



ATTITUDES OF AGRICULTURAL EMPLOYEES IN NINEVEH GOVERNORATE TOWARDS THE USE OF RENEWABLE ENERGY IN AGRICULTURAL SECTOR

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Abstract. The study aimed to identify the attitudes of agricultural employees in Nineveh Governorate towards using renewable energy in agriculture, and to reveal differences in attitudes among agricultural employees in Nineveh Governorate according to the following variables: Gender, age, educational level and years of service. The study population consisted of all agricultural employees (63) at the Nineveh Directorate of Agriculture by random sampling of 16%. Based on the results, the researcher recommends enhancing this willingness by providing greater administrative and financial support by the relevant government agencies to stimulate investment in renewable energy in agriculture and organizing training and guidance courses for agricultural employees with different educational levels on the effective use of renewable energy in agricultural sector, as well as agricultural employees participation in the international conferences to learn from the experiences of successful countries in this field.

Keywords: Employee Attitudes, Government Agencies, Renewable Energy and Agricultural Sector

Introduction

There are two critical challenges to sustainable development: energy consumption and environmental pollution (Abis et al., 2024) which stem from over-dependent fossil fuels as the energy source (Al-Obaidi and Bashir, 2025). The sustainable development is regarded as the key in all developing and developed countries with the help of renewable energy as it is clean and free of polluting the environment, and it does not emit harmful gases that affect life and living creatures (Al-Youssef et al., 2025; Al-Husayni et al., 2025). It is also seen as a solution to the issues of energy crises due to technological development, population growth and the consequent increase in the price of fossil fuels (Al-Ta'i and Walid, 2025). This has resulted in renewable energy being an all-encompassing subject, and it has received a lot of focus from many researchers, agencies, and international bodies that have an interest in the economic and environmental concerns on a global, regional, and local scale (Abdulrahman, 2024). The global reports from related institutions and agencies indicate that the emission should be reduced by around 50% by 2030 and become zero by 2050 to avoid any catastrophic climate change event (Nima, 2025), and in Iraq the deficit in electricity is 52% with dependence on fossil fuels for electricity generation that reached 98% of the total fuel used for this purpose (Al-Samarrai, 2024), namely oil and gas. This ratio is regarded as very high compared to the energy requirements of Iraq, and is certainly harmful for environmental sustainability for future generations (Al-Hamdani and Zainab, 2024). Therefore, over the years, there has been a growing trend in Iraq to promote renewable energy use in all the sectors, more particularly in the agriculture sector that consumes huge amount of renewable energy, particularly

in rural areas (Al-Sa'our et al., 2020; Rabia and Barqan, 2022). Renewable energy has been employed in agriculture to fulfill the requirements for irrigation water, domestic electricity in rural areas, and also for operating several irrigation systems and drying processes for crops (Jassim and Laith, 2024). This requires greater direct efforts toward sustainable agricultural development (Madhas and Maher, 2021) through the establishment of specialized centers to train highly competent professionals in the use of renewable energy in agriculture (Al-Badri and Abdul-Razzaq, 2025), in addition to strengthening the role of agricultural extension to keep pace with technological developments in the field of renewable energy (Al-Hafidh, 2023), as the role of agricultural extension is considered crucial in raising farmers' awareness of the importance of using renewable energy and applying its technologies in their fields (Abdul Latif et al., 2023), as most studies confirm that if extension services are properly planned and implemented, they lead to sustainable agricultural development (Al-Shadayda and Fatima, 2020). The success of agricultural extension organizations in fulfilling their development mission depends largely on the competence of their staff at all organizational levels, as well as their expertise and attitudes toward adopting innovations in the agricultural sector (Madhas et al., 2021). In light of the above, this study aims to answer the following questions:

1. What are the attitudes of the agricultural employees of Nineveh Governorate regarding the use of renewable energy in agricultural sector?
2. Is there any statistically significant difference between the attitudes of the agricultural employees in Nineveh Governorate towards the use of renewable energy in agricultural sector in terms of the following factors: gender, age, educational level, and years of service?

Materials and Methods

All the agricultural employees of the Nineveh Directorate of Agriculture (390 agricultural employees) were considered as the research population. The respondents were randomly selected from this group, with a sample size of 16% (63 respondents). Moreover, 20 of those respondents were chosen for reliability testing. Based on literature review and research studies on research topic, a specially designed questionnaire was prepared as a main instrument to collect the data. The questionnaire had two sections with data on personal and job attributes, as follows (gender, age, educational level, and number of years of service). There were 24 items, half positive and half negative in the second part. The statements were accompanied by a three-point scale ranging from the answers "Agree" (3 points) and "Neutral" (2 points) to "Disagree" (1 point), so that the numerical score each respondent could receive ranged from 24 to maximum points of 72. The total score reflects the attitude of the agricultural workers towards renewable energy in the agricultural sector. Face validity was confirmed by asking a group of agricultural extension specialists for their opinions and comments regarding the items in the questionnaire, their formulation, clarity, and measurement accuracy. After taking their comments into consideration, deletions, modifications, and additions were made to the questionnaire. Cronbach's alpha was used to estimate the reliability coefficient which resulted in 0.74. The SPSS (statistical package for social sciences) was used to fulfill the research objectives.

Results and Discussion

First step is to define the attitudes of agricultural employees in Nineveh Governorate towards the use of Renewable Energy in agriculture.

The scores that were used to indicate the attitude of the respondents were categorized into 3 categories according to a scale. This first group was a negative attitude and ranged from 42 to 49, comprising of 6 respondents, which made up 9.52% of the research sample. Regarding the attitude

towards the school's leadership, the second category (50-57) showed a neutral attitude with 36.51% of the respondents, and the third category (58-65) showed a positive attitude with 53.97% of the respondents, as indicated in Table (1).

Table 1. Distribution of respondents according to their attitudes toward the use of renewable energy in the agricultural sector.

Categories	Direction	Replication	Percentage (%)	Mean
42–49 years	Negative	6	9.52	45.43
50–57 years	Neutral	23	36.51	53.65
58–65 years	Positive	34	53.97	62.18
Total	-	63	100%	-

As indicated in table (1) maximum percentage (53.97%) have positive attitude, arithmetic mean is (62.18), while the neutral category has the arithmetic mean of (53.65) and a percentage of (36.51). This could be because most workers in agriculture know the danger to conventional energy use and the catastrophic consequences of long-term use of conventional energy.

Second: Attitude differences of Agricultural Employees towards the utilization of Renewable Energy in Agriculture; This was explored with respect to a number of variables that can be summarised as follows.

1. **Gender:** Respondents were divided into two groups based on this variable (male and female). Table 2 shows that most of the respondent was male, where 40 respondents accounted for 63.49% of the sample.

Table 2. Distribution of Respondents by Gender.

Gender	Replication	Percentage (%)	Arithmetic Mean	Calculated t-value
Male	40	63.49	81.72	0.71
Female	23	36.51	79.65	-
Total	63	100%	-	-

A t-test was employed to find the difference in attitude of the participants based on gender variable. The t-value obtained was 0.71 and this value was not statistically significant at 0.05 level. So, we can accept this null hypothesis, that there are no statistically significant differences in the attitudes of the participants based on the gender variable.

2. **Age:** The respondents were categorized into three age groups (young, middle-aged, and older) based on age. The highest percentage of respondents fell within the middle-aged group, which included 23 respondents, representing 36.51% of the research sample, as shown in Table (3).

Table 3. Distribution of Respondents by Age.

Categories	Replication	Percentage (%)	Arithmetic Mean	Calculated F-value
Young (25–35 years)	22	33.92	34.11	0.49
Middle-aged (36–46 years)	23	36.51	43.65	-
Older (47–58 years)	18	28.57	46.55	-
Total	63	100%	-	-

For analyzing the differences in attitudes of the respondents based on age a one-way analysis of variance (ANOVA) was employed. The calculated f-value was 0.49 which is not significant at 0.05 level. As a result, we reject the alternate hypothesis, which is that there are statistically significant differences between the respondents' attitudes by the age variable.

- Educational level:** in this item, the respondents were categorized into five groups (Middle School, Preparatory School, Technical Institute, College, and Post Graduate). Table (4) revealed that the highest number of respondents were in preparatory schools category, that is 19 respondents (30.16%) of the research subjects.

Table 4. Distribution of Respondents According to the Educational Level Variable.

Educational Qualification	Relication	Percentage (%)	Arithmetic Mean	Calculated F-value
Intermediate School	9	14.29	23.4	5.726*
Secondary School	19	30.16	22.8	—
Institute	7	11.11	21.9	—
University Degree	13	20.64	21.2	—
Postgraduate Degree	15	23.81	31.6	—
Total	63	100.00	—	—

*Significance level at 0.05

One-way analysis of variance (ANOVA) was used to determine any differences in attitude of the respondents based on educational level with an obtained F-value of 5.726, statistically significant at the 0.05 level. This could be due to the fact that those with higher education levels are more knowledgeable and better informed about the benefits of using renewable energy in agriculture and therefore more likely to use it for agriculture activities than those with lower education levels.

- Years of Service:** This question was divided into three groups (few years of service, moderate years of service, and many years of service). The largest proportion of respondents was in the "few years of service" category, with 27 respondents, 42.86% of the study sample (Table 5).

Table 5. Distribution of Respondents by Number of Years of Service.

Years of Service		Replication	Percentage (%)	Arithmetic Mean	Calculated F-value
Low	(5–15 years)	27	42.86	13.32	0.69
Moderate	(16–26 years)	19	30.16	19.87	-
High	(27–37 years)	17	26.98	29.43	-
Total		63	100%	-	-

A one-way analysis of variance (ANOVA) was used to determine if there were any differences in respondent's attitudes according to the variable number of years of service. The F value calculated was 0.69, which is not statistically significant at 0.05 level, so null hypothesis is accepted; meaning that there are no statistically significant differences in the attitudes of the respondents in terms of the variable (number of years of service).

Conclusions

The outcome indicated that most of the farmers/agricultural workers were in positive attitude about using renewable energy in agriculture. From this it can be concluded that the employees of the agricultural sector are willing and tend towards adopting renewable energy technologies which are alternative and environmentally friendly in agriculture.

The results indicated that there were no statistically significant differences between the attitudes of agricultural employees in the use of renewable energy in the agricultural sector according to the following variables; Gender, Age and Years of service. The above discussion leads us to conclude that the attitudes of the respondents are similar in these variables. Moreover, the results revealed that there was significant difference in the attitudes of the agricultural employees regarding the use of renewable energy in agriculture based on the variable of educational level. Therefore, one can conclude that the more educated people are more willing and inclined to use renewable energy in agriculture. Our recommendations that improve the readiness of agricultural employees to use renewable energy in agriculture by augmenting the administrative and financial support of the government towards agriculture so as to ease the availability of renewable energy technologies and their use in agricultural fields. Also, organize trainings and outreach on the effective application of renewable energy in agriculture for agricultural workers and participate them in international conference to learn from the successful countries experiences and to keep them updated with the developments on the field. Finally, inform farmers of the benefits of renewable energy in agriculture in terms of environmental and economic impacts, and impart skills to farmers about using renewable energy sources through special outreach programmes.

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