Zagazig J. Agric. Res., Vol. 35 No. (5) 2008 1107 - 1126

SOIL CLASSIFICATION OF WADI EL-SAIEDA AREA, ASWAN GOVERNORATE, EGYPT

Elwan, A.A.[1], E.A. Awad[2], S.M. Dahdouh[2], and M.K.A. Abd El-Samie [1]

1. Desert Research Center, Ministry of Agric., Egypt.
2. Dept. of Soil Sci., Fac. of Agric., Zagazig University.

Accepted 23/ 9 /2008

ABSTRACT: **The aim of this study is to give an information concerning the characteristics and classification of Wadi El-Saieda area soils, Aswan Governorate, Egypt.**

Wadi El-Saieda area occupies a portion of the Western Desert of Upper Egypt. It is bounded by Longitudes 32 ° 10' 00" and 32° 55' 00" E and Latitudes 24° 50' 00" and 25° 10' 00" N covering a surface area of approximately 450,000 feddan. The studied area occupies 369,152 feddan approximately.

Twenty soil profiles were selected to represent the geomorphic units that had been recognized, namely, Nile terraces, eroded Nubian old surfaces (Peneplain), bajada plain (colluvial plain and pavement plain) and Wadi El-Rimidin.

The obtained results can be summarized as follows:

Physical properties: Texture is mainly sand in all of the studied soil profiles with different percentages of gravel content. They are deep to very deep, some are moderately deep and few are shallow to very shallow.

Chemical properties: The soils are non salty to extremely salty as its EC_e values vary widely from 0.25 to 101 dS/m. Lime content varies from trace to 28.35%, while gypsum content ranges from not detectable to 2.55%. Soils are neutral to moderately alkaline as pH values range between 6.89 and 8.48. Exchangeable sodium percentage (ESP) values range between 8.17 and 15.69 %. Organic

matter content ranges between not detectable and 0.21 % in the studied soil profiles.

Wadi El-Saieda area soils are classified into the orders *Entisols* and *Aridisols* which are represented by six subgroups, i.e. *Typic Torriorthents*, *Typic Torripsamments*, *Typic Haplosalids*, *Typic Haplocalcids*, *Lithic Torriorthents* and *Lithic Torripsamments*. And they were classified into the family levels.

Key words: Soil properties, Soil classification, Wadi El-Saieda, Aswan, Upper Egypt.

INTRODUCTION

Wadi El-Saieda area occupies a portion of Western Desert of Upper Egypt. It is bounded by Longitudes 32° 10' 00" and 32° 55' 00" E and Latitudes 24° 50' 00" and 25° 10' 00" N covering a surface area of approximately 450,000 feddan. The studied area occupies 369,152 feddan approximately.

The area is bounded in the northern side by El-Sabiya village, by Aswan governorate in the southern side, by Idfu and River Nile in the eastern side and by plateau surface of the Western Desert in western side.

The arid climate of the studied area is considered one of the most important soil forming factors affecting soil formation and development. Therefore, analysis of the meteorological data at the present time with the back-history may reflect the physical mode of weathering.

Since, there is no meteorological station within the investigation area at present, an evaluation of the climatological parameters was drawn based on records of the nearest station located in Aswan, south of the studied area (approximately 70 km.), Central Laboratory for Agricultural Climate, CLAC (2008).

Consequently, Wadi El-Saieda area is characterized by a long dry summer with high temperature and evaporation rate with a short mild winter with approximately no rainfall. The studied area is located under the desertic conditions according to Emberger's equation, (1955).

Based on the climatological data, and Soil Survey Staff (2006), Wadi El-Saieda area soils are characterized by *torric (aridic)* moisture regime and *hyperthermic* temperature regime.

Regarding the irrigation system, two main sources for irrigation were found in the studied area namely; River Nile and the underground water.

Geologically, the study area occupies a portion of the stable shelf area formed the side of the Arab-Nubian massif, slopes gently in the alluvial and aeollian deposits. The exposed rock units are of sedimentary origin.

Quaternary and Tertiary deposits dominate the study area. Among the Quaternary, Pleistocene deposits are exposed, while Tertiary is represented by Pliocene, lower Eocene and Paleocene, United States Agency for International Development, USAID (1978).

Geomorphologically, Wadi El-Saieda area is a part of the Western Desert. It could be identified throughout interpreting satellite image which is considered one of the most common versatile and economical forms of advanced techniques. The basic advantages of satellite image afford the reality to the ground observation. The recognized geomorphic units were delineated by analyzing the main landscape that extracted from Landsat ETM+7 satellite image (2002), with the aid of the geomorphological map of Aswan by UNDP / UNESCO / NARSS / EGSMA (2002), and field investigations. The obtained results, defined four main geomorphic units and their subunits as follows:

1- Structural plateau:

- Plateau surface,
- Escarpment face,
- Wadi El-Rimidin.

2- Bajada plain:

- Colluvial plain,
- Pavement plain.

3- Eroded Nubian old surfaces (Peneplain).

4- Nile alluvial plain:

- Nile terraces,
- Flood plain.

Objectives of this work are to characterize the different soil types as well as to study their classification.

MATERIALS AND METHODS

Remote Sensing Works

Studied area was represented on ETM scene dated to 21/07/2002, Path/Row 175/043 by Landsat ETM+7 satellite image:

- Spatial Resolution: 30 meters Multispectral 15 meters pan.

-Seven colour bands of multispectral information in the visible, near – infrared, short-wave infrared and thermal infrared.

The bands were chosen with the ultimate application of the data more firmly in mind. A selection of the most adequate combination of bands 2, 4 and 7 were executed according to Lillesand and Kiefer (1979).

Field Investigation

The sites of the studied soil profiles were identified per each geomorphic unit by defining its coordinates from a satellite image and achieving it in the field using the Global Positional System (GPS).

Twenty soil profiles were selected representing the geomorphic or subgeomorphic units of the studied area (from west to east), Map 1, as follows:

1- Structural plateau :

- Plateau surface (unsampled)
- Escarpment face (unsampled)
-Wadi El-Rimidin: soil profiles Nos. 6 and 9.

2- Bajada plain:

-Colluvial plain: soil profiles Nos. 4, 5, 7, 10 and 11.

-Pavement plain: soil profiles Nos. 3, 8, 12, 19 and 20.

3- Eroded Nubian old surfaces (Peneplain): soil profile No. 2

4- Nile alluvial plain:

- Nile terraces: soil profiles Nos. 1, 13, 14, 15, 16, 17 and 18.
- Flood plain (unsampled)

The studied soil profiles were dug deep down to a depth of about 150 cm from the surface unless opposed or hindered by an obstacle or bedrock. The soil profiles were carefully examined and morphologically described according to the methods outlined by the Guidelines for Soil Description, FAO (2006).

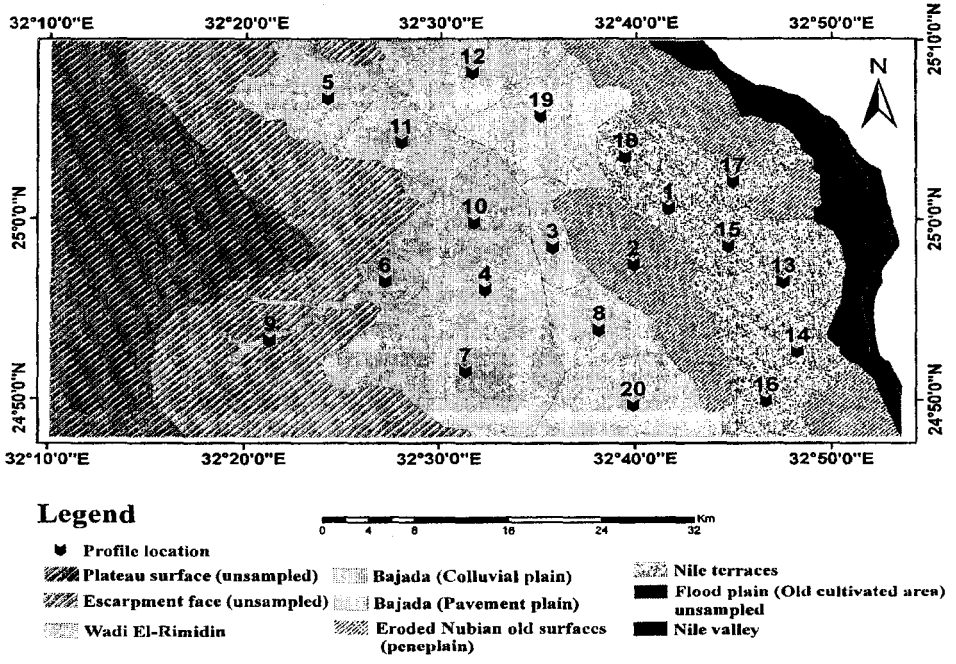
The main described elements were texture, structure, consistency and other pedological features inside the various layers of the soil profiles. These elements were carefully recorded in soil profile sheets together with external features such as location, relief of the surrounding landscapes, slope, vegetation, elevation, surface cover and other salient features.

Laboratory Analyses

Seventy-six soil samples were collected representing the subsequent layers of the studied soil profiles. These samples were air dried, crushed, sieved through a 2 mm sieve, the percentage of gravels was determined by volume. Then the fine earth (<2 mm)subjected to the following physical and chemical analyses:

Physical analyses

- Particle size distribution of samples was carried out for the fractional separation according to Wentworth (1922).



Map 1. Location of studied soil profiles based on the geomorphic units.

Chemical analyses

- Soil reaction (pH) was determined potentiometrically in the saturated soil paste using a Backman bench-type pH-meter, Richards (1954).
- Total salinity (EC_e) was determined conductimterically in the soil saturation extract, according to Richards (1954).
- Calcium carbonate was estimated by the monometric method using Collin's Calcimeter, Piper, (1950).
- Gypsum content was determined using the method of precipitation by acetone, Richards, (1954).
- Exchangeable sodium percentage (ESP) was determined using ammonium acetate method, after Jackson, (1973).
- Organic carbon and organic matter contents were determined following the Walkley and Black titration method, Jackson (1973).

Mineralogical analyses of light minerals

- Separation of sand fraction (0.25-0.063 mm) was conducted after the essential pretreatment outlined by **Jackson (1975).**
- The identification of the minerals was carried out using the polarizing microscope as described by **Brewer (1964).**

Based on the field morphological descriptions and laboratory analyses, soils of Wadi El-Saieda area have been classified according to Soil Taxonomy, Soil Survey Staff, USDA (2006).

RESULTS AND DISCUSSION

Soil Characteristics of the Investigated Area

The geomorphic or sub geomorphic units which are represented by soil profiles are (from east to west): Nile terraces, eroded Nubian old surfaces (Peneplain), pavement plain, colluvial plain and Wadi El-Rimidin. The evaluation of these units from soil characteristics view point is given hereafter:

Soils of Nile Terraces

This unit occupies an area of about 86,148 feddan. It is represented by soil profiles Nos. 1, 13, 14, 15, 16, 17 and 18. Their

analytical data can be summarized as follows:

Physical properties

- Soil texture is almost fine sand in the surface layer and changes to coarse sand with depth, except soil profile No. 15 which has a medium sand texture throughout profile depths.
- Gravels content through the entire depth of soil profiles ranges from 2.28 to 72.69%, while being absent in the second, third and fourth layers of profile No. 15 and in the second and third layers of soil profile No. 16.
- Soils are deep (> 100 cm) to very deep (>150 cm)

Chemical properties

- Soils are non-calcareous to moderately calcareous, as their calcium carbonate content varies from not detectable to 7.73%, according to FAO (2006). The highest values were detected in soil profile No. 1 and in first layers of soil profiles Nos. 13 and 18, while being absent in the successive layers of soil profile No. 15.
- Soils are non-gypsiric to slightly gypsiric, where their gypsum content ranges from trace to 2.55 %. The highest contents were detected in the soil profile No. 18.
- pH values range between 6.89 and 7.90.
- ESP values ranges between 8.17 and 14.90 %.
- The soils are slightly to extremely salty as indicated from electrical conductivity EC_e values vary widely from 0.76 to 101.00 dS/m. The lowest values were detected in the surface layers and increased with depth, as noticed in soil profile No. 17 due to leaching process by irrigation water. The highest values were recorded in soil profile No. 18.
- Soil organic matter content (O.M) is very low, not exceeding 0.27 %.

Table 1 shows the analytical data of the studied soil profiles.

Soils of Eroded Nubian Old Surfaces (Peneplain)

This unit occupies an area of about 55,800 feddan. It is represented by soil profile No. 2. Its analytical data can be summarized as follows:

Physical properties

- Soil texture is fine sand.
- Gravels content through the entire depth of soil profile ranges from 30.55 to 66.22 %.
- Soils of this geomorphic unit are very shallow (< 30cm).

Chemical properties

- Soils are moderately calcareous to strongly calcareous, where calcium carbonate content varies from 7.73 to 14.44%. Highest value was mostly detected in the surface layer.
- Soils are slightly gypsiric as its gypsum content ranges from 0.10 to 0.22%. Highest content was mostly detected in the subsurface layer.
- pH values range between 7.42 and 7.51.
- ESP values range between 11.23 and 12.41%.
- The soils are slightly to very strongly salty as indicated from (EC_e) values vary widely from 2.63 to 12.49 dS/m. The lowest value was detected in the surface layer and increased with depth.
- Soil organic matter content (O.M) is very low, not exceeding 0.14 %. Analytical data of the studied soil profile are shown in, Table 2.

Soils of Pavement Plain

This unit occupies an area of about 97,221 feddan. It is represented by soil profiles Nos. 3, 8, 12, 19 and 20. Their analytical data can be summarized as follow:

Physical properties

- Soil texture is fine sand throughout the entire depths of soil profiles, exceptional being soil profile No. 20, and the deeper and deepest layers of soil profile No. 19 which have coarse sand texture.
- Gravels content through the entire depth of soil profiles ranges from trace to 65.44 %, while being absent in the second and first layers of soil profiles Nos. 12 and 19, respectively.
- Soils of this geomorphic unit are shallow (< 50 cm) to very deep (>150 cm).

Chemical properties

- Soils are moderately calcareous to extremely calcareous, where calcium carbonate content varies from 2.24 to 28.35 %. The highest contents were mostly detected in soil profile No. 3 and

Table 1. Some physical and chemical properties of Nile terraces soils

Profile No.	Depth (cm)	Physical analyses		Chemical analyses					
		Gravel (%)	Textural Class	O. M (%)	pH	EC_e (dSm^{-1})	ESP %	$CaCO_3$ (%)	Gypsum (%)
1	0 -2	5.19	Sl.Gr.F.S	0.12	7.23	2.13	12.17	3.86	--
	2-20	4.95	Sl.Gr.F.S	0.05	7.85	2.51	14.19	6.87	--
	20-39	43.90	Gr.C S	0.09	7.43	4.90	14.16	6.10	1.60
	39-66	48.18	Gr.C S	0.03	7.20	8.30	12.47	6.87	1.20
	66-125	46.63	Gr.C S	0.03	7.11	8.33	8.71	6.87	1.50
13	0-15	18.18	Gr.F.S	0.21	7.50	3.80	14.25	7.73	1.40
	15-45	19.19	Gr.F.S	0.19	7.48	7.21	14.29	1.71	1.80
	45-60	24.24	Gr.C.S	0.12	7.05	19.80	13.18	0.85	1.10
	60-110	53.39	V.Gr.C.S	0.09	6.89	20.80	9.00	--	1.40
14	0-20	11.95	Sl.Gr.F.S	0.22	7.80	1.50	14.13	3.61	--
	20-40	7.77	Sl.Gr.F.S	0.20	7.90	5.85	12.07	3.43	0.50
	40-70	3.84	Sl.Gr.C.toF.S	0.17	7.90	8.11	9.37	1.89	1.50
	70-120	31.82	Gr.C. to F.S	0.10	7.40	8.25	10.70	2.23	1.50
15	0-21	23.25	Gr.C. to M.S	0.11	7.25	27.20	12.67	--	1.50
	21-69	--	M.S	0.11	7.50	13.90	14.90	--	1.50
	69-118	--	M.S	--	7.48	10.80	12.87	--	1.50
	118-165	--	M.S	--	7.27	7.00	13.43	--	1.40
16	0-25	25.51	Gr.F. S	0.21	7.70	4.56	11.27	3.11	0.60
	25-92	--	F.S	--	7.67	5.69	11.18	5.93	1.20
	92-160	--	F.S	--	7.20	11.50	10.33	5.50	1.50
	160-180	2.28	Sl.Gr.F.S	--	7.71	2.50	9.72	1.71	0.50
17	0-20	52.41	V.Gr.C.S	0.27	7.80	0.87	8.48	--	--
	20-55	72.69	V.Gr.C.S	0.21	7.71	0.76	12.01	--	--
	55-125	44.34	Gr.C.S	0.20	7.70	0.94	8.53	2.23	1.50
18	0 -12	38.75	Gr.F. S	0.12	7.00	43.00	10.24	7.73	1.50
	12-53	56.58	V.Gr.C.S	0.02	7.52	30.00	14.40	--	1.90
	53-89	25.00	Gr.C. S	0.02	7.50	44.50	12.73	0.43	1.50
	89-123	21.73	Gr.C.S	0.02	7.70	101.00	9.12	--	2.55
	123-175	9.52	Sl.Gr.C. S	--	7.15	13.00	8.17	--	1.80

F.S : Fine sand , M.S : Medium sand , C.S: Coarse sand , Sl.Gr.F. S: Slightly gravelly fine sand, Gr.C. S: Gravelly coarse sand, V.Gr.C.S: Very Gravelly Coarse sand, Gr.C. to M.S: Gravelly coarse to medium sand, O.M: Organic matter

Table 2. Some physical and chemical properties of eroded Nubian old surfaces (Peneplain) soils.

Profile No.	Depth (cm)	Physical analyses			Chemical analyses				
		Gravel (%)	Textural Class	O.M (%)	pH	EC_e (dSm^{-1})	ESP (%)	$CaCO_3$ (%)	Gypsum (%)
2	0-8	30.55	Gr.F.S	0.14	7.51	2.63	12.41	14.44	0.10
	8-25	66.22	V.Gr.F. S	0.10	7.42	12.49	11.23	7.73	0.22

Gr.F. S: gravelly fine sand, V.Gr.F. S: very gravelly fine sand, O.M : Organic matter.

in the first layer of soil profiles Nos. 8 and 19.

- Soils are non-gypsiric to slightly gypsiric, where their gypsum content ranges from trace to 2.50 %. Highest contents were mostly detected in soil profiles Nos.3, 8 and 19, and absent in soil profile No. 20.
- pH values range between 7.20 and 8.25.
- ESP values range between 9.92 and 14.77 %.
- The soils are slightly to extremely salty as indicated from (EC_e) values vary widely from 0.47 to 36.40 dS/m. The highest values were mostly detected in soil profiles Nos. 3 and 19.
- Organic matter content is very low, not exceeding 0.21 %.

The analytical data of the studied soil profiles are presented in Table3.

Soils of Colluvial Plain

This unit occupies an area of about 120,120 feddan. It is represented by soil profiles Nos. 4, 5, 7, 10 and 11. Their analytical data can be summarized as follows:

Physical properties

- Soil texture is fine to medium sand.
- Gravels content throughout the entire depths of soil profiles ranges from trace to 26.59 %, while being absent in the first

layer of soil profile No. 7 and in the third layer of soil profiles Nos. 10 and 11.

- Soils are moderately deep (50-100 cm) except soil profile No. 5 is shallow (30-50 cm).

Chemical properties

- Soils are moderately calcareous to strongly calcareous, where calcium carbonates content varies from 5.15 to 14.30 %. Highest contents were mostly detected in soil profiles Nos.5, and 7.
- Soils are non-gypsiric to slightly gypsiric, where their gypsum content ranges from trace to 2.60%. The highest contents were mostly detected in soil profile No. 5.
- pH values range between 7.38 and 8.40.
- ESP values range between 9.88 and 15.69%.
- The soils are not salty to moderately salty as EC_e values range from 0.25 to 3.38 dS/m. all soil profiles are not salty, expect the subsurface layers of profile No. 5 which are moderately salty.
- Organic matter content (O.M) is very low, not exceeding 0.26 %.

Analytical data of these studied soil profiles are given in Table 4.

Soils of Wadi El-Rimidin

This unit occupies an area of about 9,861 feddan, it is represented by soil profiles Nos. 6 and 9. Their analytical data can be summarized as follows:

Physical properties

- Soil texture is medium sand, except the surface layer of soil profile No. 9 which has a fine sand texture.
- Gravels content through the entire depth of soil profile ranges from nil to 55.55 %.
- Soils of this unit are shallow (<50 cm) to deep (100-150 cm).

Chemical properties

- Soils are moderately calcareous to strongly calcareous, where calcium carbonate content varies from 5.84 to 14.31%.
- Soils are non-gypsiric to slightly gypsiric, where their gypsum content ranges from not detectable to 0.40%.
- Soils are moderately alkaline as pH values range between 7.97 and 8.41.
- Organic matter content (O.M) is very low, not exceeding 0.19 %.

Table 5 represents the analytical data of studied soil profiles of Wadi El-Rimidin.

Soil Classification of the Studied Area

Soil taxonomy deals with relationship among soils and between soils and the factors that are responsible for their character, Soil Survey Staff, USDA (2006). Therefore, soils are classified by common properties for the purposes of systematizing knowledge about them and determining the processes that control similarity within group and dissimilarities among groups, Birkeland (1974).

According to Soil Taxonomy, Soil Survey Staff, USDA (2006), classification of soil profiles under consideration is done on the bases of field observations, descriptions and measurable lab characteristics.

Based on the recognized soil characteristics and their environment, it was found that:

-The prevailing climatic condition defines soil moisture and temperature regimes as *torric* and *hyperthermic* respectively.

- Presence of some pedological features in primary stage.
- Presence or absence of diagnostic horizons.

-Texture and gravel content of surface and subsurface layers differ widely with location.

- Most soils were deep to very deep, some were moderately deep and few were shallow to very shallow.

Consequently, soils of the studied area could be categorized under two orders namely; *Entisols* and *Aridisols*.

Soils belonging to the order of *Entisols* are mineral soils that have no evidence of soil profile development and consequently, no diagnostic horizons were recognized. As the studied soils are sandy within a depth of 100 cm from the surface and have less than 35 % gravels content within soil profiles, they could be classified as suborder *Psamments* , while soils that have 35% or more gravels (by volume) in some horizons within a depth of one meter, were classified as suborder *Orthents*.

Soils of suborders *Psamments* and *Orthents* which have a *torric* moisture regime fall under the great groups of *Torripsamments* and *Torriorthents*, respectively.

Table 3.Some physical and chemical properties of pavement plain soils.

Profile No.	Depth (Cm)	Physical analyses			Chemical analyses				
		Gravel (%)	Textural Class	O.M (%)	pH	EC_e (dSm^{-1})	ESP %	$CaCO_3$ %	Gypsum %
3	0-10	7.77	Sl.Gr.F.S	0.16	7.78	1.84	12.61	16.67	--
	10-27	65.44	V.Gr.F.S	0.13	7.55	10.88	11.07	15.91	1.58
	27-42	54.62	V.Gr.F.S	0.11	7.48	36.40	14.77	22.77	2.50
	42-74	5.15	Sl.Gr.F.S	0.11	7.20	25.50	11.40	28.35	1.50
8	0-9	3.36	Sl.Gr.F.S	0.13	8.00	1.42	14.02	19.77	--
	9-28	2.39	Sl.Gr.F.S	0.09	8.01	1.33	13.73	17.19	--
	28-47	0.63	F.S	0.05	7.66	8.20	10.78	10.31	1.20
	47-83	0.71	F.S	0.04	7.44	7.26	13.04	18.91	1.00
12	0-20	20.35	Gr.F.S	0.21	7.90	0.97	9.92	12.72	--
	20-38	--	F.S	0.21	8.25	0.67	13.32	9.45	--
	38-42	36.36	Gr.F.S	0.10	7.30	0.47	12.92	6.87	1.20
19	0-15	--	F.S	0.12	7.72	9.50	13.48	21.49	1.40
	15-44	10.71	Sl.Gr.F.S	0.03	7.58	4.30	13.96	8.59	1.50
	44-74	50.00	Gr.C.S	--	7.53	8.40	11.69	15.75	1.00
	74-94	36.36	Gr.C.S	--	7.46	8.80	12.14	2.85	1.20
	94-198	16.00	Gr.C.S	--	7.72	5.30	12.83	4.12	1.00
20	0-12	17.94	Gr.C.S	0.10	7.22	2.50	11.67	2.24	--
	12-35	27.02	Gr.C.S	--	7.33	1.40	12.10	4.29	--
	35-54	53.46	V.Gr.C.S	--	7.60	1.20	10.63	4.12	--
	54-85	33.33	Gr.C.S	--	7.90	1.90	11.41	5.15	--

F.S : Fine sand , Sl.Gr.F. S: Slightly gravelly fine sand, Gr.C. S: Gravelly coarse sand, V.Gr.F. S: very gravelly fine sand, V.Gr.C.S: Very Gravelly Coarse sand, O.M : Organic matter.

Table 4. Some physical and chemical properties of colluvial plain soils

Profile No.	Depth (cm)	Physical analyses			Chemical analyses				
		Gravel (%)	Textural Class	O.M (%)	pH	EC_e (dSm^{-1})	ESP %	$CaCO_3$ %	Gypsum %
4	0-10	4.07	Sl.Gr.F.S	0.16	7.95	1.17	14.48	8.76	1.30
	10-27	1.66	F.S	0.11	8.07	1.27	14.68	8.76	--
	27-65	3.48	Sl.Gr.F.S	0.12	7.97	2.57	12.61	9.45	--
	65-90	1.98	F.S	0.14	7.97	1.90	12.15	9.28	1.30
5	0-8	19.12	Gr.F.S	0.25	8.02	1.17	14.57	13.58	2.60
	8-24	1.84	M.S	0.20	7.63	3.38	13.57	6.11	1.50
	24-46	1.04	M.S	0.10	8.28	3.33	15.69	11.17	1.00
7	0-10	--	F.S	0.12	7.98	0.78	13.04	9.45	--
	10-27	26.59	Gr.F.S	0.10	8.25	0.46	13.91	14.05	--
	27-52	19.55	Gr.F.S	0.10	7.48	0.46	11.03	8.25	0.89
	52-75	25.45	Gr.F.S	0.10	7.38	0.55	11.69	14.30	0.60
10	0-27	1.40	F.S	0.23	7.96	0.72	9.88	7.73	--
	27-57	1.16	F.S	0.10	8.08	0.74	12.77	7.73	--
	57-85	--	F.S	0.02	8.21	0.44	14.02	11.17	--
11	0-17	5.26	Sl.Gr.M.S	0.26	7.81	0.70	12.89	6.70	--
	17-43	23.80	Gr.M.S	0.20	7.81	0.73	12.94	5.15	--
	43-61	--	F.to M.S	0.19	8.40	0.25	14.43	6.87	--

F.S : Fine sand , M.S : Medium sand , F. to M.S: fine to medium sand, Sl.Gr.F.S: Slightly gravelly fine sand, Sl.Gr.M.S: Slightly gravelly medium sand, Gr.M.S: gravelly medium sand, Gr.F. S: gravelly fine sand , O.M: Organic matter.

Further, as soils of *Torripsamments* and *Torriorthents* have no *lithic* or *paralithic* contact within 50cm of the soil surface, they could be placed under the subgroups *Typic Torripsamments* and *Typic Torriorthents*, respectively.

Soils of subgroup *Typic Torripsamments* presented by:

- Soil profiles Nos. 13, 14, 15 &16 for the Nile terraces soils,
- Soil profile No. 20 for the pavement plain soils and representing bajada plain soils.
- Soil profiles Nos. 4, 7, 10 & 11 for the colluvial plain soils.
- Soil profile No. 6 for Wadi El-Rimidin soils.

Meanwhile, soils of subgroup *Typic Torriorthents* presented by:

- Soil profiles Nos. 1 &17 for the Nile terraces soils.

As some soils of *Torripsamments* and *Torriorthents* have a *lithic* contact within 50cm of the soil surface, they are placed under the subgroup *Lithic Torripsamments*, soil profile No. 12 for the pavement plain soils and soil profile No. 5 for the colluvial plain soils and soil profile No. 9 for Wadi El-Rimidin soils, while *Lithic Torriorthents*, soil profile No. 2 for the eroded Nubian old surface (peneplain) soils.

Soils belonging to the order *Aridisols* are characterized by the presence of a *calcic* or a *salic* subsurface diagnostic horizon. Therefore, the soils which have a calcic horizon are classified as *Typic Haplocalcids* at the subgroup level (soil profiles Nos. 3, 8 & 19 representing some of the pavement plain soils), while soils which have a salic horizon are classified as *Typic Haplosalids* at the subgroup level (soil profile No. 18 representing some of the Nile terraces soils).

Regarding to mineralogy of sand fraction reveals that the light minerals fraction is generally dominated by quartz (95.12- 98.94 %) with less pronounced amounts of feldspars (orthoclase and plagioclase).

On basis of the particle size class within the profile control section, mineralogy, soil temperature regime, soils belonging to the former taxonomic units could be differentiated into families, Table (6).

Map (2) shows the classification at the subgroup level.

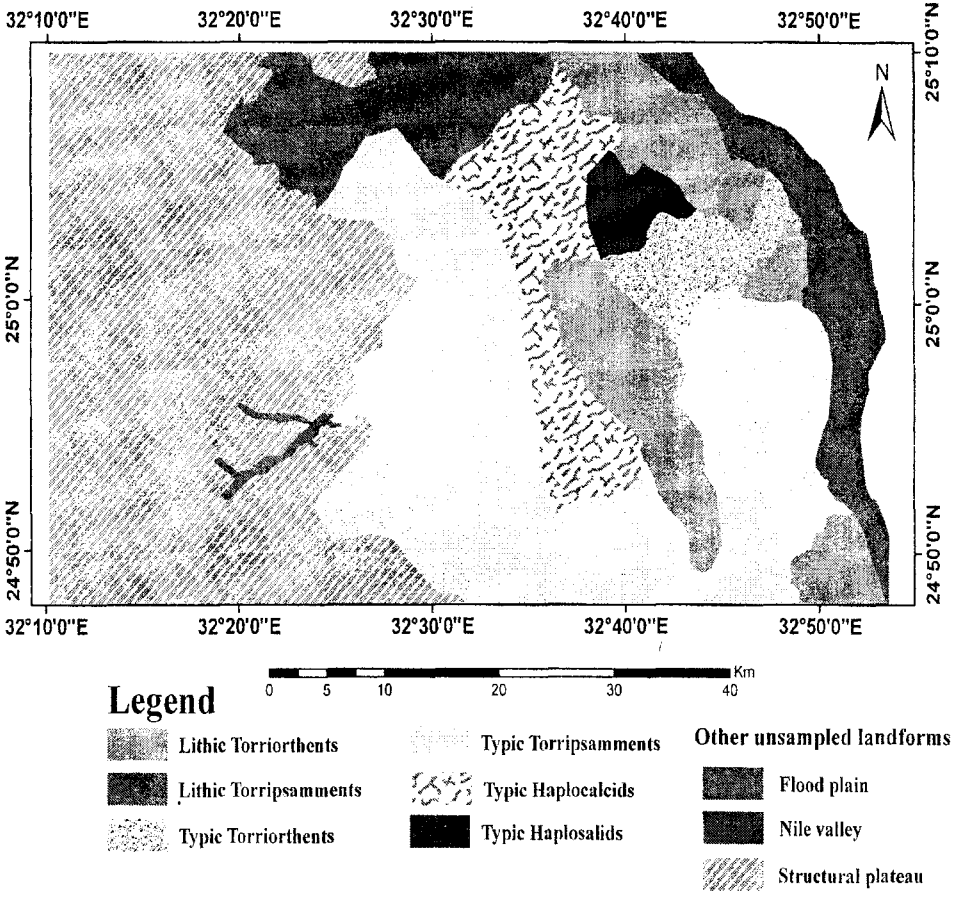
Table 5. Some physical and chemical properties of Wadi El-Rimidin soils

Profile No.	Depth (cm)	Physical analyses			Chemical analyses				
		Gravel (%)	Textural Class	O.M (%)	pH	EC_e (dSm^{-1})	ESP %	$CaCO_3$ %	Gypsum %
6 Down stream	0-8	19.90	Gr.M.S	0.15	8.00	1.79	14.53	13.33	0.10
	8-29	10.20	Sl.Gr.M.S	0.10	8.22	1.03	14.63	6.87	--
	29-63	22.55	Gr.M.S	0.09	8.05	2.22	15.22	9.45	0.40
	63-118	1.42	M.S	0.03	7.97	2.14	12.60	5.84	--
	118-150	--	M.S	0.05	8.40	1.11	14.57	6.01	--
9 Upper stream	0-20	18.18	Gr.F.S	0.19	8.41	0.59	15.30	14.31	--
	20-35	20.00	Gr.M.S	0.10	8.29	0.65	13.08	9.45	--
	35-48	55.55	V.Gr.M.S	0.09	8.38	0.79	12.94	12.85	--

M.S : Medium sand , Sl.Gr.M.S: Slightly gravelly medium sand, Gr.F. S: Gravelly fine sand, V.Gr.M.S: Very Gravelly Medium sand, Gr.M.S: Gravelly Medium sand, O.M: Organic matter.

Table 6. Soil classification of the studied soil profiles into the family level.

Geomorphic unit	Profile No.	Order	Subgroup	Family
• Nile terraces	1& 17	*Entisols*	*Typic Torriorthents*	*Sandy skeletal, siliceous, hyperthermic.*
	13, 14, 15 & 16	*Entisols*	*Typic Torripsamments*	*Siliceous, hyperthermic.*
	18	*Aridisols*	*Typic Haplosalids*	*Sandy, siliceous, hyperthermic.*
• Eroded Nubian old surfaces (Peneplain)	2	*Entisols*	*Lithic Torriorthents:*	*Shallow, hyperthermic.*
• Bajada plain:				
1-Pavement plain	3, 8 &19	*Aridisols*	*Typic Haplocalcids*	*Sandy, mixed (calcareous), hyperthermic.*
	12	*Entisols*	*Lithic Torripsamments*	*Siliceous, hyperthermic.*
	20	*Entisols*	*Typic Torripsamments:*	*Siliceous, hyperthermic.*
2-Colluvial plain	4, 7,10 & 11	*Entisols*	*Typic Torripsamments*	*Siliceous, hyperthermic.*
	5	*Entisols*	*Lithic Torripsamments:*	*Siliceous, hyperthermic.*
• Wadi El-Rimidin	6	*Entisols*	*Typic Torripsamments*	*Siliceous, hyperthermic.*
	9	*Entisols*	*Lithic Torripsamments:*	*Siliceous, hyperthermic.*



Map 2. Soil classification for soils of Wadi El-Saieda area at the subgroup level.

REFERENCES

Birkeland, W.P. 1974. Pedology, Weathering, and Geomorphology Research. Dept. of Geological Sci. Colorado, Univ. Boulder, Colorado.

Brewer, C. A. 1964. Fabric and Mineral Analysis of Soils. John Wiley & Sons Inc., New York, London, Sydney.

Central Laboratory for Agricultural Climate, CLAC. 2008. Agricultural Research Center, Ministry of Agriculture, Giza, Egypt.

Emberger's, L. 1955. Afrique due Nord-Desert Ecologic Vegetate Compte de Recherches. Plant Ecology, Review of Research, Paris, UNESCO.

FAO. 2006. Guidelines for Soil Profile Description, FAO, Isric, Publication, Rome, Italy

Jackson, M. L. 1973. "Soil Chemical Analysis" Prentice Hall, TAC-Englewood Cliffs, N. J., U.S.A.

Jackson. M.L. 1975. Soil Chemical Analysis – Advanced Course. Puble. by the Author, Soil Sci. Dept., Mad., Wisc., U.S.A..

Lillesand, T.M. and Kiefer, R.W. 1979. Remote Sensing Image Interpretation. New York, John Willey, P. 612.

Piper, C.S. 1950. Soil and Plant Analysis. Inter. Sci. Pupl. Inc. New York, U.S.A.

Richards, L.A. 1954. Diagnosis and Improvement of Saline and Alkali Soils. U.S.D.A. Hand book, No. 60, Washington, C. D., U.S.A.

Soil Survey Staff, USDA. 2006. Soil Taxonomy. A basis system of soil classification for moving and interpreting soil surveys (Tenth edition), U.S. Department of Agriculture, Natural Resources Conservation Service, U.S.D.A. Agriculture handbook No. 436.

UNDP/ UNESCO/ NARSS/ EGSMA. 2002. Joint Project for Capacity Building of the Egyptian Geological Survey & Mining Authority and For the Sustainable Development of the South Valley and Sinai, Egy/97/011.

USAID 1978. Geological map of the Aswan quadrangle, Ministry of Industry and Mineral Resources the Egyptian Geological Survey and Mining Authority, Egypt.

Wentworth, C.K. 1922. A Scale of Grade and Class Terms for Clastic Sediments. Jour. Geol., 30, P. P. 377 -392.

تقسيم أراضى منطقة وادى الصعايده – محافظة أسوان – مصر

عادل عبد الحميد علوان [١] – السيد عوض محمد عوض [٢] –

صلاح محمود دحدوح [٢] – محمد كامل عبدالعاطى عبد السميع [١]

١– مركز بحوث الصحراء – وزارة الزراعة – مصر.

٢– قسم علوم الأراضى – كلية الزراعة – جامعة الزقازيق.

يهدف البحث إلي دراسة الخواص الطبيعية والكيميائية لأراضي منطقة وادي الصعايدة بمحافظة أسوان ومن ثم تقسيم تلك الأراضى طبقا للتقسيم الأمريكى الحديث (٢٠٠٦).

تقع منطقةالدراسه بين دائرتي عرض ٢٤ ٠٥٠ ٠٠ " و ٢٥ ٠٥٢ ٠٠ " شمالا وخطي طول ٣٢ ٥ ١٠ ٠٠ " و ٣٢ ٥ ٥٥ ١ ٠٠ " شرقا وتبلغ مساحة هذة المنطقه حوالى ٤٥٠٠٠٠ فدان . كما تبلغ المساحة الممثلة بالقطاعات الأرضية ما يقرب من ٣٦٩١٥٢ فدان.

ومن خلال الاستعانة بصورة الأقمار الصناعية المستخدمة من نوعية اللاندسات الأمريكى +ETM تم إعداد خريطة الأشكال الأرضية (جيومورفولوجية) لمنطقة الدراسة والتى على أساسها تم تمييز منطقة الدراسة وتحديد وحداتها الجيومورفولوجية التالية :

المصاطب النيلية، والسطوح القديمة المعرضة للتعرية، وسهل البهادا الذى تميز إلى (سهل الأراضى المرصوفة والسهل التجانبى)، ووادى الرمدين. ولقد تم تمثيل هذه الوحدات بعدد ٢٠ قطاع أرضى مثلت بعدد ٧٦ عينه لإجراء التحليلات الطبيعيه والكيميائية. ويمكن تلخيص أهم النتائج المتحصل عليها كالآتى:

أولا: الصفات الطبيعيه للتربه

ساد قوام التربة الرملى كافة القطاعات المدروسة حيث تراوح ما بين القوام الرملى الخشن والقوام الرملى الناعم. كما تراوح محتوى الحصى فى التربه ما بين عديم إلى ٧٢,٦٩% فى كافة أراضي منطقة الدراسه، ووجد أن معظم القطاعات الأرضيه المدروسه

عميقه إلى عميقه جدا كما فى أراضى المصاطب النيليه بينما كانت متوسطة إلـى ضـحله العمق فى سهول البهادا وتميزت قطاعات أراضى السطوح القديمه المعرضه للتعريه بأنهـا ضحله جدا.

ثانيا: الصفات الكيميائيه للتربه

- تباينت ملوحة التربة تباينا واضحا في منطقة الدراسه حيـث تراوحـت قـيم التوصـيل الكهربى لعجينة التربه المشبعة ما بين عديمة الملوحة Non saline إلى شديدة الملوحه Extremely saline في أراضى منطقة الدراسه حيث سجلت القيم العاليه فى أراضـي Nile terraces & pavement plain بينمـا كانـت القـيم المنخفـضه لأراضـي colluvial plain & Wadi El-Rimidin ويرجع ذلك إلي غسيل الأملاح من تلـك الأراضى وترسيبها في أراضي Nile terraces. بينما تراوحت قيم تفاعل التربة ما بين ٦,٨٩ إلي ٨,٤٨ ، كما تراوحت قيم ESP من ٨,١٧ إلـى ١٥,٦٩ % فـى أراضـى منطقة الدراسة.

- ولقد تباين محتوي الأراضى من كربونـات الكالـسيوم مـن Non-calcareous إلـى Extremely calcareous حيث سجلت القيم العاليه فى أراضـي Bajada plains & Wadi El-Rimidin & peneplain القريبه من الهضبه الجيريه ، بينمـا كانـت القيم المنخفضه لأراضى Nile terraces الرسوبيه.

- إنخفاض نسبة الجبس حيث تراوحت نسبته ما بين عديمة إلي متوسـطة فـى أراضـى منطقة الدراسة.

وبتطبيق النظام الأمريكى الحديث فى تقسيم الأراضى وجد أن أراضى منطقة الدراسـة تتبع رتبتين هما رتبة الأراضى الحديثه *Entisols* ورتبة الأراضـى الجافـه *Aridisols* حيث تم تقسيم القطاعات الأرضية إلى ست تحت مجموعات وهى كالتالى:

- *Typic Torriorthents, Typic Torripsamments, Lithic Torriorthents* and *Lithic Torripsamments.*
- *Typic Haplosalids, Typic Haplocalcids.*

كما امكن تتبع التقسيم حتى مستوى العائلات.