Egypt. J. Soil Sci. **44**, No. 2. pp. 171- 183 (2004)

Soil Potentialities as Useful Mean for Planning Agricultural Development in Sahl Baraka, Farafra Oasis, New Valley. II. Land Suitability Assessment for some Crops

G.W. Ageeb, I.S. Rahim, M.M. Wahba and F. Awad

Soils and Water Use Department, National Research Centre, Cairo, Egypt.

THE CURRENT work was conducted to investigate the main soil characteristics that refer to the promising possibilities for expansion and economical agriculture in "Sahl Baraka" area, Farafra oasis. Forty-two soil profiles covering about 10.000 feddan in Sahl Baraka were selected for this study. Soil parameters for land suitability evaluation have been determined, besides the climatological data have been collected to estimate the suitability index in each site.

The obtained results showed that calcium carbonate; gypsum, the effective soil depth and salinity of the studied profiles were considered as the main factors controlling the suitability of five selected crops in the area.

According to the estimated capability indices, the soils of the studied area were grouped into four capability classes, *i.e.*, II, III, IV and V.

The suitability assessment of the profiles revealed that; 11% of the area are considered suitable soils; 42% are moderately suitable; 33% are marginally suitable and 14% of the studied area are unsuitable soils for barley, sorghum, potato, olive and citrus.

Moderately, marginally or even unsuitable soils due to the presence of salinity limitation due to their sandy texture can easily change their order to higher one because of the availability of a very good quality of irrigation water supply. Soils with a very shallow effective soil depth, can easily be excluded from the cultivation program and it is recommended for other utilities or for infrastructure. Soils with calcium carbonate limitations can be cultivated with tolerant crops (sorghum, barley, grape and groundnuts) and controlling the fertilizer management through proper amendment of nutrient by means of foliar application.

Keywords: Land evaluation and suitability, Sahl Baraka, Farafra oasis, New Valley, Egypt.

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 Farafra oasis. Farafra oasis covers about 4.5 million feddan, only 876442 fed is considered suitable area for agriculture (Encyclopedia of the Western Desert of Egypt, 1989).

The investigated area covers about 10.000 fed of Sahl Baraka. This area is one of the most promising agricultural extension areas in Egypt. Therefore, the agricultural development is one of the main components for the investment of the New Valley area. Land evaluation is important in establishing any land use planning and cropping pattern programs.

The main goal of this study is to establish a model for land utilization types on a sustainable basis for selected field crops (barley and sorghum), vegetables (potato) and fruits (olive and citrus).

The proposed model based on climate and soil chemical properties, which were evaluated according to their influence on the above mentioned crops. To realize this objective, 42 representative soil profiles have been selected from Sahl Baraka, Farafra oasis. The selection of the representative profiles was based on the previous study of the area discussed by Rahim *et al.* (2002).

Many articles and research work have been published dealing with land evaluation and suitability classification. In this respect Habib *et al.* (1992) applied each of the USDA land capability classification (LCC) and the FAO land evaluation system to evaluate the soils of El-Saff area. They proposed the climate, current and past erosion, overflow, wetness, permeability of subsoil, slope, workability, salt hazard, water capacity, depth of hard bedrock and response to fertilizers the most limiting factors in the study area. They classified the investigated area into five land classes and two subclasses according to their degree of limitations.

Abdel Rahman *et al.* (1993) followed also the same systems (LCC and FAO) to evaluate Wadi Qena, Upper Egypt. The obtained data revealed that the presence of four capabilities classes with three capability subclasses.

Ageeb and Rahim (2003) studied the suitability of some crops at Kharga and Dakhla oases. They found those nine sites from Kharga oasis and all sites in Dakhla oasis are suitable for most of the selected crops. But they found some other sites are moderately suitable for strawberry due to their relatively high salinity, soil reaction and / or fertility limitations.

Sanad (1994) studied the main land qualities that influence land suitability for certain crops in part of Nubariya area. These land qualities are: availability of foothold for roots, soil moisture storage capacity, oxygen availability for roots, salinity, nutrients availability, temperature regime and calcium carbonate content. Abdel Rahman and El Taweel (1994) evaluated and classified Qimen El Arus, in Beni Suef, according to its productivity for 30 tested crops. They applied SAADA model using 15 factors (*i.e.*, climate, water quality, soil physical properties, fertility, management, . . . etc.). They found that more than 83% of the studies area will cost 250-1000 L.E./fed to be reclaimed, while 16.61% will cost >1000 L.E. /fed.

Material and Methods

Setting and field study

Forty-two soil profiles were selected from Sahl Baraka, Farafra oasis, New Valley (Fig. 1).

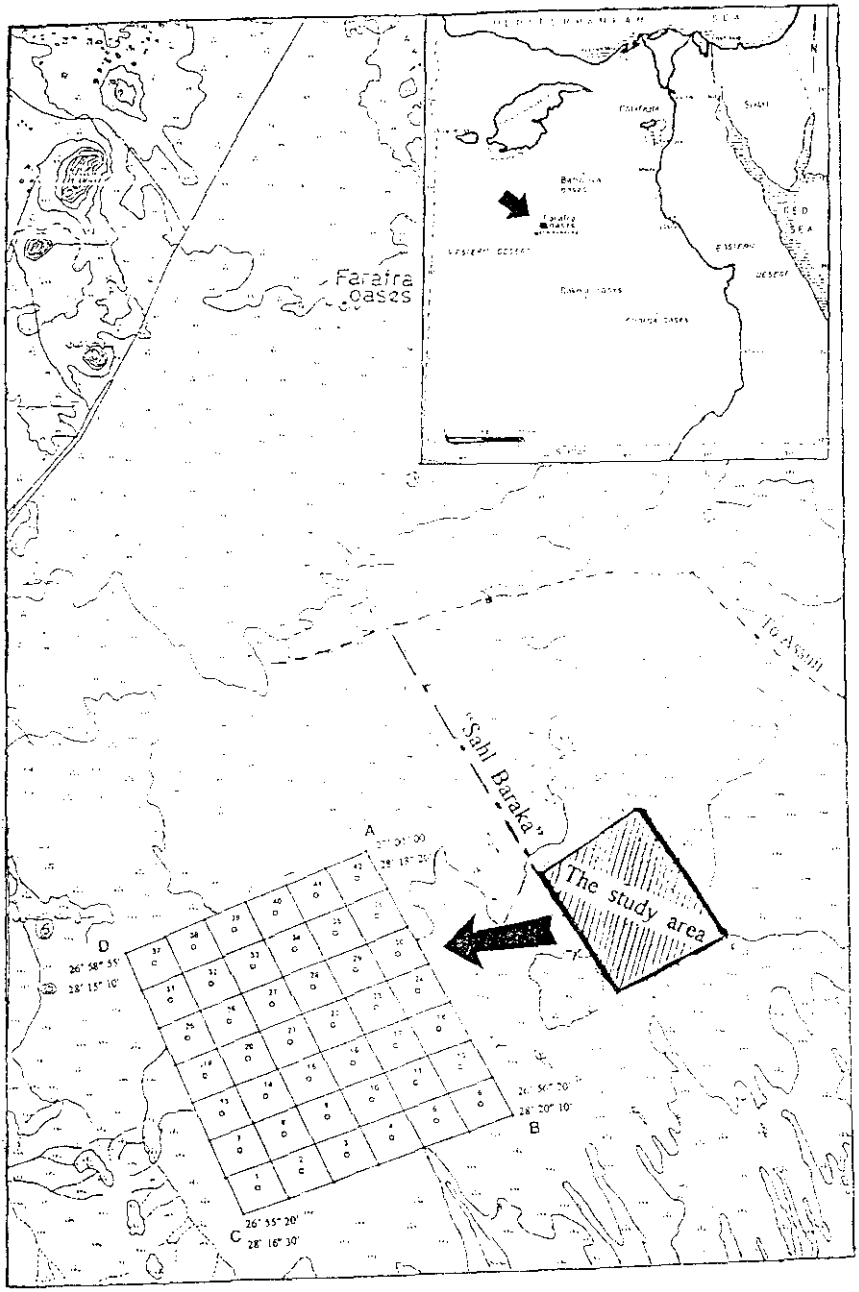

Fig. 1. Location of the studied soil profiles (localized by GPS) in Sahl Baraka, Farafra oasis, New-Valley.

Laboratory studies

106 soil samples were collected for the following analyses:

Grain size distribution (dry sieving), soil reaction (pH) of soil water suspension (1:2.5), EC (dSm^{-1}) of soil paste extract, total calcium carbonate ($CaCO_3$%) and gypsum %, were conducted according to the methods described by USDA (1991).

Evaluation methodology

The model is built in the Automated Land Evaluation System "ALES" software (Rossiter and Van Wambeke, 1995) based on the following characteristics: effective soil rooting depth, $CaCO_3$%, salinity, pH-H_2O and texture class. Air temperature parameter comes from the climatological data of the Egyptian Meteorological Authority (1996).

Values of pH-H_2O for the upper surface layer, effective soil depth (information from profile description), $CaCO_3$%, EC dS/m, texture class and gypsum content values are weight average (Sys, 1985).

Plant growth requirements for the considered crop types are based on the guideline of Sys *et al.* (1993).

Thermic conditions (C)

parameter that directly affects plant growth is appraised according to the mean annual temperature and the precipitation value, comes from the agro-climatological data (FAO, 1984).

Thermic conditions (C)

C1. Very Appropriate Thermic Conditions
The mean annual temperature is 22°C or higher Completely dry during the whole year
C2. Moderately Appropriate Thermic Conditions
The mean annual temperature is more than 15°C but lower than 22°C Precipitation less than 150 mm/year

The Effective Soil Depth (X)

X1	Very deep. No limitation	>150
X2	Deep. No limitation	150-100
X3	Slightly deep. Slight limitation	100-80
X4	Moderately deep. Moderate limitation	80-60
X5	Shallow. Severe limitation	< 60

Chemical properties (Q)

parameter indicates the higher or lower fertility, showing the facility of the soil to supply mineral nutrients to the roots. The availability depends on pH and the proportion of both of calcium carbonate and gypsum. These characteristics are assessed together.

Chemical Properties (Q)

Q1. Very Appropriate Chemical Properties		
$CaSO_4.2H_2O$%	$CaCO_3$%	pH(H_2O)
≤15	≤15	6.5-7.5
Q2. Appropriate Chemical Properties		
$CaSO_4.2H_2O$%	$CaCO_3$%	pH(H_2O)
15-20	15-30	7.5-8.5
Q3. Inappropriate Chemical Properties		
$CaSO_4.2H_2O$%	$CaCO_3$%	pH(H_2O)
20-30	30-50	>8.5

Salinity (S)

parameter has been carried out according to the limiting effects that the presence of salts more soluble than gypsum. Salt concentration is expressed in terms of the electrical conductivity (at 25°C) of the solution extracted from a saturated soil paste.

Salinity (S)

S1	Low. Slight limitations. Yield of very sensitive crops may be restricted	<4 dS/m
S2	Moderate. Moderate limitations. Yield of many crops restricted	4-8 dS/m
S3	High. Severe limitations. Only tolerant crops yield satisfactory	8-16 dS/m
S4	Very high. Very severe limitations. Only a few tolerant crops yield satisfactory	>16 dS/m

Results and Disccussions

Climate

The maximum and minimum air temperatures of the study area are 38° and 20°, respectively. Precipitation in this area is very limited even during rainy season (October and November) (0.9 mm). The mean monthly relative humidity shows the maximum during November – January. It is obvious that the evaporation rate increases at summer months and reaches a maximum value of 25mm/ year. The wind speed reaches the maximum rate during April-May (5.5km/hr) (Egyptian Meteorological Authority, 1996).

The considered criteria of the studied soil profiles are recorded in Table 1.

Soils

Field studies refer that the majority of soil profiles in Sahl Baraka have very deep solum (about 150 cm depth). However, profile no.10, which has a slightly permeable layer of limestone at depth of 30 cm, is considered a shallow profile.

TABLE 1. Texture classes and some chemical characteristics of the studied soil profiles. profiles.

Profile No.	Depth (cm)	Texture	ECe dS/m	pH 1:2.5	$CaCO_3$ %	Gypsum%	Profile	Depth (cm)	Texture	ECe dS/m	pH 1:2.5	$CaCO_3$ %	Gypsum %
1	0-30	S	2.3	8.0	11.0	0.0	23	0-50	S	3.9	8.2	17.4	4.7
	30-60	S	3.7	7.8	13.4	2.5		50-150	S	1.5	8.3	19.4	5.4
	60-150	S	3.6	7.9	7.7	3.0	24	0-30	S	3.5	8.1	21.5	0.0
2	0-55	S	1.8	8.0	12.7	0.0		30-50	S	3.4	8.4	22.6	9.3
	55-150	S	0.6	8.2	13.8	4.4		50-150	S	7.2	8.0	15.4	11.1
3	0-50	S	1.8	7.9	9.4	0.0	25	0-50	S	2.1	8.4	4.8	3.2
	50-150	S	1.4	8.1	2.8	0.0		50-150	S	3.8	8.2	2.8	5.7
4	0-30	S	2.2	8.0	26.0	0.0	26	0-40	S	1.7	8.3	3.9	0.0
	30-80	S	3.4	7.9	20.5	0.0		40-150	S	0.9	8.4	4.1	0.0
	80-150	S	1.1	8.1	4.1	2.5	27	0-30	S	4.7	8.0	12.7	0.0
5	0-50	S	2.0	8.1	23.2	0.0		30-60	S	20.4	8.0	9.7	8.9
	50-70	S	0.8	8.1	14.4	4.6		60-150	S	8.0	8.1	5.7	9.2
	70-150	S	3.5	8.0	14.9	5.2	28	0-20	S	16.4	8.1	13.8	4.7
6	0-50	S	2.6	8.2	13.8	0.0		20-50	S	6.6	7.9	7.2	7.6
	50-70	S	1.3	8.2	14.9	0.0		50-150	S	5.3	8.0	6.1	8.3
	70-150	S	2.8	8.3	10.1	7.4	29	0-40	S	4.8	8.0	19.3	0.0
7	0-50	S	1.9	8.2	10.5	0.0		40-150	S	3.6	8.1	20.4	5.9
	50-150	S	3.7	8.1	9.1	5.8	30	0-50	S	3.2	8.1	3.9	0.0
8	0-20	S	5.1	8.2	6.6	0.0		50-150	S	1.0	8.3	4.8	0.0
	20-50	S	3.6	8.3	5.4	5.3	31	0-20	S	1.8	8.0	22.6	3.5
	50-150	S	7.9	8.3	8.3	9.4		20-50	S	1.1	8.1	15.6	0.0
9	0-20	S	1.1	8.3	9.9	0.0		50-150	S	1.9	8.0	14.4	0.0
	20-40	S	0.5	8.1	2.2	0.0	32	0-10	S	19.5	8.2	14.7	5.1
	40-150	S	1.0	8.0	1.7	0.0		10-40	S	3.5	8.0	11.0	0.0
10	0-30	S	8.6	8.2	16.3	18.8		40-150	S	1.2	8.1	10.5	0.0
11	0-20	S	2.5	8.2	14.7	0.0	33	0-10	S	12.7	7.9	26.5	2.1
	20-70	S	2.8	8.1	4.5	0.0		10-25	S	10.9	7.8	6.7	11.2
	70-150	S	3.1	8.1	2.2	6.9		25-150	S	13.5	7.9	11.8	12.5
12	0-40	S	4.8	8.3	12.5	0.0	34	0-40	S	1.3	8.1	17.6	0.0
	40-60	S	3.2	8.2	7.3	0.0		40-150	S	1.6	8.1	16.5	0.0
	60-150	S	2.6	8.3	1.7	7.6	35	0-20	S	24.7	7.9	15.4	2.6
13	0-40	S	2.3	8.2	14.1	0.0		20-25	S	51.9	7.7	21.5	8.4
	40-80	S	1.5	8.4	7.2	5.8		25-40	S	10.3	7.8	28.1	9.5
	80-150	S	10.8	8.2	4.4	9.9		40-150	S	5.1	8.0	6.6	12.1
14	0-20	S	2.4	8.4	3.3	0.0	36	0-30	S	5.7	8.2	3.9	2.1
	20-150	S	1.7	8.3	4.2	0.0		30-70	S	24.7	8.0	1.7	5.2
15	0-70	S	1.5	8.4	22.6	0.0		70-150	S	22.1	7.9	4.8	7.4
	70-150	S	1.2	8.2	6.1	0.0	37	0-25	S	1.6	8.1	11.0	0.0
16	0-30	S	3.4	8.1	27.8	0.0		25-40	S	24.3	8.0	10.5	7.2
	30-120	S	2.3	8.0	19.4	14.2		40-60	S	9.5	7.8	14.3	8.2
17	0-30	S	1.2	8.4	25.9	0.0		60-150	S	10.2	7.8	14.5	9.2
	30-60	S	2.3	8.4	24.0	4.7	38	0-50	S	1.5	8.0	14.3	7.5
	60-150	S	1.8	8.4	7.9	0.0		50-150	S	4.2	8.0	8.8	9.2

TABLE 1. Contd.

18	0-30	S	3.0	8.3	24.3	0.0	39	0-50	S	2.2	8.1	16.0	8.9
	30-60	S	1.6	8.2	22.2	5.6		50-150	S	4.4	8.1	16.7	14.2
	60-150	S	3.3	8.3	11.6	7.4	40	0-30	S	5.0	8.0	27.3	2.7
19	0-150	S	1.2	8.1	7.2	0.0		30-50	S	3.6	8.1	16.2	11.4
20	0-30	S	25.3	8.1	2.8	3.6		50-150	S	5.5	8.0	26.5	13.2
	30-60	S	8.6	8.1	4.4	8.7	41	0-30	S	1.8	8.1	3.3	3.8
	60-150	S	3.9	8.4	8.3	9.3		30-150	S	10.3	8.1	31.4	5.6
21	0-20	S	2.9	8.4	6.1	0.0	42	0-20	S	3.3	7.9	14.3	2.8
	20-40	S	5.8	8.0	7.8	7.8		+ 20	C	32.6	7.6	72.8	18.7
	40-150	S	11.1	8.1	8.5	9.6							
22	0-40	S	8.2	8.2	3.4	4.7							
	40-60	S	3.3	8.1	13.8	8.2							
	60-150	S	1.9	8.2	8.9	0.0							

This study area (about 10.000 fed) is a sandy area mostly formed from aeloian sandy deposits except profile no. 42 which originated from shale deposits and has clayey texture.

There is a wide range of variation with respect to soil salinity (0.6-51.9 dS/m). According to the profiles under consideration can be grouped as follows:

a- Non saline (< 4 dS/m) includes 21 profiles no.: 1-7, 9, 11, 14-19, 23, 25, 26, 30, 31 and 34.

b- Slightly saline (4–8 dS/m): includes 8 profiles no.:8, 12, 20, 24, 29, 38, 39 and 40.

c- Moderately saline (8 –16 dS/m) includes 6 profiles no.: 10, 13, 21, 22, 33 and 41.

d- Highly saline (>16 dS/m) includes 7 profiles no.: 27, 28, 32, 35, 36, 37 and 42.

The soil pH tends to alkalinity in all profiles and the value range between 7.6 to 8.4.

Lime content of these soil profiles ranges from 1.7% to 31.4% and has no specific distribution trend with respect to soil depth. The highest calcium carbonate values are found in profile no.42 (72.8% at the depth below 20 cm).

Regarding the water quality of artisian neighboring four wells (Table 2) it is found that EC is less than 1dS/m (0.17 –0.25 dS/m). Also, pH values range between 6.6 to 6.9, which indicate the good quality of these water resources for various utilities, *i.e.*, domestic and irrigation purposes.

TABLE 2. Chemical analyses of the artisian water samples.

Sample no	EC (dS/m)	TSS (ppm)	pH
1	0.25	160	6.9
2	0.23	147	6.9
3	0.17	109	6.6
4	0.22	141	6.9

Land Evaluation

Data of the effective soil depth and classification of these soil to the great group level were obtained directly from Rahim *et al.* (2002) as showed in Table 3. For annual crops with superficial rooting system, we consider the weighted average of the upper 50 cm, while for perennial crops with a deep penetrating root system, the evaluation is made for 1m depth to estimate salinity, $CaCO_3$%, gypsum content and texture class. While soil pH values are recalculated for the upper 25 cm (Table 3).

TABLE 3. Soil parameters of the studied profiles and estimated capability indexes.

Profile No.	Texture Class	$CaCO_3$ %	Gypsum %	EC (dS/m)	pH 1:2.5	Soil depth (cm)	Soil classification (Rahim *et al*,.2002)	Capability index	Grade
1	S	10.5	2.5	3.1	8.0	150	Typic Torripsamments	63	II
2	S	13.2	1.7	1.3	8.0	150	Typic Torripsamments	61	II
3	S	6.6	0.0	1.6	7.9	150	Typic Torripsamments	67	II
4	S	18.9	0.6	2.4	8.0	150	Typic Haplocalcids	55	III
5	S	19.7	2.1	2.2	8.0	150	Typic Haplocalcids	53	III
6	S	13.1	1.9	2.4	8.2	150	Typic Torripsamments	61	II
7	S	9.9	2.4	2.7	8.2	150	Typic Torripsamments	64	II
8	S	6.9	5.6	5.8	8.2	150	Typic Torripsamments	63	II
9	S	3.1	0.0	0.9	8.3	150	Typic Torripsamments	71	II
10	S	16.3	18.8	8.6	8.2	30	Lithic Calcigypsids	15	V
11	S	6.6	2.0	2.8	8.2	150	Typic Torripsamments	66	II
12	S	7.8	2.7	3.8	8.3	150	Typic Torripsamments	66	II
13	S	9.9	3.9	4.0	8.2	150	Typic Torripsamments	64	II
14	S	3.9	0.0	1.9	8.4	150	Typic Quartzipsamment	71	II
15	S	17.9	0.0	1.4	8.4	150	Typic Haplocalcids	56	III
16	S	22.5	8.8	2.7	8.1	120	Typic Calcigypsids	54	III
17	S	19.1	1.3	1.7	8.4	150	Typic Haplocalcids	54	III
18	S	19.3	4.1	2.7	8.3	150	Typic Haplocalcids	57	III
19	S	7.2	0.0	1.2	8.1	150	Typic Torripsamments	66	II
20	S	5.1	7.0	13.4	8.1	150	Typic Torripsamments	43	III
21	S	7.7	6.7	7.8	8.4	150	Typic Torripsamments	59	III
22	S	7.1	3.6	5.2	8.2	150	Typic Torripsamments	64	II
23	S	18.2	5.0	2.9	8.2	150	Typic Haplocalcids	58	III
24	S	19.2	6.5	4.4	8.1	150	Gypsic Haplocalcids	53	III
25	S	4.0	4.2	2.8	8.4	150	Typic Quartzipsamment	75	II

TABLE 3. Contd.

26	S	4.0	0.0	1.3	8.3	150	Typic Quartzipsamment	71	II
27	S	9.4	5.6	10.0	8.0	150	Typic Torripsamments	50	III
28	S	8.9	6.8	9.2	8.1	150	Typic Torripsamments	53	III
29	S	19.8	3.2	4.2	8.0	150	Typic Haplocalcite	53	III
30	S	3.6	0.0	2.3	8.1	150	Typic Quartzipsamment	71	II
31	S	17.0	0.9	1.6	8.0	150	Typic Haplocalcids	50	III
32	S	12.0	1.7	7.7	8.2	150	Typic Torripsamments	58	III
33	S	12.6	10.9	12.9	7.9	150	Typic Calcigypsids	38	IV
34	S	17.0	0.0	1.5	8.1	150	Typic Haplocalcids	50	III
35	S	13.2	8.9	14.2	7.9	150	Typic Calcigypsids	35	IV
36	S	3.4	4.6	16.7	8.2	150	Typic Torripsamments	34	IV
37	S	12.7	5.7	9.3	8.1	150	Typic Torripsamments	51	III
38	S	12.0	8.2	2.6	8.0	150	Typic Torripsamments	65	II
39	S	16.3	11.1	3.2	8.0	150	Gypsic Haplocalcids	57	III
40	S	24.7	8.8	4.9	8.0	150	Typic Calcigypsids	34	IV
41	S	20.6	4.9	7.0	8.1	150	Typic Haplocalcids	45	III
42	C	57.2	14.5	24.8	7.9	150	Gypsic&Calcic Aquisalids	10	V

Table 3 shows the estimated capability index of the studied soil profiles according to the model of Sys *et al.* (1993), which ranged between the following grades:

Grade II. Good soils (rate range is 79-60 %): represented by profiles no.1-3, 6-9, 11-14, 19, 22, 25-27, 30 and 38.

Grade III. Fair soils (rate range is 59-40 %): represented by profiles no.4, 5, 15-18, 20, 21, 23, 24, 27, 28, 29, 31, 32, 34, 37, 39 and 41. Soil limitations are chemical properties and salinity

Grade IV. Poor soils (rate range is 39-20 %): represented by profile no. 33, 35, 36, and 40. Soil limitations are chemical properties and salinity

Grade V. Very poor soils (rate range is 19-10 %): represented only by profile no.10. Soil limitations are mainly the effective soil depth, chemical properties and salinity

The physical land suitability was applied to assess the suitability of the study area for some different crops, using Automated Land Evaluation System "ALES" and guidelines given by Sys *et al.* (1993).

Five crops have been selected for suitability evaluation representing: grains (sorghum & barley), vegetables (potatoes) and fruits (citrus & olives). These crops were found to be the most abundant in similar conditions in the oasis, particularly with respect to the climate. The growth requirement of these crops were taken into account according to the data mentioned by Sys *et al.* (1993).

In this study, the physical suitability subclasses decision tree was constructed to determine the physical suitability of the land from the land quality ratings. Four physical suitability classes were distinguished: (1) suitable, (2) moderately suitable,(3) marginally suitable and (4) unsuitable lower-case letters suffixing the class symbol denote the kind(s) of limitation(s). There are five levels of discrimination in the physical suitability subclass and decision tree with a number of decision branches at each level.

According to the model of ALES and the estimated data of soil criteria in Table 3, the suitability indices for the 42 profiles are assessed and recorded in Table 4.

a- Suitable Soils, with no limitations for all of the studied crops: represented by profiles no.1, 3, 9, 14, 15, 19, 25, 26 and 30.

b- Moderately suitable soils are represented by profiles no. 27, 28, 32, 33 and 41 for sorghum; profiles no. 2, 4-7, 11, 12, 17, 18, 21, 23, 29, and 31, 32, 33, 34 for citrus; profiles no.4, 13, 17, 18, 23, 29, 31, 32, 38 and 40 for potato; profiles no. 20, 36, 37 and 41 for barley and profile no 42 for olive.

c- Marginally suitable soils are represented by profiles no.10, 35, 36, 37, 42 for sorghum; profiles no.8, 13, 16, 20, 22, 24, 27, 28, 36, 37 and 39 for citrus; profiles no.16, 20, 21, 22, 24, 27, 28, 36, 37 and 39 for potato and profiles no.10 and 35 for barley.

d- Unsuitable soils are represented by profiles no. 10, 35, 37, 40, 41 and 42 for citrus; profiles no. 10, 33, 35, 41 and 42 for potato and profile no. 42 for barley.

Conclusion

The suitability study of the area revealed that 11% of the studied area are suitable soils; 42% are moderately suitable soils; 33% are marginally suitable soils and 14% of the studied area are unsuitable soils for some crops.

The main soil limitations in the study area are the effective soil depth, salinity and/or chemical limitations (calcium carbonates and gypsum). So, moderately, marginally or even unsuitable soils due to the presence of salinity limitations and have got sandy texture and permeability of subsoil as well can easily change its order to the higher one because of the availability of a very good quality of irrigation water supply.

Soils with a very shallow effective soil depth as profile no.10 can be easily excluded from the cultivation programs and it is recommended for infrastructure or other utilities.

TABLE 4. Suitability classification of the studied profiles.

Crops	Physical suitability classes														
	Profile No.														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Sorghum	1	1	1	1	1	1	1	1	1	3 r,g	1	1	1	1	1
Barley	1	1	1	1	1	1	1	1	1	3r,g1	1	1	1	1	1
Potato	1	1	1	2c	1	1	1	1	1	4r,c,g	1	1	2g	1	1
Citrus	1	2c,g	1	2c	2c,g,s	2c,g	2g	3S,g	1	4r,c,g, s	2c,g	2c,g,s	3c,g, s	1	1
Olive	1	1	1	1	1	1	1	1	1	4r	1	1	1	1	1

Crops	Physical suitability classes														
	Profile No.														
	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Sorghum	1	1	1	1	1	1	1	1	1	1	1	2s	2s	1	1
Barley	1	1	1	1	2s	1	1	1	1	1	1	1	1	1	1
Potato	3c,g	2c	2c,g	1	3s,g	3g,s	3g,s	2c	3g,c	1	1	3g,s	3g,s	2c	1
Citrus	3c,g	2c,g	2c,g	1	3g,s	2g,s	3c,g,s	2c	3c,g,s	1	1	3g,s	3c,g, s	2c	1
Olive	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

Crops	Physical suitability classes											
	Profile No.											
	31	32	33	34	35	36	37	38	39	40	41	42
Sorghum	1	2s	2s	1	3s	3s	3s	1	1	1	2s,c	3s,c,g
Barley	1	1	1	1	3s	2s	2s	1	1	1	2c	4c,g,s
Potato	2c	2c	4c,g,s	1	4c,g,s	3s	3g,s	2g	3g,c	2g	4c,s	4c,g,s
Citrus	2c	2s	2c,g,s	2c	4c,g,s	3g,s	4c,g,s	3c,g	3c,g	4c,g	4c,g	4c,g,s
Olive	1	1	1	1	1	1	1	1	1	1	1	2s

Notes

1 = suitable, **2** = moderately suitable, **3** = marginally suitable, **4** = unsuitable.

s = salinity limitation, **r** = rooting depth limitation ,**c** = calcium carbonate limitation, **g** = gypsum limitation.

Soils with calcium carbonate limitations can be cultivated with tolerant crops (sorghum, barley, grape and groundnuts) and controlling the fertilizer management

Therefore the recommendation is the proper choice in such areas of the study to increase the agriculture income and to reduce the inputs of these areas.

The prevailing sandy texture in these areas is given high rating due to the fact that the negative hydrophysical properties can be reduced through the application of modern irrigation systems. Also, the poor fertility level can be overcovered with amendment of nutrients through fertigation or foliar application.

References

Abdel Rahman, S. I. and El Taweel, M.I. (1994) Soil productivity classification of Qiman El Arous area, Beni Suef Governorate, Middle Egypt. *Egypt. J. Appl. Sci.* **4**, 577.

Abdel Rahman, S. I.; El Taweel, M.I. and Gad, A. (1993) Land capability classification in Wadi Qena Upper Egypt. *Agrokemica Es Talajtan*, Tom. **42**,1-2.

Ageeb, G.W. and Rahim, I.S.(2003) Estimated model for crop selection according to the environment of the New Valley, Egypt. *Egypt. J. Soil* Sci. **43**, (1-4) (In press).

ASRT. Encyclopedia of the Western Desert of Egypt (1989) Academy of Scientific Research and Technology. 4th part, Desert Institute.

Egyptian Meteorological Authority (1996) "*Climatic Atlas of Egypt.*", 157p., Pub., Arab Republic of Egypt, Ministry of Transport.

Habib, F.M.; Abdel Kader, S. and Mousa, M.A. (1992) Land capability evaluation of soils of El Saff area. *Annals of Agric. Sci. Moshtohor* **30** (2), 1052 .

Rahim, I.S.; Wahba, M.M.; Ageeb, G.W. and Awad, F. (2002) Soil potentialities as useful mean for planning agricultural development in "Sahl Baraka"- Farafra oasis, New Valley. I- Exploration, survey and classification. Mansoura Univ., *Journal of Agriculture Science* **27** (12), 8747 .

Rossiter, D.G. and Van Wambeke, A.R. (1995) *Automated Land Evaluation System* (ALES) software. Version 4.1, Cornell Univ., Dept. of Soils Crop and Atmospheric Sci., Ithaca, NY.

Sanad, M.M. (1994) Land suitability studies for proper land use in some newly reclaimed areas using remote sensing techniques, Egypt. *M. Sc. Thesis*, Fac. of Agric., Cairo Univ.

Sys, C. (1985) "*Land Evaluation*," P. 343, Parts II and III, Ghent Univ., Belgium.

Sys, C.; Van Ranst, E.; Debaveye and Beernaert, F.(1993) "*Land Evaluation*", Lecture notes, part III, crop requirements. Agric. Pub. No.7.CADC

USDA (1991) *Soil Survey Laboratory Methods Manual. Soil Survey Investigation Report*, No.**42**, Version N.1.0, Oct .1991. P. 603.

(*Received* 10/2002)

الاستفادة من القدرة الكامنـــــة للتـــربة فى التخطيط الزراعي المتطور لسهل بركه واحة الفرافرة – الوادى الجديد ٢. اختيار بعض المحاصيل للزراعة فى سهل بركة

جميل وهيب عجيب ، إبراهيم سعيد رحيم ، منير مراد وهيه وفكرى عوض مسعد

قسم الأراضي واستغلال المياه – المركز القومى للبحوث – القاهرة – مصر .

الهدف الرئيسي من هذه الدراسة هو تقييم صفات التربة ومعرفة المحاصيل التى تناسب ظروف المنطقة المدروسة فى سهل بركة بواحة الفرافرة وذلك عن طريق حساب دليل القدرة الإنتاجية Capability Index لكل موقع . وأيضا معرفة مدى ملاءمة بعض المحاصيل لزراعتها تحت هذه الظروف والتنبؤ بالناتج المتوقعة.

ولتحقيق هذا الهدف تم أخذ ٤٢ قطاعا أرضيا تغطى مساحة ١٠,٠٠٠ فدان تقريبا وتم تقدير الصفات الرئيسية بها التى تؤثر على القدرة الإنتاجية لها وهى : عمق القطاع – القوام – الأملاح – كربونات الكالسيوم – نسبة الجبس.

وتشير النتائج إلى أن الأراضي فى هذه المنطقة تقع تحت الرتبة الثانية والثالثة والرابعة والخامسة.

كما وجد أن دليل ملاءمة بعض المحاصيل مثل السورجم والشعير والموالح والزيتون والبطاطس يشير إلى أن: ١١٪ (١١٠٠فدان) من منطقة الدراسة ملائمة لزراعة كافة المحاصيل المذكورة، ٤٢٪ (٤٢٠٠ فدان) متوسطة الملائمة ، ٣٣٪ (٣٣٠٠ فدان) هامشية الإنتاج ، ١٤٪ (١٤٠٠ فدان) غير ملائمة لزراعة المحاصيل المدروسة.

الأراضي المتوسطة والهامشية الصلاحية أو حتى الغير ملائمة نتيجة ارتفاع محتواها من الأملاح وذات قوام رملي يمكن غسيلها بسهولة لتوافر المصدر الجيد للمياه فى آبار المنطقة وبذلك يمكن أن تنتقل إلى رتبة أعلى . بالنسبة للأراضي ذات المحتوى العالي من كربونات الكالسيوم يوصى بزراعتها بالمحاصيل التى تتحمل هذه الظروف مع دعم نقص العناصر المغذية عن طريق برامج التسميد المتكامل وخاصة الورقية منها.

أما المواقع ذات القطاع المحدود العمق لوجود طبقات حجرية صلبة فيمكن استغلالها فى البنية الأساسية للمشروع فى هذه المنطقة.