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Study on physiographic features and soil taxa, west of Asyut governorate, Egypt.

Ashraf A. Mohamed, Fayez M. Fahme and Nasef M.K.
Soils, Water and Environment Research Institute (SWERI), ARC.

Abstract

The study area is located west of Asyut Governorate within the coordinates of 30^o 14' 40" & 30^o 56' 00" east and 27^o 12' 50" & 27^o 41' 00" North. The main targets of this study are to establish physiographic soil map by using the visual interpretation approach of Landsat satellite data for the studied area. The physiographic units are (1) **Delta Apex of paleodrainage delta.** The soil taxonomic units are *Typic Haplocalcids; sandy skeletal; mixed; hyperthermic* & *Typic Calcigypsids; sandy skeletal; mixed; hyperthermic*, (2) **Alluvial Terraces** include soil taxonomic units of *Lithic Haplocalcids; sandy skeletal; hyperthermic* & *Typic Haplocalcids; coarse loamy; mixed; hyperthermic*, (3) **Wadi** include soil taxonomic units of *Typic Torriotthents; sandy skeletal; mixed; hyperthermic* and (4) **Aeolian deposits** include soil taxonomic units of *Typic Torripsamments; mixed; hyperthermic*. The land suitability was done for 26 crops and showed suitability in soils of the delta apex of paleodrainage delta and wadi with sesame and water melon. Soils of the Aeolian Deposits and Alluvial Terraces can be cultivated with most of the studied crops.

Keywords: west of Asyut, physiographic units, Remote Sensing, Land suitability.

Introduction

Maintaining hospitable social life for every one in Egypt is one of the most important duties of the government. Increasing populations is one of the greatest problems in Egypt and for the government's plans, where about 90 million are living on about 4% of the total land. Reclamation of the promising west desert land adjacent to the old agricultural land would be among the most suitable solutions for overcoming such a problem.

The Nubian sandstone aquifer represents the main and productive aquifer in the Western Desert and extends to great depths reaching more than 1000m in some localities where groundwater exists under high artesian conditions. The uppermost layer represents a free aquifer with shallow depth to water (Abdel Aziz, et al, 2004).

Rashed et. al. (2006) mentioned that, Remote Sensing (RS) acquires data about an object by a sensor that is far from the object using satellite platforms. Image is a digital array of elements in which each element corresponds to the reflected or omitted energy from Earth's surface. On the other hand, Geographic Information System (GIS) is a computer-based system used to store, manipulate and display large amounts of data that have been encoded in digital forms. It constructs a number of data bases and combine them rapidly in a multitude of combinations to answer the kind of questions. GIS provides tools for guidance and aiding users through an extensive process of management, planning, development, monitoring, controlling and decisions making. From field investigations and the analysis of satellite image with help of GIS, it is possible to produce relatively inexpensive, fast and accurate maps useful in planning, management and development.

The identification of land resources of Egypt for the agricultural development justifies the importance of producing a collective physiographic soil map of Egypt for building up database of land information system. This system is based on application of reliable remote sensing data as well as using global modern systems for assessment of land unit features and soil attributes. This realizes the purpose of managing natural resources, and monitoring environmental changes (Afify et al, 2010).

Materials and methods

The study area:

The study area is located in Upper Egypt to the west of desert land, adjacent to the old agricultural land, located at about 290 km south of Cairo, between about 45 km south of Minya and 30 km north of Asyut. The projected of coordinated location of the study area is between 30^o 14' 40" & 30^o 56' 00" East and 27^o 12' 50" & 27^o 41' 00" North. The physiographic units under study covered about 357,525 feddans, (Map 1).

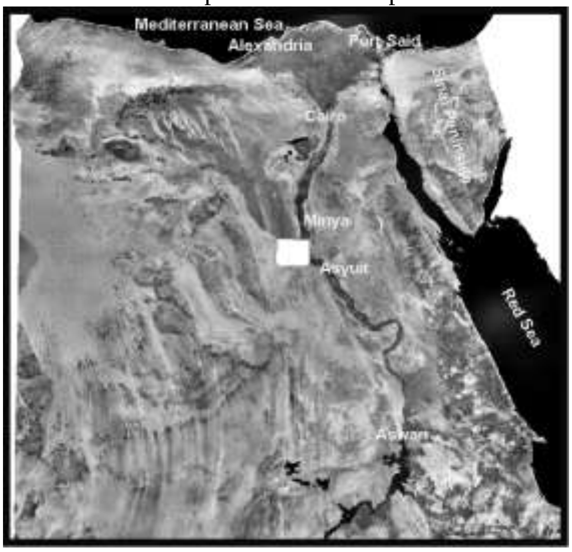
Remote sensing data processing:

The physiographic units of the study area were based on visual interpretation of Landsat 7 image for year 2000, bands: 2 (green), 3 (red) and 4 (near infrared). The projection of the image was corrected to Egyptian Transverse Mercator (ETM) using ERDAS Imagine.

The interpretation and delineation of this landscape as physiographic units were applied according to the physiographic approach as proposed by Zinck and Valenzuela (1990) using ArcGIS.

Validation and refinement of physiographic map were done during the ground truth to adjust the boundaries between the physiographic units. Twelve soil profiles were dug and described to the depth of 150 cm or to the lithic contact in representative different physiographic units, according to USDA (2003).

Map 1: Location Map.



Laboratory analyses:

Particle size distribution was carried out by the pipette method (Piper, 1950).

Determination of $CaCO_3$ content was done by using the calcimeter according to Black et al. (1965).

Soil pH was measured in saturated soil paste and Electrical Conductivity (EC) was measured in the soil paste extract by using conductivity bridge (USDA 1954).

Soluble cations and anions in the saturated soil extract were determined according to Jackson (1967) as follows; Ca^{++} and Mg^{++} by titration using versenate method, Na^{+} and K^{+} by flame photometers, Cl^{-} by the silver nitrate method, HCO_3^{-} by titration against HCl acid, and $SO_4^{=}$ by balanced deference. Gypsum was determined by the acetone method according to Bower and Huss (1948). Organic matter was determined using the modified Walkley and Black method (Jackson, 1967).

Exchangeable sodium percent (ESP) was calculated from the sodium adsorption ratio (SAR) of saturation extract of soil (USDA, 1954). Soil Taxonomy was performed according to Soil Taxonomy system of the USDA (2010).

Results and discussion

Based on the physiographic features and the laboratory analyses, the soils of the study area were classified according to Soil Taxonomy system within the physiographic units as:

Physiographic and Taxonomic Units:

Physiographic units were divided into four units using the visual interpretation of remote sensing data and GIS techniques. The rock structures in these units were excluded from the study area laying to the far west, or some parts inside the studied area. The moisture regime of the soils in the study area is *aridic* or *torric* and the temperature regime is *hyperthermic*. Soil characteristics were classified into two orders i.e. *Aridisols* and *Entisols*.

The delineated physiographic units are described in Map 2, while soil taxa are included in Tables 1, 2 and 3. These physiographic units are described as follows:

Table 1. Soil taxonomy and physiographic units of the studied area.

Physiographic Unit	Symbol	Profile No.	Taxonomy
Delta Apex of paleodrainage delta (undulating, developed sediments) *According to Afify (2009)*	DA	6	Typic Haplocalcids, sandy skeletal, mixed, hyperthermic.
		7	
		8	Typic Calcigypsids, sandy skeletal, mixed, hyperthermic.
Alluvial Terraces (Rilled to gullied, channeled)	AT	3	Lithic Haplocalcids, sandy skeletal, hyperthermic.
		4	Typic Haplocalcids, coarse loamy, mixed, hyperthermic.
		10	
Wadi	W	9	Typic Torriotthents, sandy skeletal, mixed, hyperthermic.
Aeolian Deposits (dominantly cultivated)	AD	1	Typic Torripsamments, mixed, hyperthermic.
		2	
		5	

Map 2: Physiographic Map of the studied area.

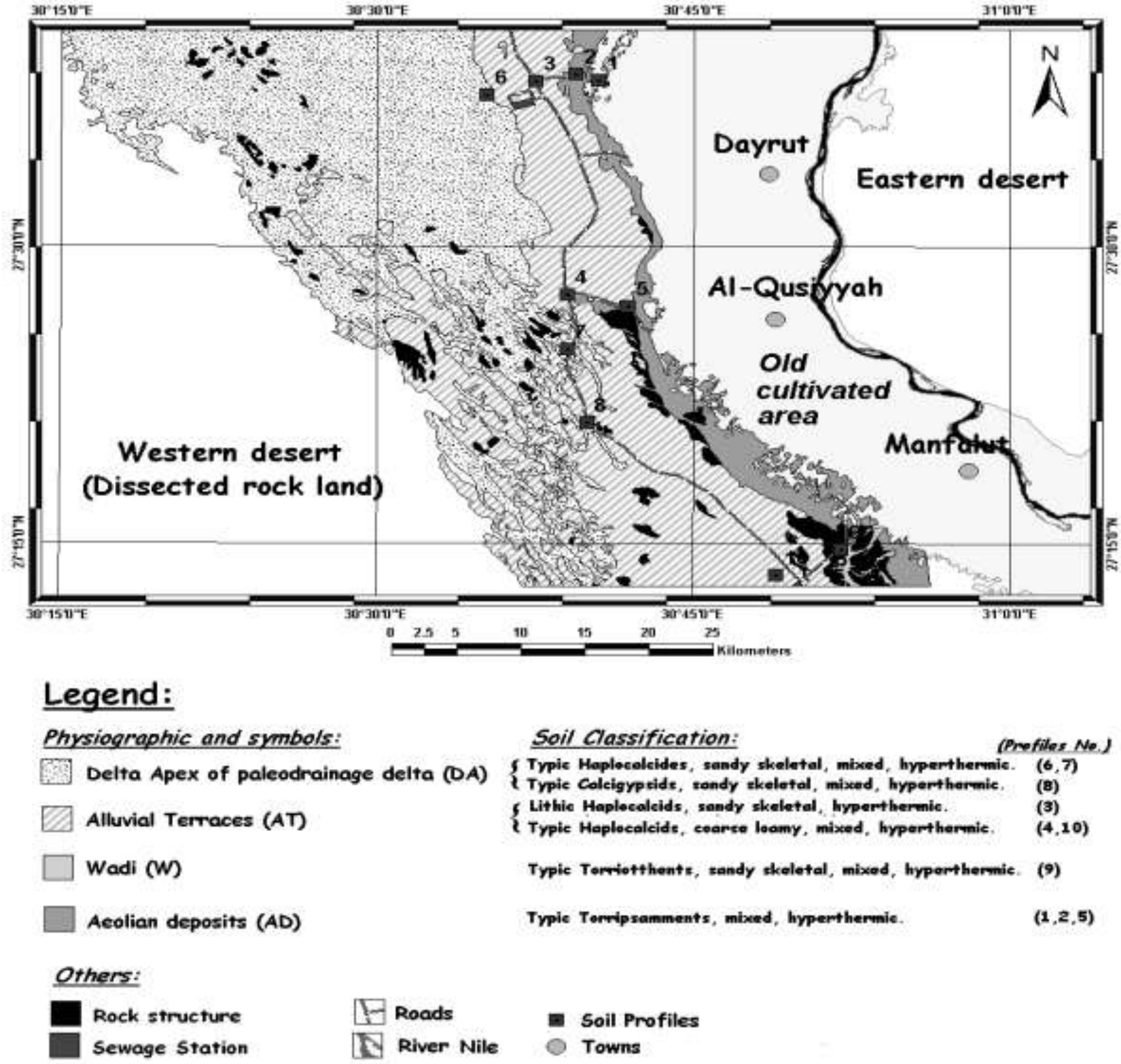


Table 2. Particle size distribution, $CaCO_3$ and gypsum contents of the studied soil profiles.

Physiographic Unit and symbol	Profile No.	Depth (cm)	Particle size distribution %				Modified textural class	$CaCO_3$ %	$CaSO_4.2H_2O$%
			C. sand	F. sand	Silt	Clay			
Delta Apex of paleodrainage delta (undulating, developed sediments) DA	6	0-20	7.13	83.72	1.85	7.30	SGS	12.1	0.31
		20-60	5.62	83.78	3.60	7.00	VGLS	13.1	0.23
		60-150	10.13	76.84	4.13	8.90	VGLS	14.5	0.54
	7	0-20	6.70	80.70	1.75	10.85	SGLS	20.4	0.49
		20-70	7.59	75.81	6.70	9.90	VGLS	25.5	0.35
		70-150	5.85	74.40	8.32	11.43	VGSL	29.9	1.20
	8	0-30	15.58	69.13	2.55	12.74	SGLS	17.0	12.60
		30-80	14.58	70.04	7.48	7.90	VGLS	13.6	11.20
		80-150	18.15	68.34	2.08	11.43	VGLS	12.8	15.00
Alluvial Terraces (Rilled to gullied, channeled) AT	3	0-20	14.72	69.78	6.15	9.35	VGLS	34.9	0.07
	4	0-30	2.80	71.07	13.88	12.25	SGSL	15.4	0.60
		30-80	7.27	68.13	16.02	8.58	SGSL	17.3	0.19
		80-150	4.26	52.84	22.72	20.18	SGSCL	22.2	0.11

	10	0-40	7.86	72.21	3.40	16.53	SGSL	18.1	0.83
		40-70	8.88	65.54	15.78	9.80	SGSL	23.1	0.53
		70-150	17.29	53.80	9.23	19.68	VGSL	39.2	0.61
Wadi W	9	0-30	8.80	76.39	5.08	9.73	SGLS	17.0	0.58
		30-80	19.07	68.90	3.03	9.00	VGLS	19.6	0.37
		80-150	16.10	72.45	1.70	9.75	VGLS	12.8	0.40
Aeolian Deposits (dominantly cultivated) AD	1	0-50	17.03	74.64	3.13	5.20	S	8.7	0.37
		50-100	20.01	73.96	1.13	4.90	S	7.8	0.36
		100-150	17.48	73.19	1.13	8.20	S	13.0	0.35
	2	0-35	5.17	46.38	10.50	37.95	SC	13.6	0.57
		35-80	14.34	75.06	1.25	9.35	LS	11.1	0.66
		80-150	21.45	67.75	1.00	9.80	LS	11.9	0.51
	5	0-50	1.90	91.10	1.17	5.83	S	13.9	0.34
		50-100	3.60	90.07	0.45	5.88	S	14.5	0.47
		100-150	4.67	85.10	2.00	8.23	S	13.6	0.33

S: sand, LS: loamy sand, SC: sandy clay, SL: sandy loam, SCL: sandy clay loam,
VG: very gravelly, SG: Slightly gravelly

Table 3. Some chemical analysis of soil paste extract for the studied soil profiles.

Physiographic unit symbol	Profile No.	Depth (cm)	pH (soil paste)	EC (dS/m)	SP	SAR	ESP	O.M	Soluble cations (mmol$_c$ L^{-1})				Soluble anions (mmol$_c$ L^{-1})		
									Ca^{++}	Mg^{++}	Na^{+}	K^{+}	HCO_3^-	Cl^-	SO_4^{--}
	6	0-20	8.16	2.30	21	3.21	3.36	0.38	9.22	5.54	8.72	1.14	3.0	13.0	8.62
		20-60	8.11	6.50	21	21.03	22.94	0.24	9.22	2.54	51.00	3.39	3.0	43.0	20.15
		60-150	7.73	22.00	24	15.89	18.16	0.19	159.90	65.70	168.80	6.15	2.5	236.0	162.05
	7	0-20	8.10	1.40	21	2.82	2.82	0.32	5.64	2.22	5.60	0.80	6.5	2.5	5.26
DA		20-70	7.89	11.50	21	20.41	22.39	0.27	31.78	4.97	87.50	3.08	3.0	67.0	57.33
		70-150	7.94	18.40	21	36.89	34.71	0.23	29.73	17.88	180.00	2.75	2.5	194.0	33.86
	8	0-30	7.87	17.00	20	20.34	22.32	0.32	29.73	33.00	113.90	5.70	2.5	136.0	43.83
		30-80	8.04	16.50	21	19.25	21.34	0.23	61.50	5.14	111.1	5.00	2.0	124.0	56.74
		80-150	7.86	18.00	21	21.16	23.04	0.12	61.50	22.98	137.50	2.95	2.0	182.0	40.93
	3	0-20	7.80	9.20	23	10.56	12.52	0.23	42.03	7.95	52.77	5.00	2.0	53.0	52.75
	4	0-30	7.88	33.00	31	46.58	40.28	0.46	72.85	5.65	291.80	6.75	2.5	320.0	54.55
		30-80	7.52	22.20	28	5.79	6.79	0.32	174.30	58.50	62.50	4.50	2.0	37.5	260.30
AT		80-150	7.99	15.00	25	29.18	29.47	0.32	34.85	4.35	129.20	1.15	2.0	87.0	80.55
	10	0-40	7.52	33.00	25	22.45	24.16	0.48	129.20	33.53	302.50	5.00	2.0	336.0	132.23
		40-70	7.55	32.00	25	11.93	14.04	0.46	198.90	20.67	225.00	2.50	1.5	298.0	147.57
		70-150	7.57	26.00	30	13.43	15.65	0.35	170.20	18.68	130.50	4.25	1.5	90.0	232.13
	9	0-30	7.99	9.00	23	10.65	15.65	0.34	37.93	6.17	50.00	2.00	3.0	45.0	48.10
W		30-80	7.80	4.10	21	4.12	4.60	0.25	24.60	1.86	15.00	2.00	2.5	15.0	25.96
		80-150	7.77	1.40	21	2.28	2.06	0.12	6.13	2.73	4.80	0.71	2.0	7.0	5.37
	1	0-50	7.63	4.00	20	3.93	4.34	0.19	24.60	1.86	14.30	1.40	2.5	16.0	23.66
		50-100	7.74	3.90	20	1.93	1.56	0.13	30.75	4.53	8.10	1.92	2.0	14.0	29.30
		100-150	7.82	4.80	20	2.35	2.16	0.12	38.00	3.16	10.67	2.13	2.0	20.0	31.96
	2	0-35	7.75	1.20	26	1.17	0.47	0.76	6.13	3.73	2.60	0.27	2.5	4.0	6.23
AD		35-80	7.74	0.90	20	1.06	0.31	0.22	4.10	2.27	1.90	1.15	2.5	3.0	3.92
		80-150	8.18	0.65	20	0.89	0.06	0.12	4.10	0.80	1.40	1.00	2.0	2.5	2.80
	5	0-50	8.08	2.30	30	2.89	2.92	0.15	13.33	2.35	8.10	0.45	3.0	10.0	11.23
		50-100	8.04	2.50	26	2.41	2.25	0.08	15.48	2.16	7.17	0.37	2.5	11.0	11.68
		100-150	8.00	2.10	40	1.84	1.44	0.06	14.35	4.27	5.62	0.37	2.0	18.0	4.61

SP: saturation percent (w/w), ESP: exchangeable sodium percent, SAR: Sodium adsorption ratio,
DA: Delta Apex of paleodrainage delta, AT: Alluvial Terraces, W: Wadi, AD: Aeolian Deposits

i. Delta Apex of paleodrainage delta:

This unit was represented by profiles 6, 7 and 8. The top layers of profiles 6 and 7 have EC values less than 4 (salt free) i.e. 2.3 and 1.4 dS/m with SAR values less than 6 (no problem) i.e. 3.21 and 2.82, as well as ESP values less than 10 (alkali free) i.e. 3.36 and 2.82, respectively. The top layer of profile 8 has EC value more than 16 (strongly saline) i.e. 17 dS/m, SAR value more than 9 (severe problem) i.e. 20.34, with ESP value (moderately alkaline) i.e. 22.32. Thus soils of this physiographic unit are suitable for agriculture except for those represented by profile 8 which has high contents of sodium and chloride i.e. 113.9 and 136 $mmol_c\ L^{-1}$, respectively.

This unit was described according to Afify (2009), as gently undulating to undulating delta apex. It was most probably deposited by the paleodrainage from the Eastern Desert through the different rock structures. These drainage channels were partly detected to be buried under the recent alluvium of River Nile. Profle 8 has a gypsic horizon >10 to 15% and calcic horizon >10 to 17% by volume, with more than 35% gravels. This profile is *Typic Calcigypsids, sandy skeletal, mixed, hyperthermic* (dominant soil). Profiles 6 and 7 have more than 35% gravels and have a calcic horizon more than 10 to 29% by volume within the control section. These profiles are *Typic Haplocalcids, sandy skeletal, mixed, hyperthermic*. This physiographic unit covers about 177,378 feddans.

ii. Alluvial Terraces:

The soils of this unit are represented by profiles 3, 4 and 10. They are moderately and strongly saline; their EC values are 9.2, 33 and 33 dS/m respectively and their SAR values are 10.5, 46.58 and 22.45, and ESP are 12.52, 40.28 and 24.1. Thus the soils are highly to severely saline and slightly to strongly sodic.

This unit is between the undulating delta apex by rills and gullies and the aeolian deposits. It is mostly gently undulating. Profiles 4 and 10 are dominated by sandy loam texture which include calcic horizon >15 to 39% by volume within the control section. These soils are *Typic Haplocalcids, coarse loamy, mixed, hyperthermic* (dominant soils). Soil profile 3 is formed over 20 cm a lithic contact on hard rock. The soil includes 60 % gravel, of loamy sand texture and calcic horizon (34.9 % $CaCO_3$). Accordingly, this soil profile is *Lithic Haplocalcids, sandy skeletal, hyperthermic*. This physiographic unit is covers about 148,619 feddans.

iii. Wadi:

This unit was represented by profile 9. The EC was 9 dS/m (moderately saline), with SAR value of 10.65 and ESP value of 15.65 (slightly alkaline). The other two horizons of this profile are non-saline non-sodic.

This physiographic unit is the resultant of dissection action of the surrounding landscape as the interaction of erosional and depositional processes in the fluvial period. This unit was dominated by more than 35% rock fragments by volume, within loamy sand texture. This soil is *Typic Torriotthents, sandy skeletal, mixed, hyperthermic*. This physiographic unit covers about 1,886 feddans.

iv. Aeolian deposits:

This unit includes normal dunes and is represented by profiles 1, 2 and 5 with EC values of 4, 1.2 and 2.3 dS/m (i.e. non saline to slightly saline), and SAR of 3.93, 1.17 and 2.89 (ESP values of 4.34, 0.47 and 2.92, respectively) i.e. non-sodic.

These deposits form local plains which are intersected by longitudinal low dunes (Afify, 2009). This unit lies between the delta apex of paleodrainage delta unit and old cultivated area. Profiles 1 and 5 are dominated by sand. Profile 2 has the same origin but is representing the man made action (reworked and cultivated), being have top layers of sandy clay texture and loamy sand in sub-soil layers. Since the soil control-section is dominated by sands and loamy sands, they would be classified as *Typic Torripsamments, mixed, hyperthermic*. This physiographic unit covers about 29,642 feddans.

Land suitability for specific crops:

In this study, the physiographic soil map was used as a base for the evaluation of land suitability. The approach of land suitability evaluation that was proposed by Sys et al, (1993) was selected for of the study area.

Twenty-six crops were selected to assess their convenience for cultivation in the studied area. The selected crops can be grouped into four categories: field, vegetable, fodder and fruit crops.

Suitability subclasses were studied for each crop, including four limitation levels and corresponding land classes as well as ratings. The landscape and soil conditions used in these study are *topography (t)*; *wetness (w)*; *soil physical conditions (s)* including texture, depth, $CaCO_3$ and gypsum; *salinity and alkalinity (n)* including EC and ESP, and *fertility characteristics (f)* including apparent CEC, base saturation, sum of basic cations, pH, and organic carbon.

Table 4 summarizes the current and potential suitability of soils developed on the different physiographic units for each crop, while Table 5 shows the potential suitability of all crops within each physiographic unit.

The potential land suitability classification based on the suitability of certain physiographic units for specific utilization crops, after executing some major land limitations for the land improvement qualities according to their essentiality in such study area.

Crops are arranged in a descending order of suitability, starting with the crops of high Ci values.

From the economic point of view, and as shown in Table 5, the cultivation of only highly suitable (S1) and moderately suitable (S2) crops is recommended. Therefore, soils of the Delta Apex of paleodrainage delta and Wadi can be cultivated only with sesame and water melon. On the other hand, soils of the Aeolian Deposits can be cultivated with most of the studied suitable crops followed by Alluvial Terraces.

Table 4. Mean values of soil suitability indices (Si) and suitability classes for the studied crops.

Crops	Physiographic unit							
	Delta Apex of paleodrainage delta		Alluvial Terraces		Wadi		Aeolian Deposits	
	CS	PS	CS	PS	CS	PS	CS	PS
Field Crops								
Barley	21.5 (N)	32.7 (S3)	9.7 (N)	45.3 (S3)	30.7 (S3)	41.0 (S3)	45.1 (S3)	53.1 (S2)
Cotton	20.6 (N)	32.9 (S3)	10.4 (N)	57.5 (S2)	25.0 (S3)	37.3 (S3)	44.1 (S3)	63.0 (S2)
Maize	8.2 (N)	37.4 (S3)	5.7 (N)	50.7 (S2)	18.2 (N)	46.9 (S3)	42.3 (S3)	62.6 (S2)
Sesame	14.3 (N)	59.9 (S2)	18.7 (N)	80.5 (S1)	25.8 (S3)	61.2 (S2)	50.7 (S2)	73.3 (S2)
Soya	5.5 (N)	22.8 (N)	3.7 (N)	33.9 (S3)	17.5 (N)	32.5 (S3)	33.3 (S3)	48.2 (S3)
Sugar cane	8.6 (N)	42.0 (S3)	3.2 (N)	55.7 (S2)	23.2 (N)	50.3 (S2)	41.9 (S3)	61.8 (S2)
Sunflower	10.7 (N)	31.8 (S3)	4.8 (N)	43.1 (S3)	19.7 (N)	39.9 (S3)	35.9 (S3)	53.3 (S2)
Wheat	7.1 (N)	32.7 (S3)	8.4 (N)	45.3 (S3)	11.3 (N)	41.0 (S3)	36.3 (S3)	53.1 (S2)
Vegetable Crops								
Cabbage	12.5 (N)	42.7 (S3)	6.7 (N)	59.6 (S2)	20.9 (N)	46.9 (S3)	50.8 (S2)	78.8 (S1)
Carrots	3.9 (N)	21.1 (N)	5.4 (N)	28.6 (S3)	9.7 (N)	31.0 (S3)	27.4 (S3)	50.0 (S2)
Beans	1.2 (N)	24.0 (N)	2.2 (N)	36.4 (S3)	3.1 (N)	34.5 (S3)	20.4 (N)	51.9 (S2)
Cowpea	5.6 (N)	37.4 (S3)	6.3 (N)	56.6 (S2)	15.1 (N)	46.9 (S3)	41.0 (S3)	62.6 (S2)
Green pepper	3.3 (N)	20.6 (N)	3.1 (N)	28.6 (S3)	9.5 (N)	29.4 (S3)	30.6 (S3)	50.9 (S2)
Onion	3.6 (N)	19.6 (N)	5.1 (N)	27.1 (S3)	4.5 (N)	26.3 (S3)	26.9 (S3)	50.9 (S2)
Pea	5.6 (N)	37.4 (S3)	5.7 (N)	50.7 (S2)	7.8 (N)	46.9 (S3)	39.2 (S3)	62.6 (S2)
White Potato	7.4 (N)	34.4 (S3)	8.5 (N)	41.8 (S3)	9.5 (N)	34.3 (S3)	35.0 (S3)	54.7 (S2)
Sweet Potato	9.9 (N)	37.4 (S3)	6.3 (N)	56.6 (S2)	18.5 (N)	46.9 (S3)	40.3 (S3)	62.6 (S2)
Tomato	6.2 (N)	17.4 (N)	4.6 (N)	30.4 (S3)	12.6 (N)	25.1 (S3)	23.9 (N)	35.1 (S3)
Water melon	15.0 (N)	60.6 (S2)	7.7 (N)	68.4 (S2)	22.9 (N)	58.1 (S2)	48.2 (S3)	75.1 (S1)
Fodder Crops								
Alfalfa	14.6 (N)	37.4 (S3)	11.1 (N)	59.6 (S2)	24.6 (N)	46.9 (S3)	44.6 (S3)	64.1 (S2)
Sorghum	19.9 (N)	37.5 (S3)	11.3 (N)	64.2 (S2)	25.2 (S3)	41.0 (S3)	48.7 (S3)	69.2 (S2)
Fruit Crops								
Mango	2.6 (N)	9.6 (N)	2.1 (N)	20.6 (N)	4.2 (N)	9.7 (N)	26.2 (S3)	40.4 (S3)
Guava	3.2 (N)	19.0 (N)	4.4 (N)	42.5 (S3)	2.8 (N)	15.0 (N)	36.2 (S3)	63.3 (S2)
Citrus	0.4 (N)	6.8 (N)	0.8 (N)	14.5 (N)	1.0 (N)	6.9 (N)	16.7 (N)	28.5 (S3)
Banana	0.3 (N)	4.2 (N)	0.4 (N)	7.0 (N)	0.6 (N)	3.5 (N)	16.1 (N)	25.4 (S3)
Olives	25.5 (S3)	33.3 (S3)	10.0 (N)	49.2 (S3)	16.9 (N)	20.1 (N)	62.6 (S2)	74.2 (S2)

CS = Current Suitability PS = Potential Suitability
S1 = Highly suitable S2 = Moderately suitable S3 = Marginally suitable N = Not suitable

Table 5. Potential suitability indices of the different crops at the studied soils.

Suitability class	Physiographic unit			
	Delta Apex of paleodrainage delta	Alluvial Terraces	Wadi	Aeolian Deposits
Highly suitable (S1)		Sesame (80.5)		Cabbage (78.8)
				Water melon (75.1)
Moderately suitable (S2)	Water melon (60.6)	Water melon (68.4)	Sesame (61.2)	Olives (74.2)
	Sesame (59.9)	Sorghum (64.2)	Water melon (58.1)	Sesame (73.3)
		Alfalfa (59.6)	Sugar cane (50.3)	Sorghum (69.2)
Marginally suitable (S3)	Cabbage (42.7)	Cabbage (59.6)	Alfalfa (46.9)	Alfalfa (64.1)
	Sugar cane (42.0)	Cotton (57.5)	Cabbage (46.9)	Guava (63.3)
	Sorghum (37.5)	Cowpea (56.6)	Cowpea (46.9)	Cotton (63.0)
	Alfalfa (37.4)	S. Potato (56.6)	Pea (46.9)	Cowpea (62.6)
	Cowpea (37.4)	Sugar cane (55.7)	S. Potato (46.9)	Pea (62.6)
	Pea (37.4)	Pea (50.7)	Maize (46.9)	S. Potato (62.6)
	S. Potato (37.4)	Maize (50.7)	Barley (41.0)	Maize (62.6)
	Maize (37.4)	Olives (49.2)	Sorghum (41.0)	Sugar cane (61.8)

	W. Potato (34.4)	Barley (45.3)	Wheat (41.0)	W. Potato (54.7)
	Olives (33.3)	Wheat (45.3)	Sunflower (39.9)	Sunflower (53.3)
	Cotton (32.9)	Sunflower (43.1)	Cotton (37.3)	Barley (53.1)
	Barley (32.7)	Guava (42.5)	Beans (34.5)	Wheat (53.1)
	Wheat (32.7)	W. Potato (41.8)	W. Potato (34.3)	Beans (51.9)
	Sunflower (31.8)	Beans (36.4)	Soya (32.5)	Pepper (50.9)
		Soya (33.9)	Carrots (31.0)	Onion (50.9)
Not suitable (N)	Beans (24.0)	Tomato (30.4)	Pepper (29.4)	Carrots (50.0)
	Soya (22.8)	Carrots (28.6)	Onion (26.3)	Soya (48.2)
	Carrots (21.1)	Pepper (28.6)	Tomato (25.1)	Mango (40.4)
	Pepper (20.6)	Onion (27.1)		Tomato (35.1)
	Onion (19.6)	Mango (20.6)	Olives (20.1)	Citrus (28.5)
	Guava (19.0)	Citrus (14.5)	Guava (15.0)	Banana (25.4)
	Tomato (17.4)	Banana (7.0)	Mango (9.7)	
	Mango (9.6)		Citrus (6.9)	
	Citrus (6.8)		Banana (3.5)	
	Banana (4.2)			

Conclusion and Recommendations

The study area is located nearby the old agriculture area. After tracing the landscape genesis and different physiographic units, it could be used as a base of land suitability for agricultural in the future, when we have money and don't have proper land to cultivate. Also, it is laying inside the proposed development corridor by El-Baz (2007). Therefore we recommend the following:

1. To dig lateral fresh water canals toward the west. They will come from the nearest canal in the old agricultural area (Tirat Banub or Bahr Yusif canals), which are near the first physiographic unit in the study area by approximately from 6 to 12 km. They will be the source of irrigation in that area and to coincide with the proposed development corridor project, specially, there is already asphalted western roads (lateral and horizontal), which they reach to the towns in old agriculture area.
2. The cost of digging canals and reclamations will not be very costly compared with Toshka project, and El-Tina plain in North Egypt. It will not need to construct buildings, because of the closest to the residential urban towns or countries in the old agricultural areas. Therefore, the transportation for those farmers will be cheap and have short time to reach to reclaimed areas.
3. The residential habitat in the old agricultural area are facing lack in services and considered as very poor areas in Egypt. This new area will be a suitable for absorb those peoples, and sources of agricultural productions for food security.
4. *Delta Apex of paleodrainage delta (DA)* and *Alluvial Terraces (AT)* can reach by reclaiming and applying adequate water to leach and wash salts downward to be suitable for agriculture, which these profiles have texture ranging from (sand, loamy sand, sandy loam and sandy clay loam).
5. The potential land suitability can be used as guide to obtain the most convenient output alternatives crops for each physiographic unit in the study area by cultivation of sesame, cabbage, water melon, olive, sorghum guava, alfalfa, cotton, cowpea, s. potato, sugar cane, w. potato, sunflower, barley, wheat, beans, pepper, onion, pea, maize and carrot.

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دراسة على الملامح الفيزيوجرافية والوحدات التقسيمية للأراضى غرب محافظة أسيوط، مصر

أشرف عبد الغنى محمد فايز مرقص فهمى محمود كامل ناصف
معهد بحوث الأراضى والمياه والبيئة، مركز البحوث الزراعية

تقع منطقة الدراسة فى الجزء الغربى من محافظة أسيوط بين خطى40" 14' 30°، 00" 56' 30° شرقاً و 50" 12' 27°، 00" 41' 27° شمالاً. وتهدف هذه الدراسة لإنشاء خريطة فيزيوجرافية بتطبيق منهج التفسير المرئى لبيانات الأقمار الصناعية Landsat لمنطقة الدراسة الممثلة، حيث كانت الوحدات الفيزيوجرافية كالتالى:

رأس الدلتا الناشئة عن طريق الصرف القديم Delta Apex of paleodrainage delta والتى تمثلت فى الوحدات الأرضية التالية:

Typic Haplocalcids; sandy skeletal; mixed; hyperthermic
Typic Calcigypsids; sandy skeletal; mixed; hyperthermic.

الشرفات النهرية Alluvial Terraces والتى تمثلت فى الوحدات الأرضية التالية:

Lithic Haplocalcids; sandy skeletal; hyperthermic
Typic Haplocalcids; coarse loamy; mixed; hyperthermic.

الوادى Wadi ذات الوحدة التقسيمية التالية:

Typic Torriotthents; sandy skeletal; mixed; hyperthermic.

الترسيبات الهوائية (الكثبان الرملية) Aeolian deposits والتى تمثلها الوحدة التقسيمية التالية:

Typic Torripsamments; mixed; hyperthermic.

تم تقييم صلاحية الأراضى لزراعة 26 محصول وحسب التقسيمات الفيزيوجرافية فإن المحاصيل التى يمكن زراعتها فى رأس الدلتا الناشئة عن طريق الصرف القديم والوادى هى السمسم والبطيخ، بينما الترسيبات الهوائية فيمكن زراعتها بأغلب المحاصيل ويليها الشرفات النهرية.