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An Approach to Sustainable Landuse and Land Suitability Indicies of Delta Wadi Hodien, Southeast Egypt.

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DUE TO the rapid increase in population in Egypt, there is a great need to expand the cultivated areas. One of the suggested areas for the horizontal expansion is Wadi Hodien region in the southeast corner of Egypt which covers about 3700 feddans (15.54 km^2).

The current work was conducted to investigate the main soil characteristics that refer to the promising possibilities for expansion and economical agriculture in "Delta Wadi Hodien". Forty four soil profiles were selected for the current study. Soil parameters for land capability and suitability evaluation have been determined, to estimate the suitability classification in each unit for seven field crops, six vegetable and fodder crops and five fruit crops promising for the study area. According to the ALES arid capability indices the soils of the studied area were grouped into three capability classes. The suitability assessment of the studied area revealed that; 16% of the area is moderately suitable (S2), 67% are marginally suitable (S3), 16% of the studied area is conditionally suitable (S4) and 1% of the area is potentially suitable (NS1) soils for the selected crops. Soil salinity and low soil fertility are the most effective soil limitations in the study. Air temperature of the area must be taken into the considered cultivation programme.

Keywords: Capability and suitability, ALES arid, Delta Wadi Hodien, Egypt.

Delta Wadi Hodein lies between Latitudes 22° 58' 00" and 23° 13' 00" N, Longitudes 35° 15' 00" and 35° 45' 00" E (Fig. 1). It occupies an area of about 759.6 km^2. The aim of the present study is to evaluate land capability and suitability for growing different crops. Such work will be useful for agricultural development policy of the region. The topography of this area varies from gently slope plains to rugged mountains and hilly lands, with elevations ranging between 50 m above sea level (at the basin outlet) to 1,443 m. Drainage basin are the fundamental units of the fluvial landscape and accordingly, a great amount of researches had focused on their geometric characteristics, including the topology of the stream network, and the quantitative description of drainage texture pattern, slope and relief (Abrahams, 1984). Because drainage basins are the physical entities used to measure the volume of water produce by runoff, the analysis of basin morphometry has been extended to include the

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interrelationships between network characteristics and the resulting water (Hadley and Schumm, 1961).

The climate of the studied area which is located in the eastern desert zone of Egypt is characterized by hot dry summer and warm winter. The maximum air temperature ranges between 45°C and 50°C during April – September and the monthly mean of daily relative humidity is 50% in October and November, whereas it reaches 60% in January and February (Deseret Research Institute 1998). The evaporation rate reaches the maximum value of 6-10.5 mm/day. The maximum rate of wind speed is 9-11 konts during April-May which known as khamaseen winds.

Wadi Hodein drainage basin is the largest Wadis in southeast area, from the areal point of view, extended over about 1,153 km^2 and received about 282.2 million cubic meters of rainfall water, this volume is contributed in as surface runoff of 143.9x106 m^3 and an evaporation loss of about 110.1x106 m^3 with 28.2x106 m^3 as infiltrated part.

The main resource of irrigation water at the study area is the artesian wells and rainfall water. Few investigations have been studied the area, mostly from geological point of view (Ball, 1936; Shata, 1962 and Abu Al Izz, 1971) as a group of essential mountains chains of Eastern Desert, among it. Few studies have been published about this area and are mainly focused on the geology and mineral resources (El-Rakiby *et al.*, 1996, Zaghloul & Elewa, and 1999, Abdel Rahman, 1997a & b).

El-Taweel and Kotb (2006) studied land resources of the investigated area based on remote sensing data, DEM and GIS. Ageeb *et al.* (2007) classified the investigated area into nine physiographic units, namely; delta plains, sandy plains, main wadies, alluvial plains, tributaries, marine terraces, denuded hills, plain with rock out crops and alluvial fans. They found that these geomorphic units occupy about 49.50, 1.65, 4.37, 7.89, 3.04, 3.44, 7.74, 3.76 and 9.26% of the study area respectively. While about 9.35% of the area are rocky.

Material and Methods

Forty-four soil profiles were chosen from Delta Wadie Hodien, southeast Egypt (Fig. 1) to represent the main soil types after Ageeb *et al.* (2007) Fig.2. The studied area covering about 3700 feddans (15.54 km^2) Delta plain unit is presented by 21 soil profiles as it occupied the largest area of the investigated area. Sandy plain; main wadies; alluvial plain; tributaries; marine terraces; denuded hills; plain with rock out crops and alluvial fans soil units are represented by 1, 4, 2, 6, 3, 1 , 4 and 2 soil profiles respectively. The profiles were morphologically described according to FAO (1990). 131 soil samples were collected for the following analyses; particle size distribution using standard sieving technique, Folk (1974), soil reaction (pH) of soil water suspension

(1:2.5), EC (dS/m) of soil extract (1:1), Cation exchange capacity (CEC), calcium carbonate content ($CaCO_3$%) and gypsum content according to Black *et al.* (1982). Land capability and suitability classification were performed according to "ALES-Arid" software (Osama *et al.*, 2004). The main soil characteristics considered in this system as follow: effective soil depth, texture, calcium carbonate content, gypsum content, organic matter, cation exchange capacity and soil salinity.

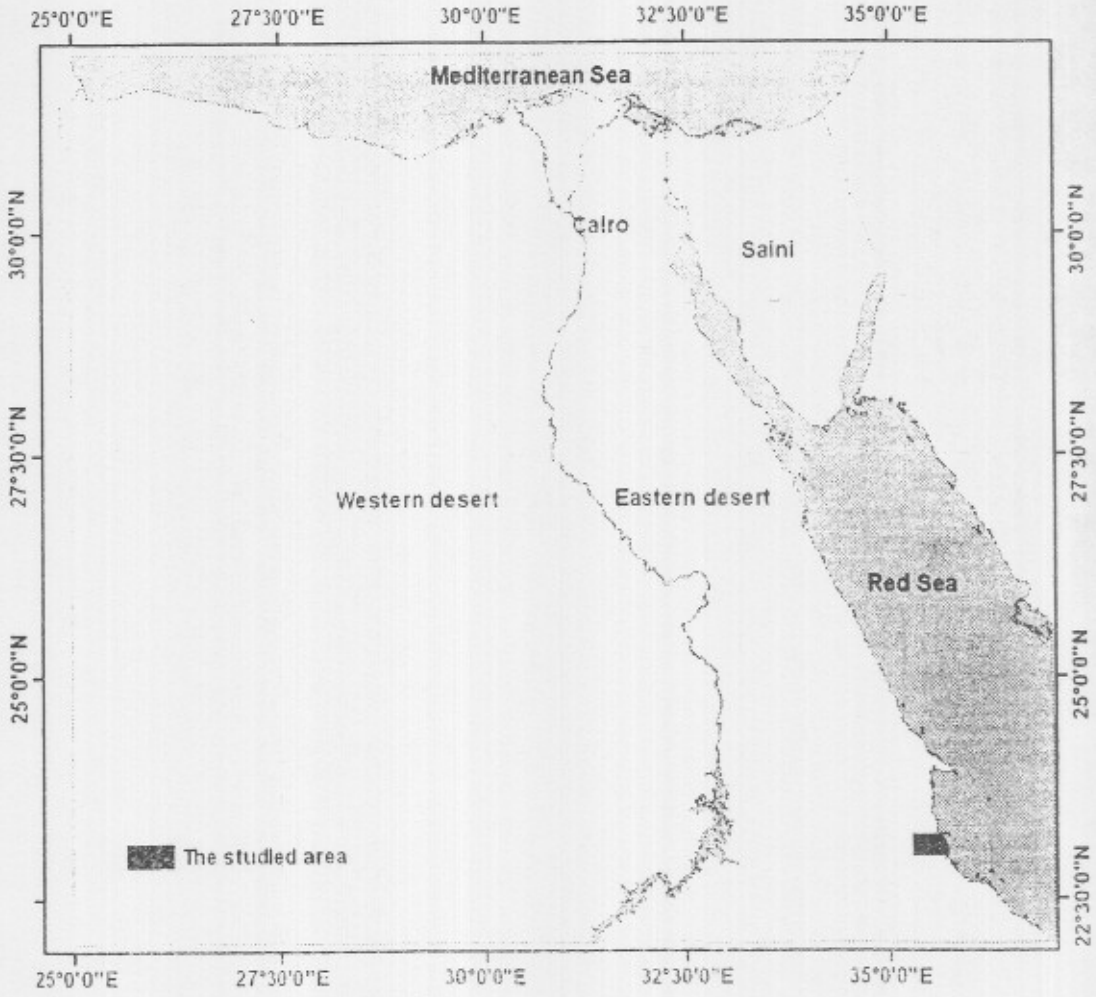

Fig. 1. Location of the study area.

Results and Discussion

The obtained data of ALES-Arid indicated that the capability classification of the studied area (Figure 3) is as the follow: Sandy plain, Main Wadies and Tributaries landforms are classified as capability class (C3); The Delta Plain is classified as capability class (C4), while Alluvial Plain, Marine Terraces, Denuded Hills, Plain with rock out crops and Alluvial Fans are classified as capability class (C4/C5).

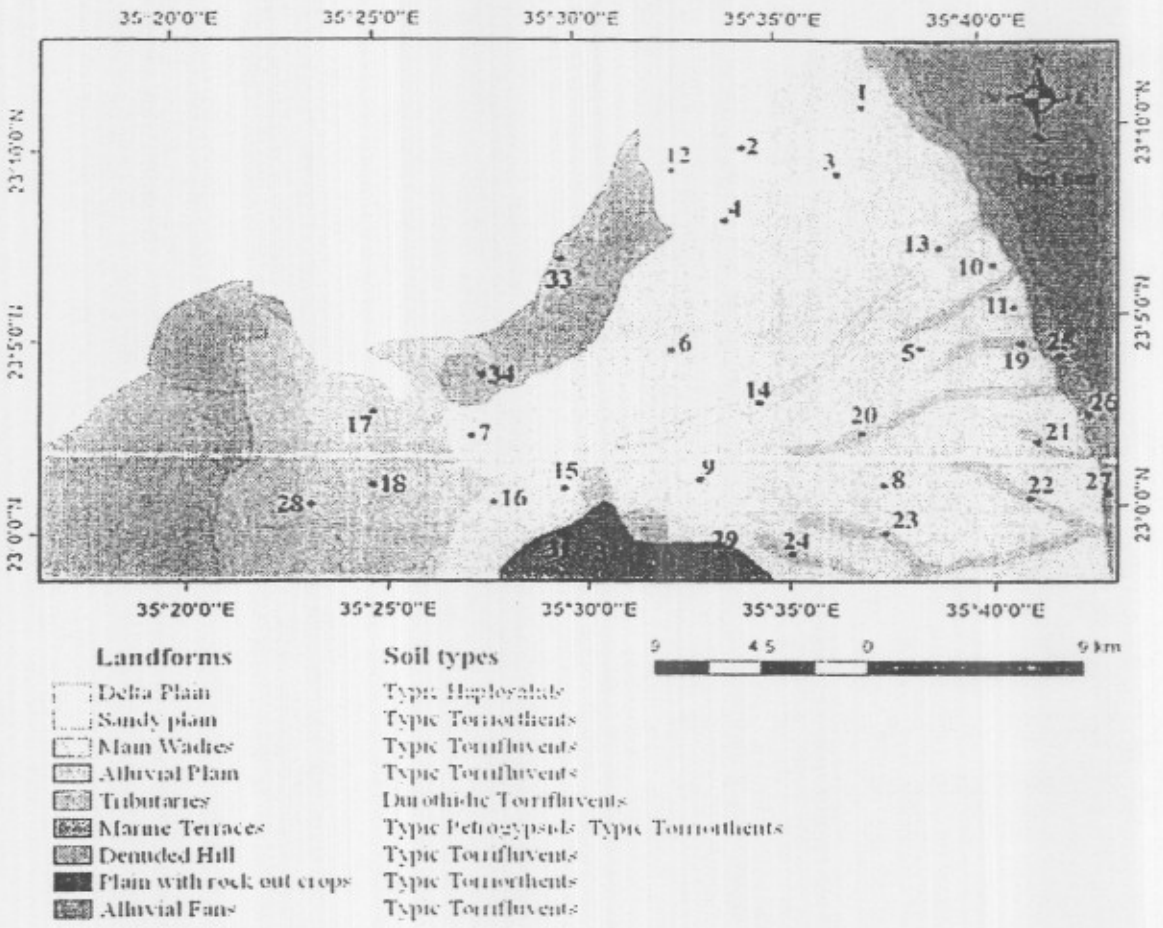

Fig. 2. The landforms and soil map of the investigated area, after Ageeb *et al.* (2007).

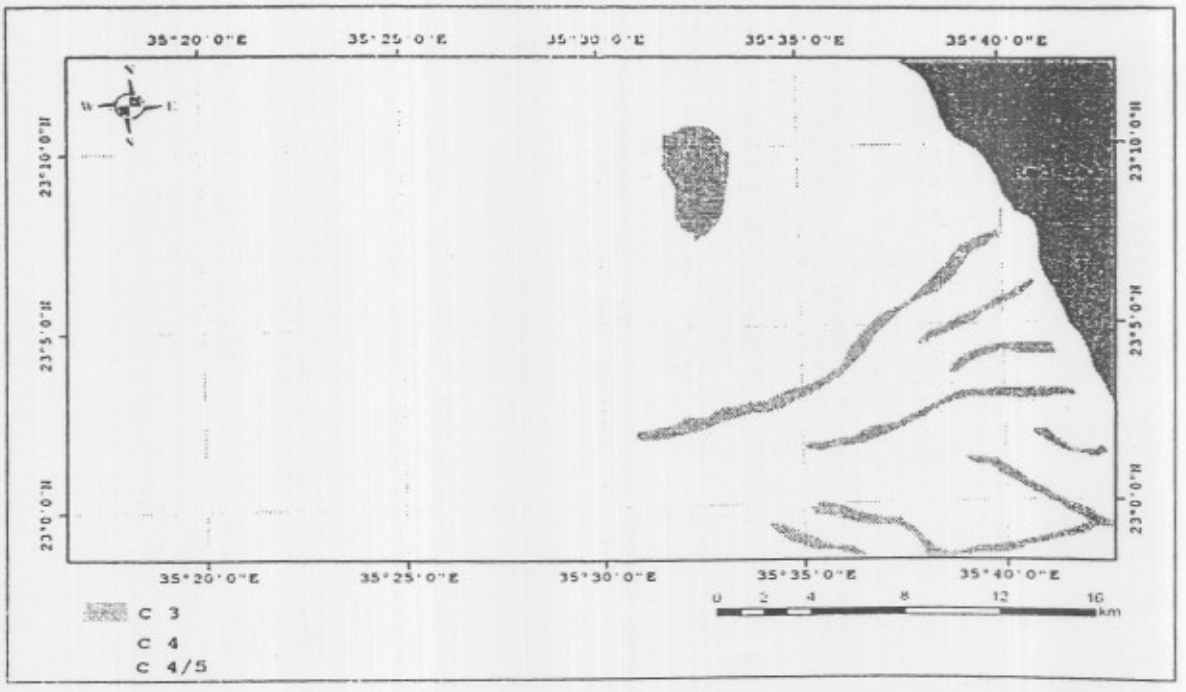

Fig. 3. Capability classification of the studied soil units.

Capability class 3

The capability class (C3) is represented by the following landforms:

The sandy plain: This unit is represented by profile no. 22. Data on Table 1 show these soils characterized by deep soil; coarse soil texture (fine sand); pH is 8.10; $CaCO_3$ content is 3.37%; gypsum content is 1.67%; CEC value is 7.33 meq/100 g soil; EC value is 2.6 dS/m and O.M content is 0.07%.

The Main Wadies: This unit is represented by soil profiles nos. 23, 24, 25 and 26. Data on Table 1 show that these soils characterized by deep soil profile; coarse and fine sandy soil texture; values of pH range from 7.73 to 8.44; $CaCO_3$ content ranges from 1.98 to 2.21%; profiles no. 23 and 26 are gypsum free, while profiles no.24 and 25 contain 0.6 and 0.75% respectively; CEC value ranges between 5.5 and 6.6 meq/100 g soil; EC values range from 0.18 to 3.10 dS/m and O.M content ranges from 0.04 to 0.2%.

The Tributaries: This unit is represented by soil profiles nos. 29, 30, 31, 32, 33 and 34. Data on Table 1 show that these soils are characterized by deep soil profiles, mostly fine sand; values of pH range from 7.67 to 8.62; $CaCO_3$ content ranged between 1.01 and 2.25%; profiles no. 29 and 31 are gypsum free, while profile no. 30, 32, 33 and 34 content are 1.6, 0.5, 0.13 and 2.05% respectively; CEC value is ranged from 5.13 to 7.3 meq/100 g soil; EC values range from 0.2 to 5.09 dS/m and O.M content from 0.1 to 0.28%.

The suitability classification of the capability class (C3)

Data on Table 2 show that 17% of these units are moderately suitable (S2); 81% is marginally suitable (S3) and 2% is conditionally suitable (S4) soils for the studied crops.

TABLE 1. ALES-Arid obtained values of the capability class (C3).

Prof. no	Depth cm	Texture Class	pH	$CaCO_3$ %	Gypsum %	CEC meq/100 gm soil	EC dS/m	O M %
22	120	fS	8.10	3.37	1.67	7.33	2.60	0.07
23	100	fS	8.44	2.03	0.00	5.50	0.18	0.20
24	100	cS	8.10	1.98	0.60	6.45	3.02	0.04
25	110	fS	7.73	1.98	0.75	6.60	3.10	0.14
26	95	cS	8.24	2.21	0.00	6.21	0.20	0.13
29	100	fS	8.62	2.12	0.00	7.30	0.20	0.20
30	100	fS	7.67	1.99	1.60	5.35	3.66	0.28
31	100	fS	8.48	1.43	0.00	5.13	0.20	0.10
32	100	fS	8.30	2.25	0.50	5.75	1.30	0.10
33	120	fS	7.79	1.01	0.13	6.13	0.81	0.27
34	100	fS	8.04	1.94	2.05	5.60	5.09	0.16

Where: cS= Coarse sand, fS= fine sand

TABLE 2. ALES-Arid Suitability classification for capability class (C3)

Pro. no.	Field crops							Vegetables						Fruits crops				
	Wheat	Barley	Sugar beat	Maize	Soya bean	Peanut	Cotton	onion	Potato	Tomato	Pepper	Alfalfa	Sorghum	Citrus	Grape	Olive	Figs	Date palm
22	S2(t)	S2(t)	S2(t)	S2(t)	S3(t)	S2(t)	S2(t)	S2(t)	S2(t)	S2(t)	S3(t,temp)	S2(t)	S2(t)	S3(t)	S3(t,temp)	S2(t)	S2(t)	S2(t)
23	S3(t)	S3(t)	S3(t)	S3(t)	S3(t)	S3(t)	S3(t)	S3(t)	S3(t)	S3(t)	S3(t,temp)	S3(t)	S3(t)	S3(t)	S3(t,temp)	S3(t)	S3(t)	S3(t)
24	S3(t)	S3(t)	S3(t)	S3(t)	S3(t)	S3(t)	S3(t)	S3(t)	S3(t)	S3(t)	S3(t,temp)	S3(t)	S3(t)	S3(t)	S3(t,temp)	S3(t)	S3(t)	S3(t)
25	S3(t)	S3(t)	S3(t)	S3(t)	S3(t)	S2(t)	S3(t)	S3(t)	S2(t)	S3(t)	S3(t,temp)	S2(t)	S3(t)	S3(t)	S3(t,temp)	S2(t)	S3(t)	S3(t)
26	S3(t)	S3(t)	S3(t)	S3(t)	S3(t)	S2(t)	S3(t)	S3(t)	S2(t)	S3(t)	S3(t,temp)	S2(t)	S3(t)	S3(t)	S3(t,temp)	S3(t)	S3(t)	S3(t)
29	S3(t)	S3(t)	S2(t)	S2(t)	S3(t)	S2(t)	S3(t)	S2(t)	S2(t)	S2(t)	S3(t,temp)	S2(t)	S2(t)	S3(t)	S3(t,temp)	S2(t)	S3(t)	S3(t)
30	S3(t)	S3(t)	S3(t)	S3(t)	S4(ece,t)	S3(t)	S3(t)	S3(t)	S3(t)	S3(t)	S3(t,temp)	S3(t)	S3(t)	S4(t)	S3(t,temp)	S3(t)	S3(t)	S3(t)
31	S3(t)	S3(t)	S3(t)	S3(t)	S3(t)	S3(t)	S3(t)	S3(t)	S3(t)	S3(t)	S3(t,temp)	S3(t)	S3(t)	S3(t)	S3(t,temp)	S3(t)	S3(t)	S3(t)
32	S3(t)	S3(t)	S3(t)	S3(t)	S3(t)	S2(t)	S3(t)	S3(t)	S2(t)	S3(t)	S3(t,temp)	S2(t)	S2(t)	S3(t)	S3(t,temp)	S3(t)	S3(t)	S3(t)
33	S3(t)	S3(t)	S3(t)	S3(t)	S3(t)	S3(t)	S3(t)	S3(t)	S2(t)	S3(t)	S3(t,temp)	S3(t)	S3(t)	S3(t)	S3(t,temp)	S3(t)	S3(t)	S3(t)
34	S3(t)	S3(t)	S3(t)	S3(t)	S4(ece,t)	S3(ece,t)	S3(t)	S3(ece,t)	S3(t)	S3(t)	S3(t,temp)	S3(t)	S3(t)	S4(ece,t)	S3(t,temp)	S3(t)	S3(t)	S3(t)

Where: Suitability classes are: S2= moderately suitable, S3= marginally suitable, S4 = conditionally suitable.
Soil subclasses: t=clay, sd=soil depth, ca= $CaCO_3$%, cec =CEC, ece= soil salinity, temp=temperature

Capability class 4

The capability class (C4) is represented by The Delta Plain landform which considered the largest soil unit in the study area (Fig.3). It is represented by 21 soil profiles. Data on Table 3 show that these soils are coarse sand. These soils have pH values range between 7.30 and 8.56; $CaCO_3$ content ranges from 0.9 to 7.81%. Most of the studied soils as represented by profiles Nos. 3, 4, 11, 14-21 are gypsum free, while profiles No.1, 2, 5, 6, 8, 9, 12 and 13 their gypsum contents are 5% or less; except profile 10as it contains 7.85%; CEC values range between 2.3and 8 meq/100 g soil; EC values are vary among these soils as following: profile no. 1 is 14.55 , profiles no. 2, 8 and 12 are 10.42, 10.25 and 10.29 dS/m, profile no.5 is 6.82 dS/m, profile no.6 is 4.5 dS/m, and the highest value occurred in profile no.7 as it is 22.17 dS/m. While the other profiles salt contents are ≤ 4.5 dS/m, and O.M content are low (<0.5%).

TABLE 3. ALES-Arid values of the Capability class (C4).

Prof. no	Depth cm	Texture Class	pH	$CaCO_3$ %	Gypsum %	CEC meq/100 gm soil	EC dS/m	O M %
1	100	cS	7.40	1.10	2.05	8.00	14.50	0.15
2	150	cS	7.58	4.58	1.88	7.60	10.42	0.23
3	100	cS	8.34	4.27	0.00	7.76	0.14	0.10
4	50	cS	7.30	4.27	0.00	7.76	0.14	0.10
5	100	cS	7.76	1.66	1.61	6.68	6.82	0.28
6	100	cS	7.84	1.95	1.95	6.40	4.50	0.12
7	100	cS	7.50	7.81	5.08	7.20	22.17	0.49
8	100	cS	8.01	3.11	0.50	5.36	1.13	0.21
9	110	cS	7.66	2.07	2.77	5.89	10.25	0.28
10	100	cS	7.39	3.13	7.85	7.40	29.00	0.41
11	110	cS	8.20	1.60	0.00	3.40	0.40	0.17
12	100	cS	8.30	1.58	0.40	2.30	10.29	0.26
13	120	cS	7.73	1.57	1.00	2.67	3.07	0.20
14	100	cS	8.48	1.46	0.00	3.00	0.64	0.08
15	100	cS	8.25	1.51	0.00	3.95	1.15	0.23
16	100	cS	8.48	0.90	0.00	3.00	0.10	0.10
17	100	cS	8.26	3.45	0.00	2.90	0.14	0.03
18	90	cS	8.44	2.73	0.00	3.89	0.21	0.27
19	100	cS	8.56	1.78	0.00	2.60	0.24	0.38
20	100	cS	8.47	1.98	0.00	4.00	0.80	0.11
21	100	cS	8.40	1.48	0.00	3.00	0.20	0.10

Where: cS=Coarse sand

The suitability classification of the capability class (C4/5)

Data on Table 4 show that 17% of these units are moderately suitable (S2); 54% is marginally suitable (S3); 27% is conditionally suitable (S4) and 2% is potentially suitable (NS1) soils for the studied crops.

Capability class (C4/5)

The capability class (C4/5) is represented by Alluvial Plain, The Marine Terraces, Denuded Hills, The plain with rock out -crops and Alluvial Fans landforms (Fig. 3).

Alluvial Plain: This unit is represented by two soil profiles, no. 27 and 28. Data on Table 5 show that the soils are characterized by deep soil, mostly coarse sand. The Values of pH are 8.55 and 8.66, $CaCO_3$ content are 2.87 and 1.79%; gypsum contents are nil; CEC values are 5.32 and 8.04meq/100 g soil; EC values are 0.63 and 0.2 dS/m and O.M contents are 0.05% and 0.04% respectively.

Marine Terraces: This unit is represented by soil profiles nos. 35, 36 and 37. Data on Table 5 show that the soil is deep, naturally well drained, mostly coarse sand. The Values of pH range from 7.20 to 8.59. $CaCO_3$ contents are less than 3%, gypsum content is occurred in soils of profile 35 only and it is1.93%CEC values are low (< 8 meq/100 g soil); EC values range from 0.19 to 9.28 dS/m and O.M contents are less than 0.5%.

*Denuded Hills:*It occupied a small area, so it represented by one soil profile, no. 38. Data on Table 5 show that the soil is deep, naturally well drained, mostly coarse sand. The of pH value is 7.77; $CaCO_3$ content is 1.13%; gypsum content is 1.98%; CEC value is 7.8 meq/100 g soil; EC value is 4.27 dS/m and O.M content is very low <0.5%.

Plain with rock out- crops: This unit is represented by profiles nos.39, 40, 41 and 42. Data on Table 5 show that these soils are deep, mostly medium sandy texture. The pH Values range between 7.47 and 8.36; $CaCO_3$ contents range from 0.94 to 1.61%; gypsum content is low (less than 4.0%); CEC values range from 5.41- 7.1 meq/100 g soil; EC values range between 0.15 and 7.60 dS/m and O.M content is <0.5%.

TABLE 4. ALES-Arid Suitability classification for capability class (C4)

Pro. no.	Field crops							Vegetables						Fruits crops				
	Wheat	Barley	Sugar beat	Maize	Soya bean	Peanut	Cotton	Onion	Potato	Tomato	Pepper	Alfalfa	Sorghum	Citrus	Grape	Olive	Figs	Date palm
1	S3(ece,t)	S3(t)	S3(t)	S4(ece,t)	S4(ece,t)	S4(ece,t)	S3(t)	S4(ece,t)	S4(ece,t)	S4(ece,t)	S4(ece,t,temp)	S3(ece,t)	S4(ece,t)	S4(ece,t)	S4(ece,t,temp)	S3(ece,t)	S3(ece,t)	S3(t)
2	S3(t)	S3(t)	S3(t)	S4(ece,t)	S4(ece,t)	S4(ece,t)	S3(t)	S4(ece,t)	S4(ece,t)	S3(ece,t)	S4(ece,t,temp)	S3(ece,t)	S3(ece,t)	S4(ece,t)	S3(ece,t,temp)	S2(t)	S3(t)	S3(t)
3	S3(t)	S3(t)	S3(t)	S3(t)	S3(t)	S2(t)	S3(t)	S3(t)	S2(t)	S3(t)	S3(t,temp)	S2(t)	S3(t)	S3(t)	S3(t,temp)	S3(t)	S3(t)	S3(t)
4	S4(t)	S4(t)	S3(t)	S4(t)	NS2(t)	S3(t)	S3(t)	S3(t)	S3(t)	S3(t)	S4(t,temp)	S3(t)	S4(t)	NS2(sd,ca)	NS2(sd)	NS2(sd)	NS2(sd)	NS2(sd)
5	S3(t)	S3(t)	S3(t)	S3(ece,t)	S4(ece,t)	S4(ece,t)	S3(t)	S3 (ece,t)	S3(ece,t)	S3(t)	S3(ece,t,temp)	S3(t)	S3(t)	S4(ece,t)	S4(ece,t,temp)	S3(t)	S3(t)	S3(t)
6	S3(t)	S3(t)	S2(t)	S3(t)	S3(ece,t)	S2(t)	S3(t)	S3 (ece,t)	S2(t)	S2(t)	S3(t,temp)	S2(t)	S2(t)	S3(t)	S3(t,temp)	S2(t)	S3(t)	S3(t)
7	S4(ece,t)	S3(ece,t)	S3(ece,t)	S4(ece,t)	S4(ece,t)	S4(ece,t)	S3(ece,t)	S4 (ece,t)	S4(ece,t)	S4(ece,t)	S4(ece,t,temp)	S4(ece,t)	S4(ece,t)	S4(ece,t)	S4(ece,t,temp)	S4(ece,t)	S4(ece,t)	S3(ece,t)
8	S3(t)	S3(t)	S3(t)	S3(t)	S3(t)	S2(t)	S3(t)	S3 (t)	S2(t)	S2(t)	S3(t,temp)	S2(t)	S3(t)	S3(t)	S3(t,temp)	S2(t)	S3(t)	S3(t)
9	S3(t)	S3(t)	S3(t)	S4(ece,t)	S4(ece,t)	S4(ece,t)	S3(t)	S4(ece,t)	S4(ece,t)	S3(ece,t)	S4(ece,t,temp)	S3(ece,t)	S3(ece,t)	S4(ece,t)	S4(ece,t,temp)	S3(t)	S3(t)	S3(t)
10	S4(ece,t)	S4(ece,t)	S4(ece,t)	S4(ece,t)	S4(ece,t)	S4(ece,t)	S4(ece,t)	S4(ece,t)	S4(ece,t)	S4(ece,t)	S4(ece,t,temp)	S4(ece,t)	S4(ece,t)	S4(ece,t)	S4(ece,t,temp)	S4(ece,t)	S4(ece,t)	S3(ece, t)
11	S4(t)	S4(t)	S4(t)	S4(t)	S4(t)	S3(t)	S4(t)	S4(t)	S3(t)	S4(t)	S4(t,temp)	S3(t)	S4(t)	NS2(ca)	S4(t,temp)	S4(t)	S4(t)	S4(t)
12	S3(t)	S3(t)	S2(t)	S4(ece,t)	S4(ece,t)	S4(ece,t)	S2(t)	S4(ece,t)	S4(ece,t)	S3(ece,t)	S4(ece,t,temp)	S3(ece,t)	S3(ece,t)	S4(ece,t)	S3(ece,t,temp)	S2(t)	S3(t)	S3(t)
13	S3(t)	S3(t)	S3(t)	S3(t)	S3(t)	S2(t)	S3(t)	S3(t)	S2(t)	S3(t)	S3(t,temp)	S2(t)	S3(t)	S3(t)	S3(t,temp)	S2(t)	S3(t)	S3(t)
14	S3(t)	S3(t)	S2(t)	S2(t)	S3(t)	S2(t)	S2(t)	S2(t)	S2(t)	S2(t)	S3(t,temp)	S2(t)	S2 (t)	S3(t)	S3(t,temp)	S2(t)	S2(t)	S2(t)
15	S4(t)	S4(t)	S4(t)	S4(t)	S4(t)	S4(t)	S4(t)	S4(t)	S4(t)	S4(t)	S4(t,temp)	S4(t)	S4(t)	S4(t)	S4(t,temp)	S4(t)	S4(t)	S4(t)
16	S3(t)	S3(t)	S3(t)	S3(t)	S3(t)	S3(t)	S3(t)	S3(t)	S3(t)	S3(t)	S3(t,temp)	S3(t)	S3(t)	S3(t)	S3(t,temp)	S3(t)	S3(t)	S3(t)
17	S3(t)	S3(t)	S3(t)	S3(t)	S3(t)	S3(t)	S3(t)	S3(t)	S2(t)	S3(t)	S3(t,temp)	S2(t)	S3(t)	S3(t)	S3(t,temp)	S3(t)	S3(t)	S3(t)
18	S3(t)	S3(t)	S2(t)	S2(t)	S3(t)	S2(t)	S3(t)	S2(t)	S2(t)	S2(t)	S3(t,temp)	S2(t)	S2(t)	S3(t)	S3(t,temp)	S3(t)	S3(t)	S3(t)
19	S3(t)	S3(t)	S3(t)	S3(t)	S3(t)	S2(t)	S3(t)	S3(t)	S2(t)	S2(t)	S3(t,temp)	S2(t)	S3(t)	S3(t)	S3(t,temp)	S2(t)	S3(t)	S3(t)
20	S3(t)	S3(t)	S2(t)	S2(t)	S3(t)	S2(t)	S3(t)	S2(t)	S2(t)	S2(t)	S3(t,temp)	S2(t)	S2(t)	S3(t)	S3(t,temp)	S2(t)	S3(t)	S3(t)
21	S3(t)	S3(t)	S3(t)	S3(t)	S3(t)	S2(t)	S3(t)	S3(t)	S2(t)	S3(t)	S3(t,temp)	S2(t)	S3(t)	S3(t)	S3(t,temp)	S3(t)	S3(t)	S3(t)

Where: Suitability classes are: S2= moderately suitable, S3= marginally suitable, S4 = conditionally suitable, NS1= potentially suitable, NS2= actually unsuitable.
Soil subclasses: t=clay, sd=soil depth, ca= $CaCO_3$%, cec =CEC, ece= soil salinity, temp=temperature.

TABLE 5. ALES-Arid values of the Capability class (C4/5).

Prof. no	Depth (cm)	Texture Class	pH	$CaCO_3$ %	Gypsum %	CEC meq/100 gm soil	EC dS/m	OM %
27	110	cS	8.55	2.78	0.00	5.32	0.63	0.05
28	120	cS	8.66	1.76	0.00	8.04	0.20	0.04
35	150	cS	7.20	1.29	1.93	5.53	9.28	0.48
36	100	cS	8.59	2.13	0.00	7.45	0.20	0.14
37	100	cS	8.20	2.44	0.00	7.90	0.19	0.17
38	100	cS	7.77	1.13	1.98	7.80	4.27	0.08
39	110	mS	8.15	0.94	0.68	5.41	1.31	0.23
40	120	mS	8.36	1.09	0.00	7.10	0.15	0.29
41	110	mS	7.47	1.61	1.98	6.82	4.67	0.10
42	100	mS	7.52	1.52	3.65	5.55	7.60	0.36
43	100	mS	8.55	1.86	3.65	5.55	0.42	0.16
44	100	mS	8.35	2.15	0.00	5.75	0.18	0.09

Where: cs= Coarse sand, ms= medium sand.

Alluvial Fans: This unit is represented by profiles no.43 and 44. Data on Table 5 show that the soils are deep , medium sandy textured. The Values of pH are 8.35 and 8.55; $CaCO_3$ contents are 1.86 and 2.15%; gypsum contents are nii-3.65 %; CEC values are 5.55 and 5.75 meq/100 g soil; EC values are 0.42 and 0.18 dS/m and O.M content are 0.16 and 0.09% respectively.

The suitability classification of the capability class (C4/5)

Data on Table 6 show that 15% of these units are moderately suitable (S2); 75% is marginally suitable (S3); 9% is conditionally suitable (S4) and 1% is potentially suitable (NS1) soils for the studied crops.

TABLE 6. ALES-Arid Suitability classification for capability class (C4/5)

Pro. no.	Field crops							Vegetables						Fruits crops				
	Wheat	Barley	Sugar beat	Maize	Soya bean	Peanut	Cotton	onion	Potato	Tomato	Pepper	Alfalfa	Sorghum	Citrus	Grape	Olive	Figs	Date palm
27	S3(t)	S3(t)	S3(t)	S3(t)	S3(t)	S3(t)	S3(t)	S3(t)	S3(t)	S3(t)	S3(t,temp)	S3(t)	S3(t)	S3(t)	S3(t,temp)	S2(t)	S3(t)	S3(t)
28	S3(t)	S3(t)	S3(t)	S3(t)	S3(t)	S2(t)	S3(t)	S3(t)	S2(t)	S2(t)	S3(t,temp)	S2(t)	S3(t)	S3(t)	S3(t,temp)	S2(t)	S3(t)	S3(t)
35	S4(t)	S4(t)	S3(t)	S4(ece,t)	NS1(ece,t)	S4(ece,t)	S3(t)	S4(ece,t)	S3(ece,t)	S4(ece,t)	NS1(ece,t,temp)	S4(ece,t)	S4(t)	S4(ece,t)	S4(ece,t,temp)	S3(t)	S3(t)	S3(t)
36	S3(t)	S3(t)	S3(t)	S3(t)	S3(t)	S2(t)	S3(t)	S3(t)	S2(t)	S2(t)	S3(t,temp)	S2(t)	S3(t)	S3(t)	S3(t,temp)	S2(t)	S3(t)	S3(t)
37	S3(t)	S3(t)	S2(t)	S2(t)	S3(t)	S2(t)	S3(t)	S2(t)	S2(t)	S2(t)	S3(t,temp)	S2(t)	S2(t)	S3(t)	S3(t,temp)	S2(t)	S3(t)	S3(t)
38	S3(t)	S3(t)	S2(t)	S3(t)	S3(ece,t)	S2(t)	S2(t)	S3(t)	S2(t)	S2(t)	S3(t,temp)	S2(t)	S2(t)	S3(t)	S3(t,temp)	S2(t)	S3(t)	S3(t)
39	S3(t)	S3(t)	S3(t)	S3(t)	S3(t)	S3(t)	S3(t)	S3(t)	S3(t)	S3(t)	S3(t,temp)	S3(t)	S3(t)	S3(t)	S3(t,temp)	S3(t)	S3(t)	S3(t)
40	S3(t)	S3(t)	S3(t)	S3(t)	S3(t)	S2(t)	S3(t)	S3(t)	S2(t)	S3(t)	S3(t,temp)	S2(t)	S3(t)	S3(t)	S3(t,temp)	S2(t)	S3(t)	S3(t)
41	S3(t)	S3(t)	S3(t)	S3(t)	S4(ece,t)	S3(t)	S3(t)	S3(ece,t)	S3(t)	S3(t)	S3(t,temp)	S3(t)	S3(t)	S3(t)	S3(t,temp)	S3(t)	S3(t)	S3(t)
42	S3(t)	S3(t)	S3(t)	S4(ece,t)	S4(ece,t)	S4(ece,t)	S3(t)	S4(ece,t)	S3 ece,t)	S3(ece, t)	S4(ece,t,temp)	S3(t)	S3(t)	S4(ece,t)	S4(ece,t,temp)	S3(t)	S3(t)	S3(t)
43	S3(t)	S3(t)	S3(t)	S3(t)	S3(t)	S3(t)	S3(t)	S3(t)	S3(t)	S3(t)	S3(t,temp)	S3(t)	S3(t)	S3(t)	S3(t,temp)	S3(t)	S3(t)	S3(t)
44	S3(t)	S3(t)	S3(t)	S3(t)	S3(t)	S3(t)	S3(t)	S3(t)	S3(t)	S3(t)	S3(t,temp)	S3(t)	S3(t)	S3(t)	S3(t,temp)	S3(t)	S3(t)	S3(t)

Where: Suitability classes are: S2= moderately suitable, S3= marginally suitable, S4 = conditionally suitable, NS1= potentially suitable, NS2= actually unsuitable .
Soil subclasses: t=clay, sd=soil depth, ca= $CaCO_3$%, cec =CEC, ece= soil salinity, temp=temperature

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محاوله لتحديد مؤشرات الاستخدامات المستدامه وصلاحيه الاراضي لمنطقه دلتا وادى حوضين، بجنوب شرق مصر

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بسبب الزياده السريعة فى اعداد السكان فى مصر ، وثمة حاجة كبيرة الى توسيع المساحات المزروعة. فان واحد من المجالات المقترحة للتوسع الافقي هو دلتا وادى حوضين جنوب شرق مصر ، والتى تغطي مساحة حوالي ٣٧٠٠ فدان (١٥,٥٤كم مربع) .الهدف من الدراسة هو دراسة أهم خصائص التربة التي تشير الى امكانيات واعدة للتوسع الزراعى في منطقة "دلتا وادي حوضين ". تم تمثيل منطقة الدراسة بعدد ٤٤ قطاع للتربة لتقدير مدى ملائمتها لزراعة ٧ محاصيل حقليه ، و٦ من الخضر والعلف و٥ محاصيل من الفواكه لمنطقة الدراسة مع الاخذ في الاعتبار أن تكون التنمية فى هذه المنطقه تنميه مستدامه للحفاظ على الموارد الطبيعيه من اراضي و مياه وبيئه.

وقد أظهرت النتائج التى تم الحصول عليها ان محتوى التربة المرتفع من الاملاح الذائبة بالاضافة إلى قوامها الرملى من العوامل الرئيسية المسيطرة على ملاءمة زراعة المحاصيل المختبرة - بجانب - درجات حرارة الهواء المرتفعة في منطقة الدراسه. ووفقاً لتقديرات مؤشرات قدرة التربة فإن منطقة الدراسة تعتبر ذات قدرة انتاجية من الدرجة الثالثة والرابعة أومابين الرابعة والخامسة. تشير النتائج المتحصل عليها من استخدام برنامج ALES-Arid إلى أن ١٦ ٪ من المساحة متوسطة الملائمة ؛ و ٦٧٪ هامشيه و ١٦ ٪ مشروطة الملائمة بينما ١٪ من منطقة الدراسة يعتبر ذو ملائمة مشروطة لـ ١٨ محصول . أظهرت النتائج أن هناك مجالاً للإستفاده من نحو ١٦-٣٠ ٪ من مساحه المنطقه المدروسة بصورة اقتصادية مع اتباع الوسائل العلمية والفنية المناسبة ووفقاً للموارد المائية المتوفره.