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Evaluation of Land capability and suitability for crop production: case study in some areas of El-Gharbiya Governorate of Egypt.

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Abstract

The current study was carried out on the soils of El-Gharbiya Governorate to estimate their capability and suitability for growing some crops (Sunflower, Cotton, wheat, potato, corn, soybean, mellon, beet, alfalfa, peach, citrus and olive). The studied area lies between latitudes 30 ˚ 42 `00`` and 31 ˚ 04 ` 00`` N, and longitudes 30 ˚ 46 ` 00`` to 31 ˚ 02 ` 00`` E, with a total area is around 63852ha. Soil texture is varying from clay to clay loam. For this purpose, 10 soil profiles were dag and collect of soil samples. The geomorphologic units the investigated area are divided into 6 land forms: 1- Decantation basin. 2-Over flow basin. 3- High terraces. 4- Moderate terraces. 5-Low terraces. 6- Levee. 7-swale. Land capability and suitability evaluation was done by integrating remote sensing and GIS techniques for three districts in El-Gharbiya Governorate of Egypt (Basuien, Kafr El-zayat and Tanta). The Micro lies program and Geographic Information System (GIS) used to assess the suitability of the land in the study area. According to Micro-LEIS-Cervatana capability model, the capability of the lands in the study area are grouped into three classes; Class1 (S1) occupied 23.64% of the study area and represented by decantation basin and overflow basin mapping units, Class2 (S2) occupied 3.60% of the study area and included swale mapping unit and Class3 (S3) occupied 72.76% of the study area and included high terraces, moderate terraces, low terraces and levee mapping units. According to the Micro-LEIS-Almagra model, the suitability of the study area classified into four classes: optimum suitability class (S1) occupying 15.70%of the study area, high suitability class (S2) occupying 58.78%of the study area, moderate suitability class (S3) occupying 13.72%of the study area, and marginal suitability class (S4) occupying 11.76%of the study area. The main limiting factors for crop production in the study area are soil texture, depth and calcium carbonate. The soil maps of agricultural suitability can be helpful in the management processes.

Keywords: Land capability, Land suitability, El-Gharbiya Governorate, GIS and Remote sensing.

Introduction

Land assessment is seen as a set of methodological guidelines rather than a land classification system, such as land capacity and land irrigation suitability **(FAO, 1976 and Van Lanen *et. al*., 1992)**. Land evaluation is a utilization mapping to give the information for the sustainable agricultural production, managing land recourses, land capability and land suitability are various kinds of identifying land for specific land uses (**FAO, 2008; Tadesse and Negese, 2020 and Debesa et al., 2020).** There for, land evaluation is a tool for strategic land use planning. Building agricultural use and management system based on agro-ecological potential and restriction is the best way to achieve sustainability **(FAO, 1978).** The specific evaluation expresses the suitability of the specific ecosystem or crop and depends on land characteristics, rationalization of land use and planting patterns, and farming techniques **(Várallyay, 2011)**. Land suitability assessment, defined as the assessment of the "quality" of land use and specific crops, is an important step in sustainable management and land use planning **(Saleh et al, 2015)**.

Land suitability is assessment considers a reasonable farming system to optimize the use of a piece of land for a specific purpose **(FAO, 1976 and Sys *et. al*., 1991)**. Suitability is a function of crop demand and land characteristics **(FAO 1976)**. Land suitability classification is the process of evaluating and grouping specific types of land according to the absolute or relative suitability of specific types of land **(Belka, 2005)**. Suitability defines the level of crop demand relative to current soil characteristics, and a measure of how well the quality of land units matches the needs of specific land use forms **(FAO, 2003)**. Land suitability assessment is a land evaluation method that determines the main constraints for growing a particular crop **(De La Rosa et al,2004 and Halder,2013).** Land suitability evaluation includes qualitative evaluation and quantitative evaluation. In the qualitative land suitability assessment , information about climate, hydrology, topography, vegetation, and soil characteristics are considered **(Mosleh et al, 2017)**.In the quantitative assessment, the results are more detailed, and the yield is estimated **(El-Baroudy, 2016)**.land suitability assessment can not only improve crop management system and increase land capacity **(El-Baroudy,2016 and Prudat et al, 2018)**, The first step in agricultural land use planning is land suitability assessment, which is usually performed to determine the type of land use suitable for a particular location **(Bodaghabadi et al., 2019).** According to the **FAO (1976, 1983, 1985, and 2007)** system, land evaluation classification was carried out to assess the suitability of the soil in the study area for agriculture and development. Land suitability using Micro LEIS is used to predict the impact of groundwater level and salinity on wheat productivity **(Bahnassy et al., 2001).** MicroLEIS has been used to determine the main limiting factors that hinder or reduce soil productivity **(Yehia, 1998). Liambila and Kibret (2016)** applied the Micro LEIS - Almagra (agricultural soil suitability) model, which is built into the MicroLEIS system for agricultural land evaluation, and selected crops for evaluation as sorghum, corn, and wheat sweet potato and soybeans.

Remote sensing technology provides a viable alternative to traditional field work because of its large area coverage, multi-spectral information and almost continuous observations.

Someoftheimportantapplicationsofremotesensingtechnologyareagriculture,geologyandhydrology**(KarlsonandOstwald,2016).**Remote sensing products play an indispensable role in many applications, such as: carbon emission monitoring, forest monitoring, medical science and epidemiological research, land change detection, natural disaster assessment, agriculture and water/wetland monitoring, climate dynamics and biology Diversity research **(Khatami et al., 2016).**.Process the data layer in the multi-standard evaluation to achieve suitability, which can be conveniently realized by using GIS. Remote sensing and GIS are used in many studies of land resource mapping and management in Egypt **(Mohamed et al., 2014 and Saleh and Belal, 2014).** The land suitability classification process is to assess and group specific land areas according to the suitability of specific land uses**. Ismail et al. (2005)** proved the usefulness of GIS in terrain parameter analysis, and the effectiveness of GIS and remote sensing integration in monitoring soil characteristics of land reclamation and mapping of potential soil units. Remote sensing (RS) data is not only used to estimate cropping system analysis and land use and land cover estimation in different seasons, but also to estimate biophysical parameters and indices **(Rao et al., 1996 and Panigrahy et al., 2006).** In addition, in the past four years, remote sensing and GIS have been increasingly used in multiple application areas, including land suitability assessment **(Hamzeh et al., 2014; El-Baroudy and Moghanm, 2014)**. The interpretation of soil quality and site information for agricultural use and management practices is integrated using geographic information systems **(FAO, 1991, 2007).**

The main purpose of this research is to (1) evaluate the land resources in parts of El-Ghabia Province, Egypt, (2) evaluate the main land use restrictions and (3) prepare land capacity maps and land suitability maps for different crops using GIS technology and Micro LEIS. The study will help establish the decision-making framework and future planning of the study area.

Materials and Methods.

1.2. Description of the Study Area.

The study area lies between latitudes 30˚42`00`` and 31˚04`00`` N, and longitudes 30˚46`00`` to 31˚02`00`` E, with a total area is around 63852 ha. A texture which varies from clay-to-clay loam. El-Gharbia Governorate is located at the middle Nile of Delta in Egypt. The Nile Delta covers only 2% of Egypt's area but hosts 41% of the country's population and comprises 63% of agricultural land **(Hereher,2010).** The Governorate is bordered by the Governorates of Kafr El-Sheikh to north and El-Monufiya to south, while is aligned by Demietta and Rosetta Nile branches in the east and the west respectively. The total area of El-Gharbia Governorate is 462,684 acres while the cultivated area is 397,714 acres'. e. 85% of the total area.

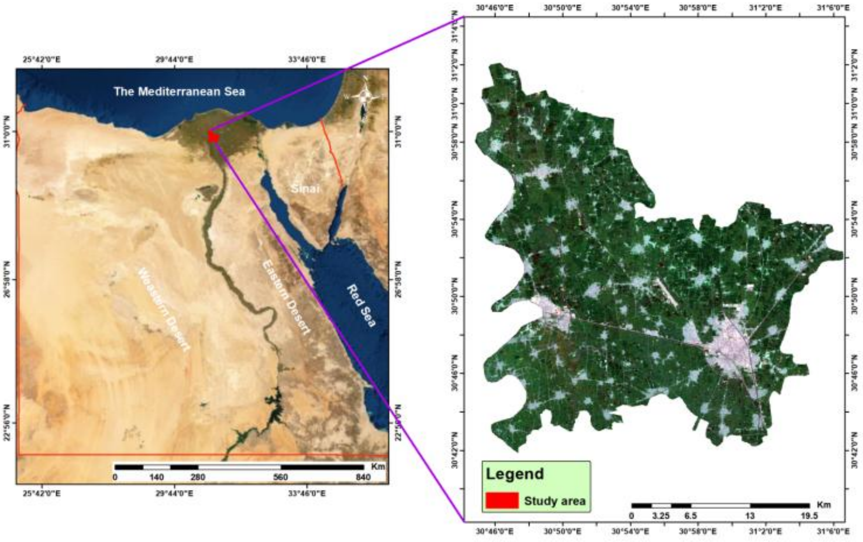

Fig.1.Locationmapofthestudyarea.

2.2. Geology

According to **Mikhailova (2001),** the most recent classic shape of the Nile delta was formed during the Holocene period, when the Holocene delta sediments began to accumulate with the rise of sea level at the end of the last glacial period. The sediment accumulation rate is estimated to be approximately 5 mm per year **(Coutellifr and Stanley, 1987).**

3.2Image processing and Software used.

Land sat -8 images (acquired in 2020) and digital elevate on model of the study area was used to define the physiographic map in the studied area. Perform all further digital image processing and analysis using standard methods provided by ENVI 5.1 and Arc-GIS 10.2 software

4.2. Soils Survey and fieldwork

A semi detailed survey was carried out to collect soil samples and to determine different soil units. The GPS was used to define the longitudes and latitudes. Ten soil profiles were taken to represent the different drawing units in the study area. The soil profile represents different landform units. The collected soils amp les amounted 30 of the different layers of soil profiles were taken for laboratory analyses. Morphological descriptions were worked out for the soil profiles in the field according to the FAO guidelines **FAO (2006**) and classified according to the Soil Taxonomy System **(USDA,2014)**.

5.2. Laboratory Analyses

The soils amples were air- dried, crushed softly, and passed through a 2-mm sieve to get the ‘‘fine earth.’’ The fine earth was analyzed in the laboratory for physical and chemical analyses. Laboratory analyses (Soil texture, $CaCO_3$ content, $CaSO_4$. $2H_2O$ content, CEC, pH, EC, ESP, soluble cations and anions, organic matter content and available N, P, K) were carried according to **(USDA, 2004 and Band yopadhyay 2007**).

6.2. Image processing.

Remote sensing analysis of the area where the Land sat Data Continuity Mission (LDCM) sensor (Land sat 8) uses data in 2020. All further digital image processing and analysis are performed using standard methods provided by ENVI 5.3 and Arc-GIS 10.2 software. According to Lilles and Kiefer (2007), image processing includes bad line operations by using the gap-filling module designed by the IDL language and data calibration to radiation.

7.2. Method of Land Evaluation

Classifications of land evaluation were undertaken according to the **FAO (1976)** system to assess land capability and suitability of the studied area soils for sustainable agriculture. The studied soils were evaluated for land capability and suitability using Micro LEIS program. Micro-LEIS is a combined software used to evaluate land data and agricultural ecosystems. Micro-LEIS is considered to be a computer-based computer with a systematic arrangement function and provides a logical explanation of land resources **(De La Rosa et al., 2004).** The data input parameters of the model include root depth, soil texture, calcium carbonate, drainage conditions, salinity and soil profile development.

8.2. The land capability classification model using the ALES program.

The Micro LEIS capability model predicts general land use capacity for a range of possible agricultural uses. The prediction of general land use capacity by the land capacity model (Micro LEIS-CERVANTANA model) is the result of qualitative evaluation and overall interpretation of the following factors:

Relief, soil, erosion, bioclimatic deficits. The order and grade of ability assessment are excellent (S1), good (S2), medium (S3) and marginal or zero (N). The sub-categories depend on the limiting factors: slope (t), soil texture (I), erosion risk (r) and bioclimatic deficit (b). Applicability CERVATANA model. Regarding slope, erosion, bioclimatic deficit and soil properties, Tables 1 and 2 show that these soils belong to the S1, S2, S3, and N levels. The main soil constraints are: effective depth (p), texture (t), drainage (d), carbonate content (c), salinity (s), alkalinity (a) and profile development (g).

Table 1. Agro-ecological evaluation method of land capacity grade using MicroLEIS-CERVANTANA model.

Land Capability order and class		
Order		**Class**
	S1	**Excellent**
S	**S2**	**Good**
	S3	**Moderate**
N	**N**	**Marginal or Null**

Table 2. Agro-ecological evaluation of land capability subclasses of the Micro LEIS-CERVANTANA model.

Land capability subclass		**Limitation factor**
Slope	**(t)**	**Slope**
Erosion risks	**(r)**	**Soil erodibility**
		Slope gradient
		Vegetation density
Soil	**(i)**	**Drainage class**

		Salinity
		Useful depth
		Texture class
		Stoniness and rockiness
Bioclimatic deficit	**(b)**	**Aridity degree**
		Frost risks

Land suitability model (Micro LEIS- ALMAGRA model).

Land suitability assessment uses the MicroLEIS-ALMAGRA model (De La Rosa et al., 2004) for application, which can show suitability regardless of economic conditions. The suitability levels of each crop (Table 3) are: best suitability (S1), high suitability (S2), medium suitability (S3), marginal suitability (S4) and unsuitability (S5).

Table 3 . Land suitability classification index and ratings of the Micro LEIS program **.**

Class	Description	Rating %
S1	**Soils with optimum suitability**	**>80**
S2	**Soils with high suitability**	**<80>60**
S3	**Soils with moderate suitability**	**<60>40**
S4	**Soils with marginal suitability**	**<40>20**
S5	**Soils with no suitability**	**<20>10**

Results and Discussion

1.3. Physiographic map and soils of the study area

The physiographic units of the studied area have been identified based on a Landsat-8 image, the field investigation and the DEM. The obtained results reveal that the main landscape in the study area is floodplain as shown in Table 4 and Figure 2. The flood plain is the main landform in the present area and covering 62624 ha. (98.07% of the total area). This landform resulted from the Nile deposits during the flooding periods. The different physiographic units of the flood plain are decantation basins and over flow basins, high river terraces, moderate river terraces, low river terraces, river levee and swales with areas of about 3966, 11130, 3832,22180ha.,16232, 2989and 2295 ha. Respectively.

Table 4. Geomorphic and Mapping units and their area and percentages of the total area.

Landscape	Physiographic Unit	Mapping Unit	Area(ha)	%of total area
Flood plain	**Decantation basin**	**DB**	3966	6.21
	Overflow basin	**OB**	11130	17.43
	High terraces	**HT**	3832	6.00
	Moderate terraces	**MT**	22180	34.74
	Low terraces	**LT**	16232	25.42
	River Levee	**RL**	2989	4.68
	Swales	**S**	2295	3.60
The Nile River		**NR**	1228	1.92
	Total area		63852	100.00

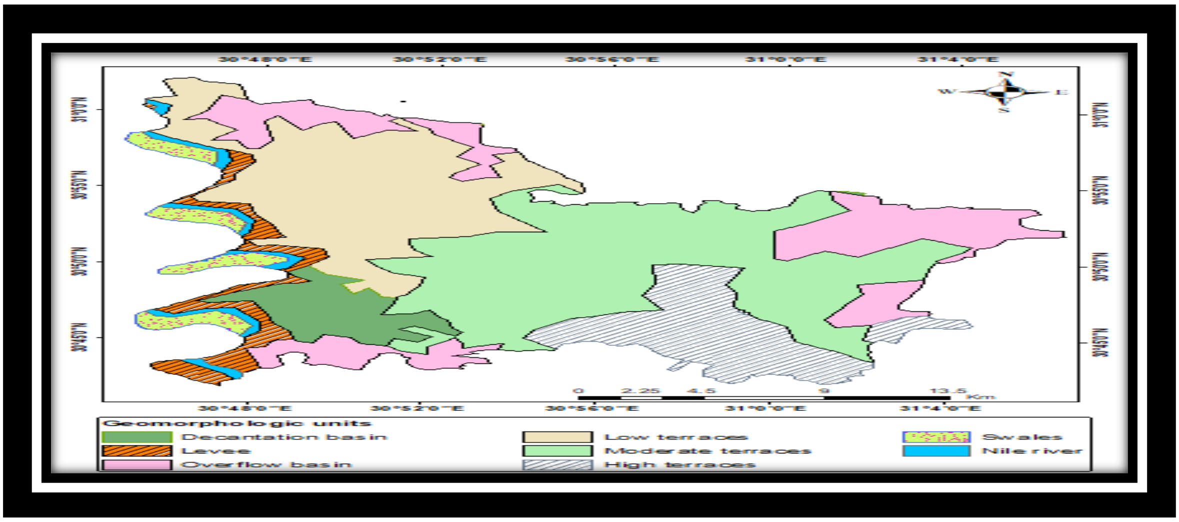

Fig2. :geomorphologic map of the study area

2.3. Land evaluation model.

In the Micro LEIS DSS system, land assessment analysis focuses on management of agricultural land use, planning, and soil protection purposes. This modeling or classification phase is done using basic information from representative regions, while the application or generalization phase is performed in unknown scenarios (Figure 3). The output of the model is linked to the characteristics of the GIS modeling environment using database fields with key attributes.

Evaluation of land capability classification using Micro LEIS- Cerventana model.

a- Estimate soil properties, such as slope, drainage conditions, soil depth, texture, calcium carbonate. content, gypsum content, salinity and sodicity were used in the land evaluation. The rating of capability classes of the studied area are present in Table 5 and illustrated in Figure8. Accordingly, the studied area could be classified into three capability classes as follow: Lands of capability class (S1): This class includes the soils which are excellent capability and non-limitation. The soils there are in the decantation basin and overflow basin and occupy 23.64% of the total area. These soils have high productivity for various crops.

b- Lands of capability class (S2): This class comprises the soils that are good capability and have moderate limitations. This class there is in the swale unit and employs an area of 3.60% of the total area. The soils of this class are moderately affected by some limitations such as soil erod ability and vegetation density. These soils have moderate productivity but can be feasible improvement practices and recommended for producing forage crops.

c- Lands of capability class (S3): This class includes the soils which are moderate capability and have high limitations. The soils of this class there are in high terraces, moderate terraces, low terraces and levee, and occupy 72.76% of the studied area. The soils of this class are very highly affected by some limitations such as texture, salinity and useful depth. These soils have moderate productivity and recommend for producing forage crops.

Table 5. Land capability classification for the studied area**.**

Land Capability class	Physiographic unit	Degree	Area ha	Area %
S1	**Decantation basin and Overflow basin**	**Excellent**	15096	23.64
S2	**Swale**	**Good**	2295	3.60
S3	**High terraces, Moderate terraces, Low terraces and Levee**	**Moderate**	45233	72.76
	The River Nile		1228	1.92
	Total area		63852	100.00

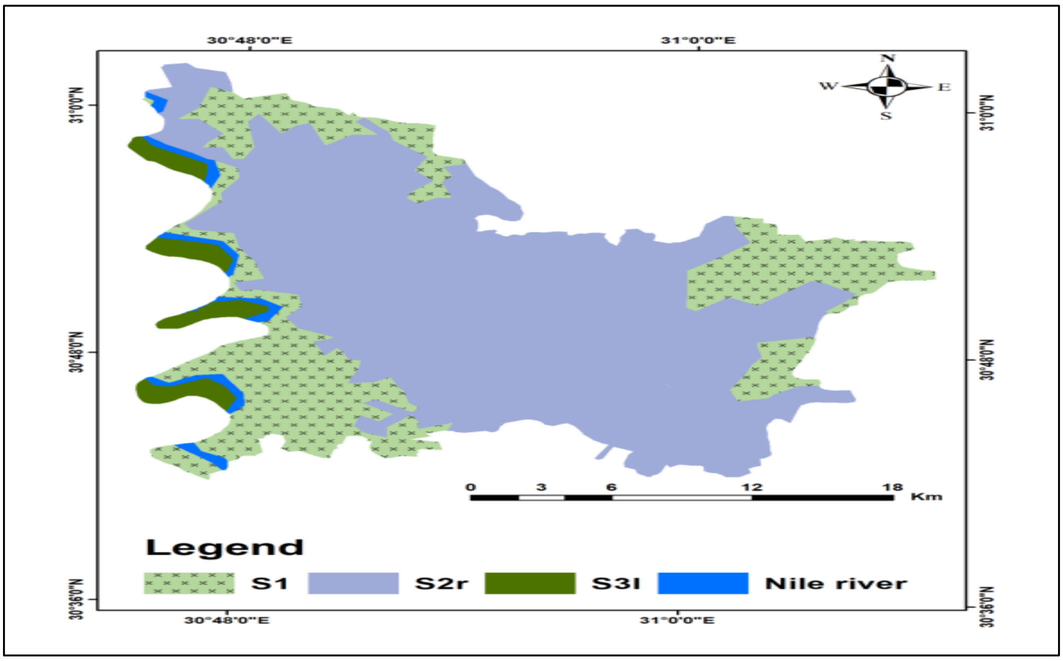

Fig3. Capability map of study area

Distribution of land suitability classes and subclasses in the studied area using Micro LEIS-ALMAGRA model.

According to Micro LEIS-ALMAGRA model, about, 15.70% of the study area is optimum suitability (S1), 58.78% are high suitability (S2), 13.72 % are moderate suitability (S3) and only 11.76% are marginal suitability for agriculture (S4). The rating of suitability classes and the limiting factors (subclasses) of the investigated area are present in Table 6. The soil texture that is mostly clay, Soil depth is the main limiting factor in the study area, and in some cases also includes drainage conditions and calcium carbonate content. Soil maps for agricultural suitability help the management process.

Table 6. Suitability classes and subclasses distribution in the study area using Micro LEIS-ALMAGRA model**.**

Land suitability		Area %	Area ha
Class	**Subclass (Soil limitations)**		
S1	**S1ptd8**	15.70	10016.00
Total		15.70	10019.84
S2	**S2t6**	11.75	7512.00
	S2tc6	11.75	7512.00
	S2cg2	3.92	2504.00
	S2g2	3.92	2504.00
	S2tcg2	3.92	2504.00
	S2a2	3.92	2504.00
	S2ca	1.96	1252.48
	S2tca2	3.92	2504.00
	S2c4	7.84	5008.00
	S2ptd	1.96	1252.00
	S2ta	1.96	1252.00
	S2pd	1.96	1252.00
Total		58.78	36321.92
S3	**S3pd3**	5.88	3756.00
	S3p3	5.88	3756.00
	S3d	1.96	1252.48
Total		13.72	8767.36
S4	**S4pd3**	5.88	3756.00
	S4t3	5.88	3756.00
Total		11.76	7514.88
The River Nile		1.92	1228.00
The Total Area		100.00	63852.00

Note: S1 (optimum suitable), S2 (high suitable), S3 (moderate suitable), S4 (marginal suitable), a(sodium saturation), c(carbonate content), d(drainage condition), g(development of the profile), p(depth) and t (texture).

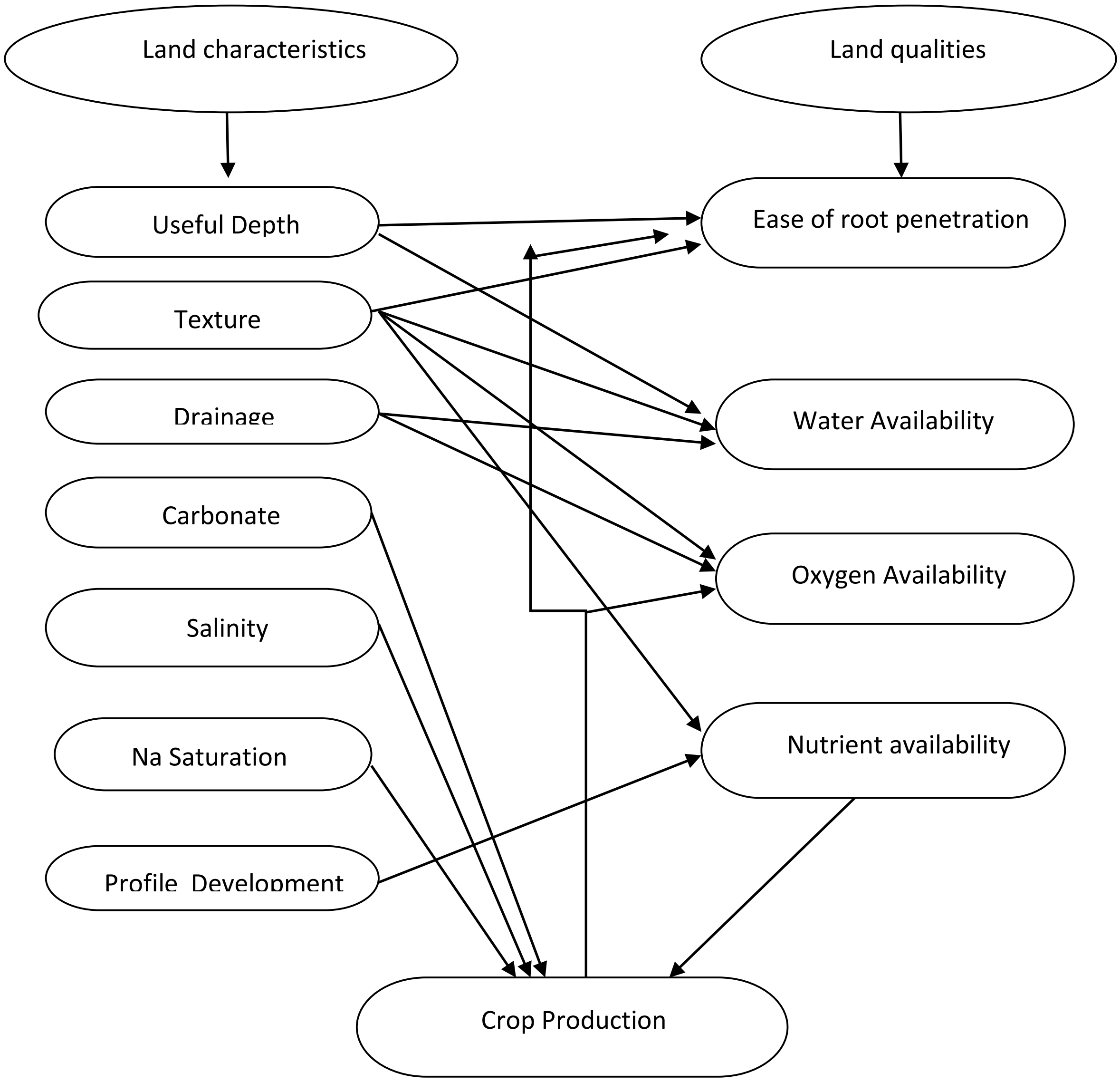

Figure 4: The overall scheme of the Almagra model, showing some direct and indirect effects of soil properties and soil quality.

Use the Micro LEIS ALMAGRA model to assess the suitability of land for growing different crops.

Use the Micro LEIS ALMAGRA model to classify the ability to grow different crops. The Micro LEIS-ALMAGRA model works interactively to compare land characteristic values with the generalization level specified for each suitability level. The applicability is based on the analysis of factors affecting the productivity of 12 traditional crops: wheat, corn, potatoes, sugar beets, alfalfa, peaches, citrus, and olives. The following steps show the application of this model. Diagnostic criteria for factors such as effective soil depth (p), texture (t), carbonate content (c), salinity (s), sodium saturation (a) profile development (g) and drainage (d) (Figure 6).

Table 7. Limitations factors and used in land suitability of study area.

Limitation Factor Symbol	Definition	Suitability class Symbol	Definition
A	Sodium saturation	**S1**	Highly suitable
C	Carbonate	**S2**	Suitable
D	Drainage	**S3**	Moderately suitable
G	Profile development	**S4**	Marginally suitable
P	Useful depth	**S5**	Not suitable
S	Salinity		
T	Texture		

Micro LEIS-ALMAGRA model is based on crop suitability that affected by potentiality of the dominant soil characteristics. The studied mapping units were evaluated to determine their suitability for growing different crops according to Micro LEIS-ALMAGRA, which to stand on the factors that govern the land suitability. Twelve crops are considered as follows: Sunflower, cotton, wheat, potato, maize, soybean, mellon, sugar beet, alfalfa, peach, citrus and olive growing in the study area. The output of the Micro LEIS-ALMAGRA model is correlated with GIS modeling to obtain the final map of the land suitability of the study area. See Table 7 for soil suitability grades and percentages of selected crops. According to the Micro LEIS-ALMAGRA program, the results indicated that 40.74% of the total study area is optimum suitability (S1), 53.74% is high suitability (S2) and 3.6 % is moderate suitability (S3) for Sunflower, soybean and alfalfa, respectively. About94.48% is high suitability (S2) and 3.6 % is moderate suitability (S3) for cotton, and sugar beet, respectively. A small area (4.68%) is optimum suitability(S1) and 93.40% is high suitability (S2), for potato. About 40.74 % of the study area is optimum suitability(S1), 53.74% is high suitability (S2) and 3.60% is moderate suitability (S3) for wheat. Most of the studied area (98.08%) is high suitable (S2) for maize. About 25.42, 53.55and 21.03 % are optimum suitability (S1), high suitability (S2), and marginal suitability (S4), respectively for growing olive. For peach cropping, 70.84% of the area is high suitability (S2), while 23.64% are marginal suitability (S4), respectively. About 4.68, 91.72 and 3.60 % are optimum suitability (S1), high suitability (S2) and moderate suitability (S3) respectively for mellon cropping. About 74.44 and 23.64% of the total area are high suitability (S2), and marginal suitability (S4), respectively for growing citrus. About 1.92% of the area is the river Nile. Figures 9, 10, 11, 12, 13, 14, 15 and 16 were selected to show the spatial distributions for suitability of selected crops.

Table 8. Soil suitability classes and percentage for growing selected crops in the studied area using Micro LEIS-ALMAGRA program**.**

Land Suitability Class	Sunflower	Cotton	Wheat	Potato	Maize	Soybean	Melon	Sugar beet	Alfalfa	Peach	Citrus	Olive
S1	40.74	0.00	40.74	4.68	0.00	40.74	4.68	0.00	40.74	0.00	0.00	25.42
S2	53.74	94.48	53.74	93.40	98.08	53.74	91.72	94.48	57.34	70.84	74.44	53.55
S3	3.60	3.60	3.60	0.00	0.00	3.60	3.60	3.60	0.00	0.00	0.00	0.00
S4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	27.24	23.64	21.03
The River Nile	1.92	1.92	1.92	1.92	1.92	1.92	1.92	1.92	1.92	1.92	1.92	1.92

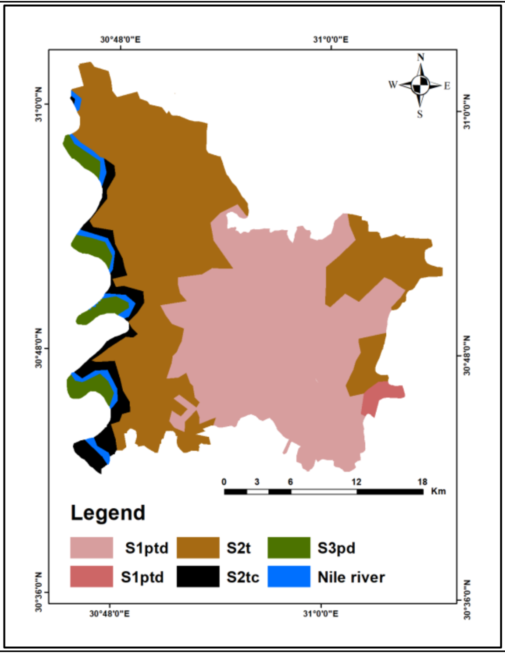

Fig. 5: Suitability map for Alfalfain the study area.

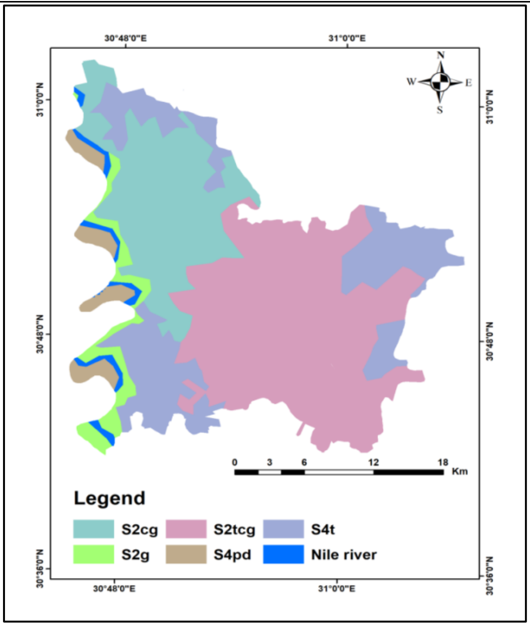

Fig6. Citrus

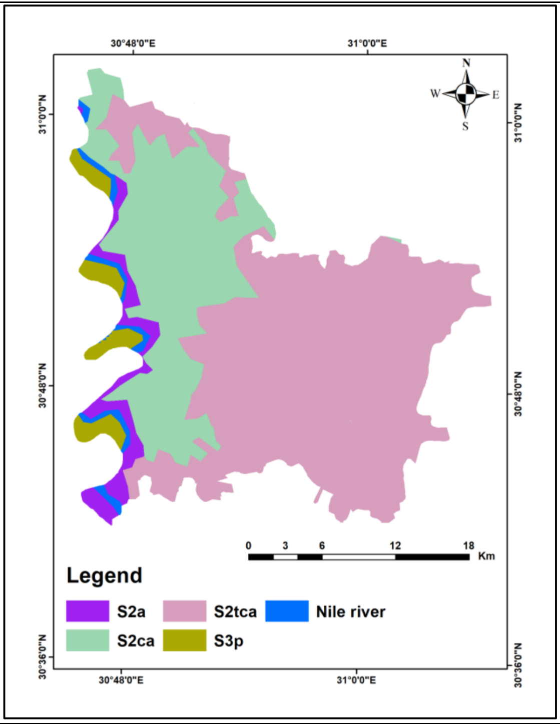

Fig7. Cotton

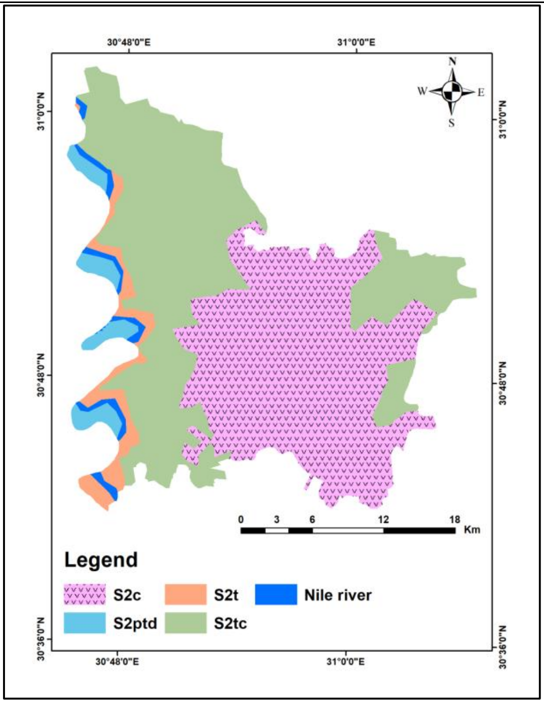

Fig8. Maize

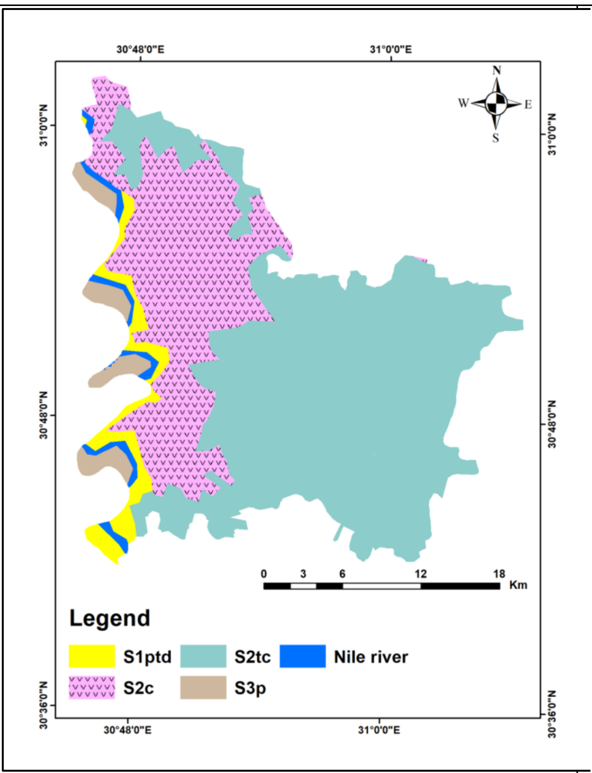

Fig. Melon

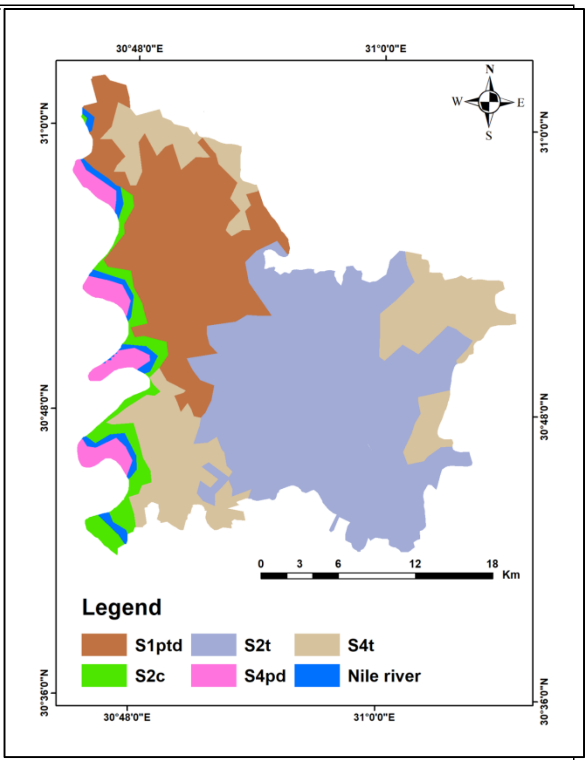

Fig. Olive

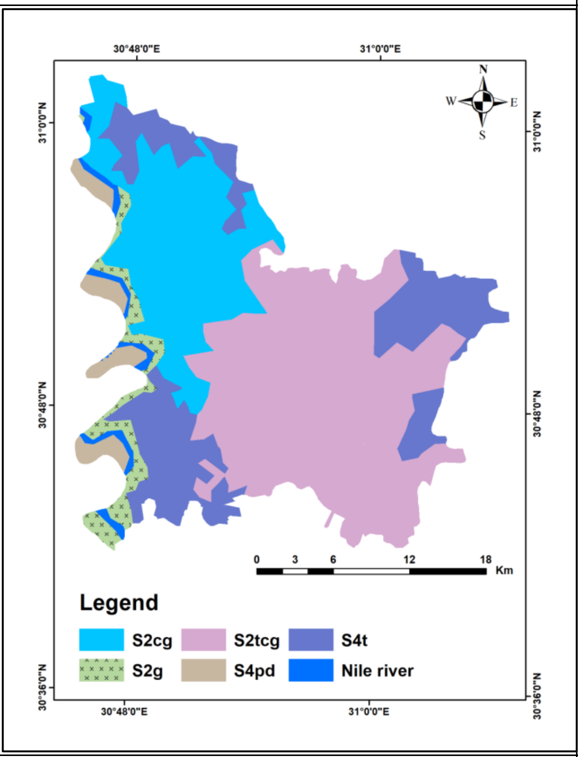

Fig9. Peach

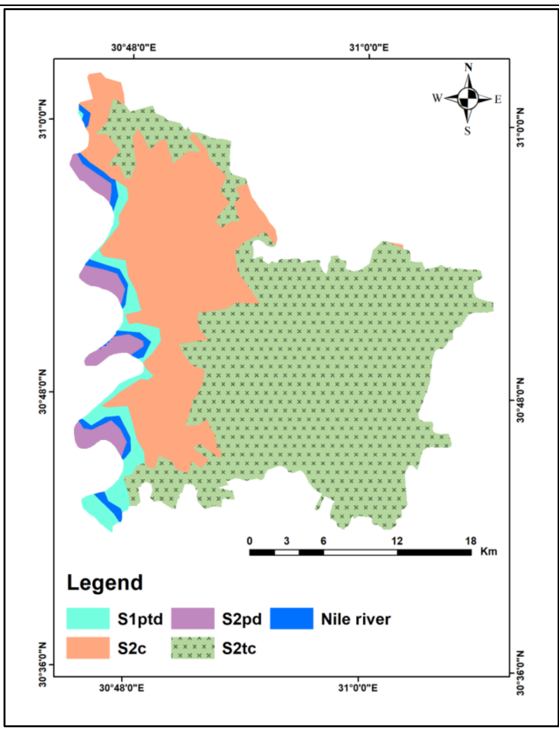

Fig10. Potato

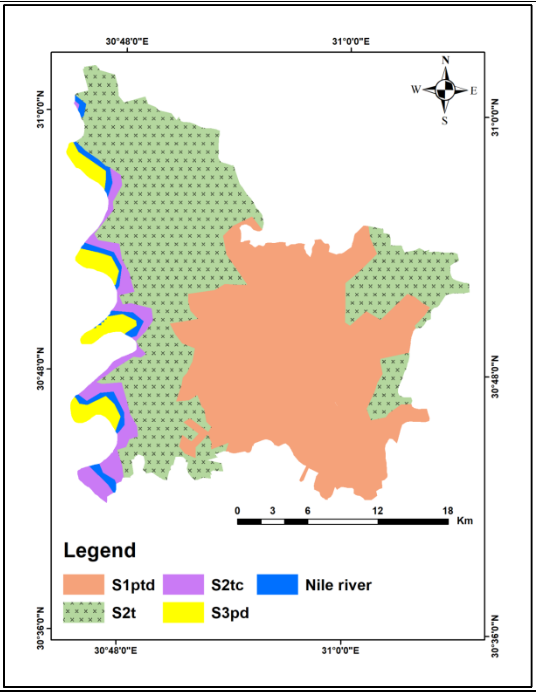

Fig11. Soybean

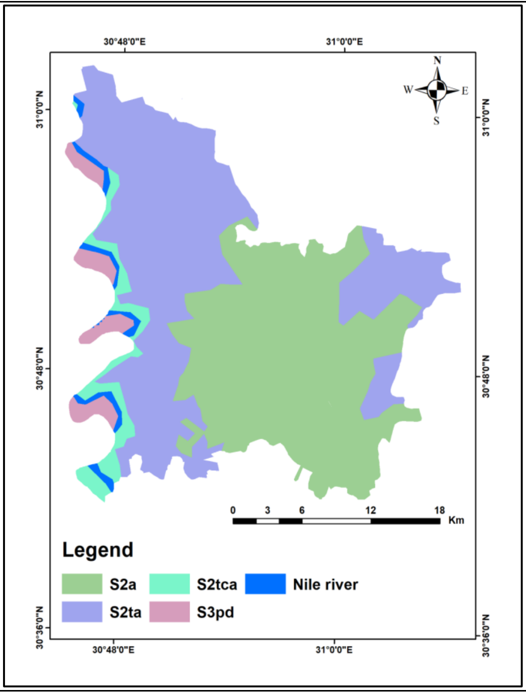

Fig12. Sugar beet

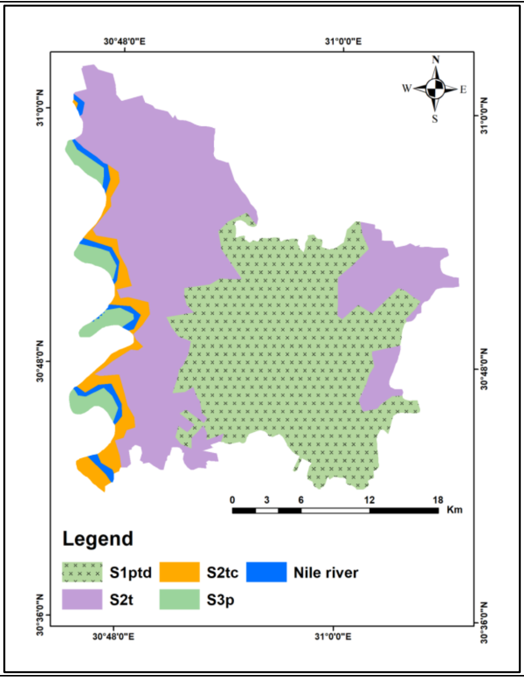

Fig13. Sunflower

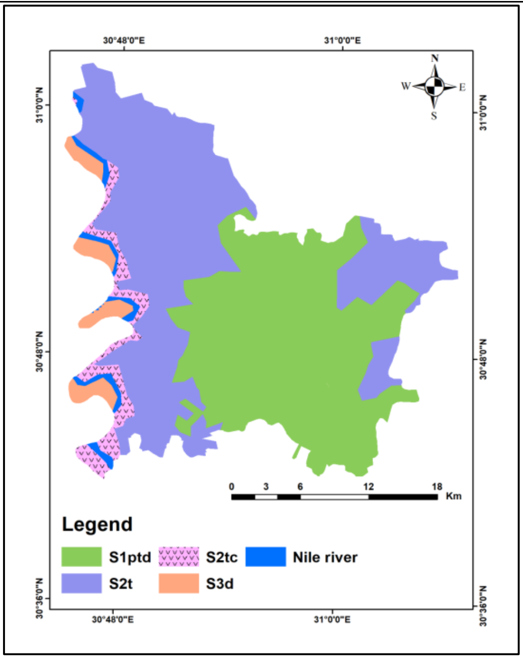

Fig14. wheat

Conclusion

Analysis of land suitability can help to achieve sustainable crop production for agriculture development in EL-Gharbia region. The Micro LEIS program was more effective in assessing the land capability and land suitability of arid and semi-arid regions. The purpose of this research is to use GIS and Micro LEIS program to assess land capability and crop suitability for various soils conditions. Some selected crops such as Sunflower, cotton, wheat, potato, maize, soybean, mellon, sugar beet, alfalfa, peach, citrus and olive growing in the study area. are recommended to be grown in the study area. According to Micro LEIS-ALMAGRA, the soils of the studied area varied in the suitability classification between optimum suitability (S1) to marginal suitability (S4). However, the capability classification, ranged from excellent (S1) to moderate (S3) for agriculture. Moderate land capabilities were found some limitations, these limitations can be improved through proper management practices. Most of the studied area98.08% are suitable for agricultural use. The study area is fertile soil and suitable for different crop production.

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تقييم قدرة الأراضي ومدى ملاءمتها لإنتاج المحاصيل: دراسة حالة في بعض مناطق محافظة الغربية في مصر

أمنيه شعبان سعيد القط1 ،هبه شوقى عبدالله راشد1 ،فهمى محمد حبيب1،وعبدالعزيز عبدالمنطلب بلال2
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وقد تناولت هذه الدراسة بعض أجزاء تربة محافظة الغربية لتقدير قدرتها الإنتاجية وملائمتها لنمو بعض انواع النباتات (عباد الشمس – والقطن –والبطاطا – القمح – والذرة – وفول الصويا –والشمام –و بنجر السكر – والفلفل – والخوخ –والموالح –و الزيتون). وتقع المنطقة المشمولة بالدراسة بين خطي عرض 00 ̋42 ̊30 و00 ̋04 ̊31 شمالا وخطي طول 00 ̋46 ̊30 و00 ̋02 ̊31شرقا، على مساحة إجمالية تساوي 63852 هكتارا. وقوام التربة يتراوح ما بين طيني إلى طيني طميي. في المنطقة حيث قد تم حفر عدد عشر قطاعات من التربة لتمثيل الوحدات الجيومورفولوجية التالية: الأحواض التجميعية – الأحواض الفيضي – الشرفات النهرية العالية – الشرفات النهرية المتوسطة – الشرفات النهرية المنخفضة – كتف النهر – المستنقعات.

وتم تقييم الملائمة من خلال دمج ما بين برنامج الميكروليز ونظم المعلومات الجغرافية في منطقة الدراسة لبعض مراكز محافظة الغربية – مصر وهي (بسيون –كفر الزيات –طنطا). طبقاً لبرنامج الميكروليز – سيرفيتانا تم تقييم مقدرة التربة وتقسيمها إلى ثلاثة أقسام، القسم الأول (S1) 23.64% ممثلة بالأحواض التجميعية والأحواض الفيضية. القسم الثاني (S2) يشغل 3,60% من منطقة الدراسة وممثلة بوحدة المستنقعات. القسم الثالث (S3)ويشغل 72% من منطقة الدراسة وموجود في الوحدات الخرائطية التالية : الشرفات النهرية العالية والمتوسطة والمنخفضة وكتف النهر. وفقا لنموذج ميكرو ليز – المجرا نموذج ملائمة .تم تصنيف منطقة الدراسة إلي 4 أقسام (قسم الملائمة المثلي) 15,70% , من منطقة الدراسة (S1) عالية الملائمة (S2) تحتل 58,78% من الدراسة , وملائمة معتدلة (S3) تشغل 13,72 % من مساحة الدراسة ,الملاءمة الحدية (S4) بتحتل 11,76% من منطقة الدراسة . العوامل المحددة الأساسية لإنتاج المحاصيل في منطقة الدراسة هو قوام التربة وعمقها وكربونات الكالسيوم. خرائط التربة للملائمة الزراعيه يمكن أن تكون مفيدة في عمليات الإدارة .