J. Soil Sci. and Agric. Eng., Mansoura Univ., Vol. 9 (12): 693 - 698, 2018

Soil Quality Assessment for Wheat Cultivation in El–Menoufia Governorate, Nile Delta, Egypt

Saeed, M.[1*]; O. Khafagi[2] and R. Bedair[3]
[1]Soils and Water Dept., Faculty of Agriculture, AL-Azhar University, Cairo, Egypt
[2]Botany and Microbiology Dept., Faculty of Science (Girls), Al-Azhar University
[3]Botany and Microbiology Dept., Faculty of Science (Boys), Al-Azhar University
[*]e-mail: Elansary_man@yahoo.com ; Phone: (002010)23333705

ABSTRACT

Sustainable agriculture is one of the most important strategies to overcome world hunger and food shortage. Soil deterioration due to mismanagement seems to be a major obstacle against achieving these goals. The present study aimed at assessing the physical and chemical quality of the soils in El-Menoufia Governorate for the cultivation of wheat which is commonly practiced. Seventeen soil profiles were selected to represent El-Menoufia Governorate soils in addition to 120 surface soil samples. Twelve physical and chemical soil parameters were chosen to evaluate soil quality including; soil salinity, exchangeable sodium, calcium carbonates content, pH, drainage, soil texture, depth, topography, surface stoniness, hardpan depth, hydraulic conductivity, and water holding capacity . Results showed variations among values of different parameters and localities. Interpolated thematic maps were produced for quantitative variables. Soil chemical quality index (CQI) and physical quality index (PQI) were calculated from the twelve investigated soil parameters. Results showed that El-Menoufia Governorate could be classified into two classes according to the physical quality measures (high and moderate), while results of chemical quality index revealed three categories (high, moderate and low). Over 85% of the soil of Menoufia governorate is of high physical quality while more than 89% is of moderate chemical quality for wheat cultivation according to both physical and chemical parameters. The results of this study are useful in planning land use management.

Keywords: Soil quality, sustainable agriculture, land use management , GIS, Entisols

INTRODUCTION

Soil quality is “the capacity of a soil to function within land use and ecosystem boundaries, to sustain biological productivity, maintain environmental quality and promote plant, animal and human health” (Doran and Jones, 1997). With respect to agriculture, soil quality would be the soil’s fitness to support crop growth without becoming degraded or otherwise harming the environment. Climate change is also likely to affect soil quality by depleting organic matter which is a major contributor to soil fertility. In extreme cases, the degradation of the agricultural ecosystems could lead to desertification, resulting in total loss of the productive capacity of the land in question (DEXIA , 2010). Assessing soil quality is an urgent challenge because it varies spatially and temporally and is affected by management and land use (www.fao.org/ag/ AGL/agll/soilbiod/default.htm).

Egypt is the most populous country in the Arab World. Wheat is the most important grain crop in Egypt. It represents almost 10 % of the total value of agricultural production and about 20 % of all agricultural imports. Egypt is also the world’s biggest wheat importer. Cereals are an essential component of the Egyptian diet accounting for 62.3 % of daily calorie intake. Per capita consumption of wheat–the main food staple in the country is around 146 kg per person per year, corresponding to 52.4 % of calorie intake from cereals (FAO, 2015).

Physical and chemical characteristics of soil vary in space and time because of variations in topography, micro-climate, drainage, salinity, microbial activities and other biotic and abiotic factors. In this context the use of remote sensing and spatial analyses allow producing multi–thematic layers of soil properties that offer a great source of data for the land management (Ali *et al*., 2007). With this view, the present study aimed at (i) evaluating soil quality of El-Menoufia Governorate for wheat cultivation depending on soil physical and chemical characteristics. (ii) Producing thematic maps of soil physical and chemical quality indices in El–Menoufia Governorate for proper future planning.

Study area

The studied area occupies the southern part of Nile Delta of Egypt. It lies between the two Nile branches of Rosetta and Damietta. It is between latitudes 31° 5' and 31° 25' N, and longitudes 30° 10' and 30° 40' E (Fig. 1). It covers an area of about 2543 km2 (254300 ha) with altitude ranging from –23 to 59m above sea level (asl.) The study area is under arid conditions (Climatological Normal for Egypt, 2006), dominated by deposits belonging to the late Pleistocene of the Neonile (Said, 1993).

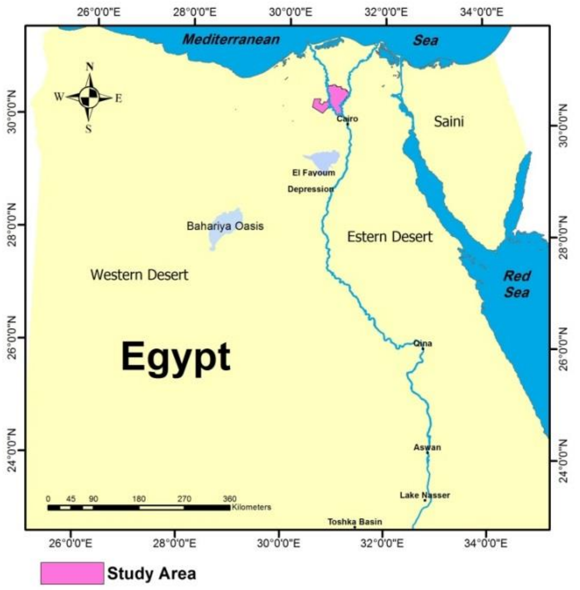

Fig. 1. Location map showing borders of El-Menoufia Governorate .

MATERIALS AND METHODS

Soil quality could be evaluated through different soil indicators including physical, chemical and biological types. Indicators are used to monitor management–induced changes in soil (USDA, 2001). Soil quality index is calculated through three steps: (i) selection of indicators, (ii) score assignment for the selected indicators and (iii) integration of indicators in one index (Karlen *et al*., 2003). In our study, standard scoring functions were used and scores ranges were based on growth requirement of wheat crop according to Sys *et al*. (1993). Twelve parameters have been chosen to assess soil quality of El-Menoufia Governorate soils for wheat cultivation. Chosen parameters include; drainage, texture, depth, topography, surface stoniness, hardpan, hydraulic conductivity, water holding capacity, salinity, ESP, CaCO3 and pH. Each parameter was assessed and rated according to FAO, (1976) and Sys *et al*., (1993), where scores ranged from 0.2 (worst condition) to 1 (best condition) (Table 1). Ranges of total chemical and physical quality indices are listed in Table 2.

The total chemical and physical quality indices were calculated according to the following formulas:

Chemical Quality Index (CQI) = (Soil salinity (SS) × Exchangeable Sodium (SE) × Soil Calcium Carbonates Content (SC) × Soil pH (SH)) $^{1/4}$

Physical Quality Index (PQI) = (Soil Drainage (SR) × Soil Texture (ST) × Soil depth (SD) × Topology (SF) × Surface Stoniness (SY) × Hardpan Depth (SP) × Hydraulic Conductivity (SG) × Water Holding Capacity (SW)) $^{1/8}$

Table 1. Rating of soil quality for wheat cultivation (after FAO, 1976 and Sys *et al.*,1993)

Land quality parameter	Unit	1	0.8	0.5	0.2
Physical properties					
Soil Drainage (SR)		Well	Moderate	Poor	Very poor
Soil Texture (ST)	%	L, SCL, SL, LS, CL	SC, SiL, SiCL	Si, C, SiC	G, S
Soil Depth (SD)	cm	>100	100–50	50–25	<25
Topography (SF)	Slope%	<2	2–4	4–6	>6
Surface stoniness (SY)	%	<20	20–35	35–55	>55
Hard pan (SP)	cm	>100	100–50	50–20	<20
Hydraulic conductivity (SG)	cm h−1	<0.5	0.5–2	2–6.25	>6.25
Water holding capacity (SW)	%	>50	50–20	20–15	<15
Chemical properties					
Salinity hazard or EC (SS)	dS m−1	<4	4–8	8–16	>16
ESP (SE)	%	<10	10–15	15–20	>20
$CaCO_3$ content(SC)	%	<5	5–10	10–15	>15
Soil reaction (SH)	pH	5.5–7	7–7.8	7.9–8.5	>8.5

Table 2. Different classes of physical and chemical soil quality indices according to (Storie, 1978)

PQI class	Score	CQI class	Score
High	> 0.75	High	> 0.9
Moderate	0.75–0.50	Moderate	0.9–0.7
Low	0.50–0.25	Low	0.7–0.5
Very low	< 0.25	Very low	< 0.5

A topographic map (scale 1: 50000) was used to verify surface elevation, also geometry correction of the obtained satellite images was undertaken to facilitate field work. Two Landsat–8 images acquired during 2017(at path 177/row 39) were employed in our study. Satellite images were geometrically and radiometrically corrected using ENVI. Ver. 5 (Fig. 2). Digital Elevation Models (DEMs 90 m) were extracted from the Shuttle Radar Topography Mission Data (SRTM) and employed to build a DEM map of the study area using ENVI. 5 and Arc GIS 10.3 (Fig. 3).

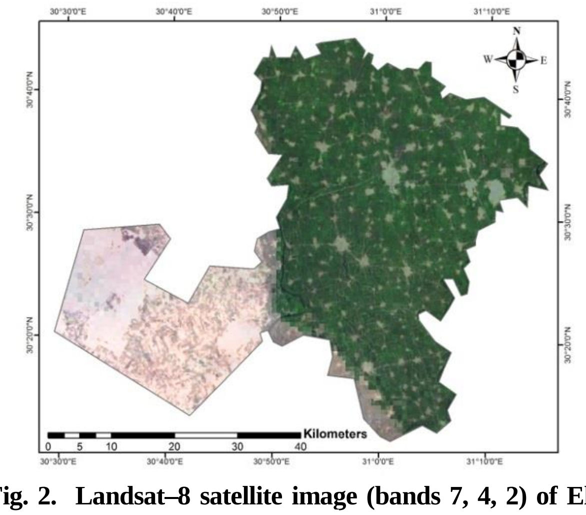

Fig. 2. Landsat–8 satellite image (bands 7, 4, 2) of El–Menoufia Governorate.

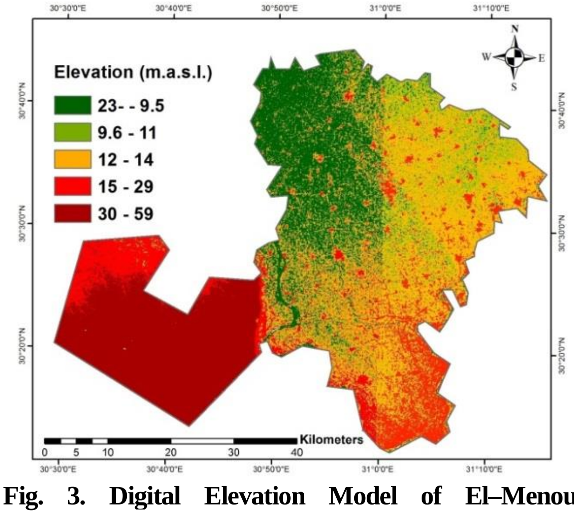

Fig. 3. Digital Elevation Model of El–Menoufia Governorate as derived from the SRTM data.

A total of seventeen soil profiles and one hundred twenty soil surface samples were chosen to assess soil quality (Fig. 4). physical and chemical properties listed in Table 1 were determined in soil profile samples representing each horizon or layer, while texture and chemical properties were only determined for surface (0-30 cm) soil samples. Air dried soil samples were sieved through 2 mm sieve and stored for further analyses after the methodology developed by Estefan *et al.* (2013) and Ryan *et al.* (1996). Particle size analysis was carried out using the international pipette method (Gee and Bauder, 1986). Electrical conductivity (Ece) was determined in extracted saturated soil paste by using a standard conductivity bridge at 25oC and results were expressed in dS m-1 according to Jones (2001). Soil reaction (pH) was determined in 1:2.5 (soil: water) using a pH meter according to Ryan *et al.* (1996). Organic matter was determined by the modified Walkley and Black method according to the method mentioned in Estefan *et al.* (2013).

Exchangeable sodium percentage (ESP) was calculated after Richards (1954). Total calcium carbonate was determined using the Collin's Calcimeter method after Ryan *et al.* (1996).

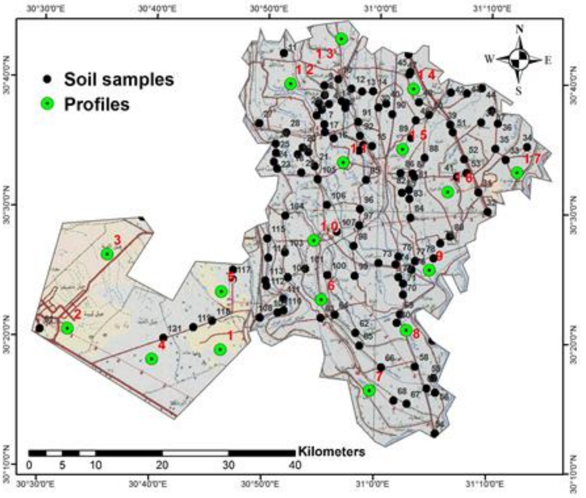

Fig. 4. A Topographic map of El–Menoufia Governorate showing the locations of 120 soil samples and 17 soil profiles.

Data obtained from the fieldwork and laboratory analyses were imported to Arc–GIS 10.3. Inverse Distance Weight (IDW) as one of the spatial interpolation models in GIS. It used to build a continuous map with estimating values of the unmeasured locations in the study area based on the distance between the known points and the unmeasured points and on the overall geostatistical relationships among the known points. IDW of Arc–GIS 10.3 software has been used to interpolate soil depth, clay content, CaCO3, organic matter (OM), electrical conductivity (EC), pH and exchangeable sodium percentage (ESP). Firstly the model has been used to develop the semi–variance diagram separately for each soil property. Consequently, values of the soil properties were acquired at unknown points on basis of the structural component of the diagrams.

RESULTS AND DISCUSSION

According to the USDA (2014) soils in the study area were classified under Entisols order (Table 3)

Results of soil analyses of the 120 soil surface samples showed variation among different localities. Thematic interpolated maps displaying the spatial distribution of soil characteristics are presented in (Fig. 7 – 12).

Results of mechanical analysis showed that the obtained soil texture ranged from sandy loam, clay loam, sandy clay loam to sand. Sandy loamy samples constitute 41.7 % of studied soil samples (50 soil samples), while clay loam soil, sandy clay loam soil and sandy soil constitute 31.7 % (38 soil samples), 22.5 % (27 soil samples) and 4.1 % (5 soil samples), respectively, (Table 4 and Fig. 5). Sandy loamy textures were represented by six soil profiles, while clay loam soil, sandy clay loam soil, sand soil and loamy sand soil were represented by 3, 4, 2 and 2 soil profiles, respectively. (Table 5, Fig. 6).

Clay content in soils varied from 5 to 34 % among the deferent samples (Table 4) and from 0.9 to 9.3 % within soil profiles (Table 5). Clay particles content ranges between 0 – 10 % in 5 soil samples , 10 – 25 % in 69 soil samples and 25 – 35 % in 46 soil samples (Fig. 7).

Soil samples of the study area are characterized by low to high level of calcium carbonate contents, ranging from 0.3 to 14.1 % in the studied soil samples. It is noticed that the low values occurred in the soils of the east and some parts of the north–west. Within 83 soil samples the range of calcium carbonate content is between 0.3 – 5 %. Thirty other soil samples have 5 – 10 % while other 7 soil samples have 10 – 14.1 % (Table 4).

Table 3. Soil taxonomy of the investigated profiles

profiles	location	Suborder	Great Group
1	30°45'58.558"E 30°19'6.35"N	*Orthents*	*Torriorthents*
2	30°32'19.414"E 30°20'30.447"N	*Orthents*	*Torriorthents*
3	30°35'48.724"E 30°26'22.308"N	*Psamments*	*Torripsamments*
4	30°39'58.443"E 30°18'8.508"N	*Orthents*	*Torriorthents*
5	30°46'7.17"E 30°23'41.45"N	*Psamments*	*Torripsamments*
6	30°55'8.089"E 30°23'7.419"N	*Fluvents*	*Torrifluvents*
7	30°59'29.343"E 30°16'10.457"N	*Fluvents*	*Torrifluvents*
8	31°2'31.747"E 30°20'56.792"N	*Fluvents*	*Torrifluvents*
9	31°4'44.872"E 30°25'42.339"N	*Fluvents*	*Torrifluvents*
10	30°54'22.221"E 30°27'58.834"N	*Fluvents*	*Torrifluvents*
11	30°56'48.428"E 30°33'57.752"N	*Fluvents*	*Torrifluvents*
12	30°51'57.816"E 30°39'45.359"N	*Fluvents*	*Torrifluvents*
13	30°56'41.591"E 30°43'16.152"N	*Fluvents*	*Torrifluvents*
14	31°3'3.725"E 30°39'47.232"N	*Fluvents*	*Torrifluvents*
15	31°3'3.725"E 30°39'47.232"N	*Fluvents*	*Torrifluvents*
16	31°6'17.1"E 30°31'40.298"N	*Fluvents*	*Torrifluvents*
17	31°12'12.692"E 30°33'15.566"N	*Fluvents*	*Torrifluvents*

Table 4. Descriptive statistics for soil analysis results of the 120 soil samples collected from El-Menoufia Governorate

Soil parameters	Mean ± SE	Median	Range	IQR
EC(dS m-1)	7.9 ± 1.85	3.71	1.61-181.13	4.28
ESP	1.655 ± 0.223	0.7	0.1-13	1.2
pH	7.8658 ± 0.0131	7.9	7.4-8.2	0.2
CaCO3(%)	4.86 ± 0.256	4.5	0.3-14.1	2.4
Clay (%)	22.772 ± 0.513	22.695	5-34.91	6.372
OM (%)	1.1692 ± 0.0591	1	0.2-3.3	0.6

Concerning soil profiles, values of calcium carbonate distribution ranged between 09-9.3.Of the total soil profiles 13 of them have a range of 0.9 – 5 % , where 4 soil profiles are of the range of 5 – 9.3 %. These results could be supported by those obtained by Slima (2006) & Shaltout *et al*. (2010) and El–Fouly *et al*. (2012) (Table 5 and Fig. 8).

Organic matter improves physical, chemical, and biological properties of soil. In general, the organic matter in the study area is low ranging from 0.2 to 2%; except for some isolated areas, where 3.3%,was locally recorded. which may be due to some recent additions. In forty one soil samples , organic matter contents ranged between 0.2 – 0.8 % , 0.9 – 1.4 % in 52 soil samples , 1.5 – 2.1 % in 20 soil samples , 2.2 – 2.7 % in 4 soil samples and 2.8 – 3.3 % in 3 soil samples, respectively (Table 4).

Regarding soil profiles ,values of soil organic matter content in 9 soil profiles ranged between 0.2 – 0.8 % , 0.9 – 1.4 % in 5 soil profiles, 1.9 % in 2 soil profiles and 2.3 % in one soil profile, respectively . These results could be supported by those obtained by Slima (2006), El–Shayeb, (1984) and El–Fouly *et al*., (2012) (Table 5, Fig. 9).

Table 5. Weighted average results of soil prameters withen the 17 soil profiles collected from El-Menoufia Governorate

Soil parameters	Mean ± SE	Median	Range	IQR
Depth (cm)	119.65 ± 5.25	3.71	90-150	4.28
EC(dS m-1)	4.333 ± 0.512	0.7	1.76-10.08	1.2
ESP	2.429 ± 0.535	7.9	0.1-6.9	0.2
pH	7.788± 0.0658	7.9	7- 8.2	0.25
Clay (%)	3.765 ± 0.542	22.695	0.9-9.3	6.372
OM (%)	0.982 ± 0.15	1	0.2-2.3	0.6

The study soils were characterized by a wide range of electrical conductivity (EC) values (1.61 - 181.13 dS m-1). Low values of EC were generally recorded in the soils irrigated with River Nile water (1.2 to 8 dS m-1), while values of >8 dS m-1 were recorded in lands irrigated with groundwater . In detail, a total of 65 soil samples recorded lower EC than 4 dS m-1 (non saline), while a range of 4 – 8 dS m-1 is recorded in other 31 soil samples , 8 – 16 dS m-1 in 17 soil samples and more than 16 dS m-1 were recorded in 7 soil samples (Table 4).

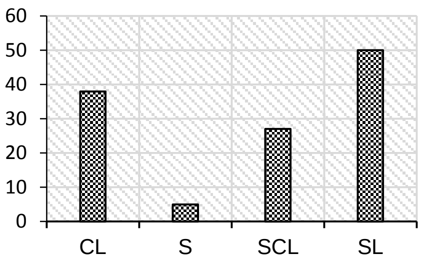

Fig. 5. Frequency of soil texture in 120 soil samples collected from El-Menoufia Governorate.

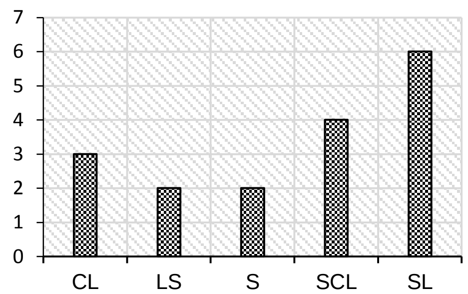

Fig. 6. Frequency of weighted average of soil texture in 17 soil profiles collected from El-Menoufia Governorate.

A total of 10 soil profiles had exhibited EC values lower than 4 dS m-1, 4 – 8 dS m-1 in 6 soil profiles and 8 – 10.08 dS m-1 in one soil profile. These results could be supported by those obtained by El–Shayeb (1984), Slima (2006) and Shaltout *et al*. (2010) (Table 5, Fig. 10).

Soil pH is could be manipulated by measures such as cropping practices that improve soil organic matter and overall soil health. For the study area, soil pH was ranged from neutral to moderately alkaline. The increase in alkalinity in some of the study area may be due to the increase in calcium carbonate content, which reached 8.2 and in the case of increase of 8.4, it is often due to sodium carbonate (FAO, 1988).

Soil pH value of soil samples ranged between 7.4 and 8.2 while pH values in soil profiles were sometimes lower than this range (8.2 to 7.5) except for one soil profile, the pH value was 7. These results are in agreement with those obtained by Slima (2006) (Table 5, Fig. 11).

Results indicate that soil sodicity (exchangeable sodium percent or ESP values) ranged from sodic to non–sodic soils. The distribution of sodicity in soil of the study area depended significantly on the distribution of pH, excluding the western part of the area. Soil ESP in soil samples ranged between 0.1 % and 13 %. Soil ESP range was between less than 10 % in 116 soil samples and 10 – 13 % in 4 soil samples (Table 4).

On the other hand, values of ESP in soil profiles were less than 7 % in all soil profiles (Table 5, Fig. 12).

Chemical and physical soil quality index for each soil sample was calculated and interpolated maps were generated (Figs. 12-13). Results showed that the soil of El–Menoufia Governorate could be classified into three categories according to chemical soil quality index (CQI); Moderate quality soils represented 89.37 % of total area (2272.7 km2), low quality represented by 9.6 % (245.6 km2) and high quality were represented by 0.97 % (24.7 km2) (Table 6, Fig. 13). On the other hand, physical soil quality index (PQI) showed that soil of El–Menoufia Governorate could be categorized into two categories; high quality represented by 85.26 % of total area (2168.2 km2), moderate quality were represented by 14.74 % (374.8 km2) (Table 6, Fig. 14).

Table 6. Percentage and area (km^2) of different quality classes in El-Menoufia Governorate.

Physical Quality			Chemical Quality		
Class	Area (km^2)	Area (%)	Class	Area (km^2)	Area (%)
High	2168.2	85.26	High	24.7	0.97
Moderate	374.8	14.74	Moderate	2272.7	89.37
Total	2543	100	low	245.6	9.6
			Total	2543	100

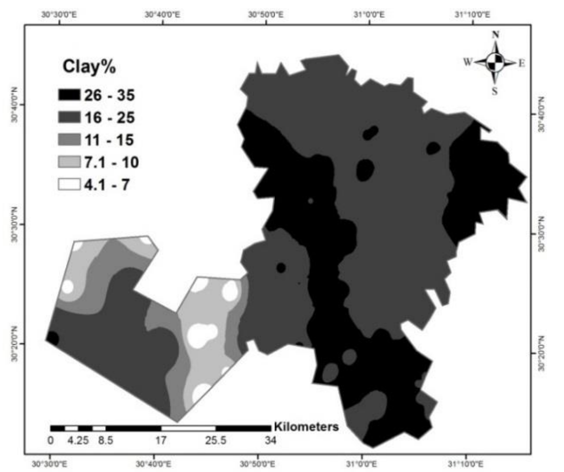

Fig. 7. Spatial distribution of Clay content (%) .

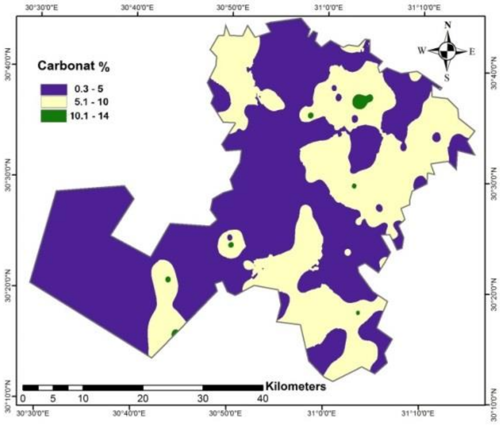

Fig. 8. Spatial distribution of $CaCO_3$ (%).

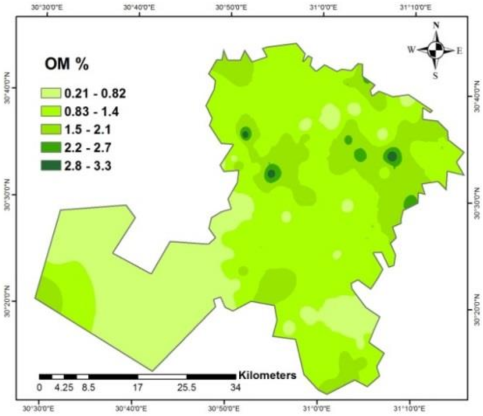

Fig. 9. Spatial distribution of OM .

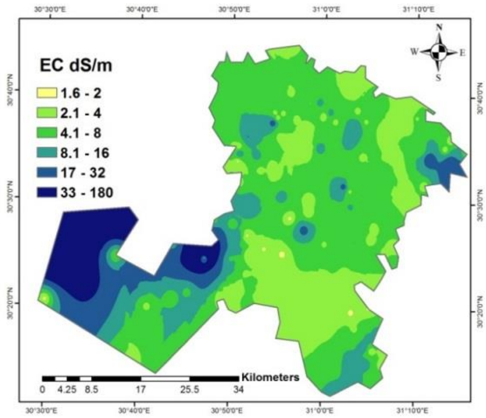

Fig. 10. Spatial distribution of EC (dS m-1) .

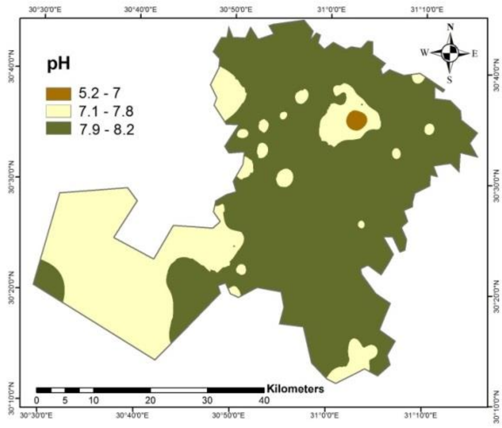

Fig. 11. Spatial distribution of pH .

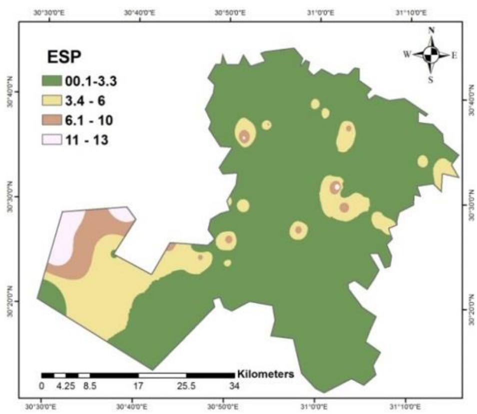

Fig. 12. Spatial distribution of ESP .

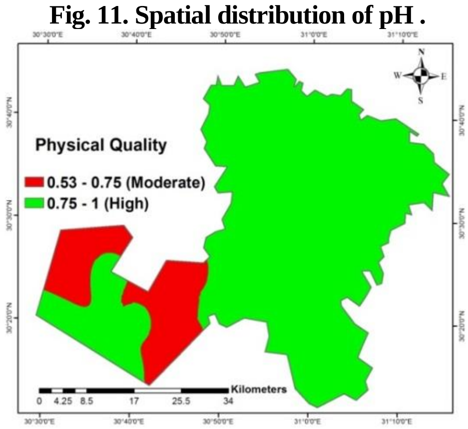

Fig. 13. Interpolated map showing physical quality index (PQI).

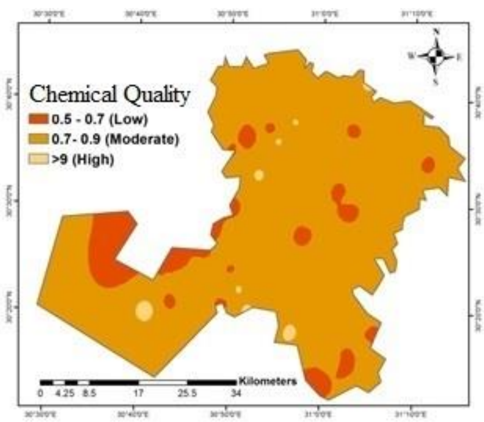

Fig. 14. Interpolated map showing Chemical quality index (CQI) .

REFERENCES

Ali, R. R., Ageeb, G. W. and Wahab, M. A. (2007). Assessment of soil capability for agricultural use in some areas west of the Nile Delta, Egypt: an application study using spatial analyses. *J. Appl. Sci.Res*. 3 (11): 1622–1629.

Climatological Normal for Egypt (2006). The Normal for El–Beheira and El–Menufiya Governorates from 1986 – 2006, Ministry of Civil Aviation, Meteorological Authority. Cairo, Egypt.

DEXIA, (2010). Sustainability team discussion paper: Food scarcity trends, challenges and solutions, Dexia Asset Management, 24 p. Sys, Ir. C., Van Ranst, E., Debaveye, Ir. J. and Beernaert, F. (1993). Land Evaluation, Part III,Crop Requirements. International Training Center for Post–graduate Soil Scientists, Ghent University.

Doran, J. W. and Jones, A. J. (1997). *Methods for Assessing Soil Quality*. SSSA Special Publication (*Soil Science Society of America, Madison*, WI). 410 p.

El–Fouly, M., Abou El–Nour, E. A. A., Shaaban, S. H. A. and Zeidan, M. S. (2012). Effect of different levels of NPK and micronutrients fertilization on yield and nutrient uptake of maize plants. *Journal of American Science*, 8(8): 209–214.

El–Shayeb, F. M. (1984). *Studies on reproductive capacity of major weeds in the cultivated land in Menoufia Governorate.* M. Sc. Thesis, Faculty of Science, Menoufia University, Shebin El–Kom. 397 p.

Estefan, G., Sommer, R. and Ryan, J. (2013). *Methods of Soil, Plant, and Water Analysis: A manual for the West Asia and North Africa region*. 3rd Edition. International Center for Agricultural Research in the Dry Areas (ICARDA, Beirut, Lebanon. p. 244.

FAO (1976). A Framework for Land Evaluation. Food and Agriculture Organization of the United Nations, Soils Bulletin No.32. FAO, Rome.

FAO (1988). Salt-Affected Soils and Their Management. Soils Bulletin, No 39. FAO, Rome.

FAO (2015). Egypt: Wheat sector review. Country highlights prepared under the FAO/EBRD Cooperation.

Gee, G. W. and Bauder, J. W. (1986). *Particle Size Analysis*. In: Klute, A. (Ed.), *Methods of Soil Analysis*. Part–1. Second Ed. *Agronomy*, Madison, WI, pp. 383–399

Jones Jr, J. B. (2001). *Laboratory Guide for Conducting Soil Tests and Plant Analysis.* CRC press, Boca Raton Florida, USA. 384 p.

Karlen, D. L., Ditzler, C. A. and Andrews, S. S. (2003). Soil Quality: why and how?. *Geoderma*, 114(3–4), 145–156.

Richards, L. A. (1954). *Diagnosis and Improvement of Saline and Alkaline Soils*. USDA Handbook No. 60, Washington, DC.,160 p.

Ryan, J., Gabaret, S., Harmsen, K. and Rachid, A. (1996). A Soil and Plant Analysis Manual Adapted for The West Asia And North Africa Region. ICARDA, Aleppo, Syria, 140.

Said, R.(1993). *The River Nile Geology and Hydrology and Utilization*. Pergman Press, Oxford; 320.

Shaltout, K. H., Sharaf El–Din, A. and Ahmed, D. A. (2010). *Plant Life in The Nile Delta*, Tanta University press, Tanta, Egypt, 244 p.

Slima, D. F. (2006). Socilogical behaviour and variability among *Pluchea Dioscoridis* (L.) DC. population in the Nile Delta. M. Sc. Thesis, Faculty of Science, Menoufia University, Shebin El–Kom. 169 p.

Stocking, M. A. (2003). Tropical Soils and Food Security: the next 50 years. *Science*, 302(5649), 1356–1359.

Storie, R., (1978). Storie Index Rating. University of California Division of Agricultural Sciences Special Publication 3203, Oakland.

USDA–NRCS (Natural Resources Conservation Service). (2001). Soil Quality Test Kit Guide. Available: http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_050956.

USDA, (2014). Keys to Soil Taxonomy, 12th ed. USDA-Natural Resources Conservation Service, Washington, DC. , 372 pp.

تقييم جودة التربة ومدى ملاءمتها لزراعة القمح بمحافظة المنوفية

محمد احمد السيد سعيد[1]، ام محمد احمد خفاجى[2] و رمضان ابراهيم بدير[3]
[1] قسم الأراضي والمياه – كلية الزراعة – جامعة الأزهر بالقاهرة
[2] قسم النبات والميكروبيولوجى – كلية العلوم(بنات) – جامعة الأزهر
[3] قسم النبات والميكروبيولوجى – كلية العلوم(بنين) – جامعة الأزهر

تعد الزراعة المستدامة واحدة من أهم الاستراتيجيات للتغلب على الجوع ونقص المواد الغذائية في العالم.. تهدف الدراسة الحالية إلى تقييم الجودة الفيزيائية والكيميائية للتربة في محافظة المنوفية بغرض زراعة القمح والمتواجد على نطاق واسع بمنطقة الدراسة ويشكل تدهور التربة بسبب سوء الإدارة احد العقبات الرئيسية في لتحقيق هذه الأهداف. تم اختيار 120 عينة تربة و 17 قطاع تربة لتمثيل وقياس خصائص التربة بمحافظة المنوفية. تم اختيار اثني عشر خاصية لتقييم جودة التربة الفيزيائية والكيميائية وهي: ملوحة التربة والصوديوم المتبادل ومحتوى كربونات الكالسيوم في التربة ودرجة الحموضة للتربة ومدى جودة صرف التربة وقوام التربة وعمق القطاع والطوبوغرافيا ونسبة الحصى بالطبقة السطحية وعمق الطبقات الصلبة والتوصيل الهيدروليكي وقدرة الاحتفاظ بالمياه. أظهرت النتائج تباينًا بين خواص التربة في المواقع المختلفة. أنتجت خرائط موضوعية interpolated للمتغيرات الكمية للتربة . تم حساب مؤشر جودة التربة الكيميائي (CQI) ومؤشر الجودة الفيزيائي (PQI) من اثني عشر خاصية للتربة. أوضحت النتائج أن التربة الزراعية بمحافظة المنوفية يمكن تصنيفها إلى فئتين (عالية ومتوسطة) طبقا لمقاييس الجودة الفيزيائية بينما أظهرت نتائج مؤشر الجودة الكيميائي ثلاث فئات (عالية ، متوسطة ، منخفضة). أوضحت النتائج أن أكثر من 85٪ من التربة الزراعية بمحافظة المنوفية ذات جودة فيزيائية عالية و أن أكثر من 89٪ من التربة الزراعية بمحافظة المنوفية ذات جودة كيميائية متوسطة لزراعة القمح ويمكن استغلال هذه النتائج لتحسين وتطوير إدارة استخدام الأراضي