

International Journal of Agriculture Extension and Social Development

Volume 8; Issue 11; November 2025; Page No. 114-122

Received: 13-08-2025
Accepted: 17-09-2025

Indexed Journal
Peer Reviewed Journal

Analysis of the relationship between farmers' characteristics and the determinants of soybean cultivation adoption in Kirkuk Governorate

Fouad Mahmoud Zoba'a, Maher Saleh Suleiman and Suad Ibrahim Al-Obeid

Department of Extension and Rural Development, Faculty of Agriculture, Sudan University of Science and Technology, Sudan

DOI: <https://www.doi.org/10.33545/26180723.2025.v8.i11b.2625>

Corresponding Author: Fouad Mahmoud Zoba'a

Abstract

This research aims to identify the determinants of soybean cultivation adoption from the perspective of farmers in Kirkuk Governorate, Iraq, and to study the relationship between the magnitude of these determinants and some of the farmers' personal, social, and economic characteristics. The researcher used a descriptive-analytical approach and relied on a questionnaire whose data was collected from a sample of 361 farmers representing various areas of the governorate. The results showed that the majority of respondents (79.78%) believe that the magnitude of the determinants facing soybean cultivation is significant, tending towards a moderate level, reflecting the existence of real obstacles that limit the adoption of this strategic crop. The most significant determinants facing farmers were identified as a lack of trust in government agencies, weak financial and technical support, difficulty in marketing the crop, and the scarcity of local markets. The results also revealed that the limited availability of extension services and the weak responsiveness of agricultural extension agents to farmers' needs are among the most prominent institutional obstacles. Statistical analysis showed a significant correlation between the magnitude of the determinants and some of the respondents' personal characteristics, such as educational level, farm size, agricultural experience, and inclination towards soybean cultivation. The research concluded with the importance of strengthening trust between farmers and government agencies, providing stimulating financial and marketing support, and activating specialized guidance programs for the soybean crop, which contributes to raising the level of farmers' adoption of it and achieving sustainable agricultural development in Kirkuk Governorate.

Keywords: Farmer characteristics, adoption, soybeans

Introduction

Agricultural development is a fundamental pillar for achieving food security and comprehensive economic development in any country. In light of rapid population growth and changing climate challenges ^[1], the last few decades have witnessed significant transformations in the global agricultural landscape, driven by technological advancements. Reforming the agricultural sector in Iraq requires concerted efforts from the government, the private sector, and civil society ^[2]. These efforts should focus on strengthening irrigation and drainage infrastructure, providing affordable agricultural inputs, and developing an effective agricultural extension system that offers technical support to farmers. Among the diverse agricultural crops, ^[3] field crops play a vital role in the global and local food basket, providing essential cereals, pulses, and oilseeds for human and animal nutrition and industry. Soybeans (*Glycine max* L.) are considered one of the most important of these crops, due to their high nutritional value as a source of protein and oil. ^[4] Soybeans are also used in the manufacture of animal feed, vegetable oils, and many other food products, making them a strategic crop of great economic and nutritional importance at both the global and local levels. Expanding soybean cultivation can reduce Iraq's dependence on imports of vegetable oils and protein. ^[5] However, soybean cultivation requires specific

technical knowledge and suitable environmental conditions, which may pose a challenge for farmers who lack the necessary experience or technical support. ^[6] Despite the increasing importance of soybeans as a strategic crop that contributes to achieving food security and providing sources of protein and oil, its cultivation in Iraq in general, and in Kirkuk Governorate in particular, is still below the desired level compared to the governorate's agricultural potential. ^[7] Preliminary data indicate that the areas cultivated with soybeans in Kirkuk Governorate are limited, and that there is a disparity in productivity levels among farmers. This situation raises questions about the underlying reasons for this challenge, especially given the increasing demand for soybean products in the local market. ^[8] The gap between the available agricultural potential in Kirkuk Governorate and the current reality of soybean cultivation constitutes a research problem that requires in-depth study. Although soybeans are considered a crop of high economic and nutritional value and contribute to enhancing soil fertility, farmers in Kirkuk have not adopted their cultivation on a large scale ^[9]. This lack of adoption can be attributed to a set of overlapping factors that need to be identified and carefully analyzed from the farmers' own perspective. Understanding the real reasons that prevent farmers from cultivating or expanding soybeans will be the cornerstone for formulating effective and sustainable solutions ^[10].

Adopting modern agricultural technologies is one of the most important challenges facing farmers in developing countries. Farmers do not automatically adopt new technologies^[11]; rather, their decisions are influenced by a complex set of economic, social, cultural, institutional, and environmental factors.^[12] In the context of soybean cultivation in Kirkuk Governorate, a range of determinants likely influence a farmer's decision to adopt or expand soybean cultivation.^[13] In addition to economic factors, social and cultural factors play a significant role. Farmers may have preferences for cultivating traditional crops they are accustomed to, or a lack of confidence in the economic viability of soybean cultivation.^[14] Limited knowledge of the economic and environmental benefits of soybeans, coupled with a lack of experience among farmers, can limit their willingness to adopt this crop.^[15] The influence of local customs and traditions, and the role of senior farmers or local leaders in influencing the decisions of other farmers, can also play a significant role in the adoption process.^[16] It is worth noting that inadequate agricultural infrastructure, such as insufficient irrigation and drainage networks and a lack of suitable roads for transporting crops, can also affect farmers' decisions to adopt crops with specific water requirements or ease of marketing.^[17] The lack of stable water sources, especially in light of climate change and rainfall shortages, poses a significant challenge for farmers in Kirkuk, leading them to prefer crops that require less water.^[18] The absence of a clear and comprehensive understanding of the determinants of soybean cultivation adoption from the perspective of farmers in Kirkuk Governorate makes it difficult to design and implement effective extension and development programs aimed at encouraging farmers to expand the cultivation of this vital crop. Therefore, identifying and analyzing these determinants will provide valuable insights for policymakers and agricultural development specialists, enabling them to develop targeted action plans to support soybean cultivation and enhance food security.

Based on the above, the current research attempts to answer the following research questions

1. Is there a significant correlation between the size of the determinants of soybean cultivation in Kirkuk Governorate and the distinctive characteristics of the farmers surveyed?
2. What are the proposals for expanding soybean cultivation in Kirkuk Governorate?

Study Objectives

This research aims to achieve the following objectives

1. To establish a correlation between the opinions of surveyed farmers regarding the extent of soybean cultivation in Kirkuk Governorate and their distinguishing characteristics, namely (age, educational level, farm size, farm type, soybean cultivation, soybean area, experience in soybean cultivation, annual income, ownership of agricultural equipment and machinery, and attitude towards soybean cultivation).
2. To identify proposals for expanding soybean cultivation in Kirkuk Governorate.

Research Population and Sample

The research population comprised all farmers registered

with the Kirkuk Agriculture Directorate and its affiliated agricultural divisions in Kirkuk Governorate, totaling 23,256 farmers distributed across four districts: Kirkuk, Hawija, Dibis, and Daquq. Hawija District was selected due to its reputation for field crop cultivation among the four districts.

Hawija District includes five agricultural divisions: Hawija, Abbasi, Zab, Riyadh, and Mahooz. Three agricultural divisions (60%) were selected: Hawija, Abbasi, and Mahooz. According to the Kirkuk Governorate Agriculture Directorate records, these three divisions contain approximately 6,000 farmers. A random sample of 361 farmers was selected using Morgan's formula. The research sample consisted of these three divisions.

Preparing the Questionnaire

To achieve the research objectives, the researcher relied on several sources to develop the initial research plan. A questionnaire was used as an important tool for obtaining accurate information related to the circumstances and realities. This was done after reviewing previous studies, literature, personal interviews with specialists, and research relevant to the current study. To achieve the research objectives, a questionnaire consisting of three parts was developed:

Part One: The Distinctive Research Framework

This part includes a number of questions through which data can be obtained regarding the main economic, social, and communication factors that led us to stop identifying the determinants of contribution to soybean cultivation in Kirkuk province, namely (age, educational level, farm ownership, type of farm holding, experience in soybean cultivation, income and housing, ownership of agricultural equipment and machinery, and attitude towards soybean cultivation).

Part Two: Constraints of Soybean Cultivation, divided into three areas

First Area: Constraints Related to the Farmer

(24) items were formulated, and four alternatives were provided for each item (large, medium, small, none).

The second area: Crop-related constraints

(24) items were formulated, and four alternatives were provided for each item (large, medium, small, none).

The third area: Extension service constraints

(24) items were formulated, and four alternatives were provided for each item (large, medium, small, none).

The third part: Suggestions for promoting soybean cultivation in the region

(15) items were formulated, and three alternatives were provided for each item (agree, somewhat agree, disagree). Respondents were also given the option to add other suggestions not mentioned in the questionnaire.

Validity Measurement

The face validity of the scales used was measured by presenting the questionnaire to agricultural extension experts. Content validity was also measured by presenting

the questionnaire to field crop experts for appropriate revisions. The questionnaire was reviewed to ensure the accuracy of the study domains and the wording of the items within each domain, and their suitability for measuring the constraints facing soybean cultivation. Each item was presented with the following answer choices: (valid, valid with modification, invalid). Scores of (2, 1, 0) were assigned, respectively. Items that did not achieve more than 75% agreement from the experts were removed. The modifications indicated for some items were implemented - Appendix (2), as detailed below:

Area 1: Farm-related constraints: Items (4) were deleted and items (3) were modified, resulting in a final scale of (18) items.

Area 2: Crop-related constraints: Items (3) were deleted and items (3) were modified, resulting in a final scale of (18) items.

Area 3: Extension service-related constraints: Items (3) were deleted and items (4) were modified, resulting in a final scale of (20) items.

Results and Discussion

First Objective: To find the correlation between the opinions of the surveyed farmers regarding the size of the determinants of soybean cultivation in Kirkuk Governorate and their distinctive characteristics, namely (age, educational level, farm size, farm type, soybean cultivation, soybean area, experience in soybean cultivation, annual

income, ownership of agricultural equipment and machinery, and attitude towards soybean cultivation).

1. Age

The results showed that the youngest of the respondents was (22 years old) and the oldest was (68 years old) with an overall average of (41.89) years and a standard deviation of (11.89) degrees. The respondents were divided into three categories according to the range and category length laws, as shown in Table (9). The table indicates that (40.1%) of the respondents were between (22-36) years old, with an average size of constraints from their perspective of (156.8). It also shows that (24.7%) were middle-aged, between (37-51) years old, with an average size of constraints of (158.66). Meanwhile, (35.2%) of the respondents were over (52) years old, with an average size of constraints from their perspective of (163.19). From the above, it is clear that the majority of respondents were young to middle-aged (64.8%). It appears that older respondents tend to perceive greater constraints than younger ones. This may be because older farmers are more attached to traditional ideas and crops, while younger people are more inclined to seek modern technologies, or perhaps younger people do not perceive the existing obstacles as significant compared to older people.

This may be due to older farmers being more attached to traditional ideas and crops, while younger people are more inclined to seek modern technologies. Alternatively, younger people may not perceive the existing obstacles as significant compared to older people.

Table 1: Distribution of respondents by age and its relationship to their opinions on the size of the determinants of soybean cultivation.

Age Group	Number	%	Average Specific Size	(r)	t-value	Significance Level
(22-36) Small	145	40.1	156.8	-0.00389	0.07371	n.s
(37-51) Medium	89	24.7	158.66			
(52+) Large	127	35.2	163.19			
Total	361	100				
Overall mean = 41.89 Standard deviation = 11.89						

To find the relationship between the size of the determinants from the farmers' point of view and their ages, Pearson's correlation coefficient was used, with a value of r (-0.00389). To confirm the significance of the relationship, the value of the (t) test was found, which amounted to (0.07372), and it is not significant at either of the two levels (0.01) and (0.05). Thus, we accept the research hypothesis which states (There are no statistically significant differences in the size of the determinants of adopting soybean crop cultivation from the farmers' point of view in Kirkuk Governorate / Iraq with regard to their different ages).

2. Educational Level

The results shown in Table (2) indicate that 27.9% of the surveyed farmers hold a bachelor's degree (college graduates), and they reported that the average size of the

constraints on soybean cultivation was 154.71 points. Second place went to secondary school graduates, representing 20.9% of the surveyed farmers, who reported that the average size of the constraints on soybean cultivation was 161.01 points. It was also found that 9.4% of the surveyed farmers held advanced degrees, and they perceived the average size of the constraints as 161.83 points and 177 points for those with master's and doctoral degrees, respectively.

As for illiterate farmers, or those who are only literate, they constituted 15.2% of the surveyed farmers, and the average size of the constraints from their perspective was 197 points and 178.51 points, respectively.

To determine the correlation between the size of the determinants from the farmers' perspective and their educational level, Spearman's correlation coefficient was found to be (-0.228).

Table 2: shows the distribution of respondents according to their educational level and its relationship to their opinions on the size of the determinants of soybean cultivation.

Educational Level Categories	Number	%	Average Determinant Size	rs	t-value	Significance Level
Illiterate	1	0.2	197	-0.228	4.436	0.01
Reads and Writes	54	15	178.51			
Primary	27	7.5	150.74			
Intermediate	22	6.1	160.40			
Preparatory	75	20.9	161.01			
Institute	47	13	144.51			
College	101	27.9	154.71			
Master's	24	6.7	161.83			
Doctorate	10	2.7	177			
Total	361	100				

To confirm the significance of the relationship, the t-test value was calculated to be 4.436, which is significant at the 0.01 level. This means rejecting the research hypothesis, which states that "there are no statistically significant differences in the magnitude of the determinants of soybean cultivation adoption from the perspective of farmers in Kirkuk Governorate, Iraq, based on their educational level," and accepting the alternative hypothesis. This indicates that illiterate farmers, who can read and write, perceive the determinants facing soybean cultivation as significant compared to those with higher education degrees. This necessitates directing extension efforts toward farmers who lack academic qualifications.

3. Size of the farm holding

The results showed that the smallest agricultural land owned by farmers was (5) dunams, while the largest was (70)

dunams, with an average of (28.16) dunams, with a standard deviation of (12.59) degrees. The respondents were divided into three categories according to the laws of range and class length. It was found that farmers who own small agricultural land ranging in size between (5-26) dunams numbered (159) farmers, constituting (44.05%), with an average specific size of (169.31) degrees. Meanwhile, the number of farmers who own a medium holding ranging between (27-48) dunams was (26) farmers, constituting (7.20%), with an average specific size of (168.85). Thus, the specific size is less than the small areas. Meanwhile, the number of farmers who own a large holding ranging between (49-70) dunams was (176) farmers, constituting (48.75%), with an average specific size of (149.38). As shown in Table (10), this means that half of the farmers own large agricultural lands and can diversify the crops they cultivate.

Table 3: Distribution of respondents according to farm size and its relationship to their opinions on the size of the constraints on soybean cultivation.

Holding Size Categories	Number	%	Mean Size Determinant	r	value t	Significance Level
(5-26) Small	159	44.05	169.31	-0.25211	4.936	0.01
(27-48) Medium	26	7.20	168.85			
(49-70) Large	176	48.75	149.38			
Total	361	100				

Overall Mean = 28.16, Standard Deviation = 12.59

To find the relationship between the size of the determinants from the farmers' point of view and the size of the farm holding, Pearson's correlation coefficient was used, and the value of r was (-0.25211) degrees. To confirm the significance of the relationship, the value of the (t) test was found, which amounted to (4.936), which is significant at the level of (0.01). Thus, we reject the research hypothesis, which states that (there are no statistically significant differences in the size of the determinants of adopting soybean cultivation from the farmers' point of view in Kirkuk Governorate / Iraq, with respect to the size of their farm holding). This means that farmers who own small agricultural land see the size of the determinants as large compared to what farmers who own large agricultural land see, and the reason may be the difficulty of diversifying agricultural crops for farmers who own small agricultural land.

4. Type of Farmholding

The results in Table (4) show that (161) farmers, representing (44.6%) of the surveyed farmers, own the

agricultural land they cultivate (ownership), and the average size of the constraints on soybean cultivation, from their perspective, was (154.08). Meanwhile, (184) farmers, representing (51%) of the total surveyed farmers, had a (contract) type of farmholding, and they indicated that the average size of the constraints on soybean cultivation was (146.25). (12) farmers, representing (3.3%) of the total surveyed farmers, indicated that their agricultural land was shared with other farmers, and they indicated that the average size of the constraints on soybean cultivation was (156.83). Finally, four farmers, representing (1.1%) of the total surveyed farmers, indicated that their land was leased, and they stated that the size of the constraints on soybean cultivation was (162.5).

To identify the relationship between the magnitude of the determinants of soybean cultivation from the farmers' perspective and their type of farmholding, Spearman's correlation coefficient was found to be 0.24. To confirm the significance of this relationship, a t-test was performed, yielding a value of 2.67, which is significant at the 0.01 level. This indicates the rejection of the research hypothesis

stating that "there are no statistically significant differences in the magnitude of the determinants of soybean cultivation adoption from the farmers' perspective in Kirkuk Governorate, Iraq, based on their type of farmholding," and the acceptance of the alternative hypothesis. This may be

attributed to the fact that farmers who own agricultural land or have contracts have greater freedom in choosing the crops they cultivate and managing their land as they see fit, compared to those who rent or share their land with other farmers.

Table 4: shows the distribution of respondents according to their type of farmholding and its relationship to their opinions on the magnitude of the determinants of soybean cultivation.

Type of holding,	Number,	%	Average size Determinant	(rs),	t-value,	Significance level
Ownership	161	44.6	154.08	-0.124	2.267	0.01
Contract	184	51	146.25			
Rent	4	1.1	162.5			
Share	12	3.3	156.83			
Total	361	100				

5. Soybean Cultivation

The results in Table (5) show that (129) farmers, representing (35.73%) of the surveyed farmers, have cultivated or are cultivating soybeans. They indicated that the average magnitude of the constraints hindering soybean

cultivation was (157.14) points. Meanwhile, the number of farmers who did not cultivate soybeans was (232), representing (64.27%) of the total surveyed farmers. They stated that the average magnitude of the constraints hindering soybean cultivation was (160.82) points.

Table 5: Distribution of Respondents According to Their Cultivation of Soybeans and its Relationship to Their Opinions on the Magnitude of the Constraints to Soybean Cultivation

Crop Cultivation	Number,	%	Average size Determinant	(rs),	t-value,	Significance level
Yes	129	35.73	157.14	-0.08	1.520	n.s
No	232	64.27	160.82			
Total	361	100				

To determine the relationship between the size of the determinants of soybean cultivation and whether or not farmers cultivate the crop, Spearman's correlation coefficient was found to be (0.08). To determine the significance of the relationship, the value of the (t) test was found to be 1.520, which is not significant at either level. This means rejecting the research hypothesis, which states that (there are no statistically significant differences in the size of the determinants of adopting soybean cultivation from the perspective of farmers in Kirkuk Governorate / Iraq, regardless of their experience in cultivating the crop).

6. Area cultivated with soybeans

The results in Table (6) show that the smallest area

cultivated by soybean farmers was (2) dunams, while the largest area was (15) dunams. The respondents were divided into three categories according to the cultivated area, based on the range and class length laws. It was found that (105) farmers, representing (29.08%) of the surveyed farmers, cultivated soybeans on an area ranging from (2-6) dunams. They indicated that the average magnitude of the constraints hindering soybean cultivation was (161.41). Meanwhile, (22) farmers, representing (6.09%) of the total surveyed farmers, cultivated soybeans on an area ranging from (7-11) dunams. They stated that the average magnitude of the constraints hindering soybean cultivation was (134.4).

Table 6: Distribution of respondents according to the cultivated area of soybeans and its relationship to their opinions on the size of the constraints on its cultivation.

Cultivated Area Categories (dunums)	Number	%	Average Determinant Size	rs	t-value	Significance Level
Not Cultivated	232	64.27	160.82	-0.209	4.409	0.01
(2-6) Small	105	29.08	161.41			
(7-11) Medium	22	6.09	134.4			
(12-plus) Large	2	0.56	160.5			
Total	361	100				

To determine the relationship between the size of the constraints on soybean cultivation and the cultivated area, Spearman's correlation coefficient was found to be -0.209. This is an inverse relationship, indicating that farmers cultivating larger areas perceive the constraints as smaller. To assess the significance of this relationship, the t-test value was found to be 4.409, which is significant at the 0.01 level. This finding rejects the research hypothesis that "there are no statistically significant differences in the size of the constraints on soybean cultivation adoption from the

perspective of farmers in Kirkuk Governorate, Iraq, regardless of their experience in cultivating the crop." This may be because farmers cultivating larger areas perceive the constraints identified by others as small and insignificant in their impact on crop cultivation.

7. Experience in soybean cultivation

The results in Table (7) show that the least experience among soybean farmers was (1) year, while the most experience was (3) years. The respondents were divided into

three categories according to their experience in cultivating the crop. It was found that (0.83%) of the surveyed farmers had cultivated soybeans for one year and indicated that the average size of the constraints hindering soybean cultivation was (154) points. Meanwhile, (23.82%) of the surveyed farmers indicated that they had cultivated soybeans for two

years and found the average size of the constraints to be (158.82) points. Finally, it was found that (11.08%) of the total surveyed farmers had cultivated soybeans for three years and found the average size of the constraints to be (153.77) points.

Table 7: Distribution of respondents according to experience in cultivating soybeans and its relationship to their opinions on the size of the constraints on its cultivation

Categories for the number of years the crop has been grown	Number	%	Average Determinant Size	(rs)	t-value	Significance Level
Not grown	232	64.27	160.82	-0.094	1.788	ns
1 year	3	0.83	154			
2 years	86	23.82	158.82			
3 years	40	11.08	153.77			
Total	361	100				

In order to identify the relationship between the size of the determinants of soybean crop cultivation and experience in cultivating the crop, it was found that the value of Spearman's correlation coefficient reached (-0.094) degrees, which is not significant at either level according to the result of the (t) test, which was found to reach (1.788) degrees. This means accepting the research hypothesis, which states that (there are no statistically significant differences in the size of the determinants of adopting soybean crop cultivation from the perspective of farmers in Kirkuk Governorate / Iraq, according to their experience in cultivating the crop).

8. Annual income

The results showed that the lowest income for the surveyed

farmers was 1 million dinars per year, while the highest annual income was 20 million dinars per year, with an overall average annual income of 5.61 million dinars. The respondents were divided into three categories according to the range and class size laws. It was found that the number of farmers with low incomes, ranging between 1 and 6 million dinars per year, was 26, representing 7.2% of the total respondents, with an average class size of 170.48 points. The number of farmers with medium incomes, ranging between 7 and 12 million dinars per year, was 278, representing 77% of the total respondents, with an average class size of 160.41 points. Finally, the number of farmers with high incomes (13 million dinars or more per year) was 57, representing 15.8% of the total respondents, with an average class size of 150.28 points.

Table 8: Distribution of respondents according to annual income level and its relationship to their opinions on the size of the determinants of soybean cultivation

Income Groups	Number	%	Average Determinant Size	R	t-value	Significance Level
(1-6) Low	26	7.2	170.48	-0.231	4.489	0.01
(7-12) Moderate	278	77	160.41			
(13+) High	57	15.8	150.28			
Total	361	100				
Overall Mean = 5.61 Standard Deviation = 3.49						

To find the relationship between the size of the constraints from the farmers' point of view and the level of income, Pearson's correlation coefficient was used, and the value of r was (-0.231). To confirm the significance of the relationship, the value of the (t) test was found, which amounted to (4.489), which is significant at the level of (0.01). Thus, we reject the research hypothesis, which states that (there are no statistically significant differences in the size of the constraints on adopting soybean cultivation from the farmers' point of view in Kirkuk Governorate / Iraq, with regard to their annual income). This means that farmers with high incomes find that the size of the constraints facing soybean cultivation is less than what farmers with low incomes see. This may be because low-income farmers may face a problem in purchasing the supplies for soybean cultivation.

9. Ownership of agricultural equipment and machinery

The results showed that the fewest number of machines and equipment owned by the surveyed farmers was (1) machine, while the most were (9) machines, with an average of (5.93) machines. The respondents were divided into three categories according to the range and class length laws. It was found that those who owned a small number of agricultural machines (1-3) numbered (62) farmers, constituting (17.2%), with an average size of (174.34) machines. The number of farmers owning an average of (4-6) agricultural machines reached (87), representing (24.1%) of the total surveyed farmers, with an average determinant score of (166.98). Meanwhile, the number of farmers owning a large number of machines (7-9) reached (212), representing (58.7%) of the total surveyed farmers, with an average determinant score of (152.9).

Table 9: shows the distribution of respondents according to machine ownership and its relationship to their opinions on the size of the determinants for soybean cultivation.

Machine Ownership Categories	Number	%	Average Size	(r)	t-value	Significance Level
(1-3) Small	62	17.2	174.34	0.149	2.855	0.01
(4-6) Medium	87	24.1	166.98			
(7-9) Large	212	58.7	152.09			
Total	361	100				
Overall Mean = 5.93 Standard Deviation = 2.20						

To determine the relationship between the size of the determinants from the farmers' perspective and the number of machines they own, Pearson's correlation coefficient was used, yielding an r-value of 0.149. To confirm the significance of this relationship, a t-test value of 2.855 was obtained, indicating significance at the 0.01 level. Therefore, we reject the research hypothesis stating that "there are no statistically significant differences in the size of the determinants of soybean cultivation adoption from the farmers' perspective in Kirkuk Governorate, Iraq, based on their ownership of agricultural equipment and machinery," and we accept the alternative hypothesis. This may be because owning a large number of agricultural machines and equipment facilitates agricultural operations for farmers.

10. The trend towards cultivating soybeans

The results shown in Table (10) indicate that the lowest

numerical value for the surveyed farmers' attitudes was (10) degrees, while the highest numerical value was (23) degrees on a theoretical range scale of (8-24) degrees, with an overall mean of (17.08) degrees and a standard deviation of (4.09) degrees. The respondents were divided according to their attitudes and the actual range and class length. It was found that the number of farmers with a negative attitude, ranging between (10-14) degrees, was (99) farmers, constituting (27.43%) of the total surveyed farmers, with an average determinant size of (167.90) degrees. The number of farmers with a neutral attitude (ranging from 15 to 19 degrees) reached 177, representing 49.3% of the total surveyed farmers, with an average determinant size of 157.52 degrees. Meanwhile, the number of farmers with a positive attitude (20 or more) reached 85, representing 23.54% of the total surveyed farmers, with an average determinant size of 148.6 degrees.

Table 10: shows the distribution of respondents according to their attitude towards soybean cultivation and its relationship to their opinions on the size of the determinants for soybean cultivation.

Trend Categories	Number	%	Mean Size Determinant	r	Value t	Significance Level
(10-14) Negative	99	27.43	167.90	-0.418	8.718	0.01
(15-19) Neutral	177	49.03	157.52			
(20+) Positive	85	23.54	148.6			
Tota	361	100				
Overall Mean = 17.08 Standard Deviation = 4.09						

From the above, it is clear that (76.46%) of the surveyed farmers have a neutral to negative attitude. To determine the relationship between the magnitude of the constraints on soybean cultivation from the farmers' perspective and their attitudes towards cultivating the crop, Pearson's correlation coefficient was used, yielding an r-value of (-0.418). To confirm the significance of the relationship, a t-test value of (8.718) was obtained, which is significant at the (0.01) level. Therefore, we reject the research hypothesis stating that (there are no statistically significant differences in the magnitude of the constraints on adopting soybean cultivation from the farmers' perspective in Kirkuk Governorate, Iraq, based on their attitudes towards cultivating the crop). This may be because farmers with a negative attitude towards soybean cultivation perceive the constraints as greater than those with a positive attitude. This highlights the need to cultivate farmers' attitudes positively towards soybean cultivation through the agricultural extension service and its activities.

Second Objective: To identify proposals for promoting soybean cultivation in Kirkuk Governorate

The results showed that there were (11) proposals for expanding soybean cultivation in Kirkuk Governorate from the perspective of the surveyed farmers. The most prominent proposal was "establishing model and demonstration fields for soybean cultivation," with a weighted average of (2.73) and a relative importance of (68.28). The second most popular proposal was "training agricultural extension agents on the latest soybean cultivation techniques," with a weighted average of (2.67) and a relative importance of (66.69). The third proposal was "implementing programs to train farmers on assessing and managing the risks to which the crop is exposed," with a weighted average of (2.64) and a relative importance of (66.00). These proposals fall within the responsibilities of the agricultural extension service and are not difficult to implement for expanding soybean cultivation in Kirkuk Governorate, as shown in Table (11).

Table 11: Proposals for Expanding Soybean Cultivation in the Region

S	The proposed	Weighted average	Percentage	Ranking
1	Establishing model and demonstration fields for soybean cultivation.	2.73	68.28	1
2	Training agricultural extension agents on the latest soybean cultivation techniques.	2.67	66.69	2
3	Implementing programs to train farmers on assessing and managing crop risks.	2.64	66.00	3
4	4. Developing practical and specialized extension programs by qualified agents.	2.63	65.72	4
5	Providing financial incentives and low-interest loans to new farmers.	2.61	65.24	5
6	Establishing laboratories for soil and water analysis and providing accurate recommendations	2.59	64.68	6
7	Opening marketing centers in the region to receive the crop.	2.58	64.47	7
8	Setting fair market prices for soybeans.	2.57	64.13	8
9	Facilitating farmers' access to the necessary equipment for planting and cultivating the crop.	2.54	63.50	9
10	Launching awareness campaigns to increase awareness of the economic and nutritional importance of soybeans.	2.52	62.95	10
11	Securing high-yielding, locally adapted seed varieties.	2.50	62.40	11
12	Strengthening cooperation between government and private entities to support crop cultivation.	2.49	62.33	12
13	Supporting research to develop improved varieties and optimal farming practices.	2.47	61.63	13
14	Preparing easy-to-understand educational publications, videos, and applications.	2.42	60.53	14
15	Crop soybean cultivation in crop rotation.	2.39	59.76	15

Conclusion and Recommendations

First: Conclusions

Based on the research findings, we conclude the following:

1. The number of constraints facing soybean cultivation is significant to moderate and may hinder or reduce the cultivated area in Kirkuk Governorate.
2. There are several obstacles, considered by farmers to be of moderate magnitude, related to their economic and social circumstances. Efforts are needed to overcome or mitigate these obstacles. Farmers' trust in government agencies and access to production inputs is a crucial factor in promoting soybean cultivation.
3. The marketing and distribution of soybean produce is a determining factor in its cultivation. Crops whose produce cannot be consumed directly are difficult for farmers to adopt.
4. There are constraints related to extension services, which farmers have indicated are significant. This suggests weaknesses in the extension activities provided by the agricultural extension service.

Second: Recommendations

Based on the preceding findings, the following is recommended:

1. Increased extension efforts by agricultural extension agents in the region are necessary to reduce the uncertainty among farmers regarding soybean cultivation.
2. The Ministry of Agriculture should provide support by supplying high-quality, weather-resistant soybean varieties and establishing collection points for them.
3. Similar studies should be conducted in other regions, including factors not addressed in this research, to identify other factors limiting soybean cultivation.

References

1. Shada MS, Amin HM, Abdullah AS. Cognitive training needs of hybrid maize growers in Al-Naameh Village, Al-Alam District and its relationship to some variables. *IOP Conf Ser Earth Environ Sci.* 2023;1214(1):012058. doi:10.1088/1755-1315/1214/1/012058
2. Abdullah A, Shareef M, Midhas A. The reasons for farmers' reluctance to practice the agricultural profession in Al-Zawiya Sub-District, Salah al-Din Governorate. *Mesopotamia J Agric.* 2021;49(1):106-121. doi:10.33899/magrj.2021.129042.1098
3. Ahmed SA, Haseep MA. The extension knowledge needs of vegetable farmers in the field of preventive maintenance of drip irrigation systems, Ishaqi/Salah al-Din Province, and its relationship with some variables. *Tikrit J Agric Sci.* 2016;16(3). <https://www.iasj.net/iasj/download/73026cd492a8dfbc>
4. Amin HM, Ali MK. Vegetable farmers' attitudes towards participating in training courses in Al-Alam District, Salah al-Din Governorate. *Int J Agric Stat Sci.* 2021;17. <https://www.researchgate.net/profile/mha-syd-shdh>
5. Hamed AA, Abdullah AS. The level of environmental conservation from the point of view of agricultural employees in the Upper Euphrates Region, Anbar Governorate, Iraq. *IOP Conf Ser Earth Environ Sci.* 2024;1371(2):022007. doi:10.1088/1755-1315/1371/2/022007
6. Abdullah AS. The extensional-epistemic needs of agricultural staff in the agricultural extension units administration in the Agricultural Directorate of Salah al-Din, Iraq. *Tikrit J Agric Sci.* 2021;21(1):75-88. doi:10.25130/tjas.21.1.8
7. Abdul Wahhab RR, Mohammed MA, Abdullah AS. Knowledge of eggplant growers of the most important scientific recommendations for growing it in greenhouses and its relationship to some variables in Zaliya Village, Samarra District. *Tikrit J Agric Sci.* 2021;21(1):102-112. doi:10.25130/tjas.21.1.10
8. Abdullah AS. The application level of sheep breeders for the most important scientific recommendations related to sheep farm management in Naameh Village. *Kirkuk Univ J Agric Sci.* 2017;8(5). https://kujas.uokirkuk.edu.iq/article_140630.html
9. Ahmed MA, Abdullah AS. The role of electronic management in developing the organizational behavior of workers in agricultural extension in Salah al-Din Governorate, Iraq. *Tikrit J Agric Sci.* 2025;25(2):249-266. doi:10.25130/tjas.25.2.20
10. Abdullah AS, Fadi AA, Younes SA. The role of artificial intelligence applications in providing

- extension services and supporting environmental sustainability from the point of view of agricultural employees in Tikrit District, Iraq. *Int J Environ Sci.* 2025;11(1):100-111.
<http://theaspd.com/index.php/ijes/article/view/9>
11. Abdel AM, Abdullah ASA. Non-verbal communication skills of agricultural extension workers in Salah al-Din Governorate, Iraq. *Cuest Fisioter.* 2023;54(3):4344-4356. doi:10.48047/7wp23309
 12. Abdullah AS, Hammood RS, Latif SS. Job satisfaction of new workers in agricultural extension in Salah al-Din Governorate, Iraq. *IOP Conf Ser Earth Environ Sci.* 2025;1487(1):012235.
doi:10.1088/1755-1315/1487/1/012235
 13. Abdullah AS, Abdullah RR, Salih KJ, Shada MS, Farhan IS. Extension management and its role in facing the challenges of using solar energy systems in the agricultural sector from the point of view of agricultural employees in Salah al-Din Governorate, Iraq. *Edelweiss Appl Sci Technol.* 2025;9(4):518-529.
doi:10.55214/25768484.v9i4.6024
 14. Abdulwahab RR, Abdullah AS, Subhan KAF. Analysis of the reality of published research in the field of agricultural extension in the Tikrit Journal of Agricultural Sciences for the period 2018-2022. *J Environ Sustain Dev Hum Health.* 2023;130.
doi:10.57195/2424-001-002-005
 15. Sakr A, Abdullah M, Madloul N, Salah N. Cattle breeders' knowledge of scientific recommendations related to cattle farm management in the Naameh area of Tikrit District, Iraq. *J Acad Stud.* 2022;4(4):43-55.
<https://asjp.cerist.dz/en/article/209249>
 16. Shareef MO, Haseeb MA, Ahmed SA. Knowledge level of wheat growers on sprinkler irrigation towards zero-tillage technology in Baiji District. *Kirkuk Univ J Agric Sci.* 2021;12(1):6.
 17. Shareef MO, Amin HM, Abdullah AS. Attitudes of first- and second-year students in the Department of Economics and Agricultural Extension, College of Agriculture, Tikrit University, towards agricultural extension specialization. *J Tikrit Univ Humanit.* 2020;27(12):438-451. doi:10.25130/jtuh.27.12.2020.21
 18. Hussein MA, Al-Hadary SS, Omar OS. Obstacles to applying methods of recycling agricultural waste from the point of view of farmers in some villages in Dakahlia Governorate. *Fayoum J Agric Res Dev.* 2024;38(3):392-412.
https://kujas.uokirkuk.edu.iq/article_177668.html