Journal

J. Biol. Chem. Environ. Sci., 2009, Vol. 4(4): 67-81
www.acepsag.org

PEDOLOGICAL AND MINERALOGICAL ASPECTS OF THE DESERT BELT REGION BETWEEN EL-FAYOUM AND THE NILE VALLEY USING REMOTE SENSING TECHNIQUE.

Ismail, M., El-Shemy, A. S. A, and Abd Allah, S. A.

Soil, water and Environment Res. Inst. Agric. Res. Center, Giza, Egypt.

ABSTRACT

Based on the visual interpretation of Landsat TM bands 7, 4 and 2, the obtained the main identified physiographic units could be categorized into six units, ie , old terraces, young terraces, alluvial fan basin, alluvial plain (locally terraced), alluvial plain and rock land.

The obtained results indicate that the studied soils have different textural grades, ranged from clay to sand with dominance of clayey texture. Soil Calcium carbonate content ranged from 4.3 to 154.0 g/kg, while soil gypsum content ranged from 11.0 to 158.2g/kg. Soil salinity ranged from non-saline to extremely saline as the EC values ranged widely from 0.70 to 156.6 dsm^{-1}. Soluble cation contains in most soils followed the order of Na^{+} > Ca^{++} > and/or Mg^{++} > K^{+}, while soluble anions in general followed the order Cl^{-} or So_4^{--}, CHO^{-}_3 and CO^{--}_3 was not detected.

The X-ray diffract grams and semi-quantitative determination of clays indicate that smectite (montmorillonite) was the predominated one followed by kaolinite minerals, while illit occurs in a few ourorint with trace of vermiculite.

According to the taxonomic system, the studied soils could be classified into three orders (i. e Aridisols, Entisols and vertisols) with further subdivisions of suborders, great groups, subgroups and families.

INTRODUCTION

The fast growing population in Egypt, above a very limited area of agricultural land confining to the Nile Valley and Delta, makes a pressing need to set up expansion programs to face and solve the problems of food, energy, employment and housing. Plants to invade the vast areas of desert, to introduce the possible into agriculture, have been laid down. Priority has been given to develop the desert area between El-Fayoum depression and the Nile Valley to reclaim these soils.

The interference area between El-Fayoum and Beni-Suaif Governorate could be considered as one of the availability of land and presence the vital roads and railways.

Geology

According to Said (1962 and 1990) and Euroconsult (1992), the area between El-Fayoum depression and the Nile Valley is essentially occupied by sedimentary rocks of the tertiary and quaternary age with tertiary basalts particularly formed in its northern and western parts. Thickness of the recent deposits of clay, sandy clay and sand in the depression, does not exceed 16.5m (Attia 1954). There are a close relation between the relief and the underlying rocks and the nature of rocks represents the main factor in landform development. The basalt sheet at Gebel Qatran area is related to the volcanic activity of the middle tertiary time (between the Eocene and Oligocene time), the geological northward dip structure (homoclinal) on the foreland side of the great Arabo-Nubian Massif, complicated by folding, faulting and basalt extrusion (Said 1992).

The objectives of this study are to evaluate the soils of the studied area for irrigated agriculture which consider the base for making agriculture development. To achieve this purpose, collection of available data and information was undertaken. Analysis of landsat images covering the area under investigation was done to identify the main physiographic units as well as collected soil samples for laboratory analyses to recognize physical, chemical and mineralogical properties. These soil properties were used as guidelines for soil classification.

MATERIALS AND METHODS

I. Location

The studied area is located on the Middle Eastern part of the Egyptian Western Desert. It is bounded by latitudes 29˚ 11¯ and 29˚

34¯ North, and longitudes 30˚ 51¯ and 31˚ 16¯ East, and stretches over three governorates Giza, El-Fayoum and Bani-Suwauf. Fig (1).

The length of this area is approximately 40 km from east to west, and its width 41.5 km with area of about 1660 km^2

II. Remote Sensing inventory for identifying the physiographic units.

Landsat images of Multispectral scanner (TM-7) were used for visual interpretation applying the physiographic approach (Fig 1).

Landsat TM-7 scene 176/40 from July 2006 was collected for this purpose. The scene georeferenced to Egypt Transfer Marcator (ETM) using Ground Control Points (GCPs) collected from map of 1:50,000 and 1:100,000 scales. During georeferncing total RMSE were maintained below 0.30 pixels. The images were resembled to 30m x 30m pixel size for multispectral and 15m x 15m pixel size for panchromatic images using Nearest Neighbor. The images of the study area was subset taking only the boundary of the study area by using Erdas Imagin 9.1.

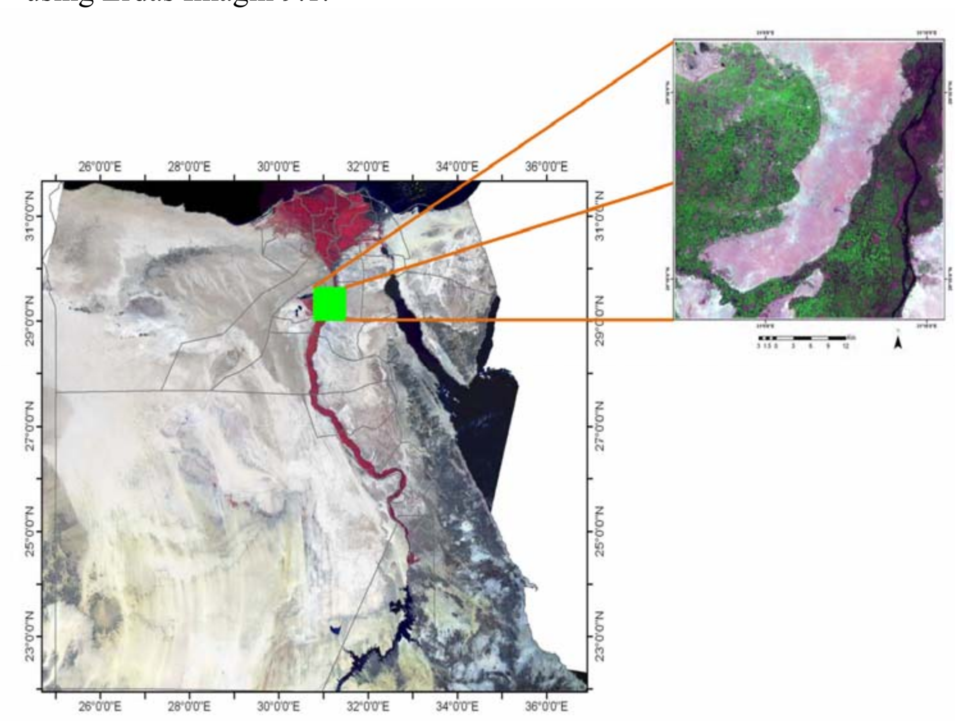

Figure (1): Location of study area.

Resolution merge for images is a tool to combine multisource imagery using advanced image processing techniques. It aims at integration of separate and complementary data to enhance the information apparent in the images as well as to increase the reliability of the interpretation. This lead to more accurate data and increase utility (Rogers and Wood 1990).

For visual interpretation different colour composites were made with Landsat TM bands 4. 3. 2, 5. 4. 3 and 7. 4. 2 in RGB. Among the colour composites the one 7. 4. 2 showed the best contrast, and this combination is used for geological application as it provides the greatest distinction between rock types. On false colour with band composite 742 visual interpretation was done. visual interpretation was depending on many elements such as tone, shape, size, pattern, texture, shadow, and association. The interpretation was done to extract all important landscape. A physiographic analysis using visual interpretation was carried out to delineate the different physiographic units of the studied area. The pre-interpretation procedure was used as described by Zinck (1988). The main physiographic units in the studied area extracted from visual interpretation and spectral classification are defined in soil maps, Fig (2) and could be categorized into 6 units. i.e.

1- Old Terraces “Q_1T”

2- Young Terraces “Q_2T”

3- Alluvial Fan Basin “A_2”

4- Alluvial plain (Locally Terraced) “$A_{1.1}$”

5- Alluvial plain “$A_{1.2}$”

6- Rock Land “R”

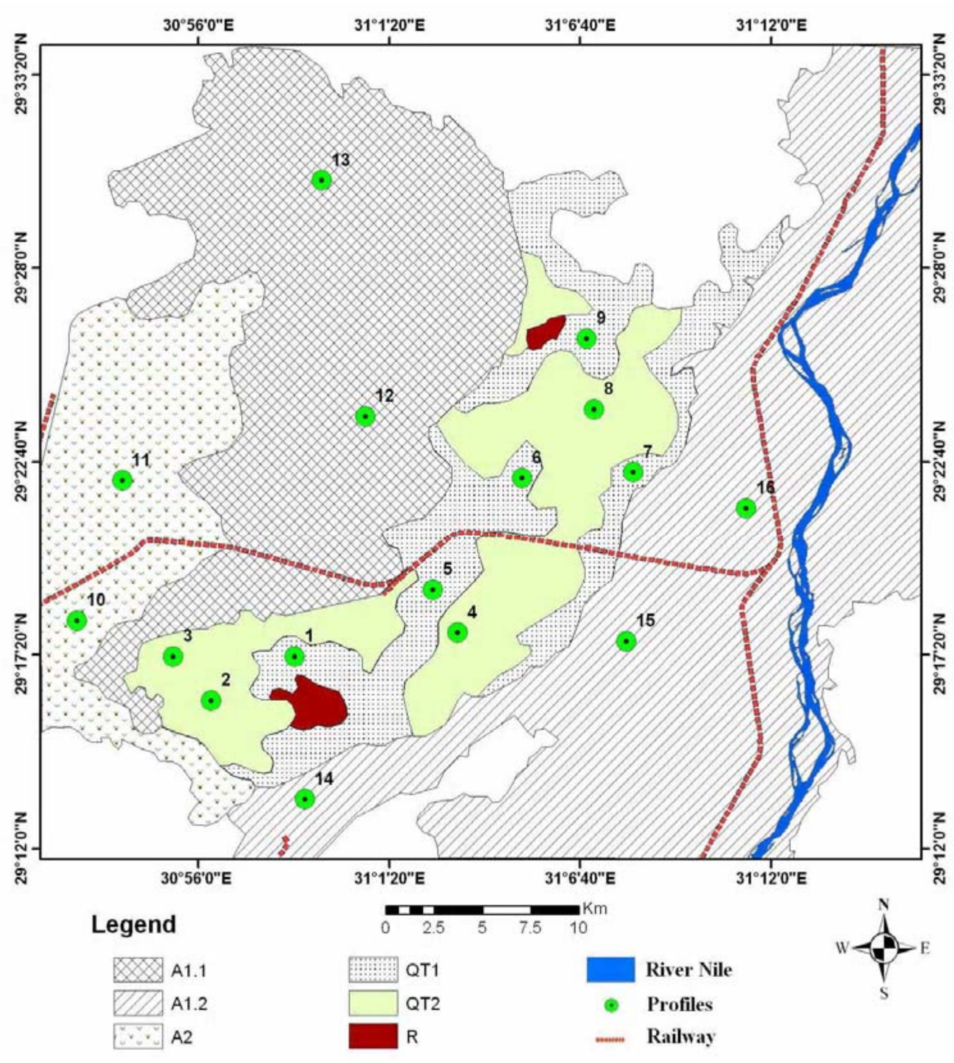

Figure (2): Physiographic units of the study area.

III. Field work

The physiographic maps were checked for the study area (Figure2) during the ground truth as well as excavating. Soil profiles representing the different physiographic units for a ful soil description according to Soil Survey Manual (USDA 2003).

IV. Laboratory analyses

Laboratory analyses were carried out for particle size distribution using the pipette method (piper 1950).

Calcium carbonate content was determined according to Black (1965).

Gypsum content was determined by precipitation with acetone (USDA, 1954).

- ❖ Soil reaction was determined using pH meter in the soil paste (USDA 1954); salinity as electrical conductivity (ECe) in the soil paste extract was assessed in the 1:1 soil water extract for salic horizon identification (Jackson 1973).
- ❖ Organic matter content was determined using the modified walkely and Black method (Jackson 1973).
- ❖ Cation exchange capacity (CEC) and the exchangeable Sodium percentage (ESP) according to Tucker (1954).
- ❖ Separation of the clay fraction was carried out after the removal of soluble salts, $CaCO_3$, O.M and free iron oxides according to Jackson (1973). The x-ray diffraction analysis of the separated clay was conducted using Philips diffractometer with Cu, K ∞-radiation for an oriented Mg-saturated air dried sample, Mg-saturated and glycerol solvated and K- saturated and heated to 550- ◦c for 4 hr (Jackson 1965). Semi-quantitative estimation of the clay minerals proportions was then conducted by measuring the peak area as outlined by Giems (1967).
- ❖ Soil was categorized to the level of soil family, using the Keys Soil Taxonomy (USDA, 2003).

RESULTS AND DISCUSSION

1.General view on of the physiographic units:

A Brief descriptions about the identified physiographic units in the studied area were carried out as follows:

a) Old Terraces "QT1"

This unit is founded in the middle part of the studied area between El-Fayoum area and the Nile Valley with area 32306.4 feddans, and slopping from North West to South east. It formed when the river flowed at very high levels above the present day river channel, while terraces of even greater age are those usually cut into widely separated, isolated segments. This unit is represented by soil profiles 1, 5, 6, 7 and 9.

b) Young Terraces "QT2"

This unit maybe essentially continuous along the entire length of the trunk Valley, being dissected only where tributary streams emerge from the valley sides and close in the elevation to the modern flood plain. It is dominant in the middle part of the studied area between El-Fayoum area and the Nile Valley with an area 37291.8 feddans, and slopping from North West to South east. This unit represented by soil profiles 2, 3, 4 and 8.

c) Alluvial Fan Basin "A2"

A low outspread mass of loose materials and/or rock material commonly with gentle slopes, shaped like an open from or a segment of a cone, deposited by a stream at the place where it issues from a narrow mountain or upland Valley; or where a tributary stream is near or at its junetion with the main stream. It is steepest near its apex which points upstream and slopes gently and convexly outward with a gradual decrease in gradient. This unit is located in the eastern part of the studied area with an area 35955.2 feddans and represented by soil profiles 10 and 11.

d) Alluvial Plain (Locally Terraces) "A1.1"

This unit is located in the eastern part of El-Fayoum depression with area 82364.3 feddans and represented by profiles 12 and 13.

e) Alluvial Plain "A1.2"

A large assemblage of fluvial landforms (braided, streams, terraces, etc.) that form low gradient, regional ramps along the flanks of mountains and extend great distances from their. This is dominant in the Western part of the studied area around the Nile River with an area115681.0 feddans and represented by profiles 14, 15 and 16.

f) Rock Land "R"

This unit is identified in the South middle part of the investigated area with area 1661.4 feddans.

Physic-chemical properties

It could be concluded from the obtained data in tables (1 and 2). That soil texture restricted between five extremes of texture closes namely loamy sand, sand, sandy clay loam, clay loam and clay, the latter class is fairly represented the soils of alluvial fan basin, alluvial plain (locally terraced) and alluvial plain, while the soils of old terraces and young terraces have texture classes varied from loamy sand to clay and sand to sandy clay loam, respectively.

Considering the analytical data, calcium carbonate content varies widely from 4.3 to 154.0 g/kg, the lowest values are recorded in the soils of alluvial fan basin, alluvial plain (locally terraced) and alluvial plain, while the highest content is detected in the old terraces and young terraces soils.

Gypsum content is considerably high in the young terrace soils ranges from 12.5 to 107.6 g/kg with a tendency to decrease with the soils of old terraces, alluvial fan basin, alluvial plain (locally terraced) and alluvial plain.

Organic matter content is very low not exceed 18.0 gkg^{-1} and such low content of soil organic matter is expected due to the prevailing aridity of the region and its very scanty vegetation.

Table (2) indication that soil reaction is natural to strongly alkaline as the pH ranges between 7.01 and 8.47. The electric conductivity of soil paste extract show that the soils are non saline to strongly saline with Ec value ranges from 0.7 to 156.6 dsm^{-1}.

The general cationic composition is dominated by Na^{+}, Ca^{++}, Mg^{++} and K^{+} accompanied by anionic composition Cl^{-} and/or $SO_4^{=}$ followed by HCO_3^{-}.

Cation exchange capacity (CEC) values ranged from 4.57 to 48.95 $Cmol_c$/Kg soil. The highest values are recorded in the alluvial plain (locally terraced) and alluvial plain soils, while the lowest content is recorded in the old terraces and young terraces soils.

From the previous results it is obvious that the variation in CEC is mainly affected by the clay contents in the soils. Also, exchangeable sodium percent in the soils under consideration is generally more than 15% i.e these soils are classified as sodic soils.

Table (1): Partiele size distribution, textural classes, Gypsum, O.M and $CaC0_3$, contents of the studied soil profiles.

Physiographic unit	Profile No.	Depth (cm)	Gravel %	Sand%		Silt %	Clay %	Texture	O.M. g/kg	$CaCo_3$ g/kg	Gypsum g/kg
				Coarse Sand	Fine Sand						
Old Terraces	1	0-25	10.0	5.80	78.50	7.30	8.40	LS	3.8	153.0	11.0
		25-75	3.5	14.30	71.90	6.50	7.30	LS	2.7	102.0	11.0
		75-120	0.0	15.30	65.20	4.20	15.30	SL	1.3	73.0	12.0
		120-150	0.0	9.50	70.00	7.90	12.60	SL	0.1	86.0	13.5
	5	0-25	25.0	7.20	70.70	5.90	16.20	SL	3.4	75.0	21.7
		25-65	20.0	3.40	69.90	11.30	15.40	SL	1.9	94.0	52.3
		65-90	15.0	7.80	69.20	10.40	12.60	SL	1.5	102.0	37.8
		90-140	0.0	4.70	57.80	15.10	22.40	SCL	2.2	79.0	18.5
	6	0-20	18.0	5.90	73.10	7.80	13.20	SL	3.0	104.0	34.7
		20-60	3.0	3.40	84.20	4.90	7.50	LS	2.1	78.0	23.5
		60-90	3.5	6.30	81.80	3.90	8.00	LS	1.1	63.0	17.4
		90-120	3.0	13.60	72.50	5.20	8.70	LS	1.0	52.0	23.0
	7	0-25	15.0	13.00	53.80	10.40	22.80	SCL	6.5	64.0	157.8
		25-75	3.0	25.30	57.90	7.50	9.30	LS	3.5	103.0	152.0
		75-150	0.0	19.80	64.70	6.40	9.10	LS	2.0	96.0	151.6
	9	0-25	2.0	2.90	60.10	17.20	19.80	SCL	4.5	28.0	70.0
		25-55	1.0	3.40	77.30	5.30	14.00	SL	2.0	152.0	19.0
		55-90	0.0	2.20	47.30	7.60	42.90	C	4.5	39.0	17.0
		90-150	0.0	2.50	78.90	6.40	12.20	SL	1.2	105.0	14.0

Table (1): Cont.

Physiographic unit	Profile No.	Depth (cm)	Gravel %	Sand%		Silt %	Clay %	Texture	O.M. g/kg	$CaCo_3$ g/kg	Gypsum g/kg
				Coarse Sand	Fine Sand						
Young Terraces	2	0-25	15.00	15.80	74.70	3.20	6.30	SL	2.4	50.0	107.6
		25-65	2.00	3.40	78.20	6.40	12.00	SL	1.2	46.0	12.5
		65-90	0.00	15.20	71.60	5.70	7.50	LS	1.0	112.0	73.8
		90-150	0.00	13.40\	72.10	5.00	9.50	LS	0.5	84.0	107.8
	3	0-30	30.00	14.20	70.30	9.20	6.30	LS	3.5	96.0	158.2
		30-70	2.00	6.50	77.10	7.30	9.10	LS	2.2	102.0	13.6
		70-150	0.00	7.20	79.60	5.20	8.00	LS	1.2	154.0	24.5
	4	0-25	15.00	8.30	70.20	7.30	14.20	SL	1.5	76.0	157.7
		25-75	0.00	10.20	84.60	2.20	3.00	S	1.2	45.0	35.6
		75-110	0.00	15.70	73.50	4.30	6.50	LS	1.0	113.0	52.7
		110-150	0.00	17.60	71.00	3.50	7.90	LS	0.5	120.0	109.6
	8	0-25	15.00	7.30	52.60	15.00	25.10	SCL	4.5	70.0	103.8
		25-75	0.00	2.20	62.60	15.20	20.00	SCL	3.2	25.0	100.0
		75-150	0.00	3.10	63.30	16.40	17.20	SCL	1.2	32.0	100.0
Alluvial Fan Basin	10	0-25	0.00	3.50	28.60	22.30	45.60	C	6.5	32.0	18.0
		25-75	0.00	5.40	86.30	3.00	5.3.00	LS	3.4	73.0	17.0
		75-150	0.00	2.10	88.20	2.50	7.20	LS	1.2	54.0	16.0
	11	0-25	0.00	3.45	27.24	25.80	43.51	C	6.0	15.3	15.0
		25-65	0.00	2.50	25.00	26.30	46.20	C	7.7	12.8	12.0
		65-90	0.00	2.85	26.89	22.46	47.80	C	6.5	13.6	13.5
		90-150	0.00	3.65	26.05	20.15	50.15	C	2.3	4.3	23.0

Table (1): Cont.

Physiographic unit	Profile No.	Depth (cm)	Gravel %	Sand%		Silt %	Clay %	Texture	O.M. g/kg	CaCoj g/kg	Gypsum g/kg
				Coarse Sand	Fine Sand						
Alluvial Plain (Locally Terraced)	12	0-30	0.00	5.25	22.77	24.38	47.6	C	14.0	17.9	21.0
		30-70	0.00	9.24	25.25	20.21	45.3	C	8.0	14.3	18.0
		70-110	0.00	7.3	21.3	25.2	46.2	C	5.0	13.6	16.0
		110-130	0.00	7.5	23.37	30.38	38.75	CL	1.3	22.1	14.0
	13	0-25	0.00	3.45	27.81	22.37	46.37	C	14.5	66.3	16.0
		25-60	0.00	4.27	22.12	25.41	48.2	C	7.6	82.5	18.0
		60-90	0.00	3.29	25.17	21.38	50.16	C	5.5	81.6	19.0
		90-150	0.00	3.65	23.76	20.16	52.43	C	3.0	76.4	16.4
Alluvial Plain	14	0-25	0.00	5.15	27.21	22.34	45.3	C	18.0	12.8	14.5
		25-60	0.00	3.24	23.26	25.7	47.8	C	8.0	25.6	13.7
		60-90	0.00	5.17	16.52	28.6	49.71	C	5.0	21.3	11.5
		90-140	0.00	3.24	26.23	22.3	48.23	C	2.0	17.0	12.0
	15	0-25	0.00	2.15	32.74	20.7	44.41	C	16.5	24.0	11.0
		25-60	0.00	6.54	24.25	22.46	46.75	C	9.0	21.5	13.0
		60-90	0.00	3.14	23.37	25.34	48.15	C	6.5	17.5	12.5
		90-130	0.00	5.45	22.45	21.74	50.36	C	2.5	13.4	10.0
	16	0-25	0.00	4.63	24.9	23.16	47.31	C	17.0	24.6	17.0
		25-60	0.00	5.27	20.91	24.17	49.65	C	7.5	21.7	13.0
		60-95	0.00	3.15	27.85	21.85	47.15	C	4.5	20.1	12.0
		95-150	0.00	4.87	31.72	20.17	43.24	C	2.1	20.3	11.0

Texture legend:

S Sand LS Loamy sand SL Sandy loam

SCL Sandy clay loam CL Clay Loam C Clay

Table (2): Chemical composition of the soil saturation extract of the studied soil profiles.

Physiographic Unit	Profile No.	Depth (cm)	pH	EC (dS/cm)	Soluble Anions ($mmol_c/L$)				Soluble Cations ($mmol_c/L$)				CEC $Cmol_c/Kg$	ESP
					HCO_3^-	$CO_3^=$	Cl^-	$SO_4^=$	Ca^{++}	Mg^{++}	Na^+	K^+		
Old Terraces	1	0-25	7.39	41.30	3.50	0.00	420.00	354.70	151.20	88.00	519.00	20.00	8.08	13.61
		25-75	7.43	26.60	2.60	0.00	240.00	503.25	129.60	99.20	508.80	8.25	5.84	19.69
		75-120	7.28	56.04	4.00	0.00	780.00	51.60	216.00	137.60	457.00	25.00	9.56	11.19
		120-150	7.56	20.90	2.40	0.00	220.00	87.60	118.80	37.20	150.00	4.00	10.18	14.54
	5	0-25	7.68	72.20	1.60	0.00	200.00	2330.60	399.60	47.60	2035.00	50.00	10.75	17.21
		25-65	7.91	11.65	0.45	0.00	71.79	44.25	66.96	11.09	37.20	1.24	11.41	21.74
		65-90	8.04	4.79	0.36	0.00	40.00	7.51	27.41	13.21	6.96	0.29	9.93	13.60
		90-140	7.97	3.96	0.42	0.00	22.63	16.54	27.93	9.05	2.30	0.30	18.30	56.61
	6	0-20	7.56	43.30	2.20	0.00	180.00	79.65	194.40	44.80	6.15	16.50	11.55	37.40
		20-60	7.52	37.70	2.40	0.00	200.00	540.20	205.20	44.40	478.00	15.00	10.0	37.0
		60-90	7.53	33.80	2.80	0.00	460.00	207.10	162.00	56.40	442.50	9.00	7.45	15.44
		90-120	7.58	41.30	5.00	0.00	500.00	832.70	216.00	23.20	1078.50	20.00	6.66	31.53
	7	0-25	7.38	17.70	3.80	0.00	180.00	135.80	129.60	68.00	115.40	6.60	21.13	55.37
		25-75	7.39	113.20	3.20	0.00	2120.00	2286.80	129.60	26.40	4174.00	80.00	7.20	23.61
		75-150	7.15	156.60	4.00	0.00	4540.00	5894.80	118.80	110.00	10085.00	125.00	5.75	37.59
	9	0-25	7.40	8.37	6.00	0.00	6.00	68.03	5.94	1.34	66.50	6.25	19.77	25.90
		25-55	7.81	3.78	2.49	0.00	9.50	25.8	23.41	11.18	2.97	0.23	8.62	23.20
		55-90	7.83	4.49	2.59	0.00	8.31	33.99	17.67	5.56	21.00	0.66 0	27.36	19.77
		90-150	8.05	4.24	2.19	0.00	7.67	32.53	14.21	8.03	19.52	64	9.49	20.86

Table (2): Cont.

Physiographic Unit	Profile No.	Depth (cm)	pH	EC (dS/cm)	Soluble Anions ($mmol_c/L$)				Soluble Cations ($mmol_c/L$)				CEC $Cmol_c/Kg$	ESP
					HCO_3^-	$CO_3^=$	Cl^-	$SO_4^=$	Ca^{++}	Mg^{++}	Na^+	K^+		
Young Terraces	2	0-25	7.63	21.50	2.30	0.00	145.0	149.30	86.40	67.6	138.6	4.0	6.14	29.97
		25-65	7.63	31.90	1.80	0.00	280.0	280.20	97.20	90.0	365.8	9.0	8.11	14.67
		65-90	7.69	33.70	2.00	0.00	520.0	246.0	108.0	100.0	552.5	7.50	7.92	26.52
		90-150	7.76	42.80	2.20	0.00	480.0	466.30	118.8	37.2	772.5	20.0	7.82	29.41
	3	0-30	7.19	50.90	2.20	0.00	220.0	813.20	205.2	65.2	750.0	15.0	6.41	30.42
		30-70	7.37	33.70	1.60	0.00	200.0	489.25	216.0	33.6	431.25	10.0	6.50	26.15
		70-150	7.46	47.80	1.80	0.00	240.0	120.0	226.8	33.2	100.0	1.80	7.12	27.39
	4	0-25	7.57	8.	0.58	0.00	73.06	11.46	57.86	13.05	13.58	0.61	12.01	17.07
		25-75	7.65	4.84	2.60	0.00	180.0	67.91	183.6	45.20	20.35	1.36	4.90	7.35
		75-110	7.75	38.30	1.80	0.00	280.0	124.65	205.2	96.4	101.80	3.05	7.13	30.58
		110-150	7.67	30.30	2.20	0.00	300.0	524.5	464.4	34.8	317.5	10.0	5.51	23.59
	8	0-25	7.08	91.60	3.00	0.00	1340.0	1652.0	302.4	217.6	2439.0	36.0	21.75	27.59
		25-75	7.01	114.10	2.20	0.00	2100.0	1039.0	410.4	348.8	2332.0	50.0	24.25	24.33
		75-150	7.10	87.30	2.40	0.00	1480.0	601.40	302.4	290.4	1466.0	25.0	19.90	15.68
Alluvial Fan Basin	10	0-25	8.10	0.92	3.69	0.00	3.26	2.24	3.23	1.86	3.84	0.27	27.49	28.96
		25-75	8.19	1.31	5.00	0.00	8.00	5.60	7.56	3.88	6.66	0.50	4.57	8.32
		75-150	8.26	1.68	5.00	0.00	15.00	4.23	8.10	2.30	13.47	0.36	6.00	30.0
	11	0-25	7.52	9.78	5.00	0.00	5.00	87.27	3.78	1.94	88.50	3.05	31.90	9.72
		25-65	8.00	6.21	2.41	0.00	30.44	29.25	26.71	1.65	33.10	0.63	33.49	21.4
		65-90	7.77	4.42	1.20	0.00	14.89	28.05	10.23	1.97	31.10	0.42	39.86	24.34
		90-150	8.00	4.82	1.20	0.00	15.14	31.79	9.08	2.94	35.75	0.42	40.03	24.98

Table (2): Cont.

Physiographic Unit	Profile No.	Depth (cm)	pH	EC (dS/cm)	Soluble Anions ($mmol_c/L$)				Soluble Cations ($mmol_c/L$)				CEC $Cmol_c/Kg$	ESP
					HCO_3^-	$CO_3^=$	Cl^-	$SO_4^=$	Ca^{++}	Mg^{++}	Na^+	K^+		
Alluvial Plain (Locally Terraced)	12	0-30	7.78	7.44	2.21	0.00	44.79	27.39	26.79	5.46	41.11	1.03	43.72	21.96
		30-70	7.65	1.10	0.84	0.00	3.05	7.10	1.10	0.45	9.31	0.13	44.60	14.13
		70-110	7.46	6.60	1.8	0.00	33.63	30.51	18.19	5.53	41.74	0.54	38.86	12.22
		110-130	7.66	7.64	1.07	0.00	43.39	27.93	25.63	4.01	46.27	0.48	27.81	29.31
	13	0-25	7.43	2.18	2.00	0.00	16.00	5.92	6.94	2.76	13.86	0.36	32.46	25.26
		25-60	7.58	6.14	2.04	0.00	34.97	24.39	16.42	7.36	37.07	0.55	32.92	27.64
		60-90	7.60	5.76	2.00	0.00	23.26	34.74	21.21	9.66	28.50	0.63	37.06	23.48
		90-150	7.67	4.52	2.20	0.00	20.00	26.25	11.97	12.03	23.45	1.00	38.51	26.23
Alluvial Plain	14	0-25	7.98	1.30	1.07	0.00	6.67	5.27	3.08	1.00	8.72	0.20	40.35	20.94
		25-60	7.83	1.54	1.31	0.00	9.44	4.65	4.20	0.99	10.07	0.14	41.80	22.94
		60-90	7.82	1.60	1.54	0.00	9.26	5.20	3.56	1.55	10.69	0.19	43.47	18.40
		90-140	7.74	1.10	2.00	0.00	9.00	1.92	2.31	0.75	9.56	0.30	48.95	20.63
	15	0-25	7.56	1.86	2.20	0.00	13.00	4.01	3.47	1.63	13.86	0.25	39.08	31.14
		25-60	7.69	1.92	2.60	0.00	15.00	4.42	5.78	1.36	14.63	0.25	39.60	34.14
		60-90	7.70	1.42	2.40	0.00	12.00	2.89	3.47	2.65	10.77	0.40	48.68	24.05
		90-130	7.76	1.60	2.40	0.00	10.00	5.81	5.78	1.36	10.77	0.30	44.71	27.18
	16	0-25	7.55	1.91	2.60	0.00	16.00	1.03	4.05	2.59	12.69	0.30	38.12	34.50
		25-60	7.90	0.70	0.92	0.00	2.87	3.21	1.33	0.43	5.01	0.23	39.25	27.01
		60-95	8.05	8.50	1.96	0.00	45.89	37.15	19.10	7.13	58.31	0.46	36.00	30.83
		95-150	8.47	1.46	1.20	0.00	8.00	5.79	1.62	1.50	11.54	0.33	40.74	37.24

Mineralogy of the clay fraction

Data illustrated in table (3) that, in general, Semi-quantitative determination of clay samples indicate that smectite (montmorillonite) group was the predominated one in soils of young terraces, alluvial fan basin, alluvial plain (locally terraced) and alluvial plain followed by kaolinite, illite, and vermiculite as clay minerals as well as quartz, dolomite and feldspars as accessory ones. On the other hand, kaolinite group was predominated one in the old terraces soils followed by montmorillonite, illite, and vermiculite as clay minerals as well as quartz, dolomite and feldspars as accessory ones.

Table (3): Semi-quantitative estimation of the mineralogical composition of the clay fraction (< 0.002mm) separated from some layers of the studied soils.

Physiographic Unit	Profile No.	Depth (cm)	Clay Minerals						Accessory Minerals		
			Kaolinite	Smectite	Illite	Chlorite	Playgorskite	Vermiculite	Quartz	Feldspars	Dolomite
Old Terraces	7	25-75	Com	Mod.	Few	-	-	Tra.	Few	Few	Few
		75-150	Com.	Mod.	Few			Tra.	Few	Tra.	Few
	9	25-55	Com.	Mod.	Mod.	-	-	-	Few	Tra.	Tra.
		55-90	Com.	Mod.	Few				Few	Tra.	Mod.
Young Terraces	3	30-70	Mod.	Com.	Mod.	-	-	Tra.	Few	Tra.	Tra.
		70-150	Few.	Com.	Few				Few	Tra.	Few
Alluvial Fan Basin	11	25-65	Mod.	Com.	Few	Tra.	-	Tra.	Few	Tra.	Mod.
		65-90	Mod.	Com.	Mod.			Tra.	Few	Few	Few
Alluvial Plain (Locally Terraced)	12	30-70	Mod.	Com.	Few	-	Few	Tra.	Few	Tra.	Few
		70-100	Mod.	Com.	Few			Tra.		Tra.	Mod.
Alluvial Plain	15	25-60	Mod.	Com.	Few	-	-	Tra.	Few	Tra.	Mod.
		60-90	Mod.	Com.	Few				Few	Mod.	Mod.

Dominant (Dom.) > 40% Common (Com.) 25-40% Moderate (Mod.) 15-25%
Few 5-15% Trace (Tra) < 5o/o Absent (-)

Soil Taxonomy

By using the physical and chemical results and according to the USDA system (2003), data in table (4) reveal that the studied soil profiles could be classified into three orders, i.e, Aridisols, Entisols and Vertisols as well as their followed sequence classification levels.

Exception of two sites located at alluvial fan basin (profiles 10 and 11), all the studied soil profiles could be classified into two orders Aridisols and vertisols which have four suborders of Salids, Gypsids, Calcids and Torrerts, as well as seven families, as follows:

1- Gypsic Haplosalids, fine loamy, mixed, hyperthermic.
2- Gypsic Haplosalids, sandy, mixed, hyperthermic.
3- Typic Calcigypsids, coarse loamy, mixed, hyperthermic.
4- Typic Calcigypsids, coarse loamy over clay, mixed, hyperthermic.
5- Typic Calcigypsids, sandy, mixed, hyperthermic.
6- Sodic Haplosalids, sandy, mixed, hyperthermic.
7- Sodic Haplosalids, fine clayey, Smectite, hyperthermic.

The twosoil sites located at alluvial fan basin are characterized by no evidence of development of pedogenic horizons and could be distinguished under the order Entisols followed by suborder of orthents and two soil families of

1- Typic Torriorthents, clayey, Smectite, hyperthermic.
2- Typic Torriorthents, sandy, mixed, hyperthermic.

Table (4): Soil classification of the studied soil profiles (According to Soil Taxonomy System, USDA 2003).

Order	Suborder	Great Group	Subgroup	Family	Representative profiles
Aridisols	Salids	Haplosalids	Gypsic Haplosalids	Fine loamy, mixed, hyperthermic.	8
				sandy, mixed, hyperthermic.	7
				coarse loamy, mixed, hyperthermic.	2,5
				coarse loamy over clayey, mixed,	9
				sandy, mixed, hyperthermic.	3,4
	Calcids	Haplocalcids	Sodic Haplocalcids	sandy, mixed hvoerthprmir	1,6
Entisols	Orthents	Torriorthents	Typic Torriorthents	clayey, smectitic, hyperthermic.	11
				sandy, mixed, hyperthermic.	10
Vertisols	Torrerts	Haplotorrerts	Sodic Haplotorrerts	fine clayey, smectitic, hyperthermic.	12, 13, 14, 15, 16

REFERENCES

Attia, M. I. 1954: Deposits in the nile Valley and Delta . Government Press ., Cairo .

Black, C. A. 1965: Methods of Soils Analysis, Part 1 and 2, Am. Soc. Agron., Madison, Wisconson, USA.

Euroconsult (Egypt, Netherlands international co.operation) 1992: Environmental profile, Fayoum Governorate, Egypt . Al- Shorouk Press, Cairo, Egypt .

Giems, O. 1976. Studies on clay minerals and clay-mineral formation in Soil profiles in Scandinavia. Medd. Det. Norske Skogsorsf Ksueesen 21:303.

Jackson, M.L. 1965. "Clay Transformation in Soil Genesis during the Quarternary". Soil Sci., 99: 15-22.

Jackson, M.L. 1973. "Soil chemical analysis". Premtice . India Proviate LTD, New Delhi.

Piper, C.S., 1950: Soil and Plant Analyses . Amonograph from the Waile Agric . Research Inst., University of Adelaide , Australia .

Richards , L. A. 1954: Diagnosis and improvement of Saline and Alkaline Soils . USDA Agriculture handbook No. 60 .

Rogers, R. H. and Wood, L. 1990 : The History and status of merging multiple sensor data : An overview , ACSM – ASPES Annual Convention , technical Papers 1990 , Vol. 4 Image processing and RS, PP. 352 – 360.

Said, R. 1962: "The Geology of Egypt". El-sevier Publishing Company, Amsterdam, New Yourk.

Said, R. 1990:the geology of Egypt . published for the Egyption General Petroleum Corporation, Conoco Hurghada Inc. and Repsol Exploracion, S.A by balkema, A. A., Rotterdam, Brookfield, the Netherlands.

Tucker, B.M. 1954. "Determination of exchangeable Calcium and magnesium in Calcareous Soils". Aust. j. agric., Res., 5: 706-715.

USDA 2003. Key to Soil Taxonomy. 8 th Edition USA.

Zinch, j. A. 1988 : Geomorphology and Soils . Internal Pupl., ITC., Enschede the Netherlands .

الاعتبارات البيدولوجية والمنرالوجية لاراضى منطقة التداخل الصحراوي بين الفيوم ووادى النيل بإستخدام تقنية الاستشعار عن بعد ونظم المعلومات الجغرافية

محمد إسماعيل سيد أحمد ، عبدالرحمن سيد عبدالرحمن الشيمى ، سامى عبد الجيد عبد الله

معهد بحوث الاراضى والمياه والبيئة – مركز البحوث الزراعية – جيزة – مصر

تمثل الدراسات البيدولوجية لاراضى الحزام الصحراوى بين الفيوم ووادى النيل أهم موضوعات هذا البحث وباستخدام التفسير المرئى لصور الأقمار الصناعية الامريكية لاندسات Landsat TM-7 band 7. 4. 2 فإنة أمكن تحديد الوحدات الفزيوجرافية لهذه المنطقة فى ستة وحدات رئيسية وهى 1) المصاطب القديمة 2) المصاطب الحديثة 3) حوض المراوح الرسوبية 4) السهل الرسوبى (مصاطب محلية) 5) السهل الرسوبى 6)الاراضى الصخرية.

وتشير نتائج التحليلات الطبيعية والكيميائية لقطاعات التربة الى ان قوام التربة فى الوحدات الفزيوجرافية المختلفة يتراوح ما بين الرملى الى الطين مع الغالبية الطينية التى تغطى اراضى الفيوم ووادى النيل – محتوى التربة من كربونات الكالسيوم تراوح ما بين 0.43 الى 15.4% بينما محتواها من الجبس تراوح بين 1.1 الى 15.82% - ملوحة التربة تراوحت ما بين عديمة الملوحة إلى عالية الملوحة حيث قيم EC تراوحت ما بين 0.7 الى 156.6% ديسيسيمنز/سم. الكاتيونات الذائبة تميزت بسيادة كاتيون الصوديوم أو الكالسيوم يلية الماغنسيوم ثم البوتاسيوم أما الأنيونات الذائبة عموماً يسود أنيون الكلوريد أو الكبريتات ثم البيكربونات أما أنيون الكربونات وجودة نادراً.

وتوضح النتائج المتحصل عليها من التحليل الشبة كمى لمعادن الطين أن مجموعة السمكتيت (المونتموريللونيت) هى السائدة يليها الكاؤولنيت بينما معادن الأليت فقد وجد بكمية قليلة أما معدن الفيرميكوليت فقد وجد بكمية نادرة.

وبإجراء عملية تقسيم لهذه الأراضى حسب نظام التقسيم الأمريكى أمكن تحديد ثلاثة رتب مختلفة وهى Aridisols، Entisols وال Vertisols وتم تقسيم هذه الرتب إلى تحت الرتب والمجموعات وتحت المجموعات والعائلات.