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SALINE MAPS OF SOME SOILS OF MUTHANNA GOVERNORATE

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Abstract: performed based on data collected from 15 soil samples from 0 to 20 cm deep. We used salinity of the irrigated soils of Al-Muthana governorate in southern Iraq. These maps were 20% of the world's land. This study was made in order to map the spatial distribution of soil or anthropogenic processes, which is certainly an environmental problem that affects more than environment and agricultural production. The main causes of this salinization come from natural It is important to study the problem of salinization, soil salinity has adverse effects both on the ordinary kriging (OK) to analyze the spatial variability of soil salinity,

The results confirmed that the use of saline maps was supportive in giving a clear vision of the of 12.11 dS m-1, for developing probability maps to determine the distribution of risk areas. showed the different classes of salinity with the highest value of 23.17 dS m-1 and lowest value map predicted by the electrical conductivity (EC) values using the ordinary kriging (OK) method while indicator kriging (IK) was used to analyze salinity versus threshold values . The salinity salinity of the soils for the study area

Keywords: -

Introduction

Acidity represents the accumulation of salts dissolved in water or ions in the soil above the most dangerous toxicity threshold Determination of dusty issues related to salinity include the concentration of quantitative salts (Aqueous) Sodium concentration Relative to calcium and manganese (sodium), salinity directly affects the growth and development of plants Sodic conditions may also cause significant deterioration in the physical properties of soil. Affect in a different way Directly affects crop growth by increasing the formation of surface crust Poor water permeability in the soil Reducing moisture in the root zone reduces the area of soil affected by sal From one city to another, wherever you arrive In Iraq, more than 50 percent of the land is suitable for agriculture However, no (FAQ 2011) There is a comprehensive assessment of soils affected by salinity around the world. Salinization is the result of both nature (such as weathering, sedimentation, and seawater intrusion) and practices Human causes (e.g. irrigation methods and soil management practices) are the dominant mechanism causing accumulation Salts in the soil in the root zones are the loss of water through evaporation, where only the water evaporates, leaving behind Salts occur due to the low annual rainfall and high temperatures in dry and semi-arid areas The soil is more fluid than in other areas. Irrigation with large amounts of salty water is unnecessary Suitable drainage systems in many cities. The percentage of soils ranges from high to medium productivity, unaffected by salinity and other soil degradation processes Between zero and sixty percent, where agricultural production ranges in the Nile Delta in Egypt and the Euphrates Valley in Iraq and Syria are severely affected by the aquacity, and the rate of decrease in cloudiness due to the aquacity and/or flooding reaches 25 per cent. The Cent in Egypt 2011, FAQ. The impact of soil salinity on food security is increasing due to the decline in soil organic carbon content Soils of the Jordanian East and North Africa regions, salinity affects the safety of the environment and economies The reserve, in addition to its negative effects on agricultural production and food security. The problem of salinity and its effects on agricultural production: Saline soil: It is the soil that contains more dissolved salts in the salty area. What is the permissible limit for agricultural crop production? The common problem: Statistics indicate that one-third of the Earth’s population suffers from food shortages, and this is evident The food problem in developing and developed countries. The problem of food shortages will become more serious in the future if..We took into account the continuous increase in the Earth's population The reality that humanity is experiencing at the present time is characterized by a population explosion Limited food from other sources requires efforts to address the problem (food shortage), and it can be This is achieved by improving agriculture and improving the level of agricultural production in the reclaimed lands Currently, new lands available for cultivation are being exploited for agricultural crops, and agricultural land areas are being increased Mainly by increasing the area of agricultural land (which can be controlled) to introduce Irrigation, as a new method in agriculture, may cause most of these lands to turn into salty lands or what not. The phenomenon of secondary salinization occurs if the necessary measures are not taken to prevent this. The phenomenon is that international reports indicate that 50% of the area of irrigated agricultural lands in The world has suffered deterioration due to the failure to take appropriate measures to prevent the phenomenon of salinization, as scientists estimate. Others stated that 1/3 of the area of irrigated agricultural land

in the marginal and semi-arid regions was affected by this. It appears that the problem of salinity and saline soil has become a problem.

The main impediment to agriculture in most countries of the world, as it has become a problem at the present time A global problem, as lands affected by salinity are spread almost all over the world, and data indicate that The area of salted land in the world is estimated at about 950 million hectares. Agriculture plays an essential role in the economic and social development in a large number of countries around the world. There fore The development of agriculture in these countries will play a role in providing food. The decline in agricultural production in The unit area, especially in the countries of the arid and semi-arid regions, is due to several factors, but the most important These factors are the problem of salinity Some experiments were conducted in central and southern Iraq, which showed that... 65-85% of changes. The yields of cereal crops were due to the effects of salinity and the level of nutrients in the soil

If we consider that changes in the level of nutrients are very small in most of the soils of central and southern Iraq The percentage decreases

The problem of salinity in Iraq

The problem of weeding is one of the main problems in Iraqi agriculture, especially in central and southern Iraq Considering that this problem is considered one of the most complex problems of agricultural production in the country, most of the lands Central and southern Iraq are subject to varying degrees of salinization due to the prevailing climatic conditions The lack of effective drainage networks, high groundwater levels, and poor soil and water management, he pointed out Al-Taie (1970) indicated that 70-80% of the lands of central and southern Iraq are located within medium soils. It is highly salty, in addition to the fact that the waters of the Dijma and Euphrates contain salts ranging between 500800 parts per million (ppm), meaning that this water adds to each hectare annually, a capacity of (5-8) tons of water. Salts, which means what is added to the irrigated lands, which have an area of approximately 3.6 million hectares.

(18-30) thousand tons of salts annually, despite the fact that a large number of reclamation projects (incision The drills, etc.) have been implemented in an area estimated at about one million hectares of agricultural land, but there are A vast area still needs a serious, radical treatment of the problem it contains. Distribution of saline soils in Iraq. The quantitative area of Iraqi territory is 320,438 square kilometers, and it consists of alluvial torrents. Inter-Nairin - the lands between Nyiri-Dajma and the Euphrates (FAO, 2012) This torrent is surrounded by mountains in the north and east that reach a height of 3550 meters above surface level The sea, and desert areas in the south and west, which represent more than 40% of the land area More than 90% of the country is arid and semi-arid areas, the total geographical area of Iraq It is 45 million hectares, of which 34 million hectares (78%) are not suitable for agriculture under the circumstances. Al-Rayna. According to estimates by the Food and Agriculture Organization, the total cultivated area in Iraq is 6 Millions of hectares (FAO, 2011), of which 50 percent in northern Iraq depend on rainwater in While the rest is irrigated. The presence of massive groundwater and salt water is considered one of the main reasons for increasing problems. The soil is salinized in these areas. Excessive irrigation conditions and poor drainage in the areas contributed Irrigated from Iraq caused a rise in groundwater levels, which led to land

degradation due to salinization. According to recent estimates, the rise in groundwater and soil salinity problems cause 5 percent damage of cultivated land annually. Acidity problems have stripped production capacity to 70% The total irrigated area in Iraq with up to 30% of production has completely disappeared and has been threatened This situation sustains irrigated agriculture, which produces more than 70% of the country's total grain production Iraq Soil salinity is more prevalent in the central and southern regions of the country.

Despite the significant risks of soil salinization, there is no comprehensive database to determine the true extent Characteristics of lands and water resources exposed to drought in Iraq. In order to develop strategies If these methods are feasible, an in-depth review of the available information about the methods is inevitable. It has been used so far to manage and improve soil and water resources exposed to salinity.-Kriking spatial statistics

The extent to which soils are affected by erosion processes can be diagnosed using the spatial prediction equation within software Geographic information system (GIS) using the Kriking method, where field and laboratory geodes are integrated Effectively in preparing high-accuracy maps of soil salinity(Zare-Mehrjardi, et al., 2010). It is part of the Kriking Geographical Census The methods,allow prediction by smoothing Statistical properties of real data according to It is a geostatistical interpolation tool (Lark (2009).Advanced, belongs to Float Kriging methods for specifying spatial data. This list includes methods Indicator Kriging, Universal Kriging, and Ordinary Kriging are different like Kriging The difference between the mentioned methods lies in how the assumption of regional variables (Co-Kriging) is calculated Z*The unmeasured value of Kriging is generally estimated by all methods (Lefohn et al., 2005). As follows: (Z * (u) as a weighted sum of the values measured at the surrounding points. (u) is defined Where: Zk: the estimated value based on existing data (Zi) Zk The number of measured points (present) used to estimate :n The starting step assigned to the estimation site reference is Kriging, the corresponding weight coefficient, weight: λi Good in developing Geographic Information System (GIS) and other calculation techniques. GIS technology is used GIS-Kriging is today widely used to predict the spatial distribution of different soil properties. Kriging.It is a mixed predictor, which partitions spatial loading into spatial autocorrelation through quasi-modelling. Objectives of the study Description of the soil salinity of the study area. Using spatial statistics methods in drawing digital maps of soil.

Methods

1.2- Study area

Al-Muthanna Governorate is located in the southwestern part of Iraq, on the outskirts of the sedimentary flow The southern part is Minno, but part of Minya is located in the southwestern part of Madaba al-Gharbiyya, which makes it difficult

Located within the Middle Euphrates region, it is bordered to the north by Al-Qadisiyah Governorate, and to the south by the Kingdom Saudi Arabia, to the east the governorates of Dhi Qar and Basra, and to the west the governorate of Najaf, and it is (282) km away. South of the capital, Baghdad, and is divided into five districts: Al-Samawah, Al-Rumaitha, Al-Samman, Al-Khidr and Al-Warka. There are seven districts: Al-Suwayr, Al-Majd, Al-Najmi, Al-Lilal, Busayya, Al-Daraji and Al-Karama, and it is the second largest. A governorate in Iraq in terms of area. Its total area is (51,740) km2, and it constitutes (11.8%) From the area of Iraq, The governorate is located within the dry desert climate,

which makes temperatures extremely high. It sometimes reaches 50 degrees Celsius during the month of July and summer, while it records average degrees. The minimum temperature is about 6 degrees Celsius in December and the second Surface water sources in Muthanna Governorate are the Euphrates River, Faraou, Al-Safi Canal, and Shatt Al-Rumaitha and its branches, as the Euphrates yoke branches before entering the borders of the governorate into two branches, which are Shatt Al-Sabil in The East and Shatt Al-Atshan in the West, entering Al-Muthanna Governorate at Al-Laylal District, and Shatt Al-Sabil branching off. North of the city of Samawah, it is divided into two branches, the eastern one is known as Al-Suwayr and is located in the Al-Suwayr district, and the western one is known as Al-Suwayr Shatt al-Samawah. As for Shatt al-Atshan, after entering the governorate's borders, it flows towards the city of Samawah and branches off from. The right bank is the Nir al-Samibat, and then the thirsty Shatt continues on its path to meet Shatt Samawah is north of the city, so that the Euphrates yoke continues in its course towards the center of Al-Khader District Al-Daraji district and Minya to Dhi Qar governorate, and in Al-Khader district, it emerges from the left bank of a stream Al-Nair is the Safi Canal, and the nature of the land through which the yoke passes is characterized by a flat, semi-natural structure that prevails in it. Agriculture. As for Al-Rumaitha part, it enters the governorate at Al-Najmi district of Al-Rumaitha district It continues its course towards the Warka district after branching into several branches, all ending within its borders Governorate.

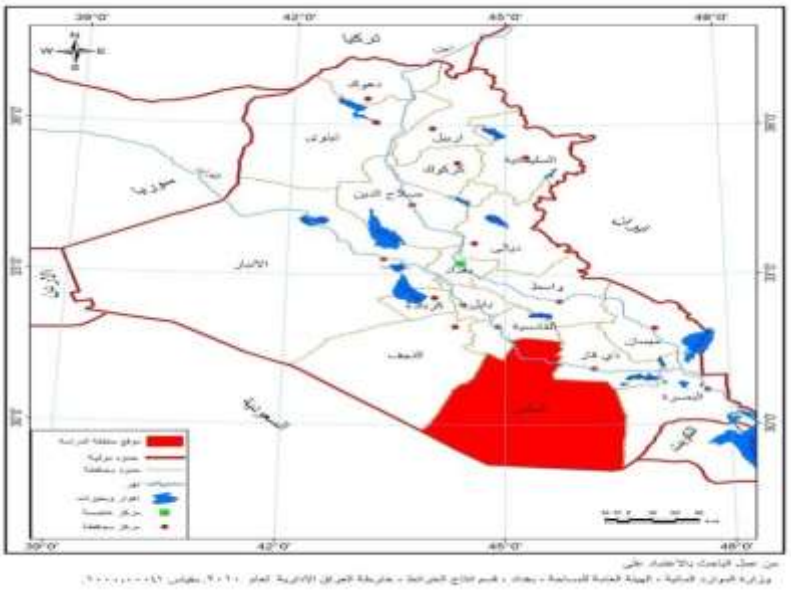

Figure (1):**Location of the study area**

Soil is one of the main natural resources that... Agricultural production depends on it, even if it is achieved The full benefit when exploited requires the application of means And modern practical procedures that help in Achieving sustainable agricultural production by increasing productivity and preserving land Muthanna Governorate ranks second after Anbar Governorate In terms of size and size 61,740 km. Geological studies, structural and depositional environment indicate the presence of three formations The main geology from the bottom to the top is (Al-Ras, Dammam and the Euphrates), as it covers the Euphrates Formation Recent green deposits with a thickness of 1-10 m may be exposed at the surface in some areas in the southwest Mmmmha Heaven The sites surrounding the springs are among the main physiographic units in Al-Muthanna Governorate, according to When Luke (21) Buringh referred to the unit of stones that is characterized by the abundance of porcelain stones and flint) 17) It occupies the central and southern part of the governorate's area, bordered by the edges of the Dabdaba Plateau to the east and The alluvial torrent area north of the border of the Kingdom of Saudi Arabia to the south and the second physiographic unit It is a fire basin unit, and the soil differs in its natural and chemical characteristics and characteristics from the area To another according to the factors that led to its formation, such as solid

rocks, organic materials, and climate. And the terrain and time, as well as the human being and the result of difference In soil properties and distributional variation Geographic variation in crop production in terms of quantity and quality . For the factors controlling its formation in Its origin and the soil are characterized Muthanna by: Governorate is characterized by diversity according to its areas of settlement.

2.2- - Soil samples

Soil samples were collected from various locations within the borders of Muthanna Governorate, at 15 depth samples It ranges between 0 - 20 cm. Samples were collected in polyethylene bags and then transported to the laboratory. The samples were air-dried, impurities were removed, ground, then passed through a 2 mm sieve and stored in a container. Plastic until laboratory tests are conducted (Raine and Jamatu, 2003).

Table (1): Coordinates of soil sample locations

Sample No.	X	Y
C1	5E7. 10/45/15	30N. 31.23.14
C2	1E6. 10/45/16	7N9. 31.30.23
C3	5E9. 10/45/16	42N. 31.30.22
C4	4E2. 10/45/17	6N8. 31.30.21
C5	3E9. 10/45/17	9N7. 31.30.21
C6.	.55E845.10.1	.98N231.30.2
C7	0E9. 10/45/18	5N0. 31.30.22
C8	0E4. 10/45/19	0N3. 31.30.22
C9	.42E145.10.2	.04N231.30.2
C10	0E5. 10/45/21	5N0. 31.30.22
C11	0E7. 10/45/21	0N1. 31.30.22
C12	5E. 10/45/22	8N4. 31.30.21
C13	8E4. 10/45/21	8N0. 31.30.21
C14.	.45E 910.22.4	.73N031.30.2
C15	4E9. 10/45/21	5N9. 31.30.19

2.3 - Electrical conductivity Ec

A 1:1 soil extract was made by taking 50 grams of soil samples and then adding 50 ml to each sample. Distilled water and the samples were placed in a shaker for half an hour. After the shaking period is over, it is filtered Samples using filter paper 42.Whatman No. The electrical conductivity of the dilution filtrate was measured using an Ec.meter under temperature (Page, 1982) Also stated in ds/cm Celsius and expressed in units of 25º

2.4- Description of spatial variation GIS- Kriking Analysis

The spatial variation of soil salinity was described using the geostatistical method (Oridinar The locations of 15 samples were georeferenced using GPS Kriging Which were selected randomly to draw the erase map using ESRI ArcMap v. 10 To perform normal Kriging. The program goes through two analytical steps to estimate the autocorrelation model as a step first and predicting unmeasured sampling points as a second step

Result and Disscusion

Soil erosion assessments aim to estimate the severity and intensity of soil erosion, as well as determine its spatial extent and distribution. Different tools are used to evaluate soil salinization, to be applied at different spatial and temporal scales: using local knowledge and experience, field monitoring, laboratory measurements, field experiments, and simulation models. The current study adopted the spatial analysis of soil salinity data collected from the soil loading laboratories, College of Agriculture / Muthanna University, to evaluate the levels of salinity of some soils in Muthanna Governorate. Using geospatial loading

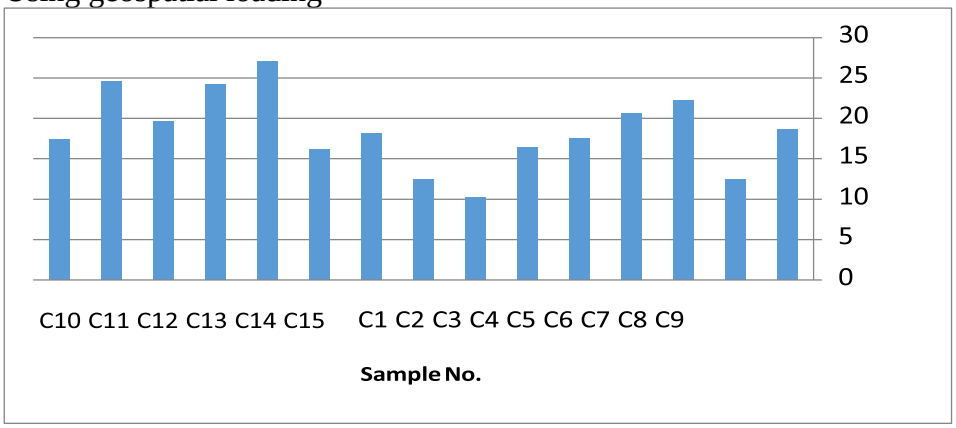

Figure (2) shows the variation in soil salinity values for some soils in Muthanna Governorate according to the soil salinity data used in this study. The EC values for dust range from 12.11 to 23.17 dS m-1, with an average value of 17.65 dS m-1. This explains the spatial heterogeneity of the data used. Figure (2): Soil salinity values for samples from the study area. Figure (3) shows the spatial distribution of soil salinity from the results obtained using Ordinary Kriking (OK). The map shows the location of soils with high salinity values ranging from. Values between 20.1 - 23.17 ds/m in the right side of the study area. While soils with values that ranged between 12.11-14.42 ds/m were concentrated in the blind part of the study area. As can be seen from Figure (3), the predominance of soils with salinity ranging between 16.44 - 18.14 ds/m and 18.14 - 20.11 ds/ m, respectively, represented by dark and medium brown monin within the boundaries of the area covered by the current study. The results obtained by applying OK, as shown in Figure (3), showed that the study area clearly suffers from the phenomenon of salinization. As it is known that the sensitivity of crops to salt stress is reflected in lower yields, in order to produce better crops, an appropriate and effective strategy must be used for reasonable management of soil salinity. The use of local soil maps is considered an effective tool for responsible agencies to develop a management plan to reduce the erosion of this soil, and a strategy for managing and protecting the soil from degradation. The soil salinity map is necessary to evaluate and monitor the accumulation of salinity and the expansion and spread of this phenomenon (Fourati et al. 2017 Triki).

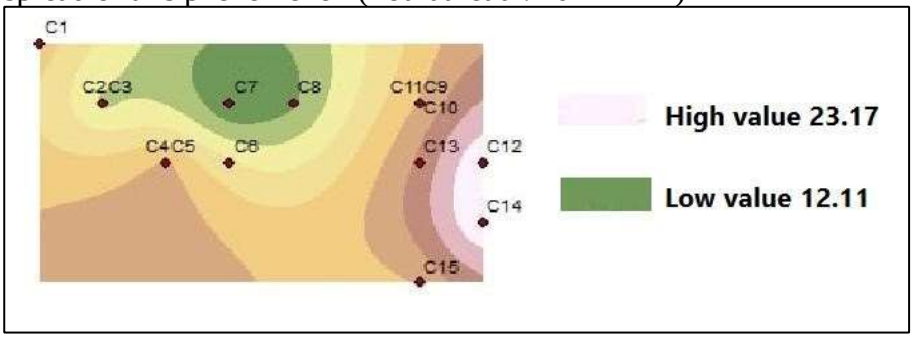

Figure (3): Salinity map of the study area predicted by OK application.

This study gave a clear picture and vision about the state of soil salinization in this study area. This provides a convenient and inexpensive method for regularly monitoring land degradation processes, especially in arid and semi-arid regions, provides an accurate estimate of spatial variation in soil erosion over large areas and ensures effective soil and water management and sustainable agricultural land use (Afrasinei et al. 2017).

Conclusion

It is important to study the problem of soil salinization, as soil salinization has harmful effects on the environment and agricultural production. The main causes of this salinization come from natural or anthropogenic processes, and it is definitely an environmental problem that affects more than 20% of the world's land. This study was conducted to map the spatial distribution of soil salinity in irrigated soils in Al-Muthanna Governorate in southern Iraq. These maps were made based on data collected from 15 soil samples at a depth of 0 to 20 cm. Ordinary Kriking (OK) was used to load the spatial variation of soil salinity. The salinity map using electrical conductivity (EC) values and applying the Ordinary Kriging (OK) method showed different salinity categories with the highest value 23.17 1-dS m and the lowest value 12.11 1-dS m, to develop maps. Possibility of determining the distribution of risk areas. The results confirmed that the use of surveyed maps was supportive in giving a clear picture of the description of the soil surveying of the study area.

In conclusion, tackling micronutrient deficiencies requires a multifaceted approach involving governments, healthcare providers, communities, and international organizations. By prioritizing the health and development of children through targeted nutrition interventions, we can pave the way for a healthier, more equitable, and prosperous future for all. Continued research and advocacy are essential to maintain momentum and drive progress in this vital area of public health.

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