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THE REALITY OF DEVELOPING THE USE OF MODERN MEANS IN AGRICULTURAL EXTENSION WORK IN NINEVEH GOVERNORATE\IRAQ

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Abstract. The study was aimed at determining the status and level of use and development of modern digital tools in agricultural extension in the Nineveh Governorate, such as agricultural extension content, digital interaction and participation, digital extension, modern communication technologies, smartphones and agricultural applications, multimedia, and agricultural videos. It also explored the link between current use and development of modern tools and selected variables at personal and professional level. It was administered using two questionnaires. The first section gathered personal and professional information, and the second section had 60 items in six sections, each containing 10 items. The questionnaire had a Cronbach alpha reliability coefficient of 0.95 and showed face validity. The study was carried out on 256 extension workers in the Nineveh Agriculture Directorate and its agricultural divisions (32). A random sample of 200 extension workers (about 78% of the population) was drawn. Data were analysed in SPSS. The findings showed moderate general level of development and modern tools used in agricultural extension work, leaning towards high. The use of modern communication tools was high, while the use of smartphones and agricultural applications was moderate, tending toward high. Digital platforms and the use of multimedia was moderate and tending to low, while digital interaction and participation was high. Digital extension content development was moderate, leaning to high. There was no significant relationship with education level, specialization, years of service or participation in training courses relating to digital technologies. Age and years of service in agricultural extension were found to be significantly correlated at 0.05 level and Internet use frequency at 0.01 level, while owning a smart phone and the most frequently used digital tool were significantly correlated at 0.05 level. The study suggests aligning digital tools and resources to farmers' needs and capacities, and building partnerships between the Nineveh Agriculture Directorate, universities, and research centers to create relevant digital platforms and tools. Extension workers' perspectives regarding barriers to the utilization of modern digital technologies in agricultural extension should be explored for further research.

Keywords: Development Reality, Modern Methods, Guidance Work, Nineveh Governorate

Introduction

Agricultural extension is deemed to be one of the critical elements in attaining sustainable agricultural development due to its role in facilitating the transfer of knowledge, expertise, information and modern agricultural technologies to the farmers and assisting them in improving their production practices and making decisions on resource management and agricultural issues (Abdullah, 2021). Traditional personal message passing is not the only scope of agricultural extension functions; it now encompasses communication, facilitation, capacity building, and linking farmers with access to knowledge, services, and climate information (Al-Mousawi, 2022). The Food and Agriculture Organization (FAO, 2017) states that agricultural extension and advisory services are essential for improving productivity, food security and rural livelihoods, and that information and communication technology (ICT) has been a vital tool in the development of agricultural extension and advisory services and expanding their access. With the development of information and communication technology (ICT), the way farmers receive agricultural extension has changed, with the use of smartphones, internet, agricultural apps, digital platforms and multimedia becoming means of disseminating extension information, sharing knowledge and expertise, and even monitoring agricultural extension (Al-Hammadi, 2019). The scientific review shows that in the course of the development of information and communication technology, the one-way communication model for agricultural extension has shifted to a more participatory model that is characterized by co-innovation, on-farm learning, and the sharing of experiences. Digital agricultural extension services are an emerging area of agricultural extension modernization which have the potential to bring more farmers under the fold of extension, address digital disparity across farmers, and deliver information faster and more flexibly. However, there is no uniform distribution of access to these services among all settings because of the digital divide and lack of digital skills. (FAO, 2024). Many modern tools can assist Agricultural Extension activities, such as agricultural digital applications, websites, social media platforms, text messaging, collecting agricultural information and data using digital systems, and smartphones (Hussein, 2011). Enabling the use of modern tools isn't just about introducing modern communication programmes into agricultural extension work but must involve creating an integrated system of choosing the right tools, creating digital content, developing the competence of agricultural extension workers, direct interaction with farmers, continually updating information and monitoring the outcomes of the use of the tools. To make digital transformation in extension a success, the ability of extension personnel to serve farmers, create digital content, and integrate technical aspects with the needs of users need to be strengthened (Youssef, 2016). An important consideration in the development of modern tools is that they will be instruments for interactive communication and not only for information transfer, as they will allow farmers to share experiences with other farmers and get answers from agricultural extension

agents. Moreover, interactive digital extension services offer the learning space and the exchange of information, ideas, and experiences. (Sen et al., 2025). The use of digital technologies in agriculture and extension in Iraq has started to take shape more clearly, as it was manifested by the development of digital platforms and applications that support farmers and agricultural extension workers (Najrata, 2024). However, the reality of extension using modern tools assumes the availability and effective organisation of those tools in the extension work, so as to ensure that knowledge and skills are transferred to the farmers using a variety of electronic communication tools. However, the study of modern tools in extension work is of particular importance in Nineveh Governorate due to the necessity to access farmers and agricultural information in different environments and regions. (Masso & Prusty, 2026). The availability of modern tools does not necessarily imply that their use in extension work has been developed: devices or applications may be available, but their use may not be advanced to higher-order, such as interaction, production of digital content or digital monitoring of agricultural practices. However, weak interaction and a lack of technical skills in agricultural extension, as well as internet connectivity issues, are among the most significant challenges facing the development of digital extension services (Al-Salman, 2023 & H. Kareem). Hence, it is observed that the tools used in agricultural extension work are still not up to date in their development and utilization, which is not in accordance with the current digital landscape. Moreover, agricultural extension workers' limited use of these tools might also impact the transfer and implementation of modern technologies, while the lack of training on using them effectively and timely and communicating them to farmers might also impact the transfer and implementation of modern technologies. In addition, agricultural extension workers lack skills in adopt and use these modern tools in agricultural extension work. All these factors led the researchers to investigate the reality of modern tools of development and use in agricultural extension work in Nineveh Governorate.

Research Objectives:

1) To find the personal and professional qualities of the participants of the research work
2) To evaluate the present situation of the use of modern tools in the agricultural extension work process in Nineveh Governorate as a whole.
3) To assess the level of use of modern communication tools in agricultural extension work.
4) To determine the extent of use of smartphones and agricultural applications in agricultural extension activities.
5) To determine the level of use of digital platforms in agricultural extension.
6) To determine the extent of use of multimedia and agricultural videos in extension.
7) To identify the level of digital interaction and participation in agricultural extension work.

8) To assess the level of development of digital content for agricultural extension work.
9) To establish the correlation between the level of development and application of modern tools in agricultural extension and each of the following variables: age, education level, specialization, length of service, duration of work in agricultural extension, participation in training courses on digital technologies, smartphone possession, frequency of internet use and the most common technology used in agricultural extension.

Materials and Methods

The study was carried out at Nineveh Governorate in Iraq. The study population consist of all agricultural staff in the Nineveh Directorate of Agriculture and the affiliated agricultural divisions, which consists of 256 agricultural staff distributed between the directorate of Agriculture and its affiliated agricultural divisions. A simple random sample of 200 AG extension workers was taken which constitutes 78% of the population. The questionnaire consisted of two parts: the first part was about personal and professional data on agricultural extension workers and the second part was a set of 60 items distributed across 6 areas, each with 10 items, namely: (The use of modern communication tools in agricultural extension work), (The use of smartphones and agricultural apps), (The use of digital platforms), (The use of multimedia and agricultural videos), (Digital interaction and participation in extension work), (The area of developing digital extension content). There were five response alternatives: "Use it to a very high degree" (code 1), "Use it to a high degree" (code 2), "Use it to a moderate degree" (code 3), "Use it to a low degree" (code 4), and "Use it very little" (code 5). These items were developed after reviewing previous research and literature on the subject. Face validity and content validity were assessed by presenting the questionnaire to a group of experts, reviewers, and specialists in the fields of educational and psychological sciences at the College of Education for the Humanities at the University of Mosul, as well as a group of faculty members from the Department of Agricultural Extension and Technology Transfer at the College of Agriculture, University of Mosul, in order to gather their observations and suggestions regarding the types of questions and to ensure the accuracy of the question wording, as well as the clarity and appropriateness of those questions for the respondents' level. Their comments were taken into account by making some modifications to the items, rephrasing some, and deleting others; 70% of the items were adopted based on the experts' opinions. To ensure the validity of the items, a sample consisting of 30 employees was selected from the population and excluded for the stability test, and Cronbach's alpha to determine the scale's reliability, yielding a reliability coefficient of 0.95, an excellent value indicating high reliability. The data obtained from the study and the most important statistical methods used were analysed using SPSS software.

Results and Discussion

Objective 1: Determine the personal and occupational traits of the study groups. To accomplish this goal, the frequencies of the variables were established, and a percentage was calculated for each variable, as listed in Table 1.

Table 1. Distribution of Respondents According to Their Independent Variables

Independent Variables	Categories	Frequency	Percentage (%)
Age	Less than 30 years	20	10.0
	30–39 years	78	39.0
	40–49 years	78	39.0
	50 years and above	24	12.0
	Total	**200**	**100.0**
Educational Attainment	Secondary school	27	13.5
	Diploma	33	16.5
	Bachelor's degree	97	48.5
	Master's degree	24	12.0
	Doctoral degree	19	9.5
	Total	**200**	**100.0**
Specialization	Specialized in agricultural extension	84	42.0
	Not specialized in agricultural extension	116	58.0
	Total	**200**	**100.0**
Years of Employment	5–10 years	38	19.0
	11–17 years	74	37.0
	19 years and above	88	44.0
	Total	**200**	**100.0**
Years Working in Agricultural Extension	2–6 years	37	18.5
	7–11 years	51	25.5
	12–16 years	112	56.0
	Total	**200**	**100.0**
Participation in Training Courses on Digital Technologies	Participated	71	35.5
	Did not participate	129	64.5
	Total	**200**	**100.0**
Smartphone Ownership	Yes	184	92.0
	No	16	8.0

	Total	**200**	**100.0**
Internet Use Frequency	Daily	86	43.0
	Once a week	32	16.0
	Several times a week	42	21.0
	Monthly	29	14.5
	Do not use the Internet	11	5.5
	Total	**200**	**100.0**
Most Frequently Used Digital Medium in Extension Work	Mobile phone	107	53.5
	WhatsApp	10	5.0
	Facebook	12	6.0
	YouTube	43	21.5
	Snapchat	9	4.5
	Agricultural applications	16	8.0
	Other (specify)	3	1.5
	Total	**200**	**100**

As can be seen in Table (1), the following results were obtained:

1) Age: The results indicated that 78% were in service 30-49 years and about 12% of the respondents were 50 years and older. As for respondents whose ages (under 30 years old) accounted for approximately (10).
2) Educational Attainment: The results showed that (48%) of the respondents held a bachelor's degree, while the percentage of respondents with graduate degrees (master's, doctorate) was approximately 21%, while those with a diploma accounted for about 16%, and those with a preparatory school diploma accounted for about 13%.
3) Specialization: The results revealed that the highest percentage (58%) were those who were not specialized in agricultural extension while about 42% were specialized in agricultural extension.
4) Years of Service: The results indicated that the researchers with 19 years or more service accounted for 44%, and the researchers with (11–17) years service accounted for about (37%), and those with (5–10) years service accounted for (19%).
5) Length of service in agricultural extension: The findings revealed that 56% of the respondents had 12 to 16 years of service in agricultural extension, 25% of the respondents had 7 to 11 years of service in agricultural extension, and 18% of the respondents had 2 to 6 years of service in agricultural extension.
6) Training Courses: The findings indicated that 35% of the respondents had participated in training courses while 64% of them had not.
7) Ownership Smartphone: The results indicated that 92% of the respondents own a smartphone they use in their extension work and 8% of them do not

have a smartphone.

8) Internet usage rate: The results showed that the majority of respondents who use the Internet daily accounted for 43%, while those who use the Internet several times a week accounted for approximately 16%. Those who use the Internet one or more times a month made up the 14% of the respondents. Finally, 5% of respondents do not use the Internet during their work.
9) The most commonly used digital tool in extension work: The results showed that the mobile phone was the most commonly used tool by respondents, at 53%, while the least commonly used digital tool was Google Meet, at 1%.

Objective 2: To evaluate the current situation of the application of modern means in agricultural extension in the governorate of Nineveh in general.
For this purpose, the lowest numerical value that represents the reality of the development and use of modern tools was (161) and the highest value which represents the reality of the development and use of modern tools was (249). Using the range and category width, the respondents were divided into three categories, as shown in Table 2.

Table 2. Illustrates the current status of the development and use of modern tools in guidance work in general.

Categories	Replicatior	Percentage %
Low (161–190)	14	7
Moderate (191–220)	118	59
High (221 and above	68	34
Total	200	100
Arithmetic Mean	212.26	
Standard Deviation	16.74	

The results showed that the actual level of development in the use of modern tools in extension work was moderate, tending toward high, with a percentage ranging from 59%, an arithmetic mean of 212.26, and a standard deviation of 16.74, This is because workers recognize the importance of modern tools in advancing extension work and the use of digital communication tools and smartphones in extension work to obtain and transmit agricultural information and communicate with farmers. The positive trend in the mean reflects a clear awareness among extension workers of the importance of these tools in accelerating the delivery of information and expanding the reach of extension services to reach the largest possible number of farmers.
Objective Third: To assess the level of use of modern communication technologies in agricultural extension work.
To attain this goal, the lowest number that represented the degree of use of modern means of communication was 21 and the highest was 48. The respondents were divided into three categories using the range and class width as shown in Table 3

below.

Table 3. illustrates the level of use of modern communication tools in agricultural extension work.

Categories	Replicatior	Percentage %
Low (21 - 29)	15	7.5
Moderate (30 - 38	76	38
High (39 - 48)	109	54.5
Total	200	100
Arithmetic Mean	36.77	
Standard Deviatior	6.38	

The results indicated that the percentage of the use of modern communication tools in agricultural extension work was high, which was (54%) with arithmetic mean of (36.77) and standard deviation of (6.38). This is because, agricultural extension workers heavily depend on modern communication tools in their extension activities in the implementation of various agricultural extension task and farmers also use modern communication tools and smartphones which are easier to use than traditional extension methods; besides, the nature of extension activities needs to have an access to the latest information in the field of agriculture to attain sustainable objectives.

Objective Four, to evaluate the extent of using agricultural Apps and Smartphones in agricultural extension.

This was achieved by using the lowest number that represented the least use of agricultural apps and the highest number that represented the most use of agricultural apps with regard to the use of the smartphone. The respondents were classified into three groups, based on the range and class width, as presented in Table (4).

Table 4. Illustrates the level of smartphone and agricultural app usage.

Categories	Replicatior	Percentage %
Low (22 - 31)	21	10.5
Moderate (32 - 41	123	61.5
High (42 ≤)	56	28
Total	200	100
Arithmetic Mean	36.11	
Standard Deviatior	5.70	

The percentage of smartphone usage among workers was found to be (61%), arithmetic mean (36.11) and standard deviation (5.70). The level of agricultural app

usage among workers was found to be on the higher side with percentage (61%), arithmetic mean (36.11) and standard deviation (5.70). This is because agricultural extension workers have an acceptable level of usage of a smartphone and also to agricultural apps, and also because, because of the speed at which information, images and videos can be accessed, and the ability of the smartphone and agricultural apps to help identify and solve agricultural issues out of the house, and to communicate with farmers who are not in the same place as the extension worker.

Objective Five: To assess the need for digital platforms in Agricultural Extension.

In terms of the use of digital platforms, the lowest indication was 23 and the highest 48, for this objective. Based on the range and length of the score distribution, the respondents were divided into three categories, as shown in Table 5.

Table 5. presents the level of use of digital platforms in agricultural extension work.

Categories	Replication	Percentage %
Low (23 - 31)	72	36
Moderate (32 - 40)	88	44
High (41 ≤)	40	20
Total	200	100
Arithmetic Mean	34.43	
Standard Deviation	6.53	

The results showed that the level of digital platform use among agricultural extension workers was low, at 36 percent, with an arithmetic mean of 34.43 and a standard deviation of 6.53. This is because currently, agricultural extension workers do not regularly use digital platforms in conducting their agricultural extension tasks, use of these platforms may be limited to personal communication or accessing general information but not as a major platform to disseminate agricultural knowledge and recommendations to farmers or because of lack of experience of the agricultural extension workers on using the digital platforms in agricultural extension work.

Objective Six: To evaluate the extent of the utilization of multimedia and agricultural video materials in the extension activities.

To achieve this objective, the lowest number that represents multimedia and agricultural video use was (22) and the highest number (48). The respondents were divided into three based on the range and class width as presented in Table (6).

Table 6. Illustrates the level of use of multimedia and agricultural videos.

Categories	Replication	Percentage %
Low (22 - 30)	59	29.5
Moderate (31 - 39)	96	48
High (40 - 48)	45	22.5

Total	200	100
Arithmetic Mean	34.04	
Standard Deviation	6.17	

Agricultural extension workers used (48%) of the agricultural videos, (34.04) of the videos and (6.17) of the standard deviation in using agricultural videos in their work of the agricultural extension; the result showed that the level of agriculture extension workers' use of agricultural videos was moderate, tending towards low. Because agricultural extension workers understand that the use of agricultural extension videos and multimedia is important in agricultural extension work and they also know that transferring agricultural information or expertise to farmers requires them to be proficient in the use of agricultural extension multimedia; but their actual use is limited and some may not be sufficiently proficient in using agricultural extension multimedia; in addition, the average level, which is generally low, could be related to the lack of specific training in agricultural extension video production and design among all the agricultural extension workers.

Objective Seven: To measure digital interaction and engagement in agricultural extension.

To reach this goal, the lowest score was 22 and the highest score was 50 that signified the level of digital interaction and participation. Based on the scale and category intervals, the respondents were categorized into three as presented in Table 7.

Table 7. Illustrates the level of digital interaction and participation in agricultural extension work.

Categories	**Replication**	**Percentage %**
Low (22 - 31)	46	23
Moderate (32 - 41)	50	25
High (42 ≤)	104	52
Total	200	100
Arithmetic Mean	35.41	
Standard Deviation	6.75	

The findings revealed that level of digital interaction with the agricultural extension work was high (52 per cent), arithmetic mean was 35.41 and standard deviation was 6.75. It is because farmers' interactions with agricultural extension workers are mainly digital and agricultural information, skills and expertise are shared digitally, and because modern digital tools can reach the maximum number of farmers at different times and can respond to all farmers' enquiries quickly, and unlike some traditional agricultural methods, do not require farmers to meet face-to-face in person.

Objective Eight: To evaluate the extent of extension uses of digital tools in agriculture.

For this goal, the lowest score was 21 with the highest being 50 for the digital extension content based on its level of development. The respondents were divided into 3 groups using the range and class width as they are shown in Table 8.

Table 8. Level of Use of Modern Communication Tools in Agricultural Extension Work.

Categories	Replication	Percentage %
Low (22 - 31)	43	21.5
Moderate (32 - 41)	112	56
High (42 ≤)	45	22.5
Total	200	100
Arithmetic Mean	35.49	
Standard Deviation	6.37	

The findings revealed that the agricultural extension content was at moderate level with (56%) percentiles, (35.49) arithmetic means and (6.37) standard deviation. This is because agricultural extension workers do not depend on the traditional extension content, but rather, they try to continually develop extension content to match the information they want to communicate and the farmers' needs. This can be attributed to the development of information sources in agriculture and the availability of the Internet and digital media that enable extension workers to have up-to-date information about agricultural work and modern agricultural methods.

Objective Nine: To understand the correlation between the current level of development and use of modern tools in agricultural extension and each of the following variables (age, level of education, specialization, length of service, duration of agricultural extension work, presence in training courses about the use of digital tools, possession of a phone smart, frequency of use of the Internet and the most used digital tool in agricultural extension work).

For this purpose, a correlation coefficient Pearson and Spearman were used to test the statistical significance of the correlation coefficient between quantitative and qualitative variables respectively, as indicated in Table (9).

Table 9. Correlation Between Independent Variables and Modern Technology Use

Variables	Correlation Coefficient	Analysis	Significancee
Age	0.268*	Pearson	Significant
Educational attainment	0.125	Spearman	Not significant
Specialization	0.136	Spearman	Not significant
Years of employment	0.129	Pearson	Not significant
Years working in agricultural	0.192**	Pearson	Significant

extension			
Participation in training courses on digital technologies	0.158	Spearman	Not significant
Smartphone ownership	0.102*	Spearman	Significant
Internet use frequency	0.304**	Spearman	Significant
Most frequently used digital medium in extension work	0.271*	Spearman	Significant

* Significant at $p < 0.05$; ** Significant at $p < 0.01$.

The results showed that there was a correlation between the current level of development of modern tools in the field of guidance and the following variables:

1) Age: The results indicated that there is a statistically significant correlation between the actual development of modern tools in extension work and age with Pearson correlation coefficient of 0.268*, significant at the 0.05 level. The age group of 30 – 49 years old agricultural extension workers may have professional and extension experiences related to the use of these skills that encourage them to see the importance of modern tools and connect them with the agricultural problems of farmers, while the younger age groups have greater flexibility in dealing with the digital technologies, smartphones, and modern applications.
2) Educational Levels: The results indicated that there were no significant differences between actual development of modern technology use in extension work and educational attainment, with a Spearman's correlation coefficient of (0.125), meaning that the educational level of agricultural extension workers would not be the main determinants of the actual development of modern technology use in extension work, because workers with bachelor's degree may have the same level of basic knowledge, and the actual development of modern technology use in extension work is more dependent on other factors.
3) Specialization: there was found to be no significant correlation between the actual use of modern tools in the agricultural extension and specialization, with the Spearman's correlation coefficient being (0.136), which means that the agricultural extension workers, whether they are specialists in agricultural extension or not, are aware of the importance of developing their agricultural extension work by using modern tools to keep up with scientific and technological developments in their field.
4) Years of Service: There was no significant correlation between the years of service and the extent of development of modern tools used by agricultural extension workers and the value of the Pearson correlation coefficient was (0.129). This indicates that years of service alone were not significant in determining the level of development of modern tools among agricultural extension workers. One worker with many years' experience may have a wide range of experience in extension work but not necessarily in modern digital

technologies and/or in using them consistently. Furthermore, the fact that a large proportion of workers whose years of service are 19 years or more) may indicate that the majority of study participants are relatively similar in terms of length of service.

5) Length of Service in Agricultural Extension: The results indicated that there was statistically significant correlation between the actual development of modern tools' use in extension work and the length of service in agricultural extension with Pearson correlation coefficient (0.192**), which is significant at the 0.01 level; This means that the length of service in agricultural extension was influential in the ability of agricultural extension workers to recognize the importance of the use of modern tools in various extension activities and how to apply them. Agricultural extension workers with long service experience (12–16 years) may be interested in improving their communication skills, including communication speed and effectiveness, to better reach their clients and deliver the correct information and recommendations.
6) Participation in training courses on digital technology: The results indicated no statistically significant correlation between actual development of modern technology use in extension work and participation in training courses on digital technologies (Spearman's correlation coefficient (0.158)) and this meant that the majority of the sample made no participation in these training courses on digital technology. This implies that there are other ways for workers to learn new skills working with modern tools than formal training courses, e.g. hands-on experience in the workplace, self-training, use of the internet and social media, or guidance work on a daily basis.
7) Smartphones Ownership: Results indicated that the actual development of the use of modern technology in extension work is statistically significantly correlated with the extent of the use of smartphones by extension workers, with a Spearman's correlation coefficient of (0.102*). This shows that the possession of a smartphone gives extension workers fast, continuous access to the Internet, agricultural digital platforms, and modern scientific resources on agriculture, as well as the possibility to communicate with and exchange information with farmers.
8) Internet Usages: The findings revealed that there was a significant correlation between the actual implementation of modern tools in agricultural extension work and the rate of Internet usage with a correlation coefficient of (0.304**) at the level of significance (0.01), indicating that the agricultural extension workers who use the Internet every day and more often have more opportunities to be introduced to modern tools and how to use and apply them in agricultural extension work.
9) The cell phone is the most commonly used tool by the respondents, which is in line with the nature of extension work that is a continuous communication with farmers both during visiting in the field or not, and ease of using the tool.

Digital tools also enable the use of a wide range of digital applications that can be utilized in agricultural extension work, such as mobile applications messaging, voice and video calls, and agricultural information.

Conclusion

From the results of the research, we can deduce the following items, the extent of development of modern tools in agricultural extension was moderate, and there was a tendency for improvement. It is an indicator of extension workers' understanding of the role of these tools in disseminating agricultural information. Using the tools of modern communication were high and significant from the point of agricultural extension workers considering the significance that these modern tools had in the agricultural work. Furthermore, the availability of smartphones and agricultural apps to employees was acceptable, as these are crucial to ensure faster and better dissemination of agricultural information and knowledge to farmers. Despite the fact that digital platforms are already used by agricultural extension workers in their work, not all of them directly use digital platforms in their work, but are using other tools which are more available and accessible to them, and easier for farmers to use. Extension workers's use of multimedia and agricultural videos was moderate; that is, extension workers are not primarily using multimedia in their extension work but are heavily using other, more effective media. Consequently, the extent of digital interaction and participation in extension work was high among agricultural extension workers, as digital participation is an important part of transmitting agricultural information to as many farmers as possible. The level of development of digital extension content was also moderate for agricultural extension workers, who had to use other programmes to transmit agricultural information. It is concluded that none of the following factors, which could influence the development and use of modern tools in agricultural extension, is significant: Educational attainment, field of specialization, years in service and involvement in training courses in digital technologies. Moreover, the variables that seem to have significant effects and meaningful relationships with the actual use of modern tools in agricultural extension work are age, years of service in agricultural extension, ownership of the mobile phone, frequency of using the internet and most frequently used digital instrument in the place of work. Our recommendations and Proposal proofs that the Nineveh Directorate of Agriculture should provide the opportunity for using mobile phones as a digital tool for communicating with farmers and exchanging agricultural information in agricultural extension work. The Nineveh Directorate of Agriculture should conduct regular, hands-on training courses on modern digital technologies for agricultural extension workers to develop their skills and abilities in using modern tools in extension work. The Ministry of Agriculture shall develop an agricultural extension online platform/portal in Nineveh governorate, containing modern and up-to-date digital agricultural information, recommendations and allowing interaction between extension workers and farmers. Agricultural extension workers should

integrate the use of modern tools with the needs of farmers, making sure that digital tools chosen are suitable for farmers' needs and skills to use them. Furthermore, promote continuous collaboration between the Nineveh Directorate of Agriculture, universities and research centers to enhance educational platforms and digital tools to support the agricultural extension and are adaptable to the agricultural conditions in all regions of the Nineveh Governorate. Conduct a study on what agricultural extension workers in Nineveh governorate face in using modern digital technologies in agricultural extension work. Finally, carry out a similar study to measure the attitudes of agricultural extension workers towards the use of modern digital tools in agricultural extension work.

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