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THE APPLICATION OF FARMERS FOR PROCEDURES OF SOIL ANALYSIS BEFORE AGRICULTURE (COMPARATIVE STUDY BETWEEN IRAQ AND SYRIA)

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ABSTRACT

Current research aims at knowing followed procedures in pre-planting soil analysis by farmers between Iraq and Syria, degree of applying these procedures by farmers, and to know the relation between the application of these procedures and the following independent variables (education level, years of expertise in farming, years of expertise in analysing soil, sources of information of analysis of soil, train to analyse soil successfully). Research included farmers in both Iraq and Syria (farmers from Nineveh governorate / Iraq and those of Damascus / Syria). A sample was taken from them that represented (20%). The final research sample consisted of 120 farmers, divided into 60 from Damascus and likewise from Nineveh / Iraq. Results showed that the degree of applying pre-planting soil analysis procedures was moderate with a descending trend. Results also showed a morally significant relationship between the application of soil analysis procedures and the variables (sources of information about soil analysis, training to analyse soil). Researchers recommend the necessity of paying more attention to enhancing knowledge and information of farmers regarding soil analysis through training courses given by the Directorate of Agriculture in the governorates where research took place. To train farmers how to use appliances by themselves to analyse soil.

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INTRODUCTION

Earth is where we live and where we extract hidden treasures. It feeds humans via crops of all types, a source of all life, where we settle. No man can exclude earth. No matter how big or small it was (Gebreegziher, 2024). Almost every human has a piece of earth, one requirement of our existence, and using the earth correctly is about serving it right. We must look after the soil by planting trees to stop erosion, cultivating all necessary crops for survival, planting trees for food, wood, and a lovely view, and sanitizing our environment. A sign of our care is to protect it from anyone who means no good; we must know its boundaries, use all correct scientific methods to construct and plant (Yurong *et al.,* 2020). Cultivated lands cover more than a third of the land area of our planet (Dwivedi and Dwivedi, 2020). In addition to providing us with food, animal feed, and fibers, cultivation and grazing lands contain incredible biodiversity, not to mention heavy tree cover. Although these ecological systems bear the footprint of humans and their inventions for centuries, they are nevertheless a legacy; the protection of this heritage is spiritually and economically important. Planting soil is that surface layer that covers earth. This layer consists of rock debris, which turned into small molecules due to many factors like rain and a range of

temperatures (Al-Azzawy *et al.,*2018). A fusion takes place between these particles and organic materials that, in turn, were decomposed by living organisms found in soil, like bacteria. The previous process forms the surface layer, which plants comprise certain features and characteristics that make soil plantable and provide a good environment for plant roots to grow (Adnan *et al.*, 2022; Prudnikova *et al.,* 2021). There are many kinds of soil with different features and characters (e.g.sandy with light brown color, large particles aery, can't retain water, muddy with dark brown color, wet muddy soil with yellow color, medium particles, appropriately aired, can retain water, full of nutrients, luscious, however, less luscious than muddy (Mruthyunjaya *et al.,* 2022). Wet muddy soil is the best to plant. Soil consists of many ingredients: solids, fluids, air, and living organisms. Solids consist of various minerals and organic materials with different concentrations (Ahmed *et al.,*2020). Soil must be healthy and agricable, toxic-free, so it won't affect growth and even poison crops or retardate soil and changes in the acidity of soil may change some chemical substances in soil, and deficiency in other elements, such as iron or magnesium, may cause poisoning (Abedinpour *et al.,* 2017; Murad*,* 2025). Soil degradation has two sides: material loss (soil erosion) and low-quality surface soil, connected with nutrient degradation, vs an increase in pollutants. Soil degradation affects the quality needed to plant crops (Alwazzan et al, 2024), it also affects the urban environment, pollution, and floods. Serving land and crops is a key element in conserving land against air and water erosion and an effective means of reducing the harmful effects of misuse. Serving the earth can be seen in enhancing the physical features of soil, which in turn will improve the construction of the earth, decrease water leaks, and reduce water erosion and surface flux. On the one hand, increasing the harshness of the Earth leads to an increase in resistance to air erosion. Besides the way of serving the ground, such as preparing it for planting, the way of planting, and choosing equipment appropriate to prevailing circumstances, all of these decrease the risk of erosion and desertification (Kreba, 2019; Al-khateeb *et al.,* 2015).

Soil in Iraq suffers from many problems that resulted from natural or human causes. These problems greatly affected agricultural activity in general, whether by restricting cultivated areas, reducing the productivity of cultivated areas, or increasing production costs. Soil in Iraq varies from one region to another in fertility and production ability (Sarhat et al,2023; El-jubouri et al., 2025). Some soils are extremely good for planting all crops, including date palms and orchards. However, some types of soil with high salt levels affect productivity (Altalb & Batkowska, 2023).

Analysing the soil is an important step every farmer must take before cultivation. This analysis can determine the success of the season and the expected harvest and economic revenue for the farmer (Ahmed *et al.,*2020). There are many agricultural methods to analyse soil, test for different crops, and determine their characteristics. Experts, engineers, and specialists do these tests. Soil is analysed chemically or mechanically. This method is used to study the content of cultivated soil and the nutrients that may exist in fields (El-Nahas *et al.,* 2022). Analysis happens by taking samples from every area of cultivated land, then testing and analyzing in agricultural laboratories, knowing the need for nutrients for plants, knowing the quality of crops and the natural quality of cultivation soil, through which vegetables and orchards are

supported, to help plants grow appropriately. To ensure successful planting, soil types must be tested to determine their suitability for crop growth. This can be done by taking a soil sample and checking it in the appropriate place. After receiving the result, a decision of to plant or not to grow is taken (Alazawe, 2024; Sarhat *et al*,2023; Al-Fayyadh & Hwaidi, 2022).

In this subject the agricultural extension is considered from of the main development tools that lead to bring about positive changes to life of rural community through the transfer the results of research, transfer the modern agricultural methods, ideas and ways to farmers, and following up on the farmers' implementation of these guidance recommendations, which leads to an increase in their productivity, their economic, social levels and agriculture progress is achieved (Siahaan *et al*, 2022; Abd-Elahad *et al.,* 2022; Masso, 2016), including guidance recommendations that related to development the ability of farmers to the preserving the soil agriculture through apply for new methods in protecting the soil and how to test and verify the soil before growing it to verify its suitability before planting (Shexani *et al*, 2023; Alsinayi *et al*, 2022).

Agricultural guidance plays an effective, tangible and important role in analysing soil in right scientific ways, to teach farmers and guide them about correct and successful guidance procedures in analysing soil (Altalb *et al.,* 2024; Pampuro *et al.,* 2020; Hussein & Mohammad, 2023). Given all the previously mentioned facts and the observed reality of soil analysis in Iraq and Syria, which depend on agriculture in their economies, researchers conducted this study to assess the extent to which farmers in these countries apply correct scientific methods in soil analysis. Thus, the following question was asked: to what extent do farmers in Iraq and Syria apply scientific guidance procedures when analysing soil?

OBJECTIVES OF RESEARCH

The research aims to know :

1- Degree of applying pre-planting soil analysis by farmers in general.
2- Know the degree of application of these procedures by farmers.
3- Know the relation between the application of these procedures and the following independent variables (academic achievement, years of experience in farming, years of experience in analyzing soil, sources of information of analysis of soil, train to analyze soil successfully) In general, in Iraq and Syria.

MATERIALS AND METHODS

1- population and sample of research:

Research took place in Nineveh Governorate/Iraq, and Damascus Governorate / Syria. Nineveh and Damascus contain large Areas of agricultural land spread across different regions of the two governorates, famous for growing various types of agricultural crops.

The Society of Research then included groups of farmers in the above-mentioned places (Farmers distinguished who registered officially). The full number of distinguished farmers in Nineveh Governorate is 300. A simple random sample representing (20%) of society was chosen with a sample size of 60 farmers. The total number of distinguished farmers in Damascus Governorate is 400; a simple random

sample of 15% (60 farmers) was selected. The final sample was (120) farmers, (60) from each of the governorates.

2- Prepare and build a research:

To obtain data from farmers on research, the authors reviewed academic literature on soil analysis and consulted specialists in soil analysis. The research tool was designed, which was a survey consisting of two parts:

First: A group of independent variables regarding farmers (education level, years of experience in farming, years of experience in soil analysis, sources of information regarding soil analysis, training to analyse soil).

Second: After consulting the soil specialists, the authors prepared (30) items on procedures for pre-farming soil analysis by farmers.

3- Measuring research variables (independent and dependent ones):

A- Measuring independent variables:

- Academic achievement: Measured through the following levels: graduate of primary school, graduate of intermediate school, graduate of secondary school, Bsc. In agriculture, numbers were assigned (1, 2, 3, 4), respectively.

- Years of experience in farming: Measured through calculating years spent in farming before collecting data.

-Years of experience in soil analysis: Measured through one of these levels (low, medium, high) were given numbers graded (1,2,3) respectively.

- Sources of information about soil analysis: Measured through adopting one of these information sources: (agricultural center in the region, elite farmers, soil specialists, local college of agriculture, websites, agricultural references and booklets, radio programs) with the following alternatives for answer (always, sometimes, seldom, never), this alternatives were given numbers were graded (1,2,3,4,5,6,7) respectively.

-Train to analyze soil: Measured through one of the following options (trained – untrained) and give it numbers graded (1,2) respectively.

B-Measuring dependent variable (applying pre-farming soil analysis procedures by farmers:

Measured through a quadruplet scale with 4 alternatives (greatly apply, moderately apply, rarely use, never apply) with the numbers graded (1,2,3,4) respectively, by asking the respondents about each item we will get the sum of degrees, which represents the degree of applying the procedures of planting soil analysis before agriculture by farmers in general.

4- Reliability and stability of scale:

After preparing the survey (research tool), the reliability of the research items was verified by a panel of specialists in soil analysis and agricultural guidance, ensuring that the scale is academically and linguistically valid. Given the experts' notes, some items were re-modelled to be appropriate for the research goals, and stability was calculated using the Alpha-Kronbach equation. The value of Alpha-Kronbach reached (0,92) using the SPSS program.

5- Collecting data:

After preparing and designing the research tool and applying reliability and stability to the research items, data were collected from respondents from 1/2/2023 to 5/3/2023.

6-Statistical means:

After collecting data, they were written down and categorized. In order to analyse data, the following statistical means were used: percentage, mathematical means, Simple Pearson correlation factor, Rank Spearman correlation factor, and SPSS.

RESULTS AND DISCUSSION

1. Degree of applying pre-planting soil analysis by farmers in Iraq and Syria:

A- Degree of applying pre-planting soil analysis by farmers in Nineveh Governorate (Iraq):

To know the degree of applying procedures of pre-farming soil analysis by farmers in Nineveh (Iraq), results showed that the highest hypothetical numerical value was (80) and the least was (40), with an average of (60). Farmers were categorized into three types based on their application of soil analysis procedures, as shown in Table 1.

Table (1): categorizing respondents according to their application of scientific procedures of pre-farming soil analysis in Nineveh Governorate (Iraq)

Categories	number	%
(40-53) low	22	36,67
(54-67) medium	28	46,67
(68-81) high	10	16,66
total	60	100%

Table (1) shows that the highest percentage gained by farmers was in the medium range (54-67), representing (46,67%), meaning that the level of applying the pre-farming soil analysis procedure is medium and descending. This may be attributed to the fact that farmers in the Nineveh Governorate need more knowledge and information for how to test and analyse soil before cultivating field Crops.

B- Degree of applying pre-planting soil analysis by farmers in Damascus Governorate (Syria):

To know the degree of applying procedures of pre-farming soil analysis by farmers in Damascus Governorate, results showed that the highest hypothetical numerical value was (100) and the least was (50), with an average of (75). Farmers were categorized into three types based on their application of soil analysis procedures, as shown in Table 2.

Table (2): categorizing respondents according to their application of scientific procedures of pre-farming soil analysis in Damascus Governorate (Syria):

Categories	number	%
(50-66) low	16	26,67
(67-83) medium	26	43,33
(84-100) high	18	30
total	60	100%

Table (2) shows that the highest percentage gained by farmers was in the medium range (67-83), representing (43.33%), meaning that the level of applying pre-farming soil analysis procedure is medium to high. This may be attributed to the fact that

farmers in Damascus Governorate need more information and knowledge about how to test and analyse soil before cultivating.

2- Know the degree of applying procedures of pre-farming soil analysis depending on the answers of respondents:

Research items were arranged according to the means of responses of farmers as shown in Table 3.

Table (3): Putting respondents according to their answers' mean depending on each item

Items	Mathematical means	No.
I consider soil analysis the determining factor in farming land	3,86	1
I adopt correct ways in storing soil specimens to be analysed	3,84	2
I avoid analysing in private laboratories	3,75	3
I depend on soil types in analysing soil pre-farming	3,73	4
Analyse soil depending on the crop I want to plant	3,70	5
Always do pre-farming soil analysis in every season	3,65	6
Didn't restrict myself to a single soil analysis	3,59	7
Depend on experts to analyse soil	3,55	8
Don't restrict myself to one spot of land to analyse soil	3,53	9
Follow the recommended times when taking soil samples for analysis	3,50	10
Personally follow the process of soil analysis	2,95	11
Analyse soil in the agricultural center	2,85	12
Know the kind of soil before analysing it	2,79	13
Always take care of the soil to preserve its features	2,75	14
Always fertilize the soil	2,73	15
Always apply agricultural courses to the land	2,71	16
Plow and smooth the soil	2,69	17
Participate in a training course of analysing soil	2,66	18
Follow agricultural websites to know ways to analyse soil	2,61	19
Always contact a local expert to solve soil problems	2,55	20
I can distinguish soil types through sight and feel of the soil	2,40	21
Diagnose soil problems via test	2,38	22
Distinguish types of soil analyses	2,35	23
Know how to take a soil sample to analyse	2,30	24
Read the results of the soil analysis	2,28	25
Know the degree of soil acidity	2,20	26
Know how to determine soil fertility	2,10	27
Know the appropriate conditions to test soil	1,99	28
Distinguish between polluted and unpolluted soils	1,97	29
Always visit soil analysis labs to follow steps of testing soil samples	1,95	30

Table (3): Arranging research items according to farmers' answers, depending on the means of answer on each item. This table also shows that the items in the first three posts were: consider the results of soil analysis when deciding how to cultivate land, always follow the correct ways to store soil samples for analysis, and avoid analysing soil in private labs. These three items show that respondents have knowledge and information regarding soil analysis. Items that came last were: always visit soil analysis labs to know the stages of soil analysis. This item reveals that respondents don't visit the laboratories of soil analysis either because they are busy with chores or unable to reach them.

3- Find the relation between the degree of application of soil analysis procedures by farmers and the independent variables of the research (academic achievement, years of experience in farming, expertise in soil analysis, sources of information on soil analysis, train to analyze soil) in general, in Iraq and Syria:

1- Education level :

According to this variable, farmers were categorized as shown in table (4).

Table (4): categorizing farmers according to their academic achievement and its relation to applying correct procedures in soil analysis.

categories	Number	%	Spearman's rank correlation factor	Sig
A graduate of primary school	7	5,82	0,163 n.s	0.056
A graduate of intermediate school	25	2,85		
A graduate of secondary school	37	30,85		
Bsc of agriculture	21	17,5		
total	120	100%		

Table (4) shows that the highest ratio of respondents was in graduates of secondary school, reaching (30,85%), while the illiterate had less than (5,83%). Results showed no morally significant relationship between respondents who applied procedures for pre-farming soil analysis and academic achievement. Spearman rank correlation coefficient was (0,163) using the SPSS program, indicating that the null hypothesis that (no morally significant relation is found between the application of farmers for procedures of soil analysis and academic achievement; meaning that farmers applying scientific methods in soil analysis don't depend on their academic achievement but on other factors.

2- Years of experience in farming:

Results showed that the longest years of experience were 30 years, and the shortest were 10 years, with an average of 19 years. Farmers were categorized into the following three types, as shown in Table 5.

Table (5): categorizing respondents according to their application of pre-farming soil analysis procedures and their relation to years of experience in farming

Categories	Number	%	Pearson's simple conjunction factor	sig
(10-16) low	25	20,83	0,095 n.s	0.251
(17-23) medium	65	54,17		
(24-30) high	30	25		
total	120	100%		

Table (5) shows that the highest percentage of respondents was in the medium category (17-23), while the low (10-16) category represented less than 20.83. The results show no morally significant relationship between farmers' applications for the correct procedures for soil analysis and years of farming experience. Pearson's simple correlation factor was (0,095) using the SPSS program, immoral. This accepts the null hypothesis, stating that no morally significant relationship is found between farmers' applications for correct procedures in soil analysis and years of farming experience. Meaning that the application of research for academic procedures in analysing soil doesn't depend on years of expertise in agriculture, but may be on other factors.

3- Expertise in soil analysis:

Farmers were categorized into three types according to this variable, as shown in Table 6.

Table (6): Categorizing farmers according to their application of procedures of soil analysis and their relation to experience in soil analysis:

categories	number	%	Spearman's rank correlation factor	sig
Poor experience	65	54,15	0.161 n.s	0.055
Medium experience	35	29,15		
High experience	20	16,70		
Total	120	100%		

Table (6) shows that the highest rate was in poor experience, representing (54,15%), whereas high experience was the lowest (16,70). Results showed that no morally significant relation was found between farmers applying procedures of soil analysis and years of experience in soil analysis. Spearman's rank correlation coefficient was (0.161) using the SPSS program, which is considered immoral. Thus, accept the null hypothesis that there is no morally significant relation between the application of farmers to procedures of soil analysis and experience in soil analysis: Meaning that the application of farmers to the right procedures in soil analysis doesn't depend on their expertise in soil analysis, rather on other variables.

4- Sources of information on soil analysis:

To study this variable, farmers were categorized according to their source of information into the following types, shown in Table 7:

Table (7): Distribution of farmers into categories according to the application of recommendations in soil analysis and their relationship with their experience in soil analysis

Categories	Number	%	Spearman's rank correlation factor	sig
Local agricultural center	20	16,67	0.026*	0.185
Elite farmers	30	25		
Soil experts	15	12,5		
Local college of agriculture	5	4,17		
website	20	16,66		
Agricultural books and booklets	15	12,5		
Radio programs	15	12,5		
total	120	100%		

Table (7) shows that the highest rate of respondents was in elite farmers, representing (25%), and the least was in the local agricultural college, representing (4,17) . The results showed a morally significant relationship between the level of application of guidance on soil analysis by farmers and the sources of information. Spearman's rank correlation factor (*0,026) at the 0.05 level. Thus, rejecting the null hypothesis stating that there is no morally significant relation between respondents applying scientific recommendations in soil analysis and the variable of sources of information, meaning that respondents applying the right procedures in soil analysis depend on the sources of information they get.

5- Train to analyse soil :

Researches were categorized into the following types, shown in Table 8, according to their training to analyse soil:

Table (8): Categorizing farmers according to their application of soil analysis procedures and their relation to training to analyse soil.

categories	number	%	Spearman's rank correlation factor	sig
trained	25	20,83	0,002 **	0.242
untrained	95	79,17		
total	120	100%		

Table (8) shows that the highest percentage of farmers was in the untrained group (79,17%), while the trained group had less than 20.83%. The results showed a morally significant relationship between the degree of applying soil analysis recommendations and the variable of training to analyse soil. Pearson's simple conjunction factor was (** 0,002) significant at the (0,01) level. Thus, rejecting the null hypothesis stating that: no morally considerable relation is found between application of farmers for recommendations of soil analysis and being trained to analyse soil, meaning that farmers applying scientific procedures of soil analysis depend on the training they received in analysing soil and the theoretical and practical information they gained during training.

CONCLUSIONS

Given these results, the researchers conclude:

1- The level of application of correct scientific procedures of soil analysis by farmers in Nineveh Governorate (Iraq) is moderate, with a bias to be low. We conclude from this that respondents have weak experience in pre-farming soil analysis.

2- The application level for correct scientific procedures of soil analysis by farmers in Damascus Governorate is moderate tend to high; we conclude from this result that respondents in Damascus Governorate have good experience in pre-farming soil analysis.

3- Variables of (Sources of information on soil analysis and training to analyse soil) have played a significant role in increasing respondents' knowledge and confidence in analysing soil before farming in Iraq and Syria.

4- The Farmers have information and skills in the following items of soil. Analysis: consider the result of soil analysis as the first determinant to plan land, follow the correct ways to store soil samples to be analysed, and avoid analysing in private laboratories.

5- Working to enhance the information and knowledge of farmers in Damascus and Nineveh Governorates regarding of pre-planting soil testing before agriculture.

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CONFLICT OF INTEREST

The authors stated that there are no conflicts of interest with the publication of this article.

تطبيق المزارعين لإجراءات تحاليل التربة قبل الزراعة (دراسة مقارنة بين العراق وسوريا)

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الخلاصة

استهدف البحث التعرف على الاجراءات المتبعة في اجراء تحاليل التربة قبل الزراعة بين العراق وسوريا, وكذلك التعرف على تطبيق الزراع للإجراءات الخاصة بتحليل التربة في كل فقرة من فقرات البحث, والتعرف على العلاقة الارتباطية بين تطبيق الزراع لاجراءات تحليل التربة والمتغيرات المستقلة التي شملها البحث وهي (التحصيل الدراسي ، عدد سنوات الخبرة في الزراعة، الخبرة في تحليل التربة، مصادر المعلومات عن تحليل التربة، التدريب على تحليل التربة). شمل البحث المزارعين في العراق وسوريا (زراع من محافظة نينوى/ العراق، ومحافظة دمشق/ سوريا). اخذت عينة منهم بنسبة (20%) حيث بلغت عينة البحث النهائية (120 مزارع) بواقع (60 مزارع من محافظة دمشق– سوريا، و (60 مزارع من محافظة نينوى ، العراق). اظهرت نتائج البحث ان

مستوى تطبيق الزراع لإجراءات تحاليل على التربة قبل الزراعة هو متوسط يميل للانخفاض، وكذلك اظهرت النتائج وجود علاقة ارتباط معنوية بين تطبيق الزراع لإجراءات تحليل التربة والمتغيرات (مصادر المعلومات عن تحليل التربة، والتدريب بمواضيع تحاليل التربة الزراعية). يوصي الباحثان على ضرورة الاهتمام بتعزيز معارف ومعلومات الزراع في موضوع تحليل التربة وذلك من خلال الدورات التدريبية المدعومة من قبل الدوائر الزراعية في المحافظات ضمن منطقة البحث، وكذلك من خلال تدريب الزراع على طرق تحليل التربة باستخدام الاجهزة لجعل المزارع يعتمد على نفسة في تحاليل التربة.

الكلمات المفتاحية: تطبيق، زراع ، تربة، مقارنة ، العراق

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