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Impact of Soil Degradation on Land Productivity of South El-Kalubia Governorate

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DIRECT evaluation of land productive capacity was excuted depending on the parametric method for evaluation of land productivity in South El-Kalubia, showed that ten soil characteristics were considered as limiting factors in land productivity. These factors are; moisture (H), drainage (D), soil depth (P), slope (E), soil pH (N), soluble salt concentration (S), texture/structure (T), organic matter (O), cation exchange capacity (A) and mineral reserve (M). The study area which covers about 44150 ha^2. 4 main geomorphologic units, *i.e.* flood plain, hummuky area, hilly area and turtle back. It is considered as unstable ecosystem due to the active degradation resulting from climate, relief and soil properties. The most active land degradation features are; salinization, sodification, waterlogging and compaction, all of which have negative impacts on land productivity. Soil topograph, physical and chemical properties too were measured to assess land productivity index (LPI). Rating of soil and topographic parameters were calculated using productivity formula for productivity classification for each land mapping unit. Most of the study areas 96.38%; 36232 ha are excellent and good classes (class I and II) in terms of agricultural use. The remaining area 3.62% ; 1364 ha are extremely poor class or nil (class V).

Keywords: Land degradation, Land productivity, El-Kalubia governorate.

Aagricultural productivity may be measured by what is termed "total factor productivity" (TFP). This method of calculating agricultural productivity compares an index of agricultural inputs to an index of outputs (Fuglie *et al.*, 2007). Land productive capacity or land quality is a comprehension, at the same time a precise concept in terms of agricultural activities. It is defined as a measure of capability of land to perform specific functions (Devi and Kumar, 2008). Undoubtedly, one of the ways to provide food is to increase production per area and to use the land with respect to its potentiality in an appropriate way.

Soil fertility is its inherent capacity to supply crops grown on it with nutrients in adequate amounts and suitable proportions, whereas soil productivity is a wider term referring to the ability of a soil to yield crops. The chief factors in soil productivity are soil organic matter (including microbial biomass), soil texture, structure, depth, nutrient content, water-storage capacity, reaction and absence of toxic substances, all of which depend on physical, hydraulic, chemical and biologic characteristics (Dengiz, 2007). According to Pieri *et al.* (1995) and Dengiz *et al.* (2010) land quality is defined as “the condition and capacity of land, including its soil, climate, topography and biological properties, for purposes of production, conservation, and environmental management”.

For many farmers (especially in non-industrial countries) agricultural productivity may mean much more. A productive farm is one that provides most of the resources necessary for the farmer's family to live, such as food, fuel, fiber, healing plants, … etc. It is a farm which ensures food security as well as a way to sustain the well-being of a community. This implies that a productive farm is also one which is able to ensure proper management of natural resources, such as biodiversity, soil, water, … etc. For most farmers, a productive farm would also produce more goods than required for the community in order to allow trade (Mundlak, 2007). Dengiz and Sağlam (2012) state that agriculture is one of the world’s most important activities supporting human life. From the beginning of the civilization, man has used the land resources to satisfy his needs. Land resources regeneration is very slow while the population growth is very fast, leading to unbalances. Potential land use assessment is likely to be the prediction of land potential for productive land use types.

Land degradation is a process in which the value of the biophysical environment is negatively affected by a combination of human-induced processes acting upon the land. Environmental degradation is a gradual destruction or reduction of the quality and quantity of human activities, animal activities or natural means. It is viewed as a disturbance to the land perceived to be deleterious or undesirable. Natural hazards are excluded as a cause. However, human activities can indirectly cause hazards such as floods and bush fires. This is considered an important topic of the 21st century due to the implications land degradation has upon agronomic productivity, the environment, and food security. It is estimated that up to 40% of the world's agricultural land is seriously degraded (Johnson and Lewis, 2007). Land degradation is defined by Bai *et al*. (2008) and Pierre (2010) as the long-term loss of ecosystem function and productivity caused by disturbances from which the land cannot recover unaided.

According to FAO (1994) there are six major causes of land degradation in the region, *i.e.* (1) deforestation, (2) shortage of land due to increased populations, (3) poor land use, (4) insecure land tenure, (5) inappropriate land management practices and (6) poverty. A major shortcoming of available statistics on land degradation is the lack of cause–effect relationship between severity of degradation and productivity. Criteria for designating different classes of land degradation are generally based on land properties rather than their impact on productivity. Assessing the productivity effects of land degradation is a challenging task (Eswaran *et al.*, 2001).

Materials and Methods

Location and geomorphology of the study area

El-Kalubia Governorate is located between longitudes 30° 10´ and 30° 40´ E and latitudes 31° 5´ and 31° 25´ N, and bounded to the north by Dakahlia Governorate, to the south by Cairo and Giza Governorates, to the east by Sharkia Governorate and the west by Monoufiya Governorate. The total area of the Governorate is 94400 ha^2, and it represents about 0.1 % of the total area of Egypt. Figure 1 shows a geomorphologic map of the South Kalubia area of the current study. This map is derived from images of the Landsat 7 satellite giving a map at a final scale of 1:250000 and by extracting raster geomorphologic units, victor geomorphologic units were then obtained using ARC GIS 9.4 software.

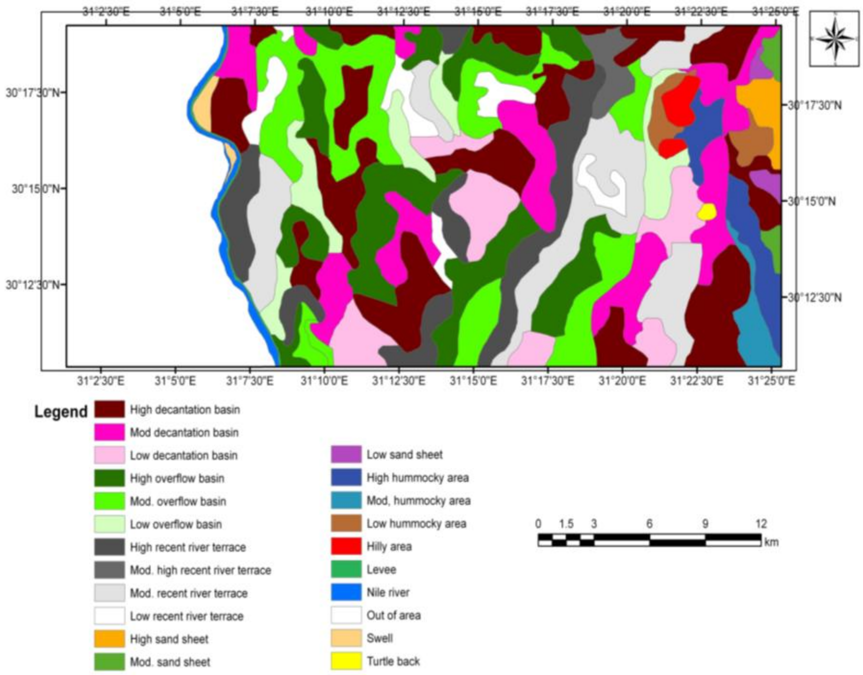

Fig.1. Geomorphology map of South El-Kalubia.

The Main geomorphic units and landforms of the study area

The geomorphic units of the study area were recognized four main landforms:

Flood plain (based on the relief, this is divided into the following three types a) Decantation basins, b) Overflow basins, C) Recent river terraces, d) Levee, and e) Swales), 2- Hummocky area, Hilly area and Turtle back (Zahra, 2007). Table 1 shows geomorphic units and their area.

TABLE 1. Geomorphic units, landform, and the total area of the studied area.

Geomorphic units	Landform	% of Total area
Flood plain	Decantation basin (DB)	25.43
	Overflow basin (OB)	38.72
	Recent river terrace (RT)	31.15
	Levee (LV)	0.45
	Swale (SW)	0.63
Hummocky area	(HM)	2.26
Hilly area	(HL)	1.19
Turtle back	(TB)	0.17

Site selection and soil characteristics

Based on distribution of physiographic units, 17 soil profiles were chosen to represent the studied area.

Detailed morphological description and classification of the selected soil profiles were recorded on the basis outlined by FAO (1990) and the USDA Soil Survey Staff (1999). Disturbed samples were air dried; ground gently, then sieved through 2 mm sieve. The soil samples were analyzed for particle size distribution, chemical and physical analyses (Rowell, 1995). Soil color in both wet and dry samples was determined using the Munssel color chart (Anon, 1975).

Data analysis

A parametric method for land evaluation has been proposed by Riquier *et al.* (1970) who stated that limitations are negative and complex concepts and that present and future capabilities are better expressed in terms of productivity. The system avoids economic and sociological considerations which lie outside the province of soil science. The system suggested the calculation of a productivity index considering ten factors as determining land productivity. They are moisture (H), drainage (D), soil depth (P), slope (E), soil pH (N), soluble salt concentration (S), texture/structure (T), organic matter (O), cation exchange capacity (A) and mineral reserve (M). A mathematical formula expressing productivity resultant from those factors is as follows:

Land Productivity Index (LPI) = $H/100 \times D/100 \times P/100 \times E/100 \times N/100 \times S/100 \times T/100 \times O/100 \times A/100 \times M/100$

Each factor is rated on a scale from 0 to 100 and the resultant index of productivity, lies between 0 and 100, and is set against a scale placing the soil in one of the following five productivity classes (Table 2).

TABLE 2. Land productivity classes.

Land Productivity Index	Definition	Class
0.65 – 1.00	Excellent	I
0.35 – 0.64	Good	II
0.20 – 0.34	Average	III
0.08 – 0.19	poor	IV
0.00 – 0.07	Extremely poor or nil	V

Each of the land characteristic with associated attribute data are digitally encoded in a GIS database to eventually generate ten thematic layers. The diagnostic factors of each thematic layer were assigned values of factor rating identified in Tables 3-7.

TABLE 3. Definition of soil moisture and organic matter.

Soil moisture content (H)		Organic matter in A1 horizon (O)	
H 1	Rooting zone below wilting point all the year round	**O1**	Very little organic matter, less than 10 g/kg
H 2	Rooting zone below wilting point for 9 to 11 months of the year H2a: 11, H2b: 10, H2c: 9 months,	**O2**	Little organic matter, 10-20 g/kg
H 3	Rooting zone below wilting point for 6 to 8 months of the year H3a:8, H3b: 7, H3c: 6 months,	**O3**	Average organic matter content, 20-50 g/kg
H 4	Rooting zone below wilting point for 3 to 5 months of the year H4a:5, H4b: 4, H4c: 3 months,	**O4**	High organic matter content, over 50 g/kg
H 5	Rooting zone above wilting point and below field capacity for most of the year	**O5**	Very high content but C/N ratio is over 25

TABLE 4. Definition of soil depth and slope.

Soil depth (P)		Slope (E)	
P1	Rock outcrops with no soil cover or very shallow cover	**E1**	Flat 0-2%
P2	Very shallow soil, < 30 cm	**E2**	Slightly 2-6%
P3	Shallow soil, 30-60 cm	**E3**	Moderately 6-12%
P4	Fairly deep soil, 60-90 cm	**E4**	High 12-20%
P5	Deep soil 90-120 cm	**E5**	Very high 20-30%
P6	Very deep soil > 120 cm	**E6**	Steep 30% +

TABLE 5. Definition of soil drainage and reserves weatherable mineral.

Drainage (D)		Reserves of weatherable mineral in B horizon (M)	
D1a	Marked waterlogging, water table almost reaches the surface all year round	**M1**	Reserves very low to nil
D1b	Soil flooded for 2 to 4 months of year	**M2**	Reserves fair
D2a	Moderate waterlogging, water table being sufficiently close to the surface to harm deep rooting plants	**M2a**	Minerals derived from sands, sandy material or ironstone
D2b	Total waterlogging of profile for 8 days to 2 months	**M2b**	Minerals derived from acid rock
D3a	Good drainage, water table sufficiently low not to impede crop growing	**M2c**	Minerals derived from basic or calcareous rocks
D3b	Waterlogging for brief period (flooding), less than 8 days each time.	**M3**	Reserves large
D4	Well drained soil, deep water table; no waterlogging of soil profile	**M3a**	Sands, sandy materials or ironstone
		M3b	Acid rock
		M3c	Basic or calcareous rocks

TABLE 6. Definition of soil texture and structure of root zone, pH of A horizon, soluble salt content and cation exchange capacity.

Texture and structure of root zone (T)		pH of A horizon (N)	
T1	Pebbly, stony or gravelly soil	**N1**	pH: 3.5-4.5
T1a	Pebbly, stony or gravelly > 60 % by weight	**N2**	pH: 4.5-5.0
T1b	Pebbly, stony or gravelly from 40 to 60 %	**N3**	pH: 5.0-6.0
T1c	Pebbly, stony from 20 to 40 %	**N4**	pH: 6.0-7.0
T2	Extremely coarse textured soil	**N5**	pH: 7.0-8.5
T2a	Pure sand, of particle structure		
T2b	Extremely coarse textured soil (> 45% coarse sand)	**Soluble salt content (S)**	
T2c	Soil with non-decomposed raw humus (> 30% organic matter) and fibrous structure	**S1**	< 0.2 %
T3	Dispersed clay of unstable structure (ESP > 15%)	**S2**	0.2-0.4 %
T4	Light textured soil, fS, LS, SL, cS and Si	**S3**	0.4- 0.6 %
T4a	Unstable structure	**S4**	0.6- 0.8 %
T4b	Stable structure	**S5**	0.8- 1.0 %
T5	Heavy-textured soil: C or SiC	**S6**	> 1.0 %.
T5a	Massive to large prismatic structure	**S7**	Total soluble salt (including Na2CO3) 0.1-0.3%
T5b	Angular to crumb structure or massive but highly porous	**S8**	0.3-0.6%
T6	Medium-heavy soil: heavy SL, SC, CL, SiCL, Si	**S9**	> 0.6%
T6a	Massive to large prismatic structure	**Cation Exchange Capacity (A)**	
T6b	Angular to crumb structure (massive but porous	**A0**	Exchange capacity of clay < 5 $cmol_c$/kg
		A1	Exchange capacity of clay < 20 $cmol_c$/kg (probably kaolinite and sesquioxides)
T7	Soil of average, balanced texture: L, SiL and SCL	**A2**	Exchange capacity of clay from 20 to 40 $cmol_c$/kg
		A3	Exchange capacity of clay >40 $cmol_c$/kg

Note: fS: fine sand, LS: loamy sand, SL: sandy loam, S: sand, C: clay, Si: Silt, SiC: silty clay, cS: coarse sand.

TABLE 7. Ratings of different soil and land characteristics.

Factor		Crop growing		
H				
H1		5		
H2a		10		
H2b		20		
H2c		40		
H3a		50		
H3b		60		
H3c		70		
H4a		80		
H4b		90		
H4c		100		
H5		100		
P				
P1		5		
P2		20		
P3		50		
P4		80		
P5		100		
P6		100		
D	H4, H5	H2, H3		
D1	10	40		
D2	40	80		
D3	80	90		
D4	100	100		
T				
T1a		10		
T1b		30		
T1c		60		
		H4,5,6	H3	H1,2
T2a		10	10	10
T2b		30	20	10
T2c		30	30	30
T3		30	20	10
T4a		40	30	30
T4b		50	50	60
T5a		50	60	20
T5b		80	80	60
T6a		80	80	60
T6b		90	90	90
T7		100	100	100

Factor		Crop growing
O		
O1		85
O2		90
O3		100
O4		100
O5		70
E		
E1		100
E2		95
E3		90
E4		85
E5		80
E6		80
M	H1,H2,H3	H4,H5
M1	85	85
M2a	85	90
M2b	90	95
M2c	95	100
M3a	90	95
M3b	95	100
M3c	100	100
	N	
N1	40	
N2	50	
N3	60	
N4	80	
N5	100	
S	T1,T2,T4	T5,T6,T7
S1	100	100
S2	70	90
S3	50	80
S4	25	40
S5	15	25
S6	5	15
S7	60	90
S8	15	60
S9	5	15
A		
A0		85
A1		90
A2		95
A3		100

Results and Discussion

Soil degradation processes

The main types of human induced land degradation in the investigated areas are salinization, sodification (alkalinization), soil compaction and water-logging. These types are affected by the human activities as follows:

In the southern part of Kalubia Governorate, there are many land degradation processes. Salinization and sodification (alkalinization) are due to accumulation of excess salts in the root zone resulting in partial or complete loss of soil productivity. The reason of salinization and sodification in the area may be poor irrigation and drainage management or high evapo-transpiration. A high salt content of the irrigation water or lack of attention given to drainage would lead to rapid salinization and / or sodification. This type of salt accumulation mainly occurs under arid and semi-arid conditions. Compaction is mainly shown as massive structure and low stability of structure under improper human activities. In the studied areas soil compaction seemed to be caused by improper use of heavy machinery, shortage of the fallow period and the excessive use of chemical fertilizers. Water-logging is one of the factors responsible for soil salinity. Over irrigation, insufficient drainage and destruction of subsurface drainage networks are main causes of water-logging in the area.

Soil characteristics and degradation evidences

Table 8 illustrates soil properties and degradation evidences of the study area.

TABLE 8. Soil properties / degradation evidences.

Mapping unit	Chemical degradation		Physical degradation	
	Salinity (s)	Sodacity (a)	Compaction (c)	Water logging (w)
DB	1.75	3.03	1.26	150
OB	2.58	7.15	1.32	150
RT	4.93	3.07	1.22	140
LV	1.23	5.78	1.27	150
SW	2.06	8.85	1.20	120
HM	3.05	4.35	1.54	110
HL	6.13	11.65	1.62	95
TB	2.17	2.70	1.68	80

FAO/UNEP criteria

The criteria (FAO/UNEP, 1978) are used to determine the degree, class and rate of different types belonging to land degradation as shown as in Table 9.

TABLE 9. Criteria used to determine the degree of different types of degradation.

Criteria/degradation type	Indicator	Unit	1	2	3	4	5
Salinization	**EC**	**dS/m**	<4	4-8	8-16	16-32	>32
		Class	**None**	**Slight**	**Moderate**	**Severe**	**Very severe**
Sodicity	**ESP**	**%**	<10	10-15	15-30	30-50	>50
		Class	**None**	**Slight**	**Moderate**	**Severe**	**Very severe**
Compaction	**Bulk density**	**g/cm^3**	>1.8	1.6-1.8	1.4-1.6	1.2-1.4	<1.2
		Class	**losses**	**Slightly hard**	**Hard**	**Very hard**	**Extremely hard**
Waterlogging	**Water logging**	**cm**	>150	150-100	100-50	50-30	<30
		Class	**None**	**Slight**	**Moderate**	**Severe**	**Very severe**

Notice: 1-5 means degree of hazard. Source: After FAO/UNEP (1978).

Land degradation assessment

With regard to salinity hazards, soils of DB, OB, LV, SW, HM and TB belong to class 1 (non-saline), while the others belong generally to class 2 (slight). With regard to sodicity hazards, all soils belong to class 1 (none) except for HL belongs to class 2 (slight). As for compaction hazards, soils of HL and TB belong to class 2 (slightly hard), whereas soils of DB, OB, RT, LV and SW belong to class 4 (very hard), except for HM belongs to class 3 (hard). All soils of the studied area belong to class 2 (slight) regarding water logging hazards, except for HL and TB belong to class 3 (moderate).

Table 10 shows the summary of land degradation assessment for soils of the study area.

TABLE 10. Land degradation assessment.

Mapping unit	**Degradation type**			
	Salinity (a) degree	**Sodicity (a) degree**	**Compaction (c) degree**	**Water logging (w) degree**
DB	N(class 1)	N(class 1)	V(class 4)	S(class 2)
OB	N(class 1)	N(class 1)	V(class 4)	S(class 2)
RT	S(class 2)	N(class 1)	V(class 4)	S(class 2)
LV	N(class 1)	N(class 1)	V(class 4)	S(class 2)
SW	N(class 1)	N(class 1)	V(class 4)	S(class 2)
HM	N(class 1)	N(class 1)	H(class 3)	S(class 2)
HL	S(class 2)	S(class 2)	S(class 2)	M(class 3)
TB	N(class 1)	N(class 1)	S(class 2)	M(class 3)

Notes: N= None, S=Slight, M=Moderate, V=Very hard, H=Hard.

Land productivity

Land productivity is assessed using the productivity model after Riquier *et al.* (1970). Land productivity classification groups are distinguished in precise numerical units. Classifications, which meet soil productivity requirements, would be taken as the highest grades. Soils with extreme limitations would be the lowest ones. Intermediate grades would be placed in between the two extreme conditions. Values of the factors of land productivity are shown in Table 11. Soil characteristics relevant to productivity are shown in Table 12, while assessment of soil productivity could be obtained by matching soil characteristics with its counterpart of the requires model rating as shown in Table 13.

TABLE 11. Values of the factors of land productivity of the studied soils of the investigated area.

Mapping unit	Moisture month	Drainage	Soil depth cm	Slope %	Soil pH	Soluble salt content dS/m	Texture / Structure	Organic matter g/kg	Cation exchange capacity $cmol_c/kg$	Mineral reserve
DB	9 month	Well drained	150	1.0	7.1	1.75	Clay	18.2	55.6	from sands, sandy material or ironstone
OB	9 month	Well drained	150	1.0	7.4	2.58	Clay loam	14.6	49.3	from sands, sandy material or ironstone
RT	9 month	Good drained	140	1.0	7.4	4.93	Clay	15.4	50.8	from sands, sandy material or ironstone
LV	9 month	Good drained	150	1.0	8.2	1.23	Clay	16.7	57.1	from sands, sandy material or ironstone
SW	9 month	Well drained	120	1.0	7.8	2.06	Clay	15.9	50.9	from sands, sandy material or ironstone
HM	9 month	Good drained	110	1.5	7.5	3.05	Sandy loam	6.5	16.5	from sands, sandy material or ironstone
HL	9 month	Good drained	95	1.5	8.0	6.13	Sand	7.3	12.1	from sands, sandy material or ironstone
TB	9 month	Good drained	80	2.0	7.5	2.17	Sand	5.6	3.6	from sands, sandy material or ironstone

TABLE 12. Soil characteristics of the investigated area.

Mapping unit	Moisture (H)	Drainage (D)	Soil depth (P)	Slope (E)	Soil pH (N)	Soluble salt concentration (S)	Texture/ Structure (T)	Organic matter (O)	Cation exchange capacity (A)	Mineral reserve (M)
DB	H4c	D4	P6	E1	N5	S1	T5b	O2	A3	M2c
OB	H4c	D4	P6	E1	N5	S1	T6a	O2	A3	M2c
RT	H4c	D3a	P6	E1	N4	S2	T5b	O2	A3	M2c
LV	H4c	D3a	P6	E1	N4	S1	T5b	O2	A3	M2c
SW	H4a	D4	P6	E1	N5	S1	T5b	O2	A3	M2c
HM	H2c	D3a	P5	E1	N5	S1	T4a	O1	A1	M2a
HL	H2c	D3a	P5	E1	N5	S2	T2a	O1	A1	M2a
TB	H2c	D3a	P4	E1	N5	S1	T2a	O1	A0	M2a

Appreviation according to Riquier *et al.* (1970).

TABLE 13. Assessment of soil productivity of the investigated area.

Mapping unit	H	D	P	E	N	S	T	O	A	M	Land Productivity Index (LPI)	Class
DB	100	100	100	100	100	100	80	90	100	100	0.720	I
OB	100	100	100	100	100	100	80	90	100	100	0.720	I
RT	100	80	100	100	80	90	80	90	100	100	0.415	II
LV	100	80	100	100	80	100	80	90	100	100	0.461	II
SW	80	100	100	100	100	100	80	90	100	100	0.576	II
HM	40	90	100	100	100	100	30	85	90	85	0.070	V
HL	40	90	100	100	100	70	10	85	90	85	0.016	V
TB	40	90	80	100	100	100	10	85	85	85	0.017	V

Soil characteristics productivity rating, land productivity index and grades are shown in Tables 12 and 13.

Land productivity assessment of the flood plain

The mapping units in this landform could be grouped in two productivity grades as follows; mapping units DB and OB which have productivity grade I and LPI value of 0.720. These units have 64.15% (24112 ha.), while RT, LV and SW have productivity grade II and LPI ranging between 0.415 and 0.576, the percentage of these units is 32.23% (12120 ha.). The main limiting factors are moisture, drainage, texture/structure, salinity, pH, organic matter and mineral reserve.

Land productivity assessment of the hummocky area

Mapping unit HM has the productivity grade v and value of (LPI) 0.070. This unit has grade v which represents 2.26% (850 ha.). The main limiting factors are moisture, drainage, texture/structure, organic matter, cation exchange capacity and mineral reserve

Land productivity assessment of the hilly area

Mapping unit HL has the productivity grade v and value of (LPI) 0.016, which represent 1.19% (447 ha.). The main limiting factors are moisture, drainage, texture/structure, salinity, organic matter, cation exchange capacity and mineral reserve.

Land productivity assessment of the turtle back

Mapping unit TB has the productivity grade v and value of (LPI) 0.017, which represent 0.17% (67 ha.). The main limiting factors are moisture, drainage, soil depth, texture/structure, organic matter, cation exchange capacity and mineral reserve.

Conclusions

Achieving and maintaining good land quality are essential for sustainable agricultural production in an economically viable and environmentally safe manner. The goal of the current study is classifying land productivity to different categories, each of which corresponding to a certain level of details. At each level the interpretation differs in precision, objectives, requirements and assumptions. These successive steps help users for a better understanding of the system. Next to this study, more research should be devoted to these important topics, in particular validation of usefulness of LPI in decision making and implantation. The similar research should be also conducted for different soil types and environments.

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تاثير تدهور التربة على انتاجية الاراضى جنوب محافظة القليوبية

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الطريقة المباشرة لحساب سعة الارض الانتاجيه تعتمد أساسا على تطبيق النموذج الرياضي لتقييم انتاجية التربة في جنوب محافظة القليوبية الذى يوضح أن هناك عشر خصائص للتربة تؤخذ في الاعتبار لعوامل محدده للانتاجية .هذه العوامل هي الابتلال ، الصرف ، الميل درجة حموضة التربة ، تركيز الأملاح الذائبة ، قوام وبناء التربة ، المادة العضوية، نوع الطين ، والسعه التبادلية للتربة والمخزون المعدني في الأرض. وتغطى منطقة الدراسة مساحه حوالي 441,5كم^2 و تشتمل على أربع وحدات جيومورفولوجية وهى السهل الفيضي ، منطقة الآكام ، منطقة التلال وظهور السلاحف.

وتعتبر منطقة الدراسة نظام ايكولوجي غير ثابت وهذا راجع إلى الأنشطة التي تؤدى إلى التدهور الناتج عن عوامل المناخ والطبوغراافيه وخصائص التربة المختلفة .

وعوامل التدهور الاكثر تاثيرا في منطقة الدراسه هى التملح والقلويه وتضاغط التربة وارتفاع منسوب الماء الارضى وكل هذه العوامل لها تاثير سلبى على انتاجية التربه.

ومن خلال التحليلات والتقييمات للخواص: الطبوغرافية والطبيعية والكيميائية للتربة من اجل حساب دليل انتاجية التربه (LPI) تم تصنيف قيم (LPI) لكل وحده خرائطية على حده وطبقا للنتائج المتحصل عليها قسمت منطقة الدراسة إلى الرتب التالية : الرتبة الاولى والثانية وهى الاقسام الممتازة والجيدة من حيث الاستخدامات الزراعية للتربة و تمثل 96،38٪ (86266،31 فدان) ، بينما تمثل الرتبة الخامسة وهى الفائقة الفقر من حيث الاستخدامات الزراعية حوالى 3،62٪ (3246،55 فدان) من جملة مساحة اراضى جنوب القليوبية موضوع الدراسة.