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SUITABILITY OF UTILIZING SHALLOW GROUNDWATER IN IRRIGTING DIFFRENT SOILS IN EL-KHARGA OASIS

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ABSTRACT:

A total of 100 shallow well water and 200 soil samples were collected from El-Kharga Oasis, New Valley to investigate:

1-The suitability of utilizing shallow groundwater in irrigating different soils in El-Kharga Oasis.

2-To estimate the impact of irrigation with the deep and shallow groundwater on the soils of El-Kharga Oasis.

3-To use GIS in assessment of the shallow groundwater and soil salinity of El-Kharga Oasis, New Valley governorate.

The study reached the following results :

1-The soil electrical conductivity values increased with depth.

2-The EC_e of the soil was a positively correlated to EC_w of water used for irrigation in both Shallow and Deep groundwater.

3-The problems of salinity was clear in the shallow groundwater and the best area to use this water was found at El-Gazair and Bolaqe villages.

It is recommended to install a drainage system to overcome the salinity problem that was caused by using the saline shallow groundwater in irrigation, especially in the north of El-Kharga Oasis in the heavy soils. A periodic analysis for soils and well waters is necessary to determine the changes taking place in the salinity.

INTRODUCTION:

El-Kharga Oasis receives the migrated people from the Nile valley and Delta. Accordingly, the demand for the water increases mainly for irrigation and for other different purposes; in many cases where the area is out of the reach for the deep groundwater, the shallow groundwater is the only source for irrigation. In other cases, there is a possibility of using both sources (deep and shallow ground waters) for irrigation. The shallow groundwater in many areas of El-Kharga Oasis is poor quality. Some areas contain enough salts so that they can significantly alter the physical and chemical soil properties and could even make growing the crops rather difficult. The costs of drilling deep

wells and required energy for extracting groundwater are being very expensive. Therefore, the shallow aquifer in El-Kharga Oasis can be a suitable solution for this problem, where the costs of drilling shallow wells and the required energy for extracting groundwater are very low.

In El-Kharga Oasis, the groundwater is considered the sole source for water and it is used in different purposes. The Quaternary aquifer is only found in north El-Kharga depression. It is used from Ginah village to northward, where most of farmers drill hand dug wells. The Quaternary aquifer acts as a store for the drain water from the excess irrigation water. Taref sandstone aquifer is only used in the south from Ginah village until Gazair village, south of El-Kharga City (Ghoubachi and Baraka, 2006).

Monitoring both groundwater and soil salinity as well as the efficiency of remedial efforts is very much needed for the ambitious programmers of desert cultivation. Remote sensing and geographical information system (GIS), as new techniques, are widely used nowadays as rapid methods for delineating soil boundaries and the characterization of soil units. Satellite images have been developed vastly to save time and money in the soil survey studies and to give more accurate results for soil mapping. The combination between remote sensing and GIS creates a good tool of monitoring the soil salinity and water logging.

The introduction of new information technologies such as GIS and computer programs into the water resource management system will enable a faster exchange of information about the discharge, pollution, and navigation, as well as more efficient solutions of the problems of water management.

The objectives of this work were:

1-In investigation the suitability of utilizing shallow groundwater in irrigating different sois in El-Kharga Oasis,

2-Estimating the impact of irrigation with the deep and shallow groundwater on the soils of El-Kharga Oasis.

3-Using the GIS software to produce maps for the wellwater and soil properties of El-Kharga Oasis.

MATERIAL AND METHODS:

El-Kharga Oasis lies in the central part of the Western desert. It covers an area of about 4500 km^2. It is located at 140 km to the east of El-Dakhla Oasis and 220 km south of Assiut city. It is bounded by long. 22° 26', & 25º 57' N and 30º 30' & 30º 42' E. El-Kharga depression has the same climatic characteristics of the Western desert.

The length of El-Kharga Oasis is about 180 Km, and the width is about 30 Km.

1-Sampling:

Filed data were collected from El-Kharga Oasis along the main road, starting form the northern border of El-Kharga to the southern border of El-Kharga City, covering a distance of about 55 Km. Both groundwater and soil samples were collected from the existing wells, crossing the main road and extending from the

eastern to the western sides wherever it was possible.

At each sampling location, the groundwater well water was sampled for water quality measurements. Also, two soil samples were collected, one from the topsoil (0-30cm) and the other from the subsoil (30-60 cm) representing the area which is being irrigated with the well.

A total of 100 well and 200 soil samples were gathered from El-Kharga Oasis.

Shallow groundwater wells were found at the northern half of El-Kharga Oasis (El-Monira, El-Sherka, south of El-Kharga city, Bolaqe and El-Gazair) (Figure 2); however the Deep groundwater wells covered the whole Oasis.

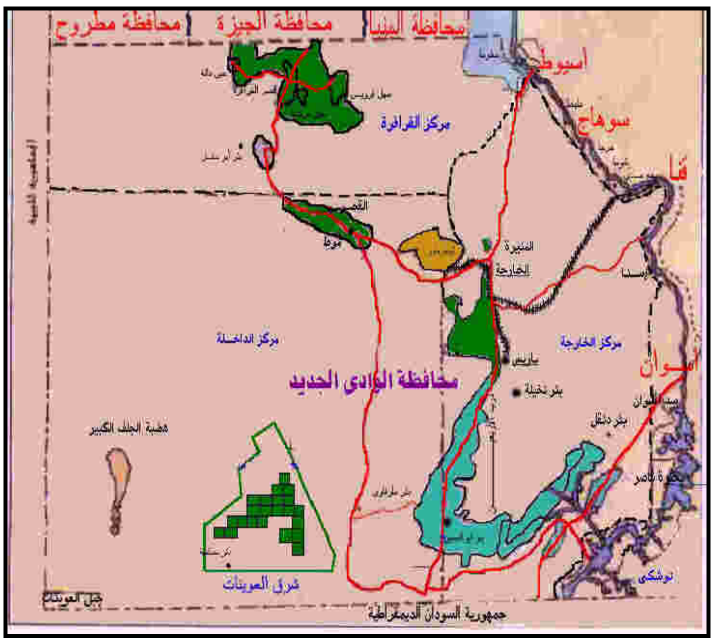

Figure 1: Egypt map showing the New Valley Governorate location

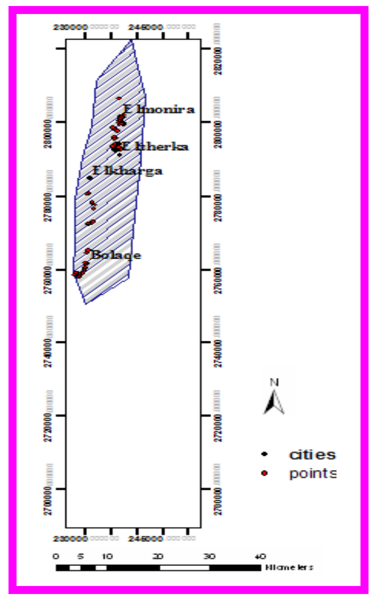

Figure 2: The location of the shallow groundwater well and soil samples collected from El- Kharga Oasis

2-Analysis of Deep Groundwater well and Soil Samples:

a-Electrical conductivity of the shallow groundwater (EC_w):

The EC_w values reached a high value of 12.00 dS/m which it was found in Taher Mohamed (well No. 52). The depth of this well is 7 meters; the well is about 3 years old, and it covers an irrigated area of 2 feddans. However, the lowest EC_w value was found in Zied Thabet (well No. 26) which it was 0.5 dS/m. The depth of this well is 85 meters; it is 11 years old, and covers an irrigated area of about 30 feddans. The overall average of the shallow groundwater salinity of the collected water samples was 3.79 dS/m.

The EC_w kriged map (Figure 3) is classified into four classes, 0.25-0.75, 0.75-2.25, 2.25-5.00 and greater than 5.00 dS/m to be in accordance with the American classification. The EC_w Class that is less than 0.25 dS/m was not found in the samples; therefore, it was omitted. The percentages of each class were calculated based on the total number of 100 water samples and were written in the kriged maps.

The kriged map (Figure 3) shows that the second class (0.25-0.75 dS/m) has only one sample of water quality according to the American classification. Moreover, 41% of the shallow groundwater water collected samples were found in the third class (0.75-2.25 dS/m) which is the dominant water quality class in El-Kharga Oasis. In addition, 30% of the samples are located in class of (2.25-5.00 dS/m). However, 28% of the samples are in the last class>5.00 dS/m) and there is no water samples that in the fourth class.

It appears from kriged map (Figure 3), that the EC_w of the shallow groundwater has lower values in El-Jazaier and Bolaqe village, while the salt contents the water increased toward the north at El-Sherka and El-Monira.

b-Electrical conductivity of the soil paste extracts (EC_e):

The EC_e kriged map of the soil (Figure 4) are classified into four classes (0-4, 4-8, 8-16 and greater than 16 dS/m).

The EC_e maps shows that 22% of shallow groundwater irrigated surface soils of El-Kharga Oasis have salinity range between of 0 to 4 dS/m, and 41% have a range 4 and 8 dS/m. However, 16 and 21% of the surface soil samples show a range of 8-16 and >16 dS/m, respectively.

On the other hand, the EC_e represents 21, 35, 28 and 16% of the salinity collected sub soil samples for the salinity classes of 0-4, 4-8, 8-16 and greater than 16 dS/m, respectively.

There are many samples of the surface soils have a higher EC_e values than those of subsurface one, which it seems to be associated with the soil texture in these areas. Also, the EC_e values of the surface soils are correlated with the EC_w of the groundwater (r= 0.538).**

The EC_e values reached maximum value of 128.67 dS/m in the topsoil of Taher Mohamed (well No. 52). However the lowest EC_e value was found in the topsoil irrigated with El-Rahma well (well No. 91), with an EC_e value of 1.44 dS/m. The overall average of the soil salinity of the collected topsoil samples was 11.30 dS/m.

The highest EC_e value in the subsoils was 49.07 dS/m which it was found in Taher Mahmoud Fayez (well No. 48). On the other hand, the lowest value was found in Abd-Elhamied Ataa (well No. 63), showing an EC_e value of 1.62 dS/m. The overall average EC_e of the collected subsoil samples was 10.48 dS/m. It appears that EC_e in the two maps of surface and subsurface soils are similar.

c-Groundwater and Soil pH:

*Groundwater:

The shallow groundwater pH reached a high value of 8.70 in Mahmoud Omar well (well No. 7), while the lowest value of 6.07 was found in Sayed Kandeel well (well No. 79). The overall

average of the pH of the collected water samples was 7.71. The pH kriged map (Figure 5) was classified into three pH classes namely, less than 7.5, 7.5-8.0 and greater than 8.0. The map shows that 34% of the collected shallow groundwater samples in El-Kharga Oasis have pH values < 7.5. However, 23% of these samples are in the range of 7.5-8.0 and 43% are greater than 8.0. It appears that 60% of collected groundwater samples from El-Kharga Oasis have pH values between 7.5 to 8.5. The pH of the shallow groundwater was correlated to ECw with r value of 0.038.

*Soil pH in soil paste extraction:

The kriged maps in Figure 6 show that 7% of the collected surface soil samples have pH values of <7.5, 14% of these samples are located in pH range of 7.5-8.0, 53% of these samples in pH range of 8.0-8.5 and 26% of these samples are over 8.5. On the other hand, 7, 17, 39 and 37% of the collected subsoil samples have pH classes of <7.5, 7.5-8.0, 8.0-8.5 and greater than 8.5, respectively. The highest pH value (9.23) was found in the topsoil of Salah Temsah (well No. 15). However, the lowest pH value (0.95) was recorded in Ain Waly topsoil (well No. 86). The overall average pH of the collected surface soil samples was 8.26. This result is matched with those obtained by Gameh *et al.* (2010). They found that the overall average pH of the collected soil surface samples was 8.53 in Sohag Governorate.

The highest subsoil pH value was 9.53 and it found in Salah Temsah (well No. 15). However the lowest value (6.32) was reported in at Housin Osman (well No. 58). The overall average pH of the subsoil samples was 8.34.

d-Soluble cations:

*Groundwater:

Soluble Sodium: **Sodium (Na) in the shallow groundwater reached a high value of 90.48 meq/l which it was found in Taher Mohamed well (well No. 52). The lowest value of soluble sodium 3.01 meq/l was found Zied Thabet well (well No. 26). The overall average of the soluble sodium of the collected water samples was 24.75 meq/l. Sodium concentration in shallow ground water in the kriged map (Figure 7) was classified into five classes (less than 10, 10-20, 20-30, 30-40 and greater than 40 meq/l). The Na-kriged map shows that El-Kharga Oasis has 30, 24, 14, 12 and 20% of the Shallow groundwater in the previous classes.**

In the soil samples, soluble sodium reached a maximum value of 811.19 meq/l_e in the topsoil and it was found in Taher Mohamed (well No. 52). However, the lowest soluble value Na was found in Ali Mohamed Ahmed (well No. 34), (4.84 meq/l_e). The overall average of the soluble sodium of the collected topsoil samples was 68.53 meq/l_e.

The highest soluble sodium value in the subsoil samples was 357.47 meq/l_e which was found in Hamid Mohamed Gouid (well No. 11). However the lowest value (3.53 meq/l_e) was found in Ali Mohamed Ahmed (well No. 34). The overall average of the soluble sodium of the collected subsoil samples was 64.98 meq/l_e.

Soil soluble sodium in the kriged maps (Figure 8) was classified into five classes namely less than 20, 20-40, 40-80, 80-160 and greater than 160 meq/l_e. It was found that 30, 23, 20, 18 and 9%, of the surface soil samples and 27, 24, 15, 28 and 6%, of the subsurface soil samples have less than 20, 20-40, 40-80, 80-160 and > 160 meq/l respectively.

*Soluble Calcium and Magnesium:

Calcium value in shallow groundwater reached a high value of 29.36 meq/l which was found in Taher Mohamed well (well No. 52). The lowest value of soluble calcium was found in Ahmed Abo-Elala well (well No. 64), which was 0.50 meq/l. The overall average of the soluble calcium of the collected water samples was 6.13 meq/l.

In the shallow groundwater, soluble calcium concentration in the kriged map (Figure 9) was classified into three classes (less than 5, 5-10 and greater than 10 meq/l). The over view of the Ca-kriged map shows that El-Kharga Oasis has 64% of the groundwater having <5 meq/l, 15% showing a range of 5-10 meq/l, and 21% having >10 meq/l.

In the soil samples, soluble calcium values reached maximum value of 375.55 meq/l_e in the topsoil that was found in Taher Mohamed (well No. 52). However the lowest value was found in Emam Ali Kandeel (well No. 25) with value of 1.35 meq/l_e .The overall average of the soluble calcium in the collected soil samples was 28.67 meq/l_e. The highest soluble calcium value in the subsoil samples was 422.19 meq/l_e which was found in Housin Osman (well No. 58). On the other hand the lowest value (0.73 meq/l_e) was found in Fadle Mahmoud (well No. 36). The overall average of the soluble calcium in the collected soil samples was 29.90 meq/l_e.

The soluble calcium in the kriged map (Figure 10) is classified into five classes (less than 5, 5-15, 15-45, 45-135 and greater than 135 meq/l_e). The Ca-kriged map shows that the respective values of the previous classes for the surface soil represent 24, 50, 9, 12 and 5% of the total samples, and the respective values of the same classes for the subsurface soil represent 26, 46, 12, 11 and 5% of the total samples.

Magnesium in the shallow groundwater reached a high value as 17.10 meq/l which was found in Mohamed Abd-Allah Seleem well (well No. 54). The lowest value of the soluble magnesium was found in Samir Zidan well (well No. 57), which was 0.9 meq/l. The overall average of the soluble magnesium of the collected samples was 6.20 meq/l.

In the shallow groundwater soluble magnesium concentration in the kriged map (Figure 11) is classified into three classes (less than 5, 5-10, and greater than 10 meq/l). The Mg-kriged map shows that El-Kharga Oasis has 50% of the shallow groundwater has value <5 meq/l, 30% has a range of 5-10 meq/l, and 20% has value >10 meq/l.

In the soil samples soluble magnesium reached a maximum value of 215.53 meq/l_e in the surface soil that was found in Taher Mohamed (well No. 52). However the lowest value found in Salah Temsah (well No. 15) with value of 0.66 meq/l_e .The overall average of the

soluble magnesium of the collected soil samples was 10.78 meq/l_e. The highest soluble magnesium value in the subsoil samples was 58.26 meq/l_e which was found in Housin Osman (well No. 58). However the lowest value was found in Fadle Mahmoud (well No. 36) and it was 0.18 meq/l_e. The overall average of the soluble magnesium of the collected soil samples was 9.03 meq/l_e.

Soil soluble magnesium kriged maps in soil (Figure 12) has been classified into four classes, less than 5, 5-10, 10-20 and greater than 20 meq/l_e. The soluble magnesium in value of <5 has 47% of the surface soil samples, the ranges of 5-10 have 27, 10-20 have 18% and there are 8% in value >20 meq/l_e. While in subsurface soil shows that 50, 28, 11 and 11% of the collected samples are class in <5, 5-10, 10-20 and greater than 20 meq/l_e respectively, in El-Kharga Oasis.

e-Soluble anions:

*Soluble chloride:

Chlorides in the shallow groundwater of the collected samples reached a high value of 56.60 meq/l which was found in Raafat Ibrahim well (well No. 19). The lowest value of shallow groundwater chlorides was found in Zied Thabet well (well No. 26) which was 1.40 meq/l. The overall average of shallow groundwater chlorides of the collected soil samples was 14.17 meq/l. Similar values were obtained in other studies by Perez-Sirvent *et al*. (2003). They found an overall average of 8.32 meq/l of soluble chloride in the groundwater of in Spain.

Chloride concentration in the shallow groundwater was as high as 56.60 meq/l which the EC_w was 6.75 dS/m. However, the Sodium Adsorption Ratio (SAR) of the same water sample was 11.22. On the other hand, the lowest value of chloride was 1.4 meq/l when the EC_w was 0.50 dS/m with SAR was 3.01 in the shallow groundwater. The shallow groundwater chloride concentration in the kriged map (Figure 13) is classified into five classes, namely less than 5, 5-10, 10-15, 15-20 and greater than 20 meq/l. The Shallow groundwater chloride class having <5 meq/l represents a large area in map. The kriged map shows that El-Kharga Oasis has 30% of the shallow groundwater chlorides having <5 meq/l, 20% having range of 5-10 meq/l, 16% having range of 10-15 meq/l, 11% showing a range of 15-20 meq/l, and 23% having >20 meq/l.

In the soil samples, soluble chlorides reached a maximum value of 553.86 meq/l_e in the topsoil at Taher Mohamed (well No. 52). However, the lowest value was found at Ali Mohamed Ahmed (well No. 34) with value of 1.55 meq/l_e. The overall average of the soluble chlorides of the collected soil samples was 33.50 meq/l_e. The highest soluble chloride value in the subsoil was 150.93 meq/l_e which was found at Taher Mohamed (well No. 52). However, the lowest value of 1.44 meq/l_e was found at Abd-Elhamid Ataa (well No. 43). The overall average of the soluble chlorides of the collected soil samples was 28.39 meq/l_e. The chloride kriged maps for the soils (Figure 14) have five classes of less than 10, 10-20, 20-40, 40-60 and greater

than 60 meq/l_e. The chlorides kriged map shows that the respective classes for the surface soil have percentage of 35, 29, 15, 5 and 16%, while the same classes for the subsurface soil have 29, 24, 23, 11 and 13%.

*Soluble Sulfate:

Sulphates in the shallow groundwater reached a high value of 65.55 meq/l which was found at Taher Mohamed well (well No. 52). The lowest value of shallow groundwater sulphates was at Zied Thabet well (well No. 26) which was 1.25meq/l. The overall average of Shallow groundwater sulphates of the collected samples was 19.91 meq/l. Also, the sulphate concentration in the kriged map (Figure 15) has five classes (class of less than 5, 5-10, 10-15, 15-20 and greater than 20 meq/l). The sulphate kriged map shows that El-Kharga Oasis has 17% of its shallow groundwater containing <5 meq/l, 21% having a range of 5-10 meq/l, 8% having a range of 10-15 meq/l, 14% having a range of 15-20 meq/l and 40% having >20 meq/l.

In the soil samples, soluble sulphates recoded a maximum value of 862.14 meq/l_e in the topsoil at Taher Mohamed (well No. 52). However, the lowest value of 1.52 meq/l_e was found at Adam Saied Helal (well No. 8). The overall average of the soluble sulphates of the collected soil samples was 60.77 meq/l_e.

The highest value of soluble sulphates in subsoil was 554.41 meq/l_e which was found at Housien Osman (well No. 58). However, the lowest value was found at Abd-Elhamid Ataa (well No. 43) which was 1.80 meq/l_e. The overall average of the soluble sulphates of the collected samples was 63.74 meq/l_e. The soluble soil sulphates in the kriged maps (Figure 16) have five classes, namely less than 10, 10-50, 50-150, 150-300 and greater than 300 meq/l_e. The soluble soil sulphates class of range 10-50 meq/l_e has a large area in both maps.

The sulphate kriged map shows that El-Kharga Oasis has 35% of the surface soils containing <10 meq/l_e, 36, 18, 8 and 3% having a range of 10-50, 50-150, 150-300 and >300 meq/l_e, respectively. On the other hand, 25% of the subsurface soil have <10 meq/l_e. More over 38, 24, 9 and 4% containing a range of 10-50, 50-150, 150-300 and >300 meq/l_e, respectively.

*Soluble Carbonates and Bicarbonates:

Carbonates and bicarbonates in the shallow groundwater reached a high value of 10.80 meq/l which was found at Abd-Elaziz Khudre well (well No.42). The lowest value of the shallow groundwater carbonates and bicarbonates was found at Mohamed Dahy well (well No. 94) which it was 0.45 meq/l.

The overall average of the shallow groundwater carbonates and bicarbonates of the collected samples was 3.98 meq/l. Similar results were obtained by Perez-Sirvent et al (2003) in Spain who found an overall average of 5.24 meq/l of soluble bicarbonates in the groundwater. The shallow groundwater carbonates and bicarbonates in the kriged map (Figure 17) have three classes of less than 3, 3-6 and greater than 6 meq/l. The carbonates and bicarbonates kriged map shows that El-Kharga Oasis has 41% of shallow groundwater having <3 meq/l, 42% containing a range of 3-6 meq/l and 17% containing >6 meq/l.

In the soil samples, soluble carbonates and bicarbonates recorded a maximum value of 43.44 meq/l_e in the topsoil at Fadle Mahmoud

(well No. 37). However, a lowest value of 4.81 meq/l_e was found at Osama Hasan (well No. 6). The overall average of the soluble carbonates and bicarbonates of the collected samples was 19.39 meq/l_e. The highest soluble carbonate and bicarbonate value in the subsoil was 40.86 meq/l_e which was found at Zied Thabet (well No. 26). However, the lowest value was found at Atia Salama (well No. 27) which it was 4.99 meq/l_e. The overall average of the soluble carbonates and bicarbonates of the collected samples was 16.96 meq/l_e. The carbonates and bicarbonates kriged maps for the soil (Figure 18) show four classes, namely less than 10, 10-20, 20-30 and greater than 30 meq/l_e. The carbonates and bicarbonates kriged map shows that El-Kharga Oasis surface soils has the values of 15, 42, 27 and 16%, respectively representing the respective previous classes. On the other hand these classes for the subsurface soil have the respective values of : 20, 55, 12 and 13%.

f- Sodium Adsorption Ratio (SAR):

Shallow groundwater SAR reached a high value of 25.39 which was found at Saied Abd-Elhafez well (well No. 17). The lowest value of SAR was found at Misara Horaief well (well No. 82) which it was 1.80. The overall average of the SAR of collected groundwater samples was 9.74. The SAR kriged map (Figure 19) has three classes, namely less than 10, 10-18 and greater than 18. The SAR class of <10 has a large area in the map. The SAR kriged map shows that El-Kharga Oasis has 55% of the shallow groundwater sample in the class of <10, 33% of these samples containing a range of 10-18 and 12% of the samples showing ASR >18.

In the soil samples, SAR reached a maximum value of 184.48 in the Salah Temsah top soil (well No. 15). However, the lowest value 1.61 was found at Mohamed Sayed Saied (well No. 76). The overall average of the SAR of the collected soil samples was 20.98. The highest SAR value in the subsoil was 205.07 which was found at Hamid Guide (well No. 11). However, the lowest (1.22) value was found at Ali Mohamed Ahmed (well No. 34). The overall average of the SAR of the collected soil samples was 23.83. Similar results were obtained by Gameh (2008) in El-Kharga Oasis, Egypt. She found that the mean of SAR in the soil was 30.05. The SAR values in kriged maps of the soils (Figure 20) has two classes of <13 and ≥13. The SAR kriged map shows that El-Kharga Oasis has 56% of the surface soil samples havening <13 and 44% of these samples containing ≥13. On the other hand, in the subsurface soil, the two ASR classes of <13 and ≥13 are equal.

g-Residual sodium carbonates (RSC):

Shallow groundwater RSC reached a high value of 3.30 meq/l_e which was found at Ahmed Abo-Elila well (well No. 64). The lowest RSC value (0) was found at the greater part of south the El-Kharga city. The overall average of the RSC of the collected shallow groundwater samples was 0.16 meq/l_e .It has two classes namely, less than 0.0 and 0.0-3.3. These respective RSC classes have 88 and 12%, of the collected sample.

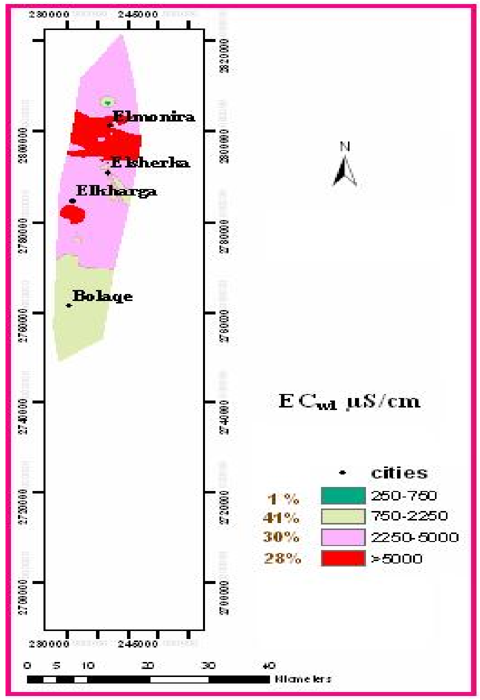

Figure (3): The electric conductivity of the Shallow groundwater (EC_w) in El-Kharga Oasis

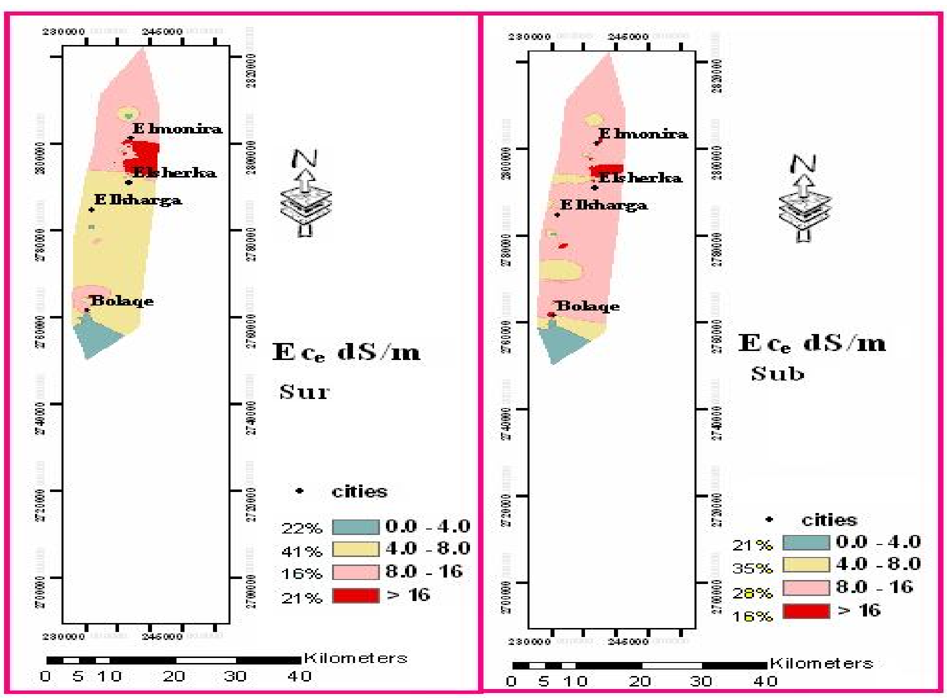

Figure (4): The electric conductivity, (EC_e) of surface and subsurface soil samples irrigated with shallow groundwater in El-Kharga Oasis

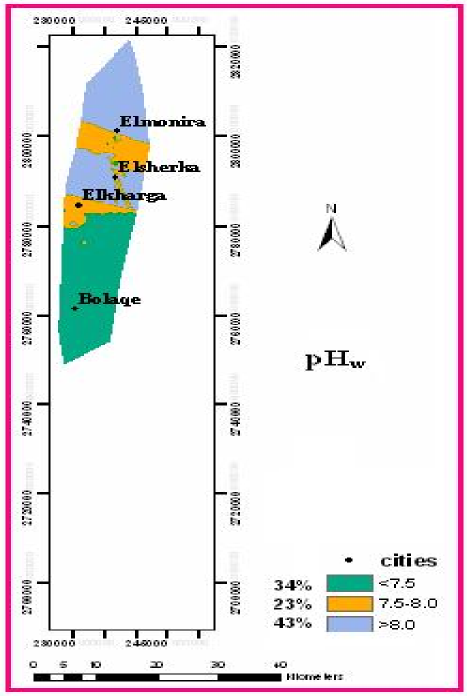

Figure 5: The pH values of the shallow groundwater in El-Kharga Oasis

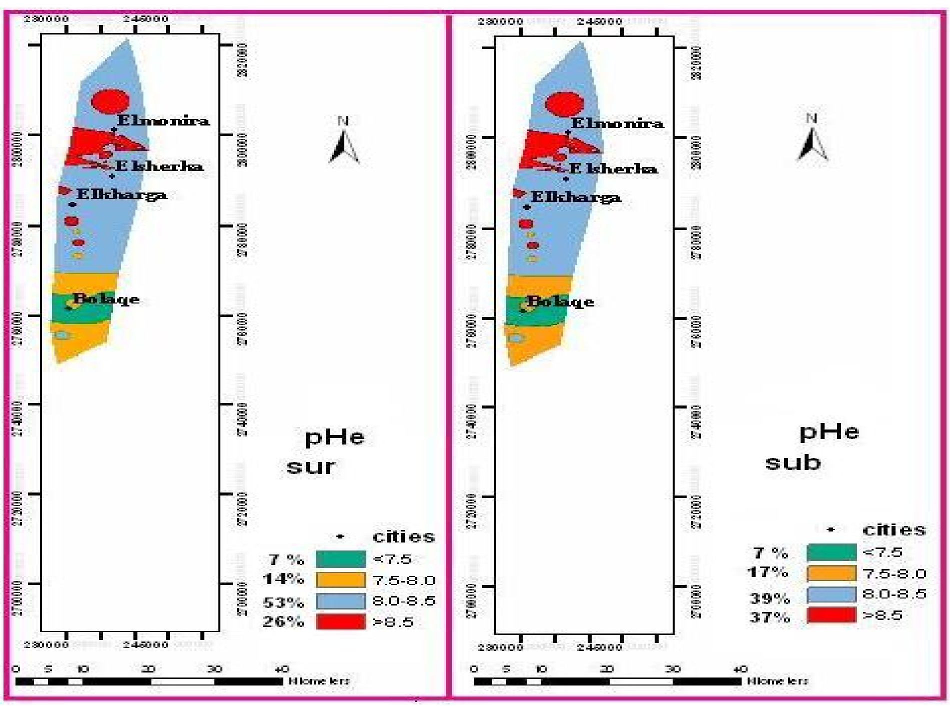

Figure (6): The pH values of surface and subsurface soil samples irrigated with shallow groundwater in El-Kharga Oasis

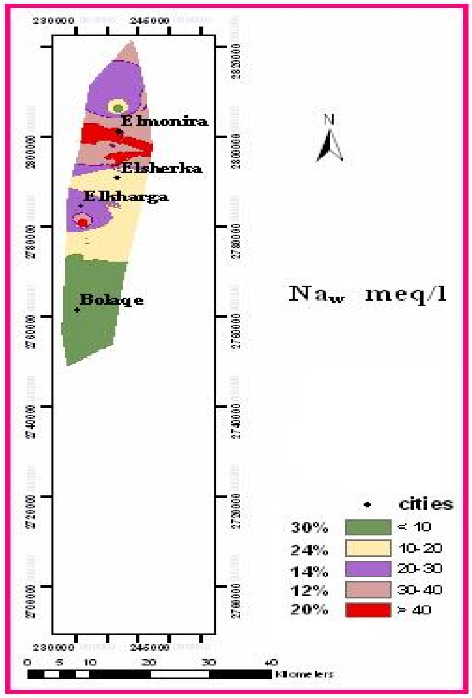

Figure (7): Sodium concentration (meq/l$_e$) of the shallow groundwater in El-Kharga Oasis

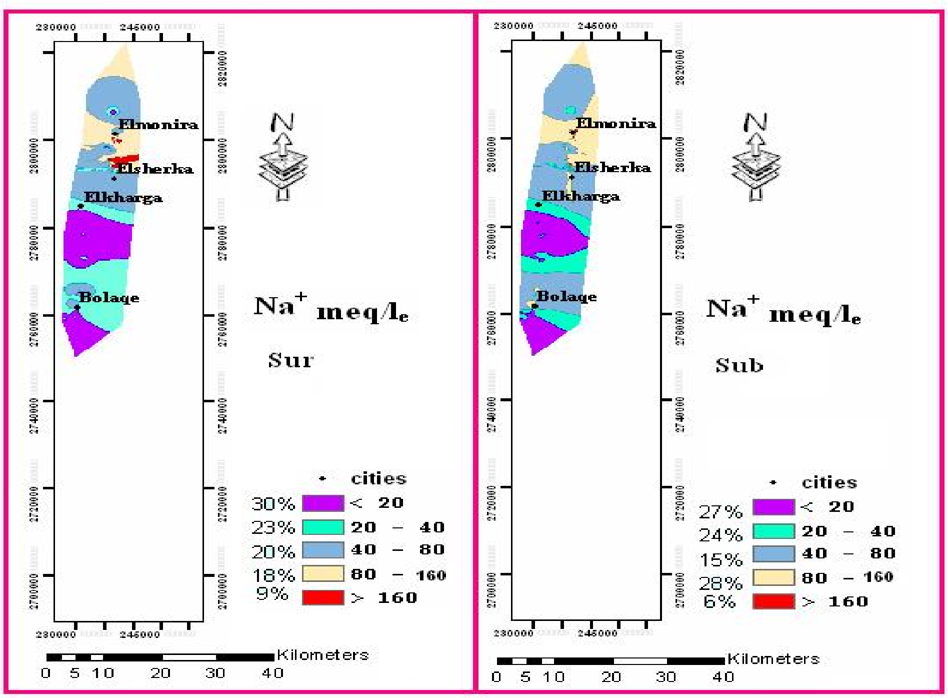

Figure (8): Sodium concentration (meq/l$_e$) of surface and subsurface soil samples irrigated with shallow groundwater in El-Kharga Oasis

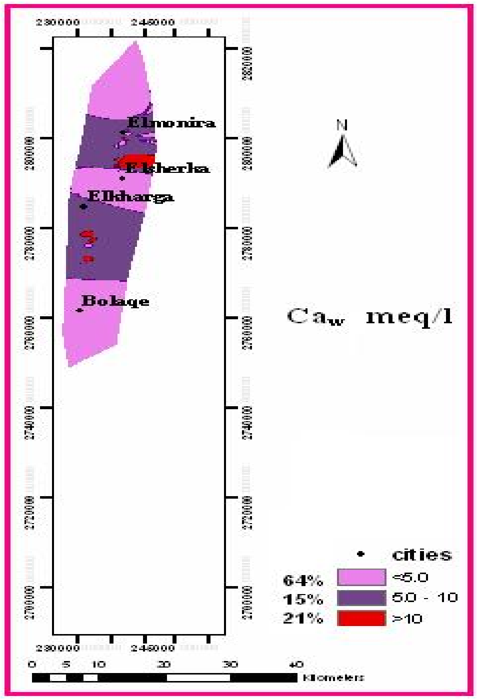

Figure (9): Calcium concentration (meq/l$_e$) of the shallow groundwater in El-Kharga Oasis

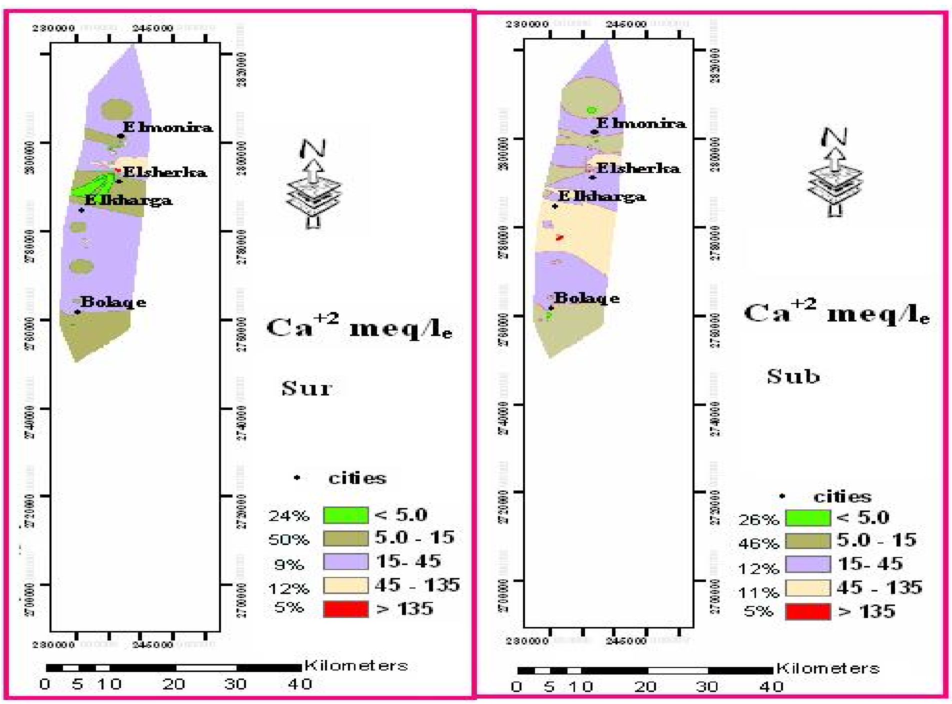

Figure (10): Calcium concentration (meq/l$_e$) of surface and subsurface Soil Soil samples irrigated with deep groundwater in El-Kharga Oasis

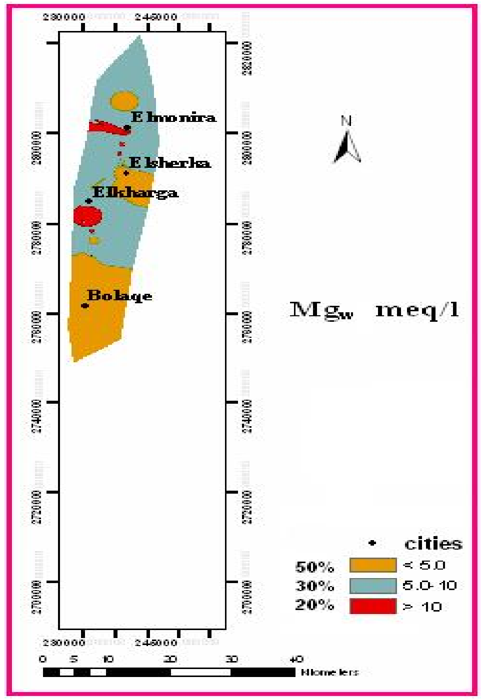

Figure (11): Magnesium concentration (meq/l_e) of the shallow groundwater in El-Kharga Oasis

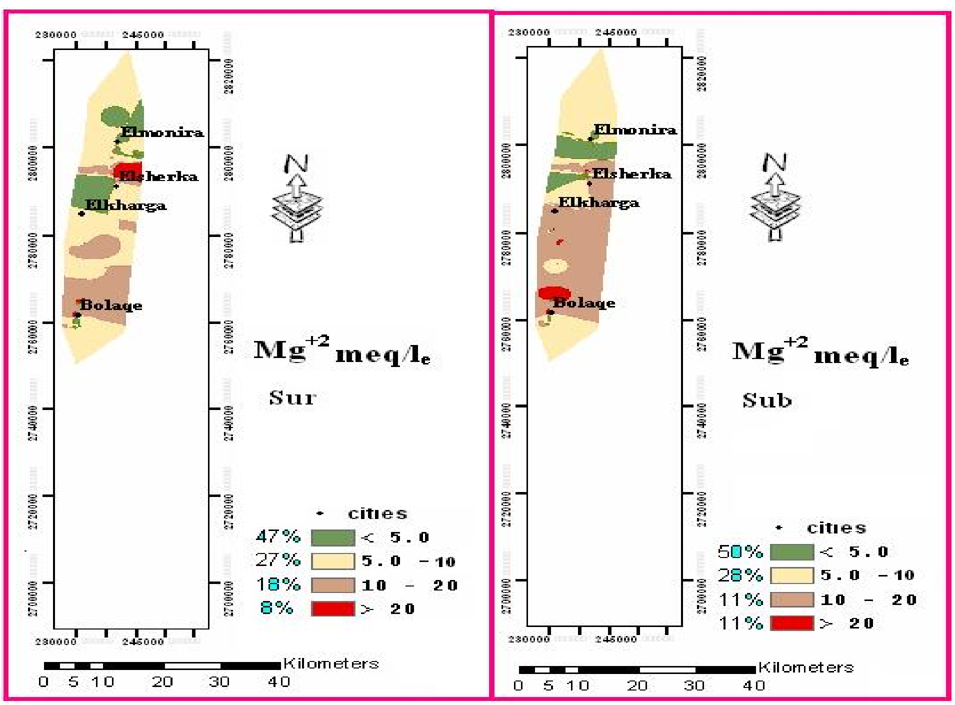

Figure (12): Magnesium concentration (meq/l_e) of surface and subsurface Soil sample irrigated with shallow groundwater in El-Kharga Oasis

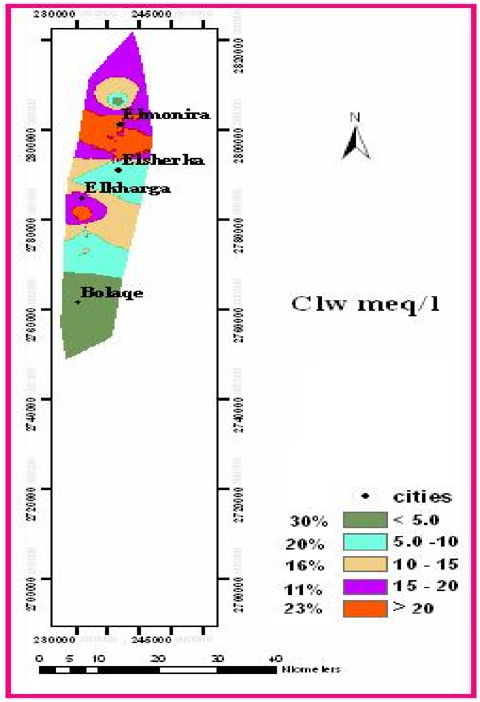

Figure (13): Chloride concentration (meq/l$_e$) of the shallow groundwater in El-Kharga Oasis

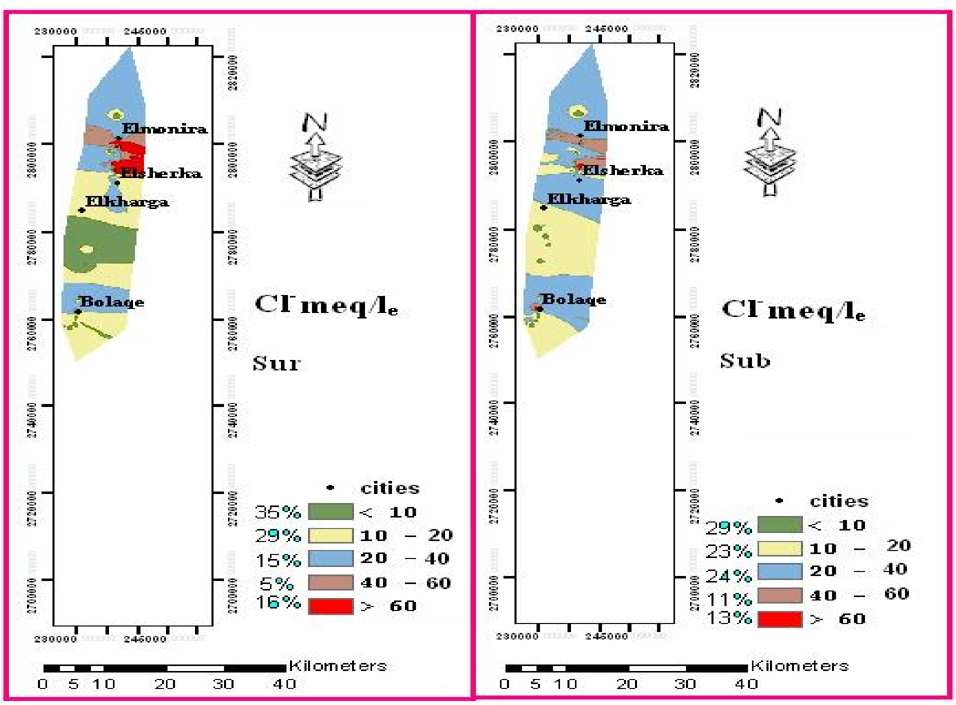

Figure (14): Chloride concentration (meq/l$_e$) of surface and subsurface Soil sample irrigated with shallow groundwater in El-Kharga Oasis

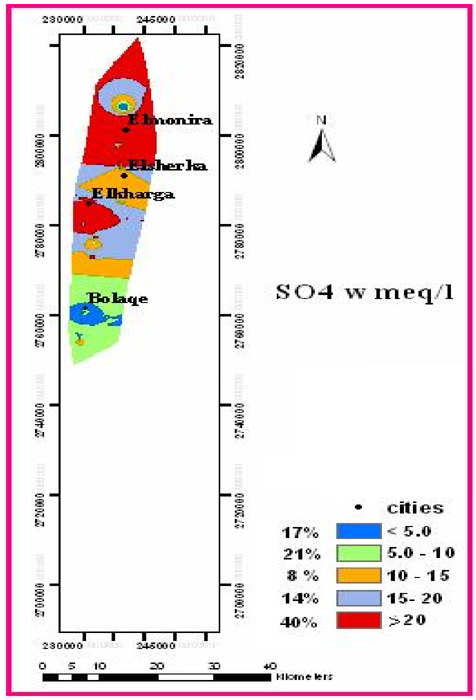

Figure (15): Sulfates concentration (meq/l$_e$) of the shallow groundwater in El-Kharga Oasis

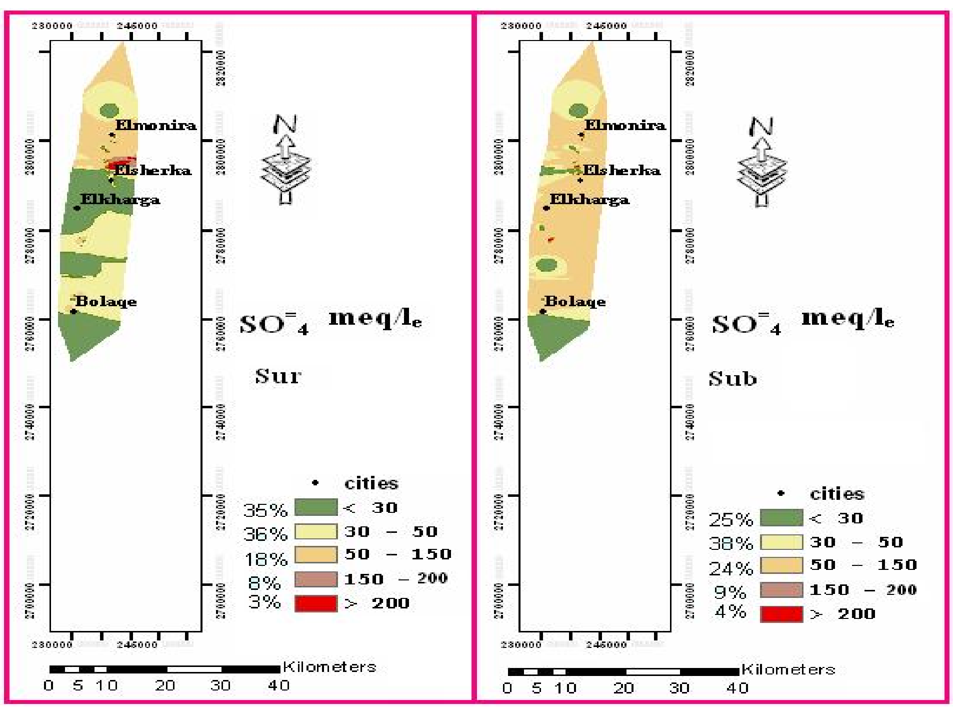

Figure (16): Chloride concentration (meq/l$_e$) of surface and subsurface Soil sample irrigated with shallow groundwater in El-Kharga Oasis

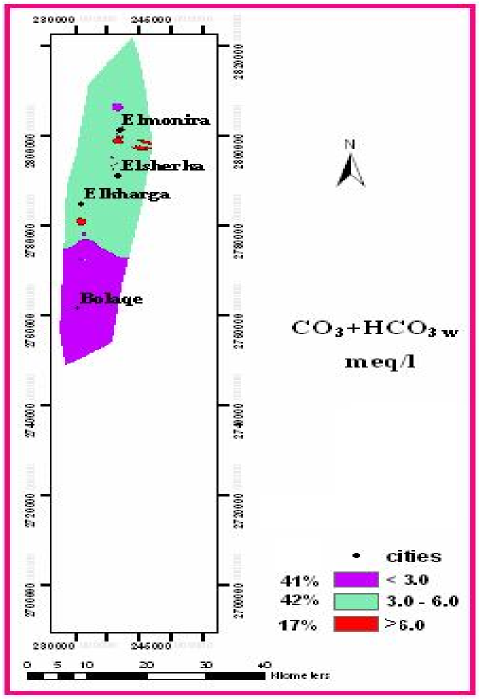

Figure (17): Carbonates and bicarbonates concentration (meq/l_e) of the shallow groundwater in El-Kharga Oasis

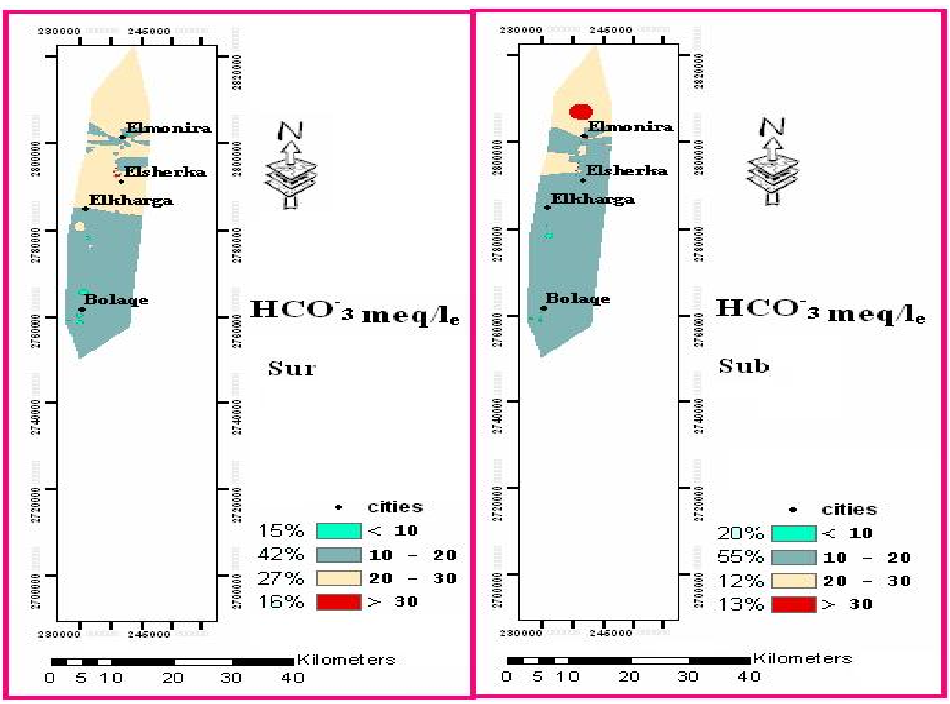

Figure (18): Carbonates and bicarbonates concentration (meq/l_e) of surface and subsurface Soil sample irrigated with shallow groundwater in El-Kharga Oasis

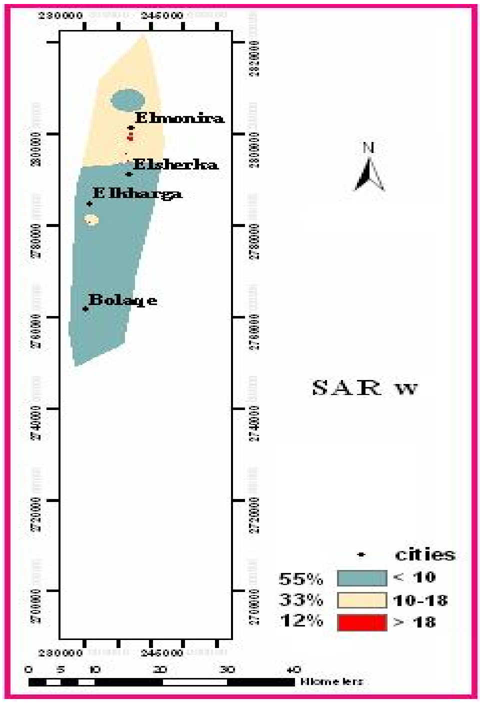

Figure (19): The sodium adsorption ratio, (SAR) of the shallow groundwater in El-Kharga Oasis

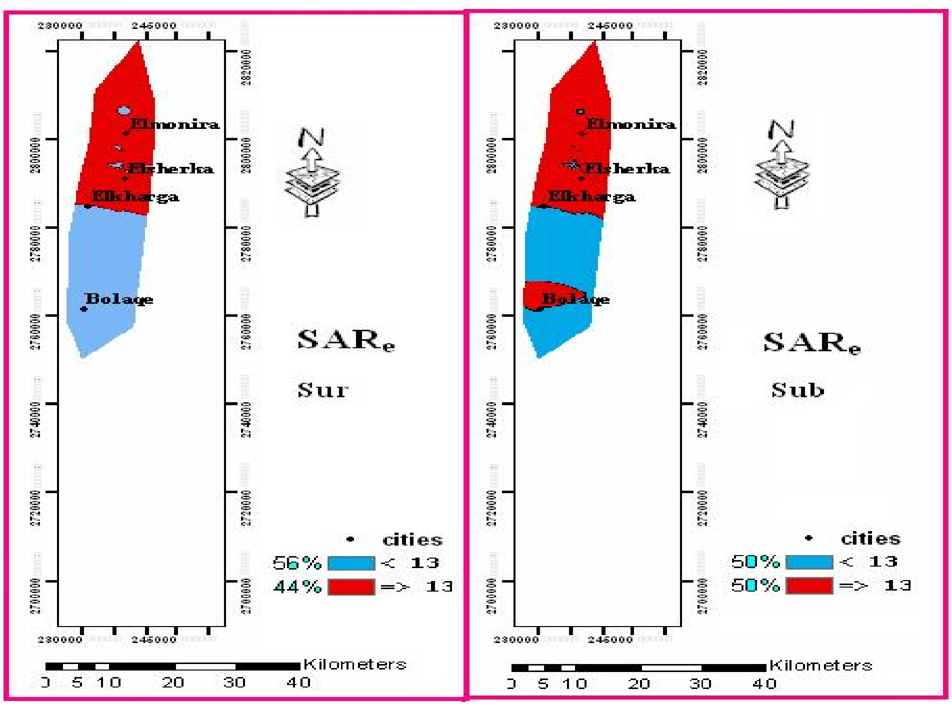

Figure (20): The sodium adsorption ratio, (SAR) of surface and subsurface Soil sample irrigated with shallow groundwater in El-Kharga Oasis

REFERENCES:

Baruah, T.C. and H.P. Barthakur (1997): A Textbook of soil analysis. Vikas Publishing House PVT LTD, New Delhi, India.

Gameh, M.A., Ghallab, A., Abdelazez, S. H. and Ibrahim, H. Baker (2010): Reassessment of the Groundwater Salinity in Sohag Using GIS. The 5th Int. Conf. for Develop. and the Env. In the Arab world. Assiut University Center for Environmental Studies, Egypt.

Gameh, Rasha M. A. (2008): Spatial Variability Hydraulic properties of New Valley Soils, Egypt. MSc Thesis, Assiut University.

Ghoubachi, S.Y., A.M. Baraka (2006): Geological settings and their bearing upon the occurrences of shallow water bearing horizon in North El-Kharga depression, Western Desert, Egypt. Desert Research Center.

Jackson, M.L. (1967): Soil chemical analysis. Asia publishing house, Madars, India.

Jackson, M.L. (1969): Soil chemical analysis-advanced course. Published by author, Soil Sci. Dept., Wisconsin Univ., Madison, USA.

McLean, E.O. (1982): Soil pH and lime requirement page 199-233. In Page, A.L., R.H. Miller and D.R. Keeney (eds.) Methods of soil analysis. Part 2-Chemical and Microbiological Properties. (2nd Ed.) Agronomy 9 soil Sci. Soc. Am, Madison, WI, USA.

Nelson, R.E. (1982): Carbonate and gypsum. Cited from USDA (1991), Soil Survey Laboratory Methods Manual. Soil Survey Investigations Report No. 42 Version 1: 280-284.

Perez-Sirvent, C., M. J. Martinez-Sanchez, J. Vidal and A. Sanchez (2003): The role of low-quality irrigation water in the desertification of semi-arid zones in Murcia, SES pain. Department of Agricultural Chemistry, Geology and Pedology, Faculty of Chemistry, University of Murcia, E-30071 Murcia, Spain.

Rhoades, J.D. (1982): Soluble Salts. In: A.L. Page, R. H. Miller and D. R. Keeney (eds). Methods of Soil Analysis, part 2-Chemical and Microbiological Properties. (2nd Ed.). A soil Sci. Soc. Am, Madison, WI, USA.

Richards, L.A. (1954): Diagnosis and improvements saline and alkali soils. U.S. Salinity Laboratory DA, US Dept. Agr. Hbk 60, 160 p.

Robinson, C. A., A. Werwer, F. El-Baz, M. El-Shazly, T. Fritch and T. Kusky (2007): The Nubian Aquifer in Southwest Egypt. Hydrogeology Journal 15: 33–45.

مدى ملائمة استخدام مياه الحفر السطحية لرى أنواع مختلفة من الأراضى فى واحة الخارجة

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نظراً لعدم تعدد مصادر المياه فى محافظة الوادى الجديد، واعتمادها الرئيسى والوحيد على المياه الجوفية، فقد اتجه أهالى المحافظة إلى مصدر آخر هو مياه الحفر السطحية؛ لذا فقد تم البحث على واحة الخارجة، والتى يبلغ طولها ١٨٠ كيلومتر، وتم جمع ١٠٠ عينة من مياه الحفر السطحية، ٢٠٠ عينة تربة على جانبى الطريق الرئيسى الذى يمتد على طول المدينة من الشمال إلى الجنوب.

وتهدف الدراسة إلى:

١– مدى ملائمة استخدام مياه الحفر السطحية لرى أنواع مختلفة من الأراضى فى واحة الخارجة.

٢– تقييم مدى تأثير الرى بالمياه العميقة والسطحية على التربة فى واحة الخارجة.

٣– استخدام نظم المعلومات الجغرافية فى توقيع خواص التربة والمياه الجوفية والسطحية فى واحة الخارجة للاستفادة منها فى الجانب العملى.

وتوصلت الدراسة إلى النتائج التالية للتوصيل الكهربى لمياه الحفر السطحية:

١– نسبة 1٪ من العينات تقع فى المدى من ٠,٢٥٠ إلى ٠,٧٥٠ ديسيمنز/م.

٢– نسبة ٤١٪ من العينات تقع فى المدى من ٠,٧٥٠ إلى ٢,٢٥ ديسيمنز/م.

٣– نسبة ٣٠٪ من العينات تقع فى المدى من ٢,٢٥ إلى ٥,٠٠ ديسيمنز/م.

٤– نسبة ٢٨٪ من العينات أكبر من ٥,٠٠ ديسيمنز/م.

التوصيل الكهربى لمستخلص عجينة التربة المشبعة EC_e:

١– نسبة ٢٢٪ من العينات تقع فى المدى من صفر إلى ٤ ديسيمنز/م.

٢– نسبة ٤١٪ من العينات تقع فى المدى من ٤ إلى ٨ ديسيمنز/م.

٣– نسبة ١٦٪ من العينات تقع فى المدى من ٨ إلى ١٦ ديسيمنز/م.

٤– نسبة ٢١٪ من العينات أكبر من ١٦ ديسيمنز/م.

وخلصت الدراسة إلى:

١– قيم التوصيل الكهربى زادت مع العمق وذلك فى التربة التحت سطحية.

٢– التوصيل الكهربى للتربة مرتبط بالتوصيل الكهربى للمياه الحفر السطحية ارتباطا معنوياً موجباً.

٣– خطورة ملوحة مياه الحفر السطحية فى شمال مدينة الخارجة بقرى الشركة والمنيرة، وتحسن صلاحية مياه الحفر فى جنوب الخارجة فى قريتى بولاق والجزائر.

٤– التوسع فى استغلال مياه الحفر السطحية بقرية الجزائر مع زيادة عمق الحفر لأكثر من ١٥٠ متر.

٥– ضرورة عمل شبكات صرف حتى نتفادى تراكم الأملاح فى منطقة انتشار الجذور مع تقارب فترات الرى وزراعة الأصناف المقومة للأملاح، وكذلك ضرورة إجراء التحليلات الدورية للتربة ومياه الآبار الجوفية والعميقة للوقوف على التغيرات التى تحث للملحية.