

## The level of wheat growers' knowledge in the field of use and maintenance of the center-pivot irrigation system in Al-Alam District/Salah al-Din Governorate

Khairallah Yassin Dakhil

, 2Hasib Mahmoud Amin<sup>1</sup>

Tikrit University | College of Agriculture 2, Tikrit University | College of Agriculture<sup>1</sup>

kh.yaseen.d0360@st.tu.edu.iq

2 hasib.m.amin@tu.edu.iq <sup>1</sup>

### Abstract

The study aims to know the level Wheat growers farmers in the region of use and maintenance who use the pivot sprinkler irrigation system in Al-Am District / Salah Al-Din Governorate. The research community included all wheat growers who used center-pivot irrigation systems in Al-Alam district and who were officially registered in the Al-Alam Agriculture Division. A random sample of (40%) of the total farmers was taken, with a size of (120) farmers. For the purpose of collecting the necessary data, a questionnaire form consisting of two parts was prepared that included: The first part includes a number of questions to obtain data related to variables related to farmers using center-pivot irrigation systems, which are (age, educational attainment, number of years of using the center-pivot irrigation system, area of land you own, sources of obtaining information, trend towards using sprinkler irrigation techniques The axial part), while the second part included measuring the level of knowledge, which consisted of four areas, and each field contains a number of questions. The first area, which is preparing and operating the system, consists of (10) questions, while the second area, which is irrigation, consists of (12) questions. The third field, adding fertilizers through irrigation, may consist of (8) questions, while the fourth field, maintenance and sustainability, consists of (15) questions, and thus the total number of questions is (45) questions in these four fields. The questionnaire was presented to the experts for the purpose of obtaining honesty. Reliability and content validity. After that, a pre-test test was conducted for the purpose of obtaining reliability and validity of the questionnaire. The reliability coefficient reached (0.75) and the Validity coefficient (0.86). After completing the data collection, an analysis of the study data was conducted, and a number of statistical methods were used, the most important of which are (range, (frequency, percentage, Pearson's law, and arithmetic mean). The researcher concluded that there is a discrepancy in the level of knowledge in the areas of use and maintenance of center-pivot irrigation systems among the farmers of Al-Alam District, Salah Al-Din Governorate. The researcher emphasized a set of recommendations, the most important of which is (there must be interest on the part of the responsible authorities, especially the extension agency, in the problems of maintenance of center-pivot irrigation systems, studying these problems and finding appropriate solutions for them. He also stressed the necessity of implementing extension activities to provide solutions to farmers using extension means and methods. and provide them with the necessary information and .sufficient expertise to avoid the problems facing farmers in the field of system maintenance

**Keywords: Pivotal, sprinklers, knowledge, maintenance, farms**

**:Contribution and research problem**

Water resources are the main important resources that are directly involved in social and societal growth in all human societies because they are effective and prominent in providing the population with drinking water, in addition to providing them with food, improving industrial needs and the built environment, and vitalizing the agricultural sector. The agricultural sector is considered the largest aircraft in the world. When irrigating crops, agricultural liquid is pumped every year (3,300) cubic kilometers of water from the earth's rivers, meaning that it can be about six

Discharge to the Mississippi River( 1)The percentage of what is consumed by agriculture represents (69%) of the total water use, and the necessary statistics that require the amount of water needed indicate that it is only (56%) of global necessities in the year 2025

(2)Population: While industry consumes 10% of water. (3), the world's aquatic population represents (10%) of the world's total area, its population is (5%) of the world's total population, and its resources are less than (0.5%). (of the world's resources, which constitutes a per capita share that is less than the averages in the world (4). As Iraq faces the major problem of water scarcity, this is what the Ministry of Agriculture has prepared for months through the main and serious challenges in the agricultural sector (Ministry of Agriculture(5), which will greatly affect agricultural production (quantitatively and qualitatively) and the accuracy and characteristics of agricultural lands, such as salinization and waterlogging (6), and this is offset by a significant increase in demand due to the conflict of growing needs far away

(7)The Iraqi per capita share of resources for all use increased only from (5282) cubic meters in the year 1990 to reach (2344) global meters in 2007 (8). Iraq occupies the first place among the Arab countries in terms of its dependence on Great Irrigation (9) said that the production of strategic vegetables depends on irrigation, and that (82%) of them depend in particular on artificial irrigation (10), while the percentage of the area of irrigated land in Iraq is out of the total land Relatively agricultural (65.7%) (11). It turns out that the amount of water required and estimated for the coming years, but all exceeds the supply of water-resistant resources, and progress has begun to progress between the supplies and the demand, and agricultural expansion has progressed to participate in the Renew systems. Recent (12) states that it is important to follow modern methods and techniques to improve water management and reduce its use, as it establishes a strategy for using water resources in agriculture on elements that include all parts of development, research, financial orientation, incentives, interventions, and technology to meet future demand (13), which calls for the use of modern means of communication in water to save available energy by (30-40%) compared to traditional irrigation (14). What emerges is the need to rationalize the use of water within water regulations for agricultural irrigation through the application of modern irrigation methods, including sprinkler spraying, one of the means that helps in rationalizing the use of water for agricultural purposes and reducing waste, as well as the possibility of fertilization with irrigation and spraying pesticides, and not in saving water and the time of its arrival. Which

facilitates the use of the integrated agricultural package (15). The use of agricultural improvements and mechanization plays an important role in the management and management of irrigated lands, which can develop the positive effect that helps in replenishing nutrients and which increases the efficiency of use of water resources, which provides a significant increase in Significant diversified strategic products in the basic basic products for food and increasing industrial vegetables to stimulate the general economy (16) Agricultural extension has an important role and a fundamental task in creating a new boom in agricultural production and increasing productivity per unit area through making central developments. It is desirable in the knowledge, skills and trends of the agricultural public to use modern agricultural methods and mechanization in the method of agricultural land management, and it began to be used by research doctors in order to provide better solutions for it to develop agricultural information, which enables further agricultural use(17). Communicating technologies to agriculture and providing them with scientific solutions for the modern forms it prepares is the central goal in which there are agricultural .((tools, as well as the(18 Considering that human knowledge is capable of absorbing all new processes and applying them with high modern skill and efficiency, he is the main one who succeeded in achieving success in agricultural intervention (19)as it still continues in modern learning on It is necessary, as this cannot be done, a call for a modern call to disseminate agricultural agricultural technologies to the audience of Extension (20). The function of agricultural extension is to select the information obtained

and emerging from scientific research to farmers, and it does not include aspects of technology only, but also reaches into life mechanisms. Farmers, their regions, and the environmental conditions in which they operate in their daily lives (21), which makes it possible to obtain modern agriculture that is technically appropriate and feasible, and the goal of its application is one of the important tasks of agricultural development (22). The process of transferring agricultural technologies in Iraq We hope in at least one direction, which is to transfer technology to agriculture because agricultural and real production are social and without sufficient attention and now limit information and forms to agriculture, as well as transferring agricultural capabilities to research agencies and centers to provide the required and important solutions (Hamid and(23). Also, the characteristics and environmental recipes developed and derived from modernity and the extent of their extension and suitability to harmonize with the environmental and social conditions of agriculture represent an important factor influencing the transfer of water (24). There are many benefits, including immediate confrontation of the threat of water scarcity, but also to keep pace with the comprehensive scientific development in water use and reduce Partial losses are only due to preparing and reducing the pieces of products, modifying and reducing the workers effectively, raising the efficiency of irrigation of all agricultural lands without loss, as well as choosing a specific size, including cutting off irrigation and reducing humidifiers, not hindering agricultural operations, and the possibility of using these technologies in more than one element (25). In addition, it is

possible to use crops that cannot be cultivated on a regular basis, depending on the characteristics and nature of humidity (26). The use of drinking water is huge, so the Ministry of Agriculture, more than two decades ago, began implementing a development program of a studied and indicative nature in 1999. Its aim is to disseminate modern irrigation technologies, including (fixed, pivot, and drip irrigation), which are considered important in addressing water scarcity in the first place, as well as using them in all other agricultural operations (fertilization, control), which leads to an increase in the type of unit area as well as an increase in overall production by providing Water for the areas, but those named for the target governorates (Nineveh, Salah al-Din, Anbar, Diyala, Wasit, Baghdad, Najaf, Jahbal, and Karbala) (27). Studies have expanded that the use of irrigation systems contributes significantly to raising the efficiency of water use by a rate ranging between (94%) \_292%) and saving large amounts of water so that you can (27\_33%), which leads to an increase in productivity by (49\_200%) to obtain wheat when using different traditional methods (28). Wherever the wheat crop is grown in this way Sprinkler irrigation in Iraq (189,941) dunums, so not Salah al-Din Governorate, but the first to use main irrigation, as the number of systems starts from (3223), and given the importance of modern irrigation technologies and their economic feasibility in achieving an increase in productivity and its council due to the demand of agriculture to use this technology It is widely spread in Salah al-Din Governorate, and the use of these factors is affected by many factors, including the

topography of the land, water quality, and .method of use and operation

:Research questions

What is the level of knowledge of -1  
wheat cultivation in the field of use and maintenance of center-pivot irrigation in Al-  
?Alam District / Salah al-Din Governorate

What is the level of wheat agricultural -2  
knowledge of users starting irrigation with main sprinkler in the following areas:  
(preparing the system's operation, the field of irrigation, the field of rapid use through main irrigation, the field of maintenance and  
?(sustainability

Is there a correlation between the level -3  
of wheat growers Knowledge of wheat cultivators in the field of using and maintaining irrigation with comprehensive sprinkler irrigation and each of the following  
Variables of interest: (age, educational level, land ownership, area irrigated with main sprinkler, number of years of using the system, sources of information, trend towards using  
(systems modern irrigation

: research aims

Determining the level of knowledgn in -1  
the field of use and maintenance of the center-pivot irrigation in Al-Alam District / Salah al-Din Governorate

Determining the level of wheat -2  
agricultural knowledge of the main irrigation user with the main sprinkler in the following areas: (preparing the system's operation, the field of irrigation, the field of ready use through the main irrigation, the field of  
(maintenance and sustainability

Determine the relationship between the -3  
level of wheat growers in the field of use and maintenance of center-pivot irrigation and each of the elements: (age, educational level,

number of years of using center-pivot irrigation, area of land they own, sources of information, trends towards the use of global .( sprinkler irrigation technologies

:Statistical hypotheses

there is no correlation between the -1  
level of wheat cultivation in the field of use  
and maintenance of center-pivot irrigation in  
Al-Alam District/Salah al-Din Governorate  
.and the age variable

there is no correlation between the -2  
level of wheat farmers in the field of use and  
maintenance of pivot sprinkler irrigation in  
Al-Alam District / Salah al-Din Governorate  
.and the educational level

There is no correlation between the -3  
level of the wheat cultivation probe in the field  
of use and maintenance of center-pivot  
irrigation in Al-Alam District/Salah al-Din  
Governorate and the number of years of using  
.center-pivot irrigation

There is no correlation between the -4  
level of wheat farms in the field of use and  
maintenance of pivot sprinkler irrigation in  
Al-Alam District / Salah al-Din Governorate  
.and the area of land it owns

There is no correlation between the -5  
level of wheat farms in the field of use and  
maintenance of center-pivot irrigation in Al-  
Alam District / Salah al-Din Governorate and  
.sources of information

Knowing of a correlation between the -6  
level of knowledge of wheat cultivation in the  
field of use and maintenance of center-pivot  
irrigation in Al-Alam District / Salah al-Din  
Governorate and the use of center-pivot  
irrigation techniques

:Procedural definitions

.Define the following terms: action research

The level of knowledge of wheat -1  
cultivation: the total information and  
knowledge possessed by agriculture in the  
field of use and maintenance of irrigation with  
.sprinkler irrigation

Area of use: Number of years of center -2  
pivot irrigation uses

Sprinkler irrigation: An irrigation -3  
method in which water is pumped through  
pipes at different ends, ending up with a water  
spray or a rotor from which a water spray  
.emerges

:Materials and methods of work

:Search methodology

Descriptive Mathod is used to achieve the  
research objectives, and this application is  
suitable for communicating specific data and  
facts about the targeted objectives in a timely  
manner

There is a certain way to classify these data  
and facts, process them, and analyze them  
carefully and clarify the correlation, in order  
to verify their meanings and reveal  
comprehensive and accurate results about the  
.research phenomenon

:Search region

Al-Alam District chosen to spend the science  
journey on the Salah al-Din expedition for  
rapid research, due to the presence of a large  
number of wheat farmers and users of main  
sprinkler irrigation, as well as the presence of  
space for cultivation and the suitability of  
groundwater. There is an agricultural plan for  
comprehensive cultivation to obtain a wheat  
crop under the Pivotal Sprinkler Irrigation  
.sprinkler system

:Research community and sample

The research community included all  
agricultural users of center-pivot irrigation  
systems in Al-Alam District, Salah al-Din

Governorate, who were officially registered in the Agriculture Division of Al-Alam District, numbering (300) farms. A reconnaissance sample of (30%) of the total agriculture was taken, and an appropriate technical drawing was drawn from Total agriculture represented (40%) of the total agriculture in Al-Alam District, and its size reached (120) farms

:Data collection tool

In order to collect ire form consisting of two basic parts was used

: part One

For this reason, a large number of questions are prepared to achieve information regarding the relevant specialized variables: (age, multi-year acquisition of use of the pivotal sprinkler irrigation system, the largest area of land, sources of obtaining information and the method of use of global sprinkler irrigation .(techniques

: The second part

This part covers a number of paragraphs that represent knowledge of each of them in the field of use and maintenance of center-pivot irrigation in Al-Alam District / Salah al-Din Governorate. For the purpose of defining knowledge in these two fields, they have been completed in literature, studies, previous research, dissertations, theses, and conducting transactions with specialists in sprinkler irrigation systems and the director of the Agricultural Division. Agricultural equipment in the simple research area is limited to (45) paragraphs in the field of use and maintenance .of the system

:Measuring search diversity

:Factor measurement

:-The new factor was measured as follows

Age: It was measured for many years -1  
 .of research age

Educational level: The educational -2  
 level was measured starting from the next level (mother, primary school graduate, middle school graduate, middle school graduate, institute graduate, college graduate, postgraduate certificate), and what she has of these following numerical educational levels .((1, 2, 3, 4, 5, 6, 7

Number of years of using -3

:comprehensive irrigation

It has been calculated for the amount of years in which research and comprehensive spraying .research has been used

The area of land that you own: It has -4  
 been developed with large quantities of :dunams that you own for research

Sources of obtaining information: This -5  
 variable was measured for the situation (11) sources can be obtained from obtaining information about central sprinkler irrigation systems, and the following alternatives were placed in front of each of them (always, must, rarely, never happen) and these may give .(Alternatives values (3,2,1, 0

Mistakes when using center vane -6  
 :techniques

This variable was measured to develop (6) items, three of which were positive and were given the following numerical values (3, 2, 1), and three Negative items were given the (following numerical values (1, 2, 3

:Factor measurement

To measure the specialized worker through (45) questions distributed over four areas, through which the level of farmers' knowledge in the field of use and maintenance is measured. Each field received a number of questions. I obtained the first field, which is preparing and operating the system, on (10) questions. As for the field The second field

received (12) questions. The third field, which is the prominent field, received (8) questions. As for the fourth field, which is of greatest importance, it received (15) questions. Therefore, the question from these questions

contains three choices, for which the following weight is determined (2, 1, 0). Therefore, the values expressing the use and maintenance of the system are limited to (45-90), as shown in .(Table (1

**Table (1) Distribution of respondents' scores**

Sequence	The field	Number of paragraphs	Scale degree
1	The first area is configuring and operating the system	10	0-20
2	The second area is irrigation	12	0-24
3	The third area is the use of fertilizers through irrigation	8	0-16
4	The fourth area is maintenance and sustainability	15	0-30
	The total	45	45-90

#### : Data collection

After completing the registration of the questionnaire form, the general sample data is controlled and distributed by those who completed all the scientific requirements that must be met in the questionnaire form, and completed the formation of personal data with the respondents, who numbered (120) since the data collection from the research began in the period from (120). 01/11/2023) until ((12/1/2023

#### Results and discussion

The first objective: Determine the level of knowledge of wheat cultivation in the field of use and maintenance of center-pivot irrigation in Al-Alam District / Salah al-Din .....Governorate

The results of the research led to a low level of knowledge with a comprehensive research knowledge level (35-51) and the highest score with a mean of (41.68) and a deviation (85-69) of (14.10). The research was divided into three .(copies, as I added in Table (2

**Table (2) Distribution of research according to inspiration level categories**

N	Categories	Frequency	%	Average	Std
1	Low(35-51)	32	26.66	47.79	14.10
2	Mediater (52-68)	38	31.66	57.68	
3	High(69-85)	50	41.68	74.9	
	The total	120	100%		

Therefore, from Table (2) the highest percentage (41.68%) falls within the top category of the level of knowledge of the respondents up to the middle category (31.66%). Therefore, the level of knowledge of the two researchers is described and is considered moderate to high. The reason for this may be due to the interest in agriculture in the field of use and maintenance, and the focus is This interest in obtaining a return and making profits for agriculture is an incentive .to continue agricultural work  
The second Objective : Determine the level of wheat agricultural knowledge among the main

sprinkler irrigation users in each field of :research

The first Field: configuring and operating the :system

The results of the research were that the lowest category expressing the level of research knowledge in the field of configuring and operating the system was (12-16) and the highest category was (7-11). Web arithmetic mean (8.67) and standard deviation (5.22).

The two studies were divided into three copies according to the law The range, as stated in .)Table (3

**Table (3): Distribution of the two researchers according to the categories of their level of knowledge in the field of configuring and operating the system**

N	Categories	Frequency	%	Average	Std
1	Low (7-11)	58	48.34	8.67	5.22
2	Lntermediate(12-16)	18	15	13.16	
3	High (17-21)	44	36.66	19.65	
	The total	120	100%		

It is intended from Table (3) that the highest percentage (48.34) falls within the category (7-11) to only a low class (15) and falls within the category (12-16). The level of the two studies is described as medium to high, and the reason may be due to In this regard, attention is paid to the cultivation of the provisions of preparation and comprehensive maintenance of irrigation in general, in order to obtain a irrigation strategy that covers all the cultivated area under the irrigation system,

in addition to ensuring the irrigation system .for the next agricultural season

:Second irrigation

Research results: The least category expressing the level of knowledge of research in the field of photography (21-and-over) with a percentage of (26.66) and the highest category (14-20) with a percentage of (44.16) and a standard deviation of (4.96). The research was scanned in triplicate



**Table (4) Distribution of the Distribution of respondents by categories of knowledge level in the field of irrigation**

N	Categories	Frequency	%	Average	Std
1	Low(7-13)	35	29.18	8.97	4.96
2	Lntermediate(14-20)	53	44.16	15.09	
3	High(21-26)	32	26.66	21.81	
	The total	120	100%		

According to Table 4, the highest percentage (44.16%) falls within the top category of the level of the respondents up to the middle class with a percentage of (29.18%). Therefore, the knowledge of the level of the respondents is described and should be considered excellent, as the middle and average categories constituted (73.34%), and this may be due to The reason for this is the interest in agriculture, which is the irrigation process, which is one of the productive thermal elements of agriculture, and any shortening of the irrigation process will have a negative impact on the crop production in quantity and .quality

The third area: final use of the international :road

The results of the research showed that the lowest category expresses the level of research knowledge in the field of the use of light through the global index (4-8), the highest category (14 or more), an arithmetic mean (15.86%), and a standard deviation (4.10). Distribution of the two research papers. Three are written as (written in Table (5

**Table (5): Distribution of the two studies into categories of hydrium level in a field that sets out to reach the global irrigation path**

N	Categories	Frequency	%	Average	Std
1	Low(11-17)	36	30	13.91	6.93
2	Lntermediate(18-24)	37	30.84	20.59	
3	High(25-31)	47	39.16	30	
	The total	120	100%		

It can be seen from Table (5) that the highest percentage (39.16%) falls within the top category of the level of the respondents up to the middle class with a percentage of (30.84%). Therefore, the level of knowledge

of the respondents is described as average and tends to rise, as the two highest categories for comprehensive research constituted (70%). The reason for this may be due to the interest in agriculture in maintaining irrigation and perpetuating the parts that were damaged or

stopped irrigation during the season and in order to obtain a strong irrigation force that covers all the cultivated area under irrigation and after the end of the cultivation period to follow up on irrigation for the coming seasons

Third objective: Determine the relationship between the level of wheat agricultural yield in the field of use and maintenance of pivot sprinkler irrigation and the causative factors

Age -1

The results of the research revealed that the ages of the two studies were limited to between (29 - 70) years, and the arithmetic average was (40) years. The two studies were distributed in three copies according to the law of range, and showed that the highest percentage was within the middle age category, as shown in Table (6

**Table (6): Distribution of the two research papers according to various age groups**

N	Categories	Frequency	%	Average	Std
1	Low(29-42)	43	35.97	0.37	0.378
2	Intermediate(43-56)	50	41.75	48.75	
3	High((57-70)	27	22.5	62.51	
	The total	120	100%		

)The correlation is significant at the 0.01 level (two-tailed .\*\*

We seek from Table (6) that the highest percentage (41.66%) of research is within the middle and intermediate age category in language (48.75), and to find a correlation between the level of knowledge and the age variable, agreeing to the Pearson correlation and the advanced limbs test (0.378), and no test The significance of the agreement was used. The t test was used for many months. The specified (2) is greater than the tabulated (t) at the possible level (0.01). Therefore, the null hypothesis is rejected and the alternative hypothesis is accepted, which continues on (there is a significant correlation between the level of knowledge and the age variable), that

is, The level of knowledge about basic irrigation varies according to the age groups of farmers. The reason for this may be that the modern agriculture group among the young is more accepting and more interested in agricultural techniques and therefore has more understanding and experience than the group that appears older and often adheres to ancient traditions. This study agrees with(29

:The area of land you own -2

The values expressing the number of years of using the system were limited to (60-116 or more). The two studies were distributed in three copies according to the range law, as I (added the table in (7

**Table (7) Distribution of the two studies according to the categories of number of years the system has been used**

T	Categories	The number	The ratio	Average	Std
1	Low((60-87)	29	24.16	72.37	0.239
2	Intermediate(88-115)	56	46.66	93.07	
3	High((116.144)	35	29.18	117.57	
	The total	120	100%		

.)The correlation is significant at the 0.01 level (two-tailed .\*\*

Ninety from Table (7) the highest percentage (46.66%) of the research is within the average category and the average knowledge score is (93.07). To find ratios between the industry level of the two researches and the number of years of using the Pearson business relationship system, the progress was made (\*\*239), and the test Significant: He agreed to use the law (t) since the protected obligation (2) is higher than the tabular (t) value (0.01), but he rejects the null and accepts the alternative hypothesis, which is set to (there is a significant correlation between the level of knowledge of the two researchers and the

variable of cultivated area), The reason for this may be that recording the practice of cultivation of pivotal red wheat increases the knowledge and information of research on how to apply scientific influences, both the number of years of work in a specific field of experience in the field, and this result was reached by what was reached by Aliyah .(Muhammad (2014

Mistakes when using pivot vane -3 :techniques

The values expressed by the Greeks were limited to the use of educational technologies (10-18), and the two papers were divided into ).three according to the law, as in Table (8

**Table (8): Distribution of modern scientific research according to various categories towards the use of irrigation technology**

N	Categories	The number	%	Average	Std
1	Negative ((10-12)	26	21.66	11.52	0.217*
2	Positive (13-15)	40	33.34	14.27	
3	Neutral (18-16)	54	45	16.57	
	The total	120	100%		

.(The correlation is significant at the 0.05 level (two-tailed .\*

It is expected from Table (8) that a percentage of researchers fall within the positive category

and the cognitive average is (16.57). To find a relationship between the level of knowledge and the tendency towards using modern technological techniques, we use the Pearson interaction, which reached a value of (0.217), and the relationship indicates well between the two variables. In order to ensure the significance of the parliamentarism used under the law (t) which allies (2) is higher than the value (t) of the table (0.05), do not reject the null hypothesis and accept the difference hypothesis that it exercises (there is a significant correlation between the two variables), and the reason is that it is all It expanded the direction of research towards the comprehensive use of vernacular irrigation as it became more interested in information and .knowledge related to vernacular irrigation

Conclusions and recommendations

#### :First - Conclusions

- 1 Lack of focus and attention on the elderly segment of farmers in terms of educating them on the use of modern irrigation technologies and keeping them away from .traditional irrigation methods
- 2 The educational level is not considered a determining factor in the management and .operation of center pivot irrigation systems
- 3 The speed and ability of farmers using center pivot irrigation systems to understand and understand how to use modern irrigation .methods while they own them
- 4 Increasing the awareness of farmers who use center pivot irrigation systems for maintenance and operation by introducing them to rural communities and communicating .among them
- 5 Lack of adequate attention given to farmers using center-pivot irrigation systems

in some technical aspects related to the .management and use of these systems

#### :Second - Recommendations

- 1 Local leaders in rural communities must be paid attention to and involved in managing and attending guidance seminars and field days related to center pivot irrigation .systems
  - 2 There is a discrepancy in farmers' knowledge about the maintenance of center pivot irrigation systems facing wheat farmers in Al Alam District, Salah al-Din Governorate. It follows from this that focus should be placed on increasing their knowledge in the field of maintenance of center pivot irrigation .systems
  - 3 Extension activities related to center-pivot irrigation systems must be implemented that help eliminate the problems facing wheat .growers
  - 4 It is necessary for farmers to participate in courses on center-pivot irrigation systems conducted by the manufacturers of .these systems
  - 5 Spare parts must be provided and maintenance centers opened in places where .pivot sprinkler irrigation systems are used
  - 6 The necessity of implementing extension activities in order to transfer solutions to farmers using various extension methods and methods in order to provide them with the information and expertise necessary to avoid some of the problems of maintenance .of pivot sprinkler irrigation systems
  - 7 Attention must be given to targeted agricultural television programs that benefit the rural community due to the low educational level of some members of the rural community
- .References

- Al-Takriti, Haifa Abdul Rahman Yassin, (1) (2013), The water crisis in the Arab world, its reality, its motives, and the vision will succeed, Kirkuk University Journal of Modern Administrative Sciences, Volume (3), Issue .((1
- Al-Hadithi, M. Khudair, Ahmed Madloul (2) Al-Kubaisi, and Yas Khidr Al-Hadithi, (2010), Modern Irrigation Technologies and Other Topics in Water Affairs, 1st edition, College of Agriculture, Anbar University. Al-Hadithi, Hikmat Fouad, Alwan Fayez Ghazi Abdul Latif, and Haider Abdel Hassan Al-Bayati, (2) 2004), Modern Trends in Maintenance Management Course, 1st edition, Dar Wael for .Publishing and Distribution, Amman, Jordan
- Al-Hadithi, M. Khudair and Al-Kubaisi, (3) Ahmed Madloul and Al-Rawi, Adel Khairallah, (2003), Estimator of blowing losses in the global sprinkler irrigation system from electrical conductivity measurements of irrigation water in Iraq's soils, Al-Anbar Journal of Agricultural Sciences, Magazine 1, .No. 1
- Al-Daoudi, Salah Jassim Amin (2003), (4) Distinct educational requirements for farmers in Tamim Governorate in the field of use and maintenance of pivot sprinkler irrigation systems and their relationship to chemical factors, Master's thesis, College of Agriculture and Forestry, University of Mosul
- Al-Rawi, Khasha Mahmoud, (1980), (5) Introduction to Statistics, Ministry of Higher Education for Scientific Sciences, University .of Mosul
- Al-Rawi, Adel Khairallah (2002), (6) Evaluating the efficiency of sprinkler irrigation as its main focus in some physical gains of gypsum soil for yellow corn production, Master's thesis, College of .Agriculture, Anbar University
- Al-Rimawi, Ahmed Shukri and others, (7) (1996), Pioneer in Agricultural Extension, 1st edition, Haneen Publishing House, Amman, .Jordan
- Al-Rimawi, Ahmed Shukri and Hassan (8) Juma Hammad (1995), Pioneer in Agricultural .Extension, Dar Haneen, Amman, Jordan
- Al-Samarrai, Abdullah Ahmed, Adnan (9) Hussein Al-Jadari, (1990), Agricultural .Extension, Education Press, Baghdad
- Al-Shamaa, Khalil Muhammad and (10) Khudair Kazem Hammoud (2000), Organized .Theory, 1st edition, p
- Saleh, Raad Omar, (2001), Sprinkler (11) irrigation, its types and advantages, Aba Center for Agricultural Research, March, No. 70. (12) Al-Salhi, Zainab Khaldoun, (2001), Reliability Indicators for Production Lines: A Case in Industrial Industries, Journal of Technological Technology, Al-Mathab University, Volume 20, Addition to Issue 2, .Baghdad, Iraq
- Al-Safawi, Safaa Younis (2008), (13) Statistics, published by Dar Ibn Al-Atheer for .Printing and Publishing, University of Mosul
- Al-Tanoubi, Muhammad Muhammad (14) Omar, (1996), Agricultural Guidance Reference, Arab Renaissance House for .Printing and Publishing, Beirut
- Al-Tanoubi, Muhammad Muhammad (15) Omar, (2001), Adapting agricultural technology to the requirements of modern development in appropriate countries, Faculty of Agriculture, Alexandria University, first .edition
- Al-Abbasi worker Fadel Khalil and (16) Radwan Thanoun Younis Al-Khashab, (2008), Determining the extent of the problems of

- sprinkler irrigation for farmers in the Al-Jazeera Irrigation Project in Nineveh Governorate and their legal relationship, published research, Al-Rafidain Agriculture .(Journal, Volume (36), Issue (3
- Brad Field, D.J, (1966), Guide to (17) • .Extension Training F.A.O, Rome
- Buffa. Elwood S, (1993) " Modern (18) • production/operations Management" John .Wiley & sons, New York
- Buford, J.A., (1983), Management in (19) • .extension, Auburn university
- Cornish, G, B. Bosworth, C. Perry and (20)•
- Burke, (2004), Water charging in irrigated .agriculture\_No\_28. Rome.p: p
- Development technology with farmer's (21) • transfers quid for participatory learning F.A.O .((1997
- Ebell, Robert, L. (1979) Essentials of (22) • Educational Measurement, 2nd ed, Englewood cliffs, Prentice mall. N.Y
- 
- (23)
- Evans,JamaR.(1997),production/operationsMa nagement,,Quality performance and value 5th .ed. West publishing Co. New york
- F.A.O. (2006), tea, technology for (24) • agriculture teca- editor fao.org. .www.fao.org/sd/teca/def-en-ASP
- FAO (1997), Management of (25) • agricultural research, A training manual, Module 8, Research – extension linkage, rome
- Green, B., L.E. smith and D.E Nill. (26) •
- (2001) soil irrigating by sprinkler, University .of Utah. USA
- Heizer, Jay&Rander, (2001), Barry. (27) • Operations management, sixth ed, New York, .prentice Hall
- Industry. Technology and the Global (28) • Market place: International patenting Trends ,2002" in Two New Technology Areas"
- .science and Engineering Indicators
- Juma, c. & yee-cheong, L. (2005). (29) • Innovation Applying knowledge in .Development. London: sterling, Va
- Al-Takriti, Haifa Abdul Rahman Yassin, (1) (2013), The water crisis in the Arab world, its reality, its motives, and the vision will succeed, Kirkuk University Journal of Modern Administrative Sciences, Volume (3), Issue .((1
- Al-Hadithi, M. Khudair, Ahmed Madloul (2) Al-Kubaisi, and Yas Khidr Al-Hadithi, (2010), Modern Irrigation Technologies and Other Topics in Water Affairs, 1st edition, College of Agriculture, Anbar University. Al-Hadithi, Hikmat Fouad, Alwan Fayez Ghazi Abdul Latif, and Haider Abdel Hassan Al-Bayati, (2) 2004), Modern Trends in Maintenance Management Course, 1st edition, Dar Wael for .Publishing and Distribution, Amman, Jordan
- Al-Hadithi, M. Khudair and Al-Kubaisi, (3) Ahmed Madloul and Al-Rawi, Adel Khairallah, (2003), Estimator of blowing losses in the global sprinkler irrigation system from electrical conductivity measurements of irrigation water in Iraq's soils, Al-Anbar Journal of Agricultural Sciences, Magazine 1, .No. 1
- Al-Daoudi, Salah Jassim Amin (2003), (4) Distinct educational requirements for farmers in Tamim Governorate in the field of use and maintenance of pivot sprinkler irrigation systems and their relationship to chemical factors, Master's thesis, College of Agriculture .and Forestry, University of Mosul
- Al-Rawi, Khasha Mahmoud, (1980), (5) Introduction to Statistics, Ministry of Higher Education for Scientific Sciences, University .of Mosul

- Al-Rawi, Adel Khairallah (2002), (6) Evaluating the efficiency of sprinkler irrigation as its main focus in some physical gains of gypsum soil for yellow corn production, Master's thesis, College of Agriculture, Anbar University
- Al-Rimawi, Ahmed Shukri and others, (7) (1996), Pioneer in Agricultural Extension, 1st edition, Haneen Publishing House, Amman, Jordan
- Al-Rimawi, Ahmed Shukri and Hassan (8) Juma Hammad (1995), Pioneer in Agricultural Extension, Dar Haneen, Amman, Jordan
- Al-Samarrai, Abdullah Ahmed, Adnan (9) Hussein Al-Jadari, (1990), Agricultural Extension, Education Press, Baghdad
- Al-Shamaa, Khalil Muhammad and (10) Khudair Kazem Hammoud (2000), Organized Theory, 1st edition, p
- Saleh, Raad Omar, (2001), Sprinkler (11) irrigation, its types and advantages, Aba Center for Agricultural Research, March, No. 70. (12) Al-Salhi, Zainab Khaldoun, (2001), Reliability Indicators for Production Lines: A Case in Industrial Industries, Journal of Technological Technology, Al-Mathab University, Volume 20, Addition to Issue 2, Baghdad, Iraq
- Al-Safawi, Safaa Younis (2008), (13) Statistics, published by Dar Ibn Al-Atheer for Printing and Publishing, University of Mosul
- Al-Tanoubi, Muhammad Muhammad (14) Omar, (1996), Agricultural Guidance Reference, Arab Renaissance House for Printing and Publishing, Beirut
- Al-Tanoubi, Muhammad Muhammad (15) Omar, (2001), Adapting agricultural technology to the requirements of modern development in appropriate countries, Faculty of Agriculture, Alexandria University, first edition
- Al-Abbasi worker Fadel Khalil and (16) Radwan Thanoun Younis Al-Khashab, (2008), Determining the extent of the problems of sprinkler irrigation for farmers in the Al-Jazeera Irrigation Project in Nineveh Governorate and their legal relationship, published research, Al-Rafidain Agriculture (Journal, Volume (36), Issue (3
- Brad Field, D.J, (1966), Guide to (17) Extension Training F.A.O, Rome
- Buffa. Elwood S, (1993) " Modern (18) • production/operations Management" John Wiley & sons, New York
- Buford, J.A., (1983), Management in (19) • extension, Auburn university
- Cornish, G, B. Bosworth, C. Perry and (20)• Burke, (2004), Water charging in irrigated agriculture\_No\_28. Rome.p: p
- Development technology with farmer's (21) • transfers quid for participatory learning F.A.O ((1997
- Ebell, Robert, L. (1979) Essentials of (22) • Educational Measurement, 2nd ed, Englewood cliffs, Prentice mall. N.Y
- (23) Evans,JamaR.(1997),production/operationsMa nagement,,Quality performance and value 5th .ed. West publishing Co. New york
- F.A.O. (2006), tea, technology for (24) • agriculture teca- editor fao.org. www.fao.org/sd/teca/def-en-ASP
- FAO (1997), Management of (25) • agricultural research, A training manual, Module 8, Research – extension linkage, rome
- Green, B., L.E. smith and D.E Nill. (26) • (2001) soil irrigating by sprinkler, University .of Utah. USA

- Heizer, Jay&Rander, (2001), Barry. (27) • Operations management, sixth ed, New York, .prentice Hall
- Industry. Technology and the Global (28) • Market place: International patenting Trends ,2002" in Two New Technology Areas" .science and Engineering Indicators
- Juma, c. & yee-cheong, L. (2005). (29) • Innovation Applying knowledge in .Development. London: sterling, Va
- Al-Takriti, Haifa Abdul Rahman Yassin, (1) (2013), The water crisis in the Arab world, its reality, its motives, and the vision will succeed, Kirkuk University Journal of Modern Administrative Sciences, Volume (3), Issue .((1
- Al-Hadithi, M. Khudair, Ahmed Madloul (2) Al-Kubaisi, and Yas Khidr Al-Hadithi, (2010), Modern Irrigation Technologies and Other Topics in Water Affairs, 1st edition, College of Agriculture, Anbar University. Al-Hadithi, Hikmat Fouad, Alwan Fayez Ghazi Abdul Latif, and Haider Abdel Hassan Al-Bayati, (2) 2004), Modern Trends in Maintenance Management Course, 1st edition, Dar Wael for .Publishing and Distribution, Amman, Jordan
- Al-Hadithi, M. Khudair and Al-Kubaisi, (3) Ahmed Madloul and Al-Rawi, Adel Khairallah, (2003), Estimator of blowing losses in the global sprinkler irrigation system from electrical conductivity measurements of irrigation water in Iraq's soils, Al-Anbar Journal of Agricultural Sciences, Magazine 1, .No. 1
- Al-Daoudi, Salah Jassim Amin (2003), (4) Distinct educational requirements for farmers in Tamim Governorate in the field of use and maintenance of pivot sprinkler irrigation systems and their relationship to chemical factors, Master's thesis, College of Agriculture .and Forestry, University of Mosul
- Al-Rawi, Khasha Mahmoud, (1980), (5) Introduction to Statistics, Ministry of Higher Education for Scientific Sciences, University .of Mosul
- Al-Rawi, Adel Khairallah (2002), (6) Evaluating the efficiency of sprinkler irrigation as its main focus in some physical gains of gypsum soil for yellow corn production, Master's thesis, College of .Agriculture, Anbar University
- Al-Rimawi, Ahmed Shukri and others, (7) (1996), Pioneer in Agricultural Extension, 1st edition, Haneen Publishing House, Amman, .Jordan
- Al-Rimawi, Ahmed Shukri and Hassan (8) Juma Hammad (1995), Pioneer in Agricultural .Extension, Dar Haneen, Amman, Jordan
- Al-Samarrai, Abdullah Ahmed, Adnan (9) Hussein Al-Jadari, (1990), Agricultural .Extension, Education Press, Baghdad
- Al-Shamaa, Khalil Muhammad and (10) Khudair Kazem Hammoud (2000), Organized .Theory, 1st edition, p
- Saleh, Raad Omar, (2001), Sprinkler (11) irrigation, its types and advantages, Aba Center for Agricultural Research, March, No. 70. (12) Al-Salhi, Zainab Khaldoun, (2001), Reliability Indicators for Production Lines: A Case in Industrial Industries, Journal of Technological Technology, Al-Mathab University, Volume 20, Addition to Issue 2, .Baghdad, Iraq
- Al-Safawi, Safaa Younis (2008), (13) Statistics, published by Dar Ibn Al-Atheer for .Printing and Publishing, University of Mosul
- Al-Tanoubi, Muhammad Muhammad (14) Omar, (1996), Agricultural Guidance



- Reference, Arab Renaissance House for .Printing and Publishing, Beirut
- Al-Tanoubi, Muhammad Muhammad (15)
- Omar, (2001), Adapting agricultural technology to the requirements of modern development in appropriate countries, Faculty of Agriculture, Alexandria University, first .edition
- Al-Abbasi worker Fadel Khalil and (16)
- Radwan Thanoun Younis Al-Khashab, (2008), Determining the extent of the problems of sprinkler irrigation for farmers in the Al-Jazeera Irrigation Project in Nineveh Governorate and their legal relationship, published research, Al-Rafidain Agriculture .(Journal, Volume (36), Issue (3
- Brad Field, D.J, (1966), Guide to (17)
- .Extension Training F.A.O, Rome
- Buffa. Elwood S, (1993) " Modern (18) • production/operations Management" John .Wiley & sons, New York
- Buford, J.A., (1983), Management in (19) • .extension, Auburn university
- Cornish, G, B. Bosworth, C. Perry and (20)•
- Burke, (2004), Water charging in irrigated .agriculture\_No\_28. Rome.p: p
- Development technology with farmer's (21) • transfers quid for participatory learning F.A.O .((1997
- Ebell, Robert, L. (1979) Essentials of (22) • Educational Measurement, 2nd ed, Englewood cliffs, Prentice mall. N.Y
- 
- (23)
- Evans,JamaR.(1997),production/operationsMa nagement,,Quality performance and value 5th .ed. West publishing Co. New york
- F.A.O. (2006), tea, technology for (24) • agriculture teca- editor fao.org. .www.fao.org/sd/teca/def-en-ASP
- FAO (1997), Management of (25) • agricultural research, A training manual, Module 8, Research – extension linkage, rome
- Green, B., L.E. smith and D.E Nill. (26) • (2001) soil irrigating by sprinkler, University .of Utah. USA
- Heizer, Jay&Rander, (2001), Barry. (27) • Operations management, sixth ed, New York, .prentice Hall
- Industry. Technology and the Global (28) • Market place: International patenting Trends ,2002" in Two New Technology Areas" .science and Engineering Indicators
- Juma, c. & yee-cheong, L. (2005). (29) • Innovation Applying knowledge in .Development. London: sterling, Va
- Al-Takriti, Haifa Abdul Rahman Yassin, (1)
- (2013), The water crisis in the Arab world, its reality, its motives, and the vision will succeed, Kirkuk University Journal of Modern Administrative Sciences, Volume (3), Issue .((1
- Al-Hadithi, M. Khudair, Ahmed Madloul (2)
- Al-Kubaisi, and Yas Khidr Al-Hadithi, (2010), Modern Irrigation Technologies and Other Topics in Water Affairs, 1st edition, College of Agriculture, Anbar University. Al-Hadithi, Hikmat Fouad, Alwan Fayeze Ghazi Abdul Latif, and Haider Abdel Hassan Al-Bayati, (2) 2004), Modern Trends in Maintenance Management Course, 1st edition, Dar Wael for .Publishing and Distribution, Amman, Jordan
- Al-Hadithi, M. Khudair and Al-Kubaisi, (3)
- Ahmed Madloul and Al-Rawi, Adel
- Khairallah, (2003), Estimator of blowing losses in the global sprinkler irrigation system from electrical conductivity measurements of

- irrigation water in Iraq's soils, Al-Anbar Journal of Agricultural Sciences, Magazine 1, .No. 1
- Al-Daoudi, Salah Jassim Amin (2003), (4) Distinct educational requirements for farmers in Tamim Governorate in the field of use and maintenance of pivot sprinkler irrigation systems and their relationship to chemical factors, Master's thesis, College of Agriculture and Forestry, University of Mosul
- Al-Rawi, Khasha Mahmoud, (1980), (5) Introduction to Statistics, Ministry of Higher Education for Scientific Sciences, University of Mosul
- Al-Rawi, Adel Khairallah (2002), (6) Evaluating the efficiency of sprinkler irrigation as its main focus in some physical gains of gypsum soil for yellow corn production, Master's thesis, College of Agriculture, Anbar University
- Al-Rimawi, Ahmed Shukri and others, (7) (1996), Pioneer in Agricultural Extension, 1st edition, Haneen Publishing House, Amman, Jordan
- Al-Rimawi, Ahmed Shukri and Hassan (8) Juma Hammad (1995), Pioneer in Agricultural Extension, Dar Haneen, Amman, Jordan
- Al-Samarrai, Abdullah Ahmed, Adnan (9) Hussein Al-Jadari, (1990), Agricultural Extension, Education Press, Baghdad
- Al-Shamaa, Khalil Muhammad and (10) Khudair Kazem Hammoud (2000), Organized Theory, 1st edition, p
- Saleh, Raad Omar, (2001), Sprinkler (11) irrigation, its types and advantages, Aba Center for Agricultural Research, March, No. 70. (12) Al-Salhi, Zainab Khaldoun, (2001), Reliability Indicators for Production Lines: A Case in Industrial Industries, Journal of Technological Technology, Al-Mathab University, Volume 20, Addition to Issue 2, .Baghdad, Iraq
- Al-Safawi, Safaa Younis (2008), (13) Statistics, published by Dar Ibn Al-Atheer for .Printing and Publishing, University of Mosul
- Al-Tanoubi, Muhammad Muhammad (14) Omar, (1996), Agricultural Guidance Reference, Arab Renaissance House for .Printing and Publishing, Beirut
- Al-Tanoubi, Muhammad Muhammad (15) Omar, (2001), Adapting agricultural technology to the requirements of modern development in appropriate countries, Faculty of Agriculture, Alexandria University, first .edition
- Al-Abbasi worker Fadel Khalil and (16) Radwan Thanoun Younis Al-Khashab, (2008), Determining the extent of the problems of sprinkler irrigation for farmers in the Al-Jazeera Irrigation Project in Nineveh Governorate and their legal relationship, published research, Al-Rafidain Agriculture .(Journal, Volume (36), Issue (3
- Brad Field, D.J, (1966), Guide to (17) .Extension Training F.A.O, Rome
- Buffa. Elwood S, (1993) " Modern (18) • production/operations Management" John .Wiley & sons, New York
- Buford, J.A., (1983), Management in (19) • .extension, Auburn university
- Cornish, G, B. Bosworth, C. Perry and (20)• Burke, (2004), Water charging in irrigated .agriculture\_No\_28. Rome.p: p
- Development technology with farmer's (21) • transfers quid for participatory learning F.A.O .((1997
- Ebell, Robert, L. (1979) Essentials of (22) • Educational Measurement, 2nd ed, Englewood cliffs, Prentice mall. N.Y

- 
- (23)
- Evans, Jama R. (1997), production/operations Management, Quality performance and value 5th ed. West publishing Co. New York
- F.A.O. (2006), tea, technology for (24) •
- agriculture teca- editor fao.org.
- .www.fao.org/sd/teca/def-en-ASP
- FAO (1997), Management of (25) •
- agricultural research, A training manual, Module 8, Research – extension linkage, Rome
- Green, B., L.E. Smith and D.E. Nill. (26) •
- (2001) soil irrigating by sprinkler, University of Utah. USA
- Heizer, Jay & Rander, (2001), Barry. (27) •
- Operations management, sixth ed, New York, prentice Hall
- Industry. Technology and the Global (28) •
- Market place: International patenting Trends ,2002" in Two New Technology Areas"
- .science and Engineering Indicators
- Juma, c. & yee-cheong, L. (2005). (29) •
- Innovation Applying knowledge in .Development. London: sterling, Va