was 16, with an average score of 28.264. Farmers in this field were also divided into three categories based on their level of adherence to the extension recommendations. The distribution of respondents across these categories is presented in Table (5.(

Table (5): Distribution of Respondents According to Their Level of Application of Extension Recommendations in the Domain of Optimal Seed Planting Date and Sowing Depth

Categories	Range	Frequency	Percentage (%)	Mean
Low	16–22	16	11.77%	19.188
Medium	23–29	61	44.85%	26.361
High	30–36	59	43.38%	32.746
Total		**136**	**100%**	

It can be seen from the above table (5) that the intermediate category (23-29) came first with a percentage (44.85%), while the high category of respondents (30-36) came second with a percentage (43.38%), while the low category (16-22) came third with a percentage (11.77%). The low category came in the third place (16-22) with a percentage (11.77). It is clear from this result that the
level of application of the respondent farmers to the of scientific extension recommendations this field is average and tends to increase as a result of their familiarity with the appropriate dates for sowing and determining the appropriate sowing depth for the variety to be planted.

The fourth Domain: planting method and amount of seed :

The results of the research for this area indicated that the highest score achieved by the respondent farmers was 28, while the lowest score was 11, with an average value of 19.970%. Based on these results, the respondents were categorized into three groups according to the level of their adherence to extension recommendations in the field of planting method and seed quantity, as shown in Table (6.((

Table (6): Distribution of Respondents According to Their Level of Application of Extension Recommendations in the Domain of Planting Method and Seed Quantity

Adoption Level	Range	Frequency	Percentage (%)	Mean
Low	11–16	28	20.58%	14.321
Medium	17–22	71	52.21%	21.803
High	23–28	37	27.21%	24.649
Total		**136**	**100%**	

ISSN 2072-3857

As shown in Table (6), the majority of farmers fell into the middle category (17–22), accounting for 52.21% of respondents. The lowest percentage, 20.58%, was observed in the low category (11–16), while the high category (23–28) represented 27.21% of the sample, making it the second highest. These findings suggest that farmers' application of extension recommendations regarding planting method and seed quantity is generally moderate with a tendency toward a high level. This indicates an awareness among farmers of the appropriate seed quantity per dunum, considering the differences between wheat varieties.

Domain Five: Irrigation and Fertilization

The analysis revealed that the highest recorded score in this area was 35, while the lowest was 12, with a mean of 26.055. Based on these results, farmers were classified into three levels of application concerning extension recommendations related to irrigation and fertilisation, as presented in Table (7.(

Table (7): Distribution of Respondents According to Their Level of Application of Extension Recommendations in the Domain of Irrigation and Fertilisation

Categories	Range	Frequency	Percentage (%)	Mean
Low	12–19	23	16.91%	16.348
Medium	20–27	53	38.97%	24.660
High	28–35	60	44.12%	31.017
Total		**136**	**100%**	

As indicated in Table (7), the highest proportion of respondents (44.12%) fell within the high category (28–35), while 38.97% were in the middle category (20–27), and 16.91% belonged to the low category (12–19). These results reflect a generally high level of implementation of extension recommendations in the area of irrigation and fertilisation. This can be attributed to the farmers' adequate knowledge of modern irrigation techniques suited to their cultivated land and their active consultation with fertiliser experts

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Domain Six: Disease, Insect, and Weed Control

The analysis revealed that the maximum score attained in this area was 36, while the minimum was 16, with a mean score of 29.161. Based on these values, respondents were grouped into three categories reflecting their level of adherence to extension recommendations in the area of pest, disease, and weed control, as shown in Table (8 .(

Table (8): Distribution of Respondents by Their Level of Application of Extension Recommendations in the Domain of Disease, Insect, and Weed Control

Categories	Range	Frequency	Percentage (%)	Mean
Low	16–22	14	10.29%	20.286
Medium	23–29	51	37.50%	25.922
High	30–36	71	52.21%	33.239
Total		**136**	**100%**	

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As illustrated in Table (8), the largest proportion of respondents (52.21%) belonged to the high category (30–36), while the lowest percentage (10.29%) was recorded in the low category (16–22). The middle category (23–29) accounted for 37.50% of the respondents. These findings
suggest a high level of adoption of extension recommendations in the area of disease, insect, and weed control. This can be attributed to farmers' commitment to regular field monitoring and their awareness of proper pest control practices

Domain Seven: Harvesting and Storage

The data analysis for this field revealed that the highest score achieved by farmers was 36, while the lowest was 19, with an average of 32.816. Based on these figures, farmers were classified into three levels according to how effectively they implemented the extension recommendations related to harvesting and post-harvest storage, as outlined in Table. (9(

Table (9): Distribution of Respondents According to Their Level of Application of Extension Recommendations in the Domain of Harvesting and Storage

Categories	Range	Frequency	Percentage (%)	Mean
Low	19–24	9	6.62%	22.333
Medium	25–30	21	15.44%	27.619
High	31–36	106	77.94%	34.745
Total		**136**	**100%**	

It is clear from the result of table (9) that the highest percentage of respondents is in the high category (31-36) with a percentage (77.94%), the medium category (25-30) with a percentage (15.44%), and the low category (19-24) with a percentage (6.62%) due to the commitment of the respondent farmers to the extension recommendations in terms of following the climate at harvest time and how to store the grain .

Third Objective: Examining the Relationship Between the Level of Implementation of

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Extension Recommendations by Wheat Seed Producers and Selected Independent Variables

- 1Educational Achievment

To explore the relationship between farmers' educational achievement and their application of extension recommendations, respondents were classified into eight categories: illiterate, can read and write, primary, intermediate, preparatory, institute, college, and postgraduate. Table (10) presents the distribution of respondents across these educational levels and illustrates how this variable relates to their level of implementation of extension recommendations in certified wheat seed production

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The Table (10): Distribution of Respondents According to Educational Achievment and Its Relationship with Their Level of Application of Extension Recommendations in Certified Wheat Seed Production

Categories of Aducational Achievement	Frequency	Percentage (%)	The value of spearman rank rss	Value sig
Illiterate	15	11.0%		
Can read and write	25	18.4%		
Primary	25	18.4%		
Intermediate	22	16.2%		
Secondary	17	12.5%	0.025 n.s	0.770
Institute	9	6.6%		
College	16	11.8%		
Graduate studies	7	5.1%		
Total	**136**	**100 %**		

Table (10) shows that the highest percentage of the educational achievement categories are (reading and writing) and (elementary) with 18.4 per cent each. Followed by (16.2 per cent) the category of middle school graduates. The percentage of middle school graduates reached (12.5 per cent). The percentage of college graduates was (11.8%), followed by illiterate (11.0%), institute (6.6%), and the lowest percentage (5.1%). When examining the correlation between the level of With regard to the relationship between farmers' application of extension recommendations and their level of academic achievement, the analysis revealed no statistically significant correlation, as indicated by a Spearman's rank correlation coefficient (rs) of 0. This supports the null hypothesis, which states that there is no significant association between the level of application of extension recommendations by certified wheat seed producers in the Kurdistan Region of Iraq and their educational attainment. This lack of correlation may be attributed to the fact that most farmers acquire their knowledge and skills not through formal education or academic resources, but rather through informal sources such as relatives, peers, or practical experience.

Type of Land Ownership - 2

Respondents were also classified based on the type of land ownership into the following categories: ownership, rental, shared, contractual, and other forms .

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Table (11) distribution of farmers across these categories and its relationship to their application of extension recommendations in certified wheat seed production is presented.

Ownership Type	Frequency	Percentage (%)	The value of spearman rank rss	Value sig
Owned	65	47.8%	0.075 n.s	0.386
Rented	18	13.2%		
Shared	4	2.9%		
Contract	38	27.9%		
Others	11	8.1%		
Total	**136**	**100%**		

Table (11) clearly shows that the highest proportion among the categories of land ownership type is "landowners," accounting for 47.8%. This is followed by "land contractors" at 27.9%, and "land lessees" at 13.2%. The "shared ownership" category comes next with 2.9%, while the remaining unspecified categories collectively represent 8.1%.

Upon analyzing the correlation between the level of implementation of extension recommendations for the production of certified wheat seeds and the land ownership type variable, no statistically significant relationship was found. The Spearman's rank correlation coefficient was calculated at 0, indicating the absence of a meaningful correlation. Accordingly, the null hypothesis—which states that there is no significant correlation between the level of adoption of extension recommendations by certified wheat seed producers in the Kurdistan Region of Iraq and the type of land ownership—is accepted

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This finding may be attributed to the fact that farmers, regardless of whether they own the land or lease it, are equally motivated to follow extension recommendations, suggesting that ownership status does not influence their level of compliance.

3 -Cultivated Land Area: The data revealed that the largest cultivated land area among respondents was 6,000 dunums, while the smallest was 10 dunums. Respondents were categorized into three groups based on the size of their cultivated land, and the calculated mean area was 242.176 dunums, as presented in Table (12 .(

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Table (12): Distribution of the respondents according to the variable of cultivated land area and its relationship with the level of adoption of extension recommendations in the production of certified wheat seeds

Land Size (dunams)	Frequency	Percentage (%)	The value of person r	Value sig
10–2006	119	87.5%	0.251 **	0.003
2007–4003	11	8.09%		
4004–6001	6	4.41%		
Total	**136**	**100%**		
arithmetic mean 242.176 - standard deviation 672.823 - high value 6000 – low value 10 length of the category 1997				

Table(12) illustrates that the majority of farmers (87.50%) fall within the low land area category (10–2006 dunums), representing the highest proportion among all groups. A smaller percentage (8.09%) belongs to the medium land area category (2007–4003 dunums), while only 4.41% of farmers are in the high land area category (4004–6001 dunums), marking the lowest proportion.

Upon analyzing the relationship between the level of application of extension recommendations in the cultivation of certified wheat seeds and the cultivated land area, a statistically significant correlation was identified. The Pearson correlation coefficient was found to be (0.251**), which is significant at the 0.01 level. This result indicates a meaningful positive relationship between the extent of farmers' adherence to extension recommendations and the size of their cultivated land.

Accordingly, the null hypothesis—stating that there is no significant correlation between the level of application of extension recommendations by certified wheat seed producers in the Kurdistan Region of Iraq and the cultivated land area—is rejected in favor of the alternative hypothesis. This relationship may be explained by the fact that larger landowners are more motivated to apply agricultural recommendations in order to manage high cultivation and service costs effectively and minimize the risk of financial loss.

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- 4Number of Years Receiving Certified Seeds from the Seed Inspection and Certification Department:

Respondents were classified into three categories based on the number of years they have been receiving certified seeds from the Seed Inspection and Certification Department. The arithmetic mean was (4.779) years, with a standard deviation of (5.765), as shown in Table (13 .(

Table (13) presents the distribution of respondents based on the number of years they have obtained certified seeds from the Seed Testing and Certification Department, and examines its relationship with their level of adherence to extension recommendations in certified wheat seed production.

Categories of years Receiving Seeds	Frequency	Percentage (%)	The value of person r	Value sig
5–10 years	121	88.97%	0.043 n.s	0.618
11–16 years	10	7.35%		
17–22 years	5	3.68%		
Total	**136**	**100%**		
arithmetic mean 4.779 - standard deviation 5.765 - high value 22 – low value5- length of the category 5				

Table (13) shows that the highest proportion of farmers (88.97%) falls within the category of 5–10 years of receiving certified seeds. The second highest category is 11–16 years, comprising 7.35% of respondents, while the lowest percentage (3.68%) falls within the 17–22 years category.

When analyzing the correlation between the level of application of the extension recommendations in certified seed cultivation and the variable of the number of years of receiving certified seeds from the Seed Inspection and Certification Department, no statistically significant correlation was found. The correlation coefficient value was 0, indicating the absence of a meaningful relationship.

Consequently, the null hypothesis—stating that there is no significant correlation between the implementation of extension recommendations and the number of years farmers have received certified seeds—is accepted.

This may be attributed to the fact that the extension recommendations are often concerned with practices such as irrigation, pest control, and harvesting, which may not be directly influenced by the duration of certified seed use

- 5Number of Participants in Training Courses on Certified Wheat Seed Production

Respondents were grouped into three categories based on the number of times they participated in training courses related to certified wheat seed production, with a class interval of 5, as illustrated in Table (14(

Table (14): Distribution of respondents based on participation in training courses on certified wheat seed production and its relationship with the level of application of extension recommendations in wheat seed production.

Categories of Number of Courses	Frequency	Percentage (%)	The value of person r	Value sig
1–5	90	66.18%	0.117 *	0.039
6–10	26	19.12%		
11–15	20	14.70%		
Total	**136**	**100%**		
arithmetic mean 1.257- standard deviation 1.989- high value 16 – low value1- length of the category 5				

Table (14) indicates that the highest percentage of farmers (66.18%) falls within the 1–5 years category, followed by the 6–10 years category at 19.12%, and the lowest percentage (14.70%) is found in the 11–15 years category.

When examining the correlation between the level of application of extension recommendations and the number of participants in training courses related to certified wheat seed production, the correlation coefficient value of 0.177* is statistically significant at the 0.05 level. This finding leads us to reject the null hypothesis, which states that there is no significant correlation between the level of application of extension recommendations by certified wheat seed producers in the Kurdistan Region/Iraq and the number of participants in training courses on certified wheat seed production.

This may be explained by the fact that increased participation in training courses enhances farmers' knowledge and awareness, which in turn encourages them to apply the extension recommendations more effectively

Sources of Agricultural Information on Certified Wheat Seed Production - 6

The results declared that the hightest value was (46) and the lower value was (19 (

Respondents were categorized based on the sources of agricultural information they use regarding certified wheat seed production.to three Categories as shown in Table(15(

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Table (15): Distribution of respondents based on their sources of agricultural information on certified wheat seed production and its relationship with the level of application of extension recommendations in certified wheat seed production.

Categories of Information Exposure	Frequency	Frequency	The value of person r/rs	Value sig
Low (19–32)	20	14.71%	0.443 **	0.000
Medium (33–46)	82	60.29%		
High (47–60)	34	25.00%		
Total	**136**	**100%**		
arithmetic mean 38.743- standard deviation 8.811- high value 60 – low value19- length of the category 14				

Table (15) reveals that the lowest exposure to information sources is found in the 19–32 age group, which constitutes 14.71% of the research population. The 47–60 age group accounts for 25.00% of individuals with medium exposure to information sources. In contrast, the 33–46 age group, characterized by high exposure, represents 60.29% of the total research population.

To assess the correlation between the level of application of extension recommendations and the sources of agricultural information, the Pearson correlation coefficient was calculated, yielding a value of 0.443**, which is statistically significant at the 0.01 level.

Therefore, the null hypothesis, which suggests there is no significant correlation between the level of application of extension recommendations by certified wheat seed producers in the Kurdistan Region/Iraq and the variable of agricultural information sources, is rejected. This finding can be explained by the fact that the more farmers are exposed to agricultural information sources, the more they increase their knowledge, thereby improving their chances of applying extension recommendations effectively.

Conclusions :

The level of implementation of extension recommendations by the certified wheat seed producers is average and tends to be high. The respondent farmers have high expertise in the area of variety selection. The least knowledge of the respondent farmers is in the field of planting method and seed quantity. We conclude that the farmers in the research sample have little information in the field of planting method and seed quantity and their reliance on traditional methods due to their adherence to agricultural customs and traditions as a result of their long experiences with them, as well as their lack of full adoption of modern techniques and new information, which leads to waste of seeds and poor germination, which affects production negatively. The results of the research indicated that there is a positive significant correlation between the area of cultivated land and the level of application of extension recommendations. We also conclude that the number of farmers' participation in training courses has an impact on the level of their application of extension recommendations in the cultivation of certified seeds because training courses improve farmers' agricultural practices and provide them with new and modern skills, and that agricultural

ISSN 2072-3857

information sources affect farmers' application of recommendations related to the cultivation of certified wheat seeds because the more access farmers have to agricultural information, the more opportunities to improve productivity and economic and environmental sustainability in the agricultural sector. The variables of educational attainment, type of land ownership, number of years of taking certified seeds from the Seed Inspection and Certification Department and type of farming do not play a role in enhancing the experiences and information that would increase the level of their application of the extension recommendations

Recommendation :

Activating the role of agricultural extension and providing various and varied extension services to farmers, such as preparing training courses designed and directed to farmers according to their level of experience and their different needs by agricultural training and extension centers, and developing an agricultural plan that supports farmers with fertilizers, pesticides and improved seeds. Providing the necessary fuel to operate agricultural machinery such as sprinklers and other irrigation systems according to a well-designed agricultural plan by agricultural directorates in each governorate. Establishing a hotline or electronic platforms to provide immediate guidance, answer farmers' queries, and provide personal and field guidance. Conduct ongoing field research to identify new challenges facing farmers to issue up-to-date recommendations by the directorate of research and agricultural extension.

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ISSN 2072-3857