LAND SUITABILITY FOR IRRIGATED AGRICULTURE IN KOM-OMBO WESTERN PLAIN ,ASWAN-EGYPT.

Soliman,Y.R.A; M.E.M. Wahdan and M.K.Nasef.
Soils, Water and Environmet. Res. Institute, Agric. Res. Center, Giza, EGYPT.

ABSTRACT

Kom –Ombo western plain is located in upper Egypt between longitudes of 32° 38˙ and 32° 55˙ 30˝ East and latitude of 24° 20˙ 30˝ and 24°40˙40˝North covering about(215151.9 feddans).Twelve representative soil profiles of the studied area were chosen on basis of differentiation in the physiographic units,i.e., river terraces, alluvial fans and wadi bottom.

The studied soil profiles were classified to eight soil families blonging Aridisols and Entisols orders and four subgroups i.e., Typic Haplogypsids,Typic Haplocalcids, Typic Torriopsamments and Typic Torriorthents.

Concerning land suitablity, the studied soils are affected mainly by topography, soil texture and salinity/alkalinity as soil lemitation in variable intensity degrees with moderately and marginally suitable classes. By exciting the suitable soil improvement practices, the potential capability classes assessed were highly and moderately suitable.

Land suitability levels were assessed for cultivating group of proposed crops including annual crops (barley, maize, wheat, sesame,soya, alfalfa, sorghum, beans, cabbage and carrots) and perennial ones (citrus, mango and olives). The current suitability was negatively affected by some soil limitations, which require.

a major improvement concerning soil, salinity, sodicity and fertility to improve the land suitability to be more profitable potential land suitability as: (1) Soils of river terraces were moderately suitable (S2) for sesame, alfalfa, cabbage, olives and marginally suitable (S3) for barley, wheat, carrots, citrus and mango. (2) Soils of alluvial fans were highly suitable (S1) for Cabbage; moderately suitable (S2) for maize, sesame, alfalfa, olives and marginally suitable (S3) for sorghum and mango. (3) Soils of wadi bottom were highly suitable (S1) for sesame moderately suitable (S2) for maize, alfalfa, sorghum; cabbage and marginally suitable (S3) for barley and wheat.

Key words: Kom-Ombo western plain, physiographic soil units, soil taxonomy, land capability and soil suitability for certain crops.

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.**Khidr(2012)** indicated that Kom-Ombo western plain

is cover about 220.000 feddans and most of the area is considered suitable area for cultivation.

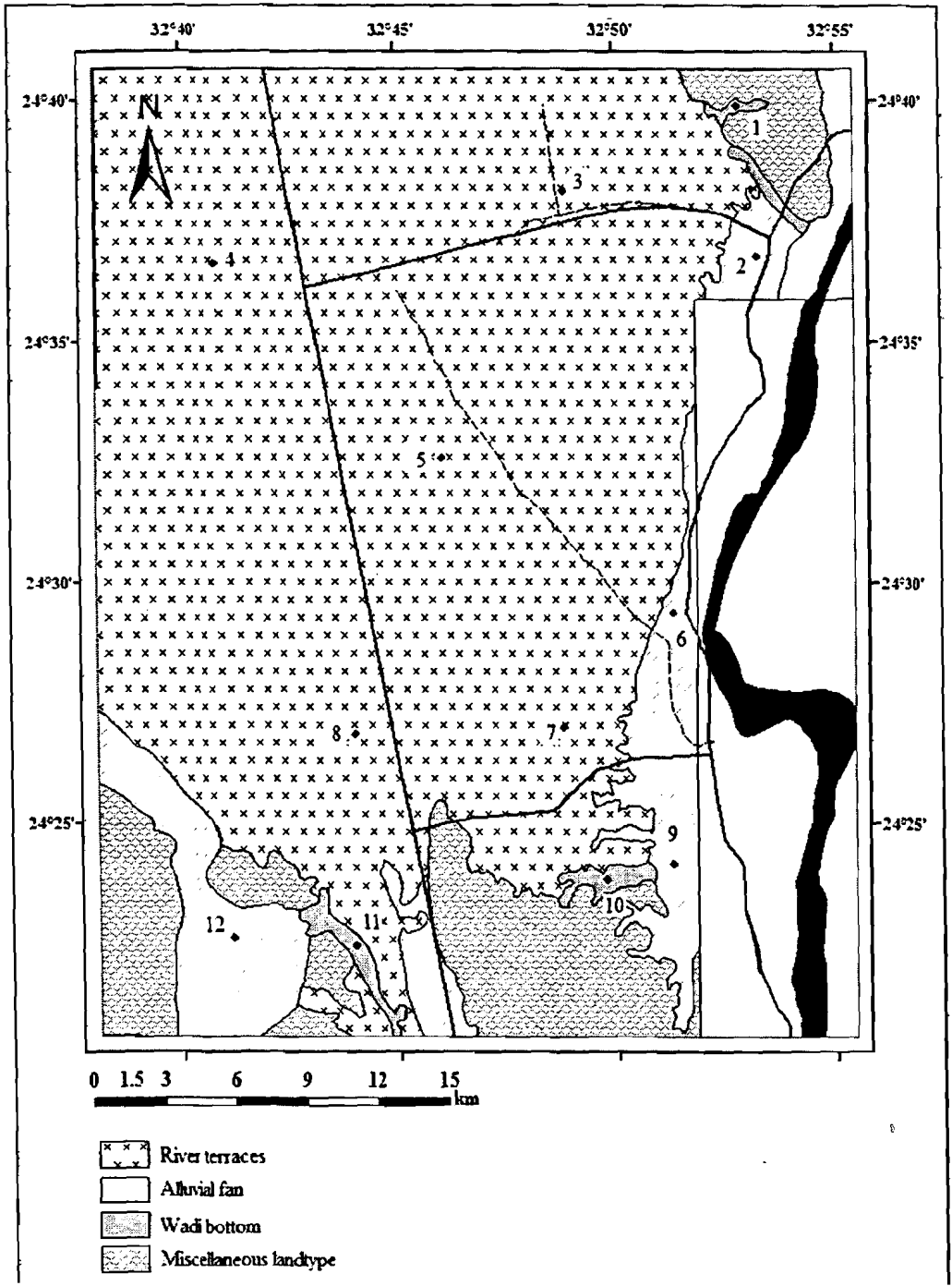
Using CLAC (2014), the soil temperature regime of the studied area could be defined as hyperthermic and soil moisture regime as torric.According to **Said (1990),**the geological construction of the studied area is covered by Tertiary, Nubian formation (sandstone), Pliocene (gravels and sands) and Quaternary Pleistocene (river silt, sands, and gravel). However, five main geomorphic units namely river terraces, alluvial fans and outwash plains, wadi bottom ,and Miscellaneous land types were identified in this area according to HDSS (1965).

The present study aims to evaluate the land suitability of the dominont physiographic units in Kom-Ombo Western plain for irrigated agriculture taken into consideration the limiting soil criteria.

MATERIALS AND METHODS

The studied area is located in the west of Kom-Ombo district in upper Egypt between longitudes of 32° 38˙ and 32° 55˙ 30˝ East and latitudes of 24° 20˙ 30˝ and 24° 40˙40˝ North (Mapl) covering about (215151.9 feddans). According to HDSS (1965), a numbers of soil profiles minipits were used for checking the boundaries between mapping units in the studied, area then twelve soil profiles were chosen to represent the dominant soils of the physiographic units (Map 1). The soil profiles were dug to a depth 150 cm or to lithic contact (bedrock). Thirty-nine soil samples were collected according to the morphological variations throughout the soil profile layers that were described according to ***USDA (2003)***and the soil colour was determined with the aid of***MunsellColour Chart (1975)***, as shown in Table (1).The soil samples were air-dried, crushed and passed through a 2-mm sieve and were kept for the laboratory analysis.

Physical and chemical properties of the collected soil samples were carried out as follows:particle size distribution, soluble ions in soil paste extract, calcium carbonate, gypsum and organic matter contents were determined according to ***Page et al.*** **(1982)**. Soil Electrical Conductivity (EC_e) was measured in the soil paste extract and soil pH in soil paste was also determined according to the methods outlined by ***Richards, (1954)***.



Map (1):physiographic units and location of soil profiles of the studied area.

Table(1):Morphololgical description of the studid soil profiles.

Physiogra-Phic unit	Prof. No.	Topography	Depth (cm)	Color (dry)	Texture	Structure	Consistence (dry)	Effervesce-Nce	Boundary	Gravel (%)	Common Features	Effervescence	Boundary
River terraces	3	Undulating	0-20 20-65 65-120	10YR 6/4 5YR 4/4 5YR 5/4	SC L LS S	MS MS MS	Soft Slightly hard Hard	+++ + +	CW CW –	10 35 50	Common soft lime accumulations Few soft gypsum accumulations –	Strong Weak Weak	C.W C.W –
	4	Gently undulating	0-15 15-35 35-110	10YR 6/3 10YR 5/4 5YR 5/4	SL SL LS	MS MS MS	Soft Soft Slightly hard	+++ +++ +++	CS CW –	15 20 65	– Common soft lime accumulations –	Strong Strong Strong	C.S C.W –
	5	Gently undulating	0-25 25-75 75-125	10YR 6/4 10YR 5/3 10YR 5/3	LS LS LS	SG SG SG	Loose Loose Loose	++ ++ ++	CW CW –	7 5 7	– – –	Moderate Moderate Moderate	C.W C.W –
	7	Undulating	0-25 25-50 50-150	7.5YR 6/6 5YR 6/8 2.5YR 5/8	SL SC L CL	MS MS B	Soft Slightly hard Hard	+ +++ +++	CW CW –	35 25 10	Very few soft lime accumulations Common soft lime accumulations Few soft lime accumulations	Weak Strong Strong	C.W C.W –
	8	Almost flat	0-30 30-60 60-120	10YR 6/3 5YR 5/4 5YR 5/4	SL SL SL	MS MS MS	Soft Slightly hard Hard	++++++ +++	CW GW –	30 40 45	– Few soft lime accumulations Few soft lime accumulations	Strong Strong Strong	C.W G.W –
Alluvial fans	2	Alost flat	0-20 20-60 60-100 100-150	10YR 8/6 7.5YR 6/4 5YR 4/3 7.5YR 5/4	LS SC L SL SL	MS MS MS MS	Soft Soft Slightly hard Slightly hard	++++++ +++ +	CW CW CW –	2 3 40 45	– – – –	Strong Strong Strong Weak	C.W C.W C.W –
	6	Undulating	0-15 15-45 45-150	10YR 8/6 5YR 7/6 5YR 6/6	S S S	SG MS MS	Loose Soft Soft	++ ++ ++	CS CS –	2 10 5	Very few soft lime accumulations Few soft lime accumulations Few soft lime accumulations	Moderate Moderate Moderate	C.S C.S –
	9	Almost flat	0-15 15-30 30-70 70-150	5YR 7/6 5YR 6/8 5YR 7/6 2.5YR 5/8	LS LS SL SL	MS MS MS MS	Soft Slightly hard Hard Very hard	++ +++ +++ +++	CS CS CS –	3 10 15 15	Very few soft lime accumulations Few soft lime accumulations Common soft lime accumulations Common soft lime accumulations	Moderate Strong Strong Strong	C.S C.S C.S –
	12	Undulating	0-20 20-70 70-130	7.5YR 8/8 7.5YR 6/6 7.5YR 6/6	S LS LS	SG MS MS	Loose Soft Soft	++ ++ ++	CS CS –	10 30 40	– Few soft gypsum accumulations Few soft gypsum accumulations	Moderate Moderate Moderate	C.S C.S –
Wadi bottom	1	Almost flat	0-15 15-45 45-150	10YR 5/6 10YR 5/6 7.5YR 6/6	LS LS LS	MS MS MS	Soft Slightly Hard Slightly Hard	++ +++ +	CW GW –	5 30 15	– – –	Moderate Strong Weak	C.W G.W –
	10	Almost flat	0-20 20-50 50-80 80-150	10YR 6/8 10YR 5/8 10YR 5/8 10YR 5/3	S S S LS	SG MS MS MS	Loose Soft Soft Slightly Hard	+++ +++ +++ ++	CW CW CW –	20 3 6 2	Few soft lime accumulations Few soft gypsum accumulations Few soft lime and gypsum accumulations Few soft lime and gypsum accumulations	Strong Strong Strong Moderate	C.W C.W C.W –
	11	Almost flat	0-30 30-65 65-125	10YR 7/8 10YR 7/8 10YR 7/2	LS SL SC L	SG MS MS	Loose Soft Slightly Hard	++ + +	CS GW –	1 5 -	Few soft lime and hard gypsum accumulations Common soft and hard gypsum accumulations Common soft and hard gypsum accumulations	Moderate Weak Weak	C.S G.W –

Texture: S=sand LS =loamy sand SL=sandy loam SCL=sandy loam Cl=clayloam. Boundary:CW=clear wavy CS=clearsmoth Gw=gradual wavy Effervescence: +++=strong ++=moderate +=weak Structure:MS=massive SG=single grains B=blocky

Texture: S=sand LS =loamy sand SL=sandy loam SCL=sandy loam Cl=clayloam. **Boundary**:CW=clear wavy CS=clearsmoth Gw=gradual wavy **Effervescence**: +++=strong ++=moderate +=weak **Structure**:MS=massive SG=single grains B=blocky

Soil classification up to the family level was performed according to ***USDA (2014)***.

Land evaluation for irrigation was done according to the parametric system undertaken by ***Sys et al (1991)***as well as their suitability for 13 crops using a numerical system undertaken by **Sys *et al.* (1993)**, which is a program developed through matching soil properties together with crop requirements. The main soil parameters used in this system are climate, soil depth, soil texture, gravel percentage, $CaCO_3$ percentage, gypsum percentage, salinity (EC_e), alkalinity (ESP), slope pattern and drainage conditions. A suitability indexes of 13 crops for the studied soils was done according to this program.

RESULTS AND DISCUSSION

I. Main characteristics of the studied soils:

1- Soils of river terraces:

This terrace lies about 50 or 60 m above the level of the Nile and consists of complexes of gravel soils and somewhat lower loamy coarse sand soils. The high older river terraces formation on the west side of the Nile is everywhere adjacent to the present river course, only interrupted by some areas where the Nubian sandstone rockland crops out.

Between these outcrops, the old river terrace deposits are again present, more or less eroded by gullies, formed in later erosion stages, which mostly drain to the present river bed. It appears that rounded gravel also occur on top of the outcropping rockland area which proves that river Nile deposits formerly existed at an even higher level, having been eroded in later stages (**HDSS, 1965**).

This unit represents the biggest unit in the studied area and occupied about(163670.2 feddans=76.07%). Soils of profiles 3, 4, 5, 7 and 8 are the representative.Topography is varied from almost flat to undulating.The soil profiles are deep with a surface covered with medium gravel and in some places with overblown sand. Soil texture is sand to clay loam (Table 1).

The analytical data (Table 2) reveal that calcium carbonate and gypsum contents range from 2.21 to 16.7 % and 0.09 to 3.26% respectively.Organic matter contents are very low and range from 0.07 to 0.28 % Contents of organic matter are very low due to the arid conditions and its very scanty vegetation.

Table (2): Some physical properties of the studied soil profiles.

Physio-Graphic	Prof. No.	Depth (cm)	Particle Size distribution (%)				Texture class	$CaCO_3$ (%)	Gypsum (%)	OM (%)
			Coarse Sand	Fine Sand	Silt	Clay				
River terraces	3	0-20	26.10	23.77	20.02	30.11	Sandy clay loam	10.15	1.21	0.17
		20-65	57.99	28.11	5.41	8.49	Loamy sand	6.05	3.26	0.14
		65-120	70.53	22.33	2.43	4.71	Sand	2.21	2.65	0.11
	4	0-15	22.86	56.50	8.04	12.60	Sandy loam	15.09	0.18	0.13
		15-35	38.86	28.31	15.74	17.09	Sandy loam	15.62	0.17	0.11
		35-110	38.65	43.35	5.70	12.30	Loamy sand	16.21	0.21	0.07
	5	0-25	55.30	28.70	4.20	11.80	Loamy sand	3.30	0.09	0.19
		25-75	35.89	47.14	5.75	11.22	Loamy sand	4.32	0.11	0.13
		75-125	33.82	49.81	5.56	10.81	Loamy sand	4.39	0.12	0.08
	7	0-25	28.21	51.12	8.05	12.62	Sandy loam	1.20	0.31	0.22
		25-50	20.11	40.39	10.80	28.70	Sandy clay loam	14.60	0.36	0.11
		50-150	1.35	27.02	41.18	30.45	Clay loam	14.60	0.51	0.07
	8	0-30	43.54	23.49	15.17	17.80	Sandy loam	7.70	0.23	0.28
		30-60	53.85	26.10	7.95	12.10	Sandy loam	3.40	0.23	0.09
		60-120	34.10	45.85	8.30	11.75	Sandy loam	3.45	0.25	0.08
Alluvial fan	2	0-20	50.70	30.25	8.13	10.92	Loamy sand	4.74	0.26	0.33
		20-60	14.25	30.85	24.15	30.75	Sandy clay loam	8.60	0.55	0.11
		60-100	44.90	22.10	15.90	17.10	Sandy loam	4.30	0.66	0.09
		100-150	32.06	43.55	10.23	14.16	Sandy loam	3.72	0.32	0.08
	6	0-15	49.99	38.33	7.52	4.16	Sand	3.10	0.22	0.29
		15-45	63.23	28.24	5.42	3.11	Sand	4.30	0.41	0.19
		45-150	59.11	32.16	5.53	3.20	Sand	5.10	0.29	0.11
	9	0-15	38.29	44.36	5.83	11.47	Loamy sand	15.10	0.11	0.35
		15-30	51.77	30.97	6.83	10.44	Loamy sand	15.90	0.33	0.19
		30-70	25.65	53.55	7.42	13.38	Sandy loam	16.70	0.35	0.11
		70-150	36.14	38.14	8.74	16.98	Sandy loam	16.00	0.41	0.09
	12	0-20	35.61	53.25	4.81	6.33	Sand	2.02	0.55	0.32
		20-70	48.93	36.33	2.77	11.97	Loamy sand	2.58	5.65	0.15
		70-130	49.95	31.05	7.68	11.32	Loamy sand	4.02	6.25	0.11
Wadi bottom	1	0-15	36.25	47.18	5.90	10.67	Loamy sand	5.11	0.21	0.15
		15-45	36.45	44.52	6.47	12.56	Loamy sand	4.25	0.25	0.12
		45-150	50.73	32.73	4.94	11.60	Loamy sand	1.53	0.33	0.11
	10	0-20	65.56	26.77	2.61	5.06	Sand	4.01	1.05	0.34
		20-50	84.20	10.28	2.51	3.01	Sand	3.43	2.32	0.21
		50-80	62.57	31.02	2.18	4.23	Sand	3.49	2.56	0.18
		80-150	47.42	32.82	7.98	11.78	Loamy sand	2.61	3.02	0.11
	11	0-30	51.67	30.41	6.39	11.53	Loamy sand	4.34	3.26	0.33
		30-65	43.40	30.45	13.92	12.23	Sandy loam	3.44	8.23	0.11
		65-125	40.82	20.84	10.20	28.14	Sandy clay loam	2.44	7.25	0.09

Data in Table (3) indicate that soil reaction is neutral to moderately slightly alkaline as the pH values range between 7.01 to 7.93. The electric conductivity of soil paste extract shows that the soils are non-saline to extremely saline with EC_e values ranging from 1.03 to 37.3 dS/m.

Table(3):chemical commotion of soil saturation extracted of the studied soil profiles.

Physio-graphic	Prof. No.	Depth (cm)	pH	EC (dS/m)	Soluble Cations ()				Soluble Anions ()				SAR
					Ca^{++}	Mg^{++}	Na^{+}	K^{+}	$CO_3^{=}$	HCO_3^{-}	Cl^{-}	$SO_4^{=}$	
River terraces	3	0-20	7.25	22.79	110.91	13.96	303.22	3.21	–	1.6	400	29.7	38.37
		20-65	7.27	19.5	152.73	24.34	223.74	4.64	–	1.8	340	63.65	23.78
		65-120	7.48	18.14	94.55	18.13	245.43	5.89	–	1.2	264	98.8	32.70
	4	0-15	7.61	19.9	61.91	3.62	229.79	2.68	–	2.6	275	20.4	40.14
		15-35	7.39	33.9	121.82	22.57	530.75	2.86	–	2.2	510	165.8	62.46
		35-110	7.51	24.5	140.91	146.89	126.91	1.79	–	1.6	183	231.9	10.58
	5	0-25	7.93	1.91	10.62	7.23	1.9	0.15	–	1.5	2	16.4	0.64
		25-75	7.20	1.03	21.89	14.89	25.8	0.27	–	1.0	39	22.85	6.02
		75-125	7.31	6.54	43.96	19.22	4.5	0.24	–	1.0	49	17.92	0.80
	7	0-25	7.62	5.56	28.8	16.06	14.3	0.15	–	2.0	12	45.31	3.02
		25-50	7.10	35.4	240.83	148.71	84.0	1.3	–	1.5	90	383.34	6.02
		50-150	7.01	37.3	298.88	145.4	64.4	1.25	–	1.5	77	431.43	4.32
	8	0-30	7.25	26.6	109.9	46.99	192.5	0.41	–	1.0	260	88.8	21.73
		30-60	7.21	31.0	164.85	129.99	109.3	0.65	–	1.5	240	163.29	9.00
		60-120	7.16	21.9	109.9	25.93	134	0.6	–	1.5	160	108.93	16.26
Alluvial fans	2	0-20	7.65	2.80	15.3	9.2	4.2	0.15	–	1.5	8.3	19.05	1.20
		20-60	8.02	2.16	12.9	7.1	2.6	0.1	–	1.0	7.5	14.2	0.82
		60-100	7.48	22.91	169.0	103	30.0	0.13	–	1.0	97	204.13	2.57
		100-150	7.43	25.53	173.0	111	40.0	0.13	–	1.0	109	214.13	3.36
	6	0-15	7.60	0.54	4.32	1.2	0.25	0.07	–	1.0	4	0.84	0.15
		15-45	7.10	0.48	3.16	1.3	0.50	0.02	–	1.0	2	1.98	0.33
		45-150	7.40	1.33	7.53	4.97	1.12	0.02	–	2.0	6	5.64	0.45
	9	0-15	7.85	1.93	6.15	2.19	12.48	0.25	–	2.0	17	2.07	6.11
		15-30	7.86	1.54	7.15	2.23	6.44	0.15	–	2.0	6	7.97	2.97
		30-70	7.51	2.36	7.30	4.16	12.48	0.28	–	1.5	18	4.72	5.21
		70-150	7.58	1.73	6.38	5.5	6.02	0.15	–	1.5	9	7.55	2.47
	12	0-20	7.94	3.01	16.3	10.2	4.0	0.11	–	2.0	7.5	21.11	1.10
		20-70	7.81	9.02	45.5	33.0	14.0	0.11	–	2.0	37	53.61	2.23
		70-130	7.82	8.3	43.0	29.0	12.6	0.9	–	1.5	39	45	2.10
Wadi bottom	1	0-15	7.82	2.26	8.99	2.5	12.80	0.09	–	4.25	17	3.13	5.34
		15-45	7.74	2.91	12.09	4.1	13.00	0.1	–	3.5	22.5	3.29	4.57
		45-150	7.51	34.19	95.66	12.6	390.80	0.18	–	5.0	481	13.24	53.12
	10	0-20	7.70	3.56	23.92	9.44	2.33	0.13	–	1.5	20	14.32	0.57
		20-50	7.61	1.73	9.24	8.6	1.60	0.06	–	1.0	8	10.5	0.54
		50-80	7.52	2.49	11.82	9.02	4.80	0.14	–	1.0	14	10.78	1.49
		80-150	7.63	2.27	14.35	7.65	1.60	0.06	–	1.0	15	7.66	0.48
	11	0-30	7.51	18.31	13.97	12.18	220.0	1.61	–	2.0	165	80.76	60.84
		30-65	7.72	13.60	28.37	18.93	103.0	1.22	–	1.5	94	56.02	21.18
		65-125	7.81	3.71	12.35	8.45	16.0	0.82	–	1.0	26	10.62	4.96

2- Soils of alluvial fans and outwash plains:

The soil of this unit is of little importance. With a few exceptions they are gravelly soils with gravel content only slightly less than of the river terraces **(HDSS, 1965)**.

This unit covers an area of about(2226.7 feddans=1.04%) Profiles 2, 6, 9 and 12represented the soils of this unit. Topographically of landscape is gently undulating to undulating. The soil profiles are deep covered with

different sizes of gravel and few stones. Soil texture is sand varied from sandy clay loam classes (Table 1).

The analytical data in Table (2) reveal that calcium carbonate and gypsum contents range from 2.02 to 16.7 % and 0.11 to 6.25 %, respectively. Organic matter content is very low and ranges from 0.08 to 0.35 % and such low content of organic matter is expected due to the prevailing aridity of the region and its very scanty vegetation.

Data in Table (3) indicate that soil reaction is neutral to moderatly slightly alkaline as the pH values range between 7.10 and 8.02. The electric conductivity of soil paste extract shows that the soils are non-saline to strongly saline with EC_e values ranging from 0.48 to 25.53 dS/m.

3- Soils of wadi bottom:

The wadi bottom soils are of little importance for the development of agriculture, being almost always represented by gravelly coarse sandy soils, sometimes cobbly, sometimes less gravelly but gritty and with some loam admixture; furthermore they always occupy narrow strips of land, the bottom parts of the wadis which are characterized by stream beds (**HDSS, 1965**).

This physiographic unit occupies an area of about (2359.53 feddans =1.09%) and which represented by profiles 1, 10 and 11. Topography is almost flat with deep soil profiles. Soil texture class varies from sand to sandy clay loam (Table, 1).

The analytical data in Table (2) reveal that calcium carbonate and gypsum contents range from 1.53 to 5.11 % and 0.21 to 8.23 %, respectively.Also organic matter content is very low and ranges from 0.09 to 0.34 % .

Data in Table (3) indicates that soil reaction is slightly alkaline as the pH values range between 7.51 to 7.82. The electric conductivity of soil paste extract shows that the soils are non-saline to extremely saline with EC_e values ranging from 1.73 to 34.19 dS/m.

II. Soil Taxonomic Units:

Soils in different physiographic units were classified to the family level using **USDA (2014).** According to the climatic data of the **CLAC (2014),** the moisture regime of the study area is "*torric*" and the temperature regime is "*hyperthermic*". The taxonomic conclusions are based on soil morphology, physical, and chemical properties which illustrated in Tables (1 – 3). The soils under consideration are classified into two orders namely Aridisols and Entisols. The main soil attributes that are required for defining each taxonomic unit are described as follows:

Order: Aridisols:

Soil profiles 4, 9, 11 and 12 have one of the diagnostic horizons such as gypsic or calcic horizons. So, these soils can be classified as Aridisols order

according to **USDA (2010)** and can be classified into two great groups as follows:

1- Haplogypids

Typic Haplogypids, fine- loamy, mixed, hyperthermic (profile 11).
Typic Haplogypids, sandy, mixed, hyperthermic (profile 12).

2- Haplocalcids

Typic Haplocalcids, sandy skeletal, mixed, hyperthermic (profiles 4).
Typic Haplocalcids, coarse loamy, mixed, hyperthermic (profile 9).

Order: Entisols:

The rest of soil profiles, are characterized by no evidence of any genetic soil horizons; therefore, they are related to Entisols order.

These soils can be classified into two great groups as follows:

1- Torripsamments

TypicTorripsamments, siliceous, hyperthermic(profile 5).

2-Torriorthents

TypicTorriorthents, fine loamy, mixed, hyperthermic (profile 7).
TypicTorriorthents, loamy skeletal, mixed, hyperthermic (profiles2 and 8).
TypicTorriorthents, sandy, mixed, hyperthermic (profiles 1, 6 and 10).
Typic Torriorthents,sandy skeletal,mixed,hyperthermic(profile3)

III. Land Suitability for irrigation:

The current and potential suitability of the studied soils was estimated by matching between the present soil characteristics and their ratings which calculating by using the parametric system outlined by **Sys et al (1991)**, as shown in Table (4). The obtained results indicate that all soils have no to slight intensity of limitation for wetness, soil depth, calcium carbonate and gypsum contents. Also, data show that most of the studied soils are suffering from some limiting factors, i.e., topography (t), soil texture including gravel (s_1) and salinity/alkalinity (n).

The obtained results show that the estimated current indices of the studied soil profiles ranged between 28.05 and 67.5 indicating the soils of the studied area can be categorized into two classes, as follows:

1-Marginally suitable soils (S3):

Soils belonging to this class have capability index ranging from 28.05 to 47.5. These soils are represented by all profiles developed on the physiographic units of the river terraces and wadi bottom as well as profiles 6 and 12of alluvial fans. These soils have moderate intensity of topography and salinity and moderate to severe intensity of soil texture, since most of the studied area had a light texture, i.e., sandy, loamy sand or sandy loam.

2-Moderately Suitable soils (S2):

The suitability index of these soils is ranged from 52.02 to 67.5. The soils of this class are represented in some soils of alluvial fans unit (profiles 2 and 9), river terraces (profile 7) and wadi bottom (profile 11) with moderate limitation of topography, soil texture or salinity and alkalinity.

For raising the suitability potential of these soils, soil improvement practices should be carried out such as land leveling and removing the excess of soluble salts through applying the leaching requirements under an efficient drainage ditches for soils suffering from salinity. Such agro-management practices will be corrected the rating of soil potential suitability, and it is ranged 42.75 – 76.5. Potential soil suitability becomes as follows:

1- Highly suitable soils (S1): The rating of this class is > 75 and represented by soil profile 7 (river terraces).

2- Moderately suitable soils (S2): The rating of this class is 50 – 75 and represented by soil profile 3 and 8 (river terraces); soil profile 2 and 9 (alluvial fans); soil profile 11(wadi bottom).

3- Marginally suitable soils (S3): The rating of this class is 25 – 50 and represented by the rest of the studied soil profiles.

Table (4): land suitability for irrigation of the of the studied soil profiles .

Physiographic units	Profile No.	Topography (t)	Wetness (w)	Soil Physical characteristics				Salinity and alkalinity (n)	Current		Potential	
				Texture (s_1)	Depth (s_2)	Carbonate (s_3)	Gypsum (s_4)		Rating	Class and limitations	Rating	Class and limitations
River Terraces	3	80	95	65	90	95	100	75	31.68	S3t,s_1,n	55.58	S2s_1
	4	90	90	60	90	95	90	75	28.05	S3s_1,n	46.17	S3s_1
	5	90	95	55	100	95	90	100	40.21	S3s_1	47.03	S3s_1
	7	80	100	85	100	100	90	85	52.02	S2t	76,5	S1
	8	100	95	65	90	95	90	75	35.64	S3st,n	50,02	S2si
Alluvial fans	2	95	100	85	100	95	90	90	62.14	S2st	72.68	S2
	6	80	100	50	100	95	90	100	34.2	S3t,st	42.75	S3si
	9	100	100	75	100	100	90	100	67.5	S2st	67.5	S2si
	12	80	95	50	100	95	100	98	35.38	S3t,st	47.5	S3si
Wadi bottom	1	95	100	50	100	95	90	75	30.46	S3st	42.75	S3si
	10	100	100	50	100	95	100	100	47.5	S3st	47.5	S3si
	11	100	95	75	100	95	100	80	54.5	S2st,n	71.25	S2si

t = topography s_1= soil texture n=salinity and alkalinity

S1=highly suitability S2= moderately suitability S3=marginally suitability

1- Highly suitable soils (S1): The rating of this class is > 75 and represented by soil profile 7 (river terraces).

2- Moderately suitable soils (S2): The rating of this class is 50 – 75 and represented by soil profile 3 and 8 (river terraces); soil profile 2 and 9 (alluvial fan); soil profile 11(wadi bottom).

3- Marginally suitable soils (S3): The rating of this class is 25 – 50 and represented by the rest of the studied soil profiles.

IV. Land Suitability for Certain Crops:

The dominant characteristics in each physiographic unit were represented by certain soil profiles to be matched with the crop requirements to assess their suitability with different crops.The simple approach that proposed by Sys et al. (1993) was selected for land

suitability evaluation of the studied area. The landscape and soil conditions used in these tables are topography; wetness; soil physical conditions (texture, gravel, depth, $CaCO_3$ and gypsum); salinity and alkalinity (EC and ESP), and fertility characteristics (pH, and organic carbon).

Thirteen crops were selected to assess their convenience for cultivation in the studied area. The selected crops are annual crops (barley, maize, wheat, sesame,soya, alfalfa, sorghum, beans, cabbage and carrots) and perennial ones (citrus, mango and olives). The current and potential land suitability levels associated with the soil limitations.

For the current land suitability, the present land qualities of the virgin lands were evaluated to be utilized for each specific use without land improvement. It was found that using the virgin land for most of cropping patterns is not profitable as the different soil limitations integrated to reduce the values of the current suitability. Accordingly, the current land suitability classification was modified to be more applicable by specifying a major land improvement. This land improvement in the study areas is for the land quality of drainage, salinity, sodicity, fertilityand cultivated under modern irrigation system to produce the potential land suitability for the different physiographic units.

It could be concluded that potential suitability of soils developed on the different physiographic units for specific crops can be discussed as follows:

Soils of river terraces:

* Moderately suitable (S2) for sesame, alfalfa, cabbage and olives.
* Marginally suitable (S3) for barley, wheat, carrots, citrus and mango.

Soils of alluvial fan:

* Highly suitable (S1) for Cabbage
* Moderately suitable (S2) for maize, sesame, alfalfa and olives
* Marginally suitable (S3) for sorghum and mango

Soils of wadi bottom:

* Highly suitable (S1) for sesame
* Moderately suitable (S2) for maize, alfalfa, sorghum and cabbage
* Marginally suitable (S3) for barley and wheat

Finally, it can be concluded that the data of this study are created to update and support the local knowledge, particularly the best use of land whether be under demand for agriculture use or be planned for later on use. That means the obtained results represent the best adaptation between certain land units with specific soil properties to give the maximum outputs from the agricultural utilization projects.

REFERENCES

CLAC (2014). Central laboratory for agriculture Climate, Ministry of Agriculture climatic elements from Aswan station

HDSS(1965).HighDamSoil Survey,United Arab Republic NDP&FAO.

Khidr, M.H. (2012). Genesis and uniformity of Kom-Ombo western plain soils, Egypt. Minufiya J. Agric. Res., (37) 5: 1249-1261

MunsellColour Charts (1975). Edition MunsellColour, Macbeth Division of Kollmorgen Corp., 2441 North Calvert Street, Baltimore, Maryland, USA.

Page, A.L.; Miller, R.H. and Keeney, D.R. Eds. (1982). Methods of Soil Analysis. Part 2. Chemical and Microbiological Properties. 2nd (Ed.). Amer. Soc. of Agronomy. Madison, Wisconsin, USA.

Richards, L.A.(1954). Diagnosis and improvement of saline and alkali soils. USDA Handbook No. 60, US. Gov. Printing Office, Washington, DC., USA.

Said, R. (1990). Geology of Egypt. Published for the Egyptian Central Petroleum Corporation. Conco. Hurghada Inc. by Balkema, A.A. Roterdam, the Netherlands.

Sys, C. (1991). Land evaluation. Parts I and II, Lecture Notes, Ghent Univ., Ghent, Belgium.

Sys, C. Ranst, E.; Van Debaveye, and J. Beernaer, T.F. (1993). Land evaluation, Part III "crop requirements"., Agric. Public. 7, Gen. Adm. for Dev. Coop., Brussels, Belgium.

USDA (2003). Soil Survey Manual. United State, Department of Agriculture, Handbook 18, U.S. Gov. Print Off., Washington, DC., USA.

USDA (2014). Keys to Soil Taxonomy.12th Edition, United States Department of Agriculture, USA.

تقيم مدى صلاحية الأراضى للزراعة المروية فى سهل كوم أمبو الغربى -اسوان-مصر

ياسر ربيع أمين سليمان ، مصطفى عيسى مصطفى، وهدان محمود كامل ناصف
معهد بحوث الأراضى والمياه والبيئة/ مركز البحوث الزراعية/ الجيزة

تعتبر اراضى سهل كوم أمبو الغربى من المناطق الملائمة للتوسع الزراعى فى مصر. ولدراسة صلاحيتها للزراعة، تم اختيار ١٢ قطاعا أرضيا (تمثلها ٣٩ عينة) ممثلة للوحدات وهى كالتالى:

River terraces, Alluvial fan, Wadi bottom

اجريت عملية التصنيف لهذه الأراضى وقد وجد أن هذه الأراضى تتبع الرتب Aridisols and Entisols ويتبعها اربعة تحت المجموعات التالية:

. Typic Haplogypsids Typic Torriopsamments and Typic Torriorthents

وتبعا لنظام تقييم صلاحية الاراضى للزراعة والمقترح بواسطة sys et al/1991 قد وجد أن الاراضى تحت الدراسة تعانى من بعض المعوقات ممثلة فى الطبوغرافية والقوام والملوحة والقلوية وبدرجات شدة متباينة كما وجد ان اراضى منطقة الدراسة تنتمى إلى درجتين من الصلاحية تتمثل فى التالى:

١-أراضى متوسطة الصلاحية بظروفها الحالية (S2).

٢-أراضى حدية الصلاحية (S3).

وعند رفع القدرة الانتاجية لهذه الاراضى عن طريق اجراء عمليات تحسين التربة المناسبة أمكن رفع دليل الصلاحية لجميع الاراضى تحت الدراسة.

كما أمكن تحديد مدى ملائمة الوحدات الفزيوجرافية بمنطقة الدراسة لنمو الحاصلات الزراعية من خلال ربط النتائج المتحصل عليها من دليل تقييم خواص الاراضى بالمستويات المختلفة لاحتياجات المحاصيل الزراعية المختارة باستخدام نظام التقييم المقترح بواسطة Sys et al (1993) أمكن تحديد الصلاحية الحالية والكامنة (المستقبلية) لـ ١٣ محصول ممثلة لبعض المحاصيل الحولية والمستديمة. وأوضحت النتائج المتحصل عليها بان هذه الاراضى صالحة لزراعة مدى واسع من المحاصيل تحت الدراسة وبدرجة ملائمة عالية وذلك بعد التخلص من المعوقات السابق ذكرها واستخدام نظم الرى الحديثة.