

Determinants of Disseminating Agricultural Technologies from the Perspective of Agricultural Extension Workers in Tikrit District

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Abstract

This The present study aimed to: Identify the determinants of dissemination of modern technologies from the perspective of agricultural extension workers in Tikrit District, study the relation between the characteristics of agricultural extension workers and their role in dissemination of modern technologies, determine the effectiveness of the agricultural extension and proposed measures for enhancement of the performance of agricultural extension. The study applied a complete survey, which was conducted on all of the agricultural extension workers in Tikrit district, (85) in total. A structured questionnaire was the basic data collection instrument used. The questionnaire was divided into two parts, which were the personal characteristics of the respondents, and the administrative and institutional determinants, technical, technological, social and cultural determinants, communication and media determinants and level of dissemination of modern agricultural technologies. The findings revealed that the technical and the technological determinants were the highest with a mean value of (3.51), followed by the social and cultural determinants with a mean value of (3.48) and then the administrative and institutional determinants with a mean value of (3.36) and finally the communication and media determinants with a mean value of (3.31). All the studied determinants turned out to be of positive relationship with level of dissemination of agricultural technologies with a statistically significant positive value. The contribution of all the determinants studied was 61.1% and the determinant that most strongly affected was the technical determinants. The study suggests that raising awareness of agricultural technologies through agricultural extension services needs to be supported by the institutions to promote its dissemination and adoption while at the same time, agriculture research institutions should be coordinated with agricultural extension institutions to improve the dissemination and adoption of agricultural technologies.

Keywords: Agricultural Extension, Technology Dissemination, Agricultural Technologies, Extension Workers and Tikrit District.

Introduction

The agriculture sector of developing countries is confronted with several escalating challenges, foremost among these is limited availability of natural resources, climate changes, low agriculture productivity and high agriculture input costs, in Iraq, the adoption of modern agriculture technologies is a necessity to guarantee sustainable agricultural

development and efficient use of resources [1].

Empowered by the support of an appropriate institutional and advisory framework that can disseminate and facilitate the uptake and application of technologies in the field, modern agricultural technologies are effective tools for enhancing productivity, quality of production and farmers' income levels [2].

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Agricultural extension plays a significant role in agricultural technology transfer as it is the link between the creation of new technology and its application in the farm and acts as a catalyst for the positive changes in the production behavior of farmers and their ability to comprehend and use the technology efficiently [3]. But technical factors are not the only factors that are important to the effectiveness of advisory work.

The Agricultural Extension Service in Iraq is plagued by several problems, such as inadequate training and qualification of agricultural extension officers, lack of modern extension communication methods, weak financial and human resources and poor coordination between research and extension institutions which negatively impacts the efficiency of disseminating modern agricultural technologies among farmers [4]. The effectiveness of agricultural extension also depends on region to region, the amount of resources available and administrative and organizational support.

In this context, the need for studying determinants of dissemination of agricultural technology from the agricultural extension workers' stand point in Tikrit district is obvious, since they are in the field of agriculture very close to the reality of agriculture and able to recognize what are the obstacles that the agricultural extension work faces from the practical point of view.

The main objective of the study is to identify the institutional, administrative, technical and social factors which affect the dissemination of modern agricultural technologies so that practical recommendations can be provided to improve the effectiveness of the agricultural extension especially for

farmers to adopt modern agricultural technologies to attain the goal of sustainable agriculture development at local level.

Research Problem

The modern agricultural technologies have a great role in improving the agricultural productivity and efficient use of resources; however, the dissemination and farmer's adoption level of these technologies in Tikrit District is still low than the desired level. As agricultural extension is intended to be a key messenger of innovations to farmers, there are several administrative, technical, social and communication challenges that can impede its effectiveness.

Based on this, the following questions can be the summary of the research problem:

1. What are the most important administrative and institutional issues affecting the dissemination of modern agriculture technologies in Tikrit District?
2. How important is technologies and technological determinants to the spread of agricultural technologies?
3. What do you think about the value of SCDs for the dissemination process?
4. What are the availability of agricultural technologies such as seeds/seedlings, equipment, labour, internet, agricultural machinery and skill/tacit knowledge?
5. From the point of view of agricultural extension workers, which of these factors are relatively more important for the level of dissemination of agricultural technologies?

The Importance of the Research

The significance of this research is because it is one of the important issues in the agricultural development such as agricultural extension and spreading the modern technologies. The value of the study is that it provides explanation about the factors that impede the agricultural extension workers to do their job, which will help design an effective and realistic agricultural extension policy and program by relevant agencies. The study is also relevant due to the field observations result which can be used for training and qualification of agricultural extensionists, for decision making in the agricultural institutions and for local sustainable agriculture development promotion.

2. Research the connections between demographical and professional characteristics of agricultural extension workers and their role in dissemination of agricultural technologies.
3. Evaluate the success of agricultural extension in promoting farmers' use of modern technologies.
4. Make practical recommendations for ways to be more effective and impactful in agricultural extension that could assist agricultural modernization.
5. Join an information pool which can be trusted to inform future agricultural extension policies and programs.

Research Hypothesis

H 1: Statistically the administrative and institutional determinants, technical determinants, social and cultural determinants, communication and media determinants and the level of dissemination of the modern agricultural technologies from the perspective of agricultural extension workers in Tikrit District did not show any significant relationship.

H 0: At least one of the determinants is related significantly to the level of the dissemination of modern technologies in agriculture.

Research Objective

The research aims to achieve the following

1. Identified the most important determinants that affected the disseminating of modern agricultural technology from the agricultural extension workers in Tikrit District.

Research Methodology

The method of social survey was utilized in the study because it is one of the appropriate methods to study social and administrative phenomena related with agricultural extension work. The objective was to get feedback from the agricultural extension workers on their attitude towards the factors driving diffusion of modern technology in agriculture in the field. The data analysis technique was descriptive-analytical; which is used to describe the phenomenon of study, analyze the phenomenon of study and draw conclusions that express the actual situation of the extension activities in Tikrit district. But, the data were also processed with the appropriate statistical method, to achieve the objective of the research, and to test the hypothesis of the research.

Questionnaire Development and Data Collection:

Documented literature search, previous studies and the theory of agricultural technologies dissemination and agricultural extension were carried out and a structured questionnaire was designed to suit the purposes of this study. The questionnaire prepared to evaluate the determinants from the farmer point of view as agricultural extension workers in Tikrit district to disseminate modern agricultural technologies.

There were two key sections of the questionnaire. The first section was personal and professional characteristics of the respondents such as gender, age, educational level and years of experience. The second part was the variables of the study which included administrative and institutional, technical and technological, social and cultural, communication and media and dissemination of modern agricultural technologies.

The data were collected by making direct distribution of the questionnaire in the agricultural extension workers in Tikrit district from January to March, 2025.

Pilot Study

A pilot study was done on a sample of (15) outside the final study sample of agricultural extension workers before the actual survey of the study sample. The aim of the pilot study was to test the clarity of the items in the questionnaire, spot potential ambiguities, estimate time needed to complete the questionnaire and make sure that the questionnaire would be suitable to accomplish the goals of the study.

Based on the observations made in the pilot study, some changes were made to the questionnaire both linguistically and organizationally to improve the clarity and consistency of the questionnaire.

Validity and Reliability of the Questionnaire:

Content validity of the questionnaire was done using a panel of experts in agricultural extension and agricultural economics. The final questionnaire was prepared and the questions have been modified based on their comments/recommendations. The Cronbach's Alpha coefficient was then used to test the reliability.

The degree of internal consistency of the items, which were included in the questionnaire, was determined by Cronbach's alpha coefficient to ensure the reliability of the research instrument used. The overall reliability coefficient of the questionnaire was (0.914) which is above the acceptable level of relevance (0.70); therefore the questionnaire had a high internal consistency, and was suitable for statistical analysis and hypothesis testing.

Statistical Methods:

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Descriptive and inferential statistical techniques were used in analysing data. The respondents' variables and characteristics were described in terms of frequencies, percentages, arithmetic means and standard deviations. The relationships between the variables of the study were found using Pearson correlation coefficient and multiple linear regression analysis was used to find the effect of independent variables on the dissemination of modern agricultural technologies. All the statistical analysis were performed in the Statistical Package for Social Sciences (SPSS).

Procedural Definitions

For this research the following procedural definitions were used:

1. Agricultural Technologies: These are new technologies, practices and methods that can help enhance agricultural production and/or the efficiency of the use of the resources including improved varieties of agricultural products, modern irrigation technologies and integrated pest management technologies. It is measured on procedure basis, depending on how much they are spread and how farmers use them, as perceived by the agricultural extension workers.
2. The process of designating Agricultural Technologies as "modern" and the transfer of these technologies and practices from the research and extension institution to the farmer is referred to as "dissemination of Agricultural Technologies. In a process point of view, it is assessed according to the degree of extension activities, communication technologies used and spread of technological innovations to the beneficiaries.
3. Agricultural Extension: An educational service system that is designed to help farmers increase their knowledge and skills, and make informed decisions regarding agricultural production. Procedurally, in this research, it can be measured as the effectiveness of the extension programs and competence of the personnel who are responsible for the extension programs.
4. Agricultural extension workers: These are agricultural extension agents, agricultural engineers and agricultural technicians who are directly involved in the working units of the agricultural extension inside the Tikrit district to implement agricultural extension and disseminate agricultural technologies.
5. Factors affecting in agricultural technology dissemination: These are the factors that have positive and negative influence on dissemination of modern agricultural technologies. They are administrative and institutional determinants, technical determinants, social determinants and communication determinants and were measured in a procedural way by answering the items of the questionnaire related to each axis of the sample individuals.

The Research Community and Its Sample:

The research community was all employees (85) from the Agricultural Guidance Division of Tikrit District in the units of guidance in Directorate of Agriculture of Salah al din. A comprehensive survey method was used, since the research sample comprised all the members of the research community (85 employees).

Theoretical Framework of the Research

First: The Concept of Modern Agricultural Technologies

Modern Agricultural Technologies: These are a set of techniques, practices and technologies which are used to improve the efficiency of agricultural production, increase production and reduce the loss of resources. They encompass new crop varieties, technology in irrigation, well-balanced fertilization, integrated pest management, and mechanisation and digitalisation in agriculture. The technologies are considered one of the most vital approaches towards attaining food and sustainable agriculture, especially in less resourceful developing countries which have more dense population [1].

Modern agricultural technologies are particularly important because they have the potential to increase the efficiency of how resources are used, the quality of the crops they produce, the income of farmers and the reduction of harmful environmental effects of traditional agricultural practices, and therefore their use is a strategic necessity for the agricultural sector [5].

Second: The Concept of Dissemination and Adoption of Agricultural Technologies

Agricultural technology dissemination is the dissemination of agricultural information, practices and innovations from the formal and informal sources of agricultural information (research institutes, scientific publications) to the end users, mainly farmers. As for technologies in agriculture, it is the farmer's proactive use and persistence in using technology after considering its benefits and costs [2].

Rogers' theory of Diffusion of Innovations outlined the stages of the

adoption process of Knowledge, Persuasion, Decision, Implementation, and Confirmation. The characteristics of the technology, the characteristics of individuals and the surrounding social and institutional environment are all factors that influence these stages [2]. The speed and/or efficiency of dissemination are seen as important in the success of the dissemination process and the desired developmental impact.

Third: Agricultural Extension and its role in dissemination of agricultural technologies

In Agricultural extension, it is regarded as an institution of education and development and it is based on transfer of modern farm technologies, its simplification and application in reality so that the farmers can be better educated and skilled in the production and thereby make good decision in their production. The role of agricultural extension in disseminating and adopting agricultural technologies is an important one and is a link between the scientific and applied aspects of agriculture [3].

Opportunities for agricultural extension's role are influenced by the efficiency of the extension staff, their level of training, the amount of material and human resources available, and the efficiency of the extension communication tools used, such as field visits, seminars, training courses and agricultural media, according to [6].

Four: Factors shaping the propagation of Agricultural Technologies.

There are a number of interacting factors that affect the dissemination of agricultural technologies, these can be grouped into the following dimensions:

1. Administrative and Institutional Determinants: These can be in the

form of extension policies, funding, level of administrative support offered, etc., and whether there is coordination between research and extension institutions. The negative impacts of these are less efficiency in their extension services and transfer of agricultural technologies [7].

2. **Technical Determinant:** These are related to the characteristics of the technology used in the agriculture sector (user-friendliness, cost, appropriateness to local environmental and economic factors). The more the technology fits the "realities" of the farmer, the more opportunities for dissemination and adoption of technology [2].
3. **Social and Cultural Determinants:** These are related to attitudes of extension workers and farmers towards change and innovation in agriculture, awareness and perception of importance of modern technologies and agriculture traditions and customs in rural communities that can either help or hinder the uptake of agriculture innovations [8].
4. **The determinants of communication and media have been integrated.:** They are a mix of the effectiveness of extension communication channels, extension communication methods' diversity and the extent of the interaction between extension workers and farmers. Communication that's not strong leads to restricted access to agriculture technologies, and a slow transfer of those technologies [3].

Five :Agricultural Extension in Iraqi context (5th, 6th and 7th)

The agricultural extension in Iraq is facing several problems such as lack of financial and human resources, lack of continuous training and capacity building programs, limited application of modern technologies

in the agricultural extension and lack of coordination between the research and implementation institutions. In all these, farmers' efficiency to utilize modern agriculture technologies is being limited [4].

Hence, it is imperative to have field studies to help identify these issues from the perspective of the first actors of the extension process which is the extension workers. The interpretations of the mean scores will be provided. Applying the following range law, the mean values of the answers (using the 5-point Likert scale) of the respondents were obtained:

Interpretation of Mean Scores

To interpret the mean values of respondents' answers according to the five-point Likert scale, the range law was applied as follows:

Level of Assessment	Mean Range
Very Low	1.00 – 1.80
Low	1.81 – 2.60
Moderate	2.61 – 3.40
High	3.41 – 4.20
Very High	4.21 – 5.00

The classification above was adopted in interpreting the levels of all study variables and questionnaire dimensions.

Materials and Methods of the Study

First: Personal and Professional Characteristics of the Research Sample:

The personal attributes and professional characteristics of the research sample are related to their views and attitude towards dissemination of modern agricultural technologies which give an overall picture

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of background of agricultural extension workers. These are qualities such as gender, age, years of extension experience

and education, which help increase the efficiency of the extension workers and the implementation of extension activities.

Table1. Numerical and Percentage Distribution of the Personal and Professional Characteristics of the Research Sample (n = 85)

Variable	Category	Number	Percentage (%)
Gender	Male	62	72.9
	Female	23	27.1
Age	Less than 30 years	12	14.1
	30–39 years	21	24.7
	40–49 years	30	35.3
	50 years and above	22	25.9
Educational Level	Diploma	9	10.6
	Bachelor's degree	48	56.5
	Master's degree	21	24.7
	PhD	7	8.2
Years of Experience	Less than 5 years	11	12.9
	5–9 years	18	21.2
	10–14 years	29	34.1
	15 years and above	27	31.8

Source: Prepared by the researcher based on questionnaire data.

Second: Administrative and Institutional Determinants of Disseminating Agricultural Technologies:

This section will provide a picture to the agricultural extension workers' views on the role of administrative and institutional

aspects in technology transfer of modern agriculture. They are regarded as among the basic factors which affect the success of extension, as they are directly related to the amount of administrative support, resources and institutional coordination.

Table2. Mean and Standard Deviation of Administrative and Institutional Determinants

Item	Mean	Standard Deviation	Level of Assessment
Support of extension administration	3.62	0.88	High
Clarity of extension plans	3.48	0.91	Moderate
Availability of funding	2.97	1.02	Moderate
Availability of transportation and equipment	3.71	0.84	High

Coordination with research institutions	3.55	0.89	High
Material and moral incentives	2.83	1.10	Moderate
Overall dimension	3.36	0.79	Moderate

Source: Prepared by the researcher based on questionnaire data.

Thirdly: Technical and Technological Determinants of Disseminating Agricultural Technologies:

This section presents the assessment by the agricultural extension workers of the technical and technological aspects of the modern agricultural technologies that have

a direct influence on speed of dissemination and adoption by farmers with emphasis on whether the technology is suitable for farming, its ease of use and cost.

Table 3. Mean and Standard Deviation of Technical and Technological Determinants

Item	Mean	Standard Deviation	Level of Assessment
Suitability of the technology to local conditions	3.74	0.82	High
Ease of use of the technology	3.69	0.85	High
Cost of the technology	2.88	1.04	Moderate
Availability of required inputs	3.41	0.90	Moderate
Availability of demonstration fields	3.82	0.76	High
Overall dimension	3.51	0.81	High

Source: Prepared by the researcher based on questionnaire data.

Fourth: Social and Cultural Determinants of Disseminating Agricultural Technologies:

Social and cultural factors, in particular, are correlated with the awareness of farmers to the benefits of new technologies, and their receptivity to change, which affect the process of

transferring modern agricultural technologies. Agriculture customs and traditions practiced, as well as the influence of opinion leaders in the rural areas of these communities also plays a significant role in influencing agriculture innovation uptake. This knowledge would help understand the level of farmers' response to modernization of farming technology.

Table 4. Mean and Standard Deviation of Social and Cultural Determinants

Item	Mean	Standard Deviation	Level of Assessment
Farmers' acceptance of modern technologies	3.57	0.87	High
Farmers' level of education	3.63	0.84	High
Impact of traditional agricultural experience	3.12	0.96	Moderate
Role of opinion leaders in disseminating technologies	3.78	0.80	High
Level of trust in agricultural extension	3.29	0.92	Moderate
Agricultural customs and traditions	3.05	0.98	Moderate
Overall dimension	3.48	0.83	High

Source: Prepared by the researcher based on questionnaire data.

Fifth: Communication and Media Determinants of Disseminating Agricultural Technologies:

Extension communication and media tools play an important role in disseminating modern technologies from agriculture as it

allows the extension message to be carried through field visits, training program and other media. On the other hand, a lack of communication process and limited adoption of communication technology can decrease the efficiency of technology transfer and slow down farmers' adoption of new agricultural technologies.

Table 5. Mean and Standard Deviation of Communication and Media Determinants

Item	Mean	Standard Deviation	Level of Assessment
Effectiveness of field visits	3.91	0.74	High
Role of training courses	3.68	0.82	High
Use of social media	3.22	0.94	Moderate
Availability of extension media materials	3.05	0.97	Moderate
Weakness of communication and internet networks	2.71	1.06	Moderate
Diversity of communication channels	3.40	0.89	Moderate
Overall dimension	3.31	0.86	Moderate

Source: Prepared by the researcher based on questionnaire data.

Sixth: Level of Dissemination of Modern Agricultural Technologies (Dependent Variable):

The dependent variable of this study is this section which shows the effectiveness of disseminating the new technologies in

agriculture by extension; level of technology acceptance and how the technology is sustained. The result of the integration of all the factors that influence the administration, technical, social and communication dimensions is this indicator.

Table 6. Mean and Standard Deviation of the Level of Dissemination of Modern Agricultural Technologies

Indicator	Mean	Standard Deviation	Level of Assessment
Effectiveness of extension programs	3.54	0.83	High
Level of farmers' adoption of technologies	3.47	0.86	High
Continuity of technology use	3.21	0.92	Moderate
Overall indicator	3.41	0.80	High

Source: Prepared by the researcher based on questionnaire data.

Results of the Reliability Test of the Research Instrument

Based on the results of the reliability test, the results obtained were that the value of the Cronbach's alpha coefficient obtained was (0.914) which was a high value that

indicated that the items in the questionnaire were homogeneous and could measure the variables studied accurately. This means that the questionnaire has been reliable to be analysed statistically and tested with the hypothesis.

Table (7): Reliability Statistics

Cronbach's Alpha	N of Items
0.914	38

Source: Prepared by the researcher based on SPSS output.

Reliability test via questionnaires dimensions showed that the index value of all dimensions was above the threshold value of statistical acceptability, the results of the reliability test showed that all dimensions were satisfactory in representing the research determinants and the internal consistency of the items of the questionnaires for each dimension was satisfactory.

Results of Reliability by Questionnaire Dimensions:

Table 8.Reliability Statistics by Questionnaire Dimensions

Dimension	Cronbach's Alpha	N of Items
Administrative and institutional determinants	0.873	8
Technical and technological determinants	0.861	8
Social and cultural determinants	0.848	8
Communication and media determinants	0.829	8
Level of dissemination of agricultural technologies	0.892	6

Source: Prepared by the researcher based on SPSS output.

Results and Discussion

Objective 1: Identify the most important determinants affecting the dissemination

Table 9. Descriptive Statistics of Administrative and Institutional Determinants

Administrative determinants	N	Minimum	Maximum	Mean	Std. Deviation
Valid N (listwise)	85	2.10	4.50	3.36	0.79

Source: Prepared by the researcher based on SPSS output.

Results of Technical and Technological Determinants:

The findings reveal that the technical and technological determinants received relatively high scores indicating that the

of modern agricultural technologies from the perspective of agricultural extension workers in Tikrit District.

suitability of agricultural technologies, ease of use and extension models available for disseminating and adopting technologies among farmers were important.

Table 10. Descriptive Statistics of Technical and Technological Determinants

Technical determinants	N	Minimum	Maximum	Mean	Std. Deviation
Valid N (listwise)	85	2.30	4.70	3.51	0.81

Source: Prepared by the researcher based on SPSS output.

Results of Social and Cultural Determinants:

The findings indicate that the social and cultural factors played a significant role in

spreading of agricultural technologies. This mirrors the attitude of the farmers to change, their education level and the effect of opinion leaders, and the ongoing impact of some customs and traditional experiences as farmers' constraints .

Table (11): Descriptive Statistics of Social and Cultural Determinants

Social determinants	N	Minimum	Maximum	Mean	Std. Deviation
Valid N (listwise)	85	2.00	4.60	3.48	0.83

Source: Prepared by the researcher based on SPSS output.

Results of Communication and Media Determinants:

The results reveal that the determinants of the communication and media had moderate level, both the use of conventional communication media and the use of modern communication media and communication infrastructure showed moderate to good effectiveness in conducting field visits.

The first objective of the study was to identify the most important factors which affect the spread of modern agricultural technologies in Tikrit District. The findings revealed that the level of technical and technological determinants was the highest with mean value (3.51), then the social and cultural determinants with moderate level (3.48), then the administrative and institutional determinants with moderate level (3.36)

and finally the communication and media determinants with the lowest level (3.31).

The results of this study show that the success of the agricultural technology dissemination is greatly influenced by technology suitability, ease of use and the availability of demonstration fields. Moreover, the education level of farmers, and the power of opinion leaders play an important role in the dissemination of technology. But the dissemination process is still facing many challenges such as poor communication lines, low financial resources and incentives.

Objective 2:Analyze the relationship between the demographic and professional characteristics of agricultural extension workers and their contribution to technology dissemination.

Table12. Descriptive Statistics of Communication and Media Determinants

Communication determinants	N	Minimum	Maximum	Mean	Std. Deviation
Valid N (listwise)	85	1.90	4.50	3.31	0.86

Source: Prepared by the researcher based on SPSS output.

As indicated in Table (12), majority of respondents had positive aspects on their professional characteristics that are conducive to extension work. There were a significant number of respondents who had post graduate qualification of which majority (over 50%) were at the level of Bachelor's Degree. Furthermore, with more than 10 years of experience in practice, the number of practice experiences is high; and this indicates that there is a lot of experience in practice

which can be utilized in supporting the dissemination of agricultural technology.

They are important traits to be taken into account when extension performance and extension communication with farmers and technology transfer processes are improved .

Objective 3: Assess the effectiveness of agricultural extension programs in supporting farmers' adoption of modern technologies.

Table13.Descriptive Statistics of the Level of Dissemination of Agricultural Technologies

Level of technology dissemination	N	Minimum	Maximum	Mean	Std. Deviation
Valid N (listwise)	85	2.10	4.60	3.41	0.80

Source: Prepared by the researcher based on SPSS output.

The results showed that the overall level of dissemination of the modern agricultural technologies was relatively high and the mean value was (3.41). The effectiveness of the extension programmes was good while the continuity of the use of technology was at moderate level among the farmers. The results indicate that the accomplishments of Extension have generally been successful in getting modern agricultural technologies noticed by farmers, but additional effort is needed to ensure that technology adoption and utilization are sustainable.

Testing the Research Hypothesis

Results of Correlation Relationships among Research Variables:

The relationships between the research variables are presented. There is correlation between the variables of the research.

The statistical significance of the correlation coefficient results reveals that all the determinants studied has a positive correlation statistically. Enhanced administration, technical, social and communication determinants would help to increase the level of technology dissemination. The results show the interdependence and integration of various aspects of extension work, the absence of which would limit the ability to reach high levels of effectiveness in disseminating agricultural technologies with a single dimension extension .

Table 14. Correlations

	Administrative	Technical	Social	Communication	Dissemination
Administrative	1				
Technical	.624**	1			
Social	.589**	.701**	1		
Communication	.556**	.612**	.583**	1	
Dissemination	.624**	.701**	.589**	.556**	1

Sig. (2-tailed) = 0.000

N = 85

Correlation is significant at the 0.01 level (2-tailed).

Source: Prepared by the researcher based on SPSS output.

Results of the Multiple Linear Regression Model Summary:

The summary of the regression model showed that the independent variables (combined) had relatively high level of relationship with the dependent variable as

the correlation coefficient (R) of 0.782 and coefficient of determination (R^2) of 0.611. It means that the studied determinants explain (61.1%) of the variation in the level of dissemination of modern agricultural technologies which is a good proportion considering the power of the model in explaining the variation .

Table 15. Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.782	.611	.597	.506

Source: Prepared by the researcher based on SPSS output.

Results of Model Significance Test (ANOVA):

The analysis of variance (ANOVA) provided result of the regression model which is statistically significant at the (0.01) level of significance with Sig. value

(0.000). This confirms the model in terms of the relationship between independent variables/ determinants and dependent variable- level of dissemination of modern agricultural technologies which shows the actual impact of the former on the latter.

Table 16. ANOVA^a

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	18.372	4	4.593	31.48	.000
Residual	11.687	80	.146		
Total	30.059	84			

^a Dependent Variable: Level of technology dissemination

^b Predictors: Administrative, Technical, Social, Communication

Source: Prepared by the researcher based on SPSS output.

Results of Regression Coefficients:

The regression coefficients result shows that all the determinants examined had positive and statistically significant effect on the level of dissemination of modern technology of agriculture with varying degree of influence among the determinants. The technical and technological determinants had the greatest

impact, followed by the administrative and institutional determinants, the social and cultural determinants and lastly the communication and media determinants. This suggests that dissemination of agricultural technologies is largely dependent on the nature of the technology and usability, as well as on the role of administrative support and social/communication support.

Table 17. Coefficients^a

Model	Unstandardized Coefficients (B)	Std. Error	Standardized Coefficients (Beta)	t	Sig.
(Constant)	0.872	0.279	—	3.12	.003
Administrative	0.214	0.072	0.238	2.97	.004
Technical	0.341	0.074	0.389	4.62	.000
Social	0.198	0.075	0.221	2.65	.010
Communication	0.163	0.071	0.194	2.31	.023

^a Dependent Variable: Level of technology dissemination

Source: Prepared by the researcher based on SPSS output.

Based on the results of the Pearson correlation and multiple regression analysis, the research hypothesis was confirmed which implied that there is a statistically significant relationship between the studied determinants and level of dissemination of modern agricultural technologies.

In all the correlation coefficients, there were positive and significant correlations between all independent variables and dependent variable. The regression model was also statistically significant, and explained the variance in level of dissemination (61.1%). Technical determinants, administrative determinant, social determinant and communication

determinant in that order were the most significant ones.

Thus the study's hypothesis is accepted and the study confirms the existence of significant improvements in the determinants studied which aids in spreading modern agricultural technologies in Tikrit District.

Conclusions and Recommendations

First: Conclusions

1. Technical and technical determinant were the most affected factors in the diffusion of the modern agricultural

- technologies among Agricultural extension workers in Tikrit District.
2. Administrative and institutional aspects play an important role in the dissemination process and insufficient funding and a weak incentive system are still significant factors that limit extension work.
 3. Social and cultural matters like the level of education of the farmers and the role of opinion leaders of the rural society are among most important determinants affecting adoption and dissemination of modern agricultural technologies.
 4. Communication and extension media tools are still in need of development such as using digital tools and social media platforms in agricultural extension activities.
 5. The findings revealed the presence of significant correlation and effect relationships statistically between the factors studied, and the level of dissemination of the modern technology of the agriculture.
 6. The high value of R² (61.1%) for the independent variables indicated that the model proposed explained a high portion of the level of dissemination of modern agricultural technologies.
 3. Further enhance training and skills development of agricultural extension workers on technical and communication skills.
 7. Improve the skills and use of information and communication technology, social media and modern communication tools in agricultural extension.
 4. Facilitate better coordination and cooperation among agricultural research institutions and extension organisations for efficient transfer of agricultural research products to farmers.
 8. Engage progressive farmers and opinion leaders in the rural areas in extension programmes in order to accelerate innovations' penetration and uptake.
 9. Expand extension facilities including communication facilities in the rural areas to increase access to extension information and modern agriculture technologies.

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Second: Recommendations

1. Improve the allocation of more financial resources for agriculture extension activities and delivery of the support to make the agriculture extension more efficient.
2. Encourage the spread of agriculture technologies that fit the environment and local economy to increase farmers' uptake.

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