5. SUMMARY AND CONCLUSION

Fertile soils are becoming a scarce resource in many areas of El Fayoum depression. This ultimately leads to the importance of investigating all our available soil resources in order to evaluate soil suitability for agriculture and to share in our national plan for reclamation new soils. The current study was carried out on the same tract of the aforementioned approach, however, it is a need to get out of the old agricultural soils in El Fayoum depression and to expand horizontally at the outer desert zone to increase the overall cultivated area. In the late eighties, the search for suitable extension areas led to the promising desert zone at the northern-east area of El Fayoum Governorate, which can be able to reclaim as well as to share in the agricultural utilization projects.

The current study was carried out on the aforementioned promising desert zone at the northern-east area of El Fayoum Governorate, which is divided into two parts, *i.e.,* North Bahr Wahby adjacent to the east side of Cairo–El Fayoum desert road (Part I) and West Kom Oshim adjacent to the west side of the desert road (Part II). The studied area lies between latitudes 29^{o} 34" and 29 ^{o} 36" N and longitudes 31^{o} 00" and 30^{o} 53" E. The first step towards achieving the previous target was represented by conducting a semi-detailed soil survey map based on the technique of visual interpretation for satellite images and geopedological approach, in order to identify the physiographic units and their soil properties as well as to determine and its relevant land qualities.

Also, soil capability and physical suitability evaluation for specific crops using the Automated Land Evaluation System (ALES) was taken into consideration. Such tools are a need to get out of a comprehensive Geographic Database for the whole area under study, which based on field soil survey and the available data and materials. This comprehensive Geographic Database were used to conduct a soil capability and suitability evaluation "physical", and studying the mapping units of the current land use among the studied area.

From the geomorphology point of view, the area under investigation is characterized by two main landscapes, *i.e.*, Plateau and Piedmont, which are recognized into four landforms and thirteen mapping units. The mapping units were strictly verified in the filed and representing by forty five soil profiles, besides mini-pits and testing augers samples were intensively made. The soil profiles were carefully described in situ as well as the main soil physical and chemical characteristics of the different mapping units were determined and stored into ILWIS-GIS databases. According to Soil Taxonomy **(USDA, 2006)**, the soils of the studied area, which belonging the orders of Entisols and Aridisols are classified up to the sub groups of Gypsic Haplosalids, Petro gypsic Haplosalids, Calcic Haplosalids, Duric Haplosalids, Typic Haplosalids, Typic petrogypsid and Typic Torriorthents.

The Integrated Land and Water Information System (ILWIS), as a data processing environment has been intensively used in all the processing steps of the present study as well as all its vector or raster facilities, overlaying, crossing, map calculations and classifying purposes were used for making the

final maps. The obtained data of USDA Capability Classification System were created on ILWIS-GIS to prepare Land Capability maps. Eight land use types were selected based on the land physical suitability evaluation of the different crops after FAO and ALES System. Such selected land use types are identified into cotton, barley, sorghum, sugar beet, sunflower, alfalfa, chamomile and tomato.

The land physical evaluation results also indicate that the northern soils of Part I and majority area of Part II are classified as marginally capable (934.68 fed. for Part I and 27.84 fed. for Part II, which constitute about 25 % total area), while those of the northern portion are of either limited capable 83.66 fed. for Part I and 123.8 fed. for Part II, which constitute about 5 % of total area) or not capable 2700 feddans (681.66 fed. for Part I and 2018.36 fed. for Part II, about 70% of total area). The main soil constrains, which controlled land capability classes in the studied area, are more attributed to that the majority of the studied soils are suffering from salinity hazardous and cementation constraints.

By improving the soil properties, which can be able to improve, the soil can approach potential capability, and hence about 448 feddans (324.64 fed. at Part I and 123.80 fed. at Part II) will become highly capable, about 123 feddans at Part I will become moderately capable, about 1909 feddans (664.06 fed. at Part I and 1244.63 fed. at Part II) will become marginally capable and about 1189 feddans (640.60 fed. at Part I and 548.58 fed. at Part II) with limited capability, while the not capable area will be about 200.64 feddans (70.7 fed at Part I, 129.94 fed. at Part II).

The assessment of soil physical suitability for different land uses is done for the areas that are suitable for agriculture with specific crops. ALES software is utilized to implement the FAO framework of land suitability, and the results are exported to GIS to be displayed in maps. Total area of 3870 feddans is evaluated, the results indicate that the area under the current suitability could be categorized into; about ٢٦٥٤ fed. are highly suitable (1016.54 fed. for barley, 988.7 fed. for sorghum, 324.16 fed. for cotton and 324.16 fed. for sugar beet), about 5855 fed. are moderately suitable, (1592.86 fed. for barley, 988.7 fed. for tomato, 988.7 fed. for chamomile, 692.4 fed. for cotton, 324.16 fed. for sunflower, 324.16 fed. for alfalfa and 280 fed. for sorghum) and 8419 fed. are marginally suitable (١٨٠٣.٩٥ fed. cotton, ١٦٢٠.٩ fed. chamomile,١٥٩٢.٨٦ fed. sugar beet, ١٥٥٢.٧٩ fed. sorghum, ٦٩٢.٣٨ fed. sun flower, ٦٩٢.٣٨ fed. alfalfa,٢٥٢.٢٦ fed. tomato and ٢١٢.١٩ fed. barley) and about ١٤٠٣١ fed. not suitable classes (٢٨٥٣.٤٦ fed. alfalfa, ٢٨٥٣.٤٦ fed. sun flower, ٢٦٢٩.٣ fed. tomato, ١٢٦٠.٦ fed. chamomile, ١٢٦٠.٦ fed. sugar beet, ١٠٧٧.٣٥ fed. cotton, ١٠٤٨.٤١ fed. barley and ١٠٤٨.٣٥ fed. sorghum).

The selected land use types are: cotton, barley, sorghum, sugar beet, sun flower, chamomile, alfalfa and tomato. Five land qualities were considered based on the requirements of the selected LUTs, which are salinity and alkalinity, nutrients availability, moisture availability, oxygen availability and rooting conditions.

The results of the evaluation procedure for each land use type can be concluded as follows:

For LUT1 "cotton" almost 72 % of the total area is classified as highly (324 feddans), moderately (666 feddans) and marginally suitable (1804 feddans), located on the Peidmont landscape that is occupied the majority area of Parts I and II. However, the areas that classified as not suitable soils (about 1077 feddans) are concentrated on the southern-east and west portions of Part I and middle and eastern portions of Part II.

For LUT2 "barley" almost 73 % of the total area is classified as highly (1017 feddans), moderately (1593 feddans) and marginally suitable (212 feddans), mostly located on the Peidmont landscape that is occupied the majority area of Parts I and II. However, the areas that classified as not suitable soils (about 1048 feddans) are concentrated on the southern-east and west portions of Part I and scatter of Part II.

For LUT3 "sorghum" almost 73 % of the total area is classified as highly (about 989 feddans), moderately (about 280 feddans) and marginally suitable (about 1553 feddans), mostly located on the Peidmont landscape that is occupied the majority area of Parts I and II. However, the areas that classified as not suitable soils (about 1048 feddans) are concentrated on the southern- west portions of Part I and scatter of Part II.

For LUT4 "sugar beet" almost 67 % of the total area is classified as highly (about 324 feddans), moderately (about 692 feddans) and marginally suitable (about 1593 feddans), mostly located on the Peidmont landscape that is occupied the majority area of Parts I and II. However, the areas that classified as not suitable soils (about 1261 feddans) are concentrated on the

southern- east, southern- west, and northern- east portions of Part I and scatter of Part II.

For LUT5 "Sunflower "almost 26 % of the total area is classified as moderately (about 324 feddans) and marginally suitable (about 692 feddans), mostly located on the Peidmont landscape that is occupied the majority area of Parts I and II. However, the areas that classified as not suitable soils (about 2853 feddans) are concentrated on the southern- east, southern-west and northern- east portions of Part I and scatter of P II.

For LUT6 "Chamomile" almost 67 % of the total area is classified as moderately (about 989 feddans) and marginally suitable (about 1621 feddans), mostly located on the Peidmont landscape that is occupied the majority area of Parts I and II. However, the areas that classified as not suitable soils (about 1261 feddans) are concentrated on the southern- east southern-west and northern- east portions of Part I and scatter of Part II.

For LUT7 "alfalfa" almost 26% of the total area is classified as moderately (about 324 feddans) and marginally suitable (about 692 feddans), mostly located on the Peidmont landscape that is occupied the majority area of Parts I and II. However, the areas that classified as not suitable soils (about 2853 feddans) are concentrated on the southern- east southern-west and northern- east portions of Part I and the majority of Part II.

For LUT8 "tomato" almost 32% of the total area is classified as moderately (about 989 feddans) and marginally suitable (about 552 feddans), mostly located on the Peidmont landscape that is occupied the majority area of Parts I and II. However, the areas that classified as not suitable soils (about

2629 feddans) are concentrated on the southern- west, southern-east and northern- east portions of Part I and all area of Part II.