-20- Summary of

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REMOTE SENSING AND GEOGRAPHIC INFORMATION SYSTEM (GIS) IN MAPPING OF SOIL AND CROPS IN NORTH DELTA, EGYPT

Summary

The objectives of the current study are:

1. Examine factors affecting the accuracy of geometric correction such as:

a-Number of ground control points (GCPs)

b-Distribution of such (GCPs)

c-The grade of model equations

2-Mapping of the soil salinity according to the spot satellite images of the studied area

3- Using R.S. in detecting of the growing plants.

4-Using GIS in monitoring of soil productivity in the studied area, considered as cornerstone of any agricultural development program.

Using satellite image for mapping of soil and vegetation in the area located North of Nile Delta in El-Hamoul and Baltiem District. The studied area is bounded to north by the Mediterranean sea and Burullus lake, to the south by Kafr El-Sheikh District, to the west by Biala District and to the east by El-Riad District, longitudes $31^0$18’ 6.9” and $30^0$54’ 21.9”E, latitudes $31^0$10’ 51.1” and$31^0$36’ 3.3”N.

The obtained results helped to identify factors enhancing the accuracy of geometric correction as follows: -

1-Number of ground control points: -

Using sixteen GCPs were revealed the highest accuracy where. The obtained RMSE (Root Mean Squares Error) was 3.04 metes 0.15 pixel).

Where as uses eight GCPs exhibited the lowest accuracy, where the obtained RMSE was 8.03 meter (0.4 pixel).

2- Well distribution of GCPs was higher than the heterogeneous distribution of GCPs of the image. The RMSE in the case of well distribution of GCPs 3.04 meter (0.15 pixel), where as it was RMSE 7.17 meter (0.36 Pixel) in the case of heterogeneous distribution.

3- Effect of model equations:

Third order equation exhibited high accuracy compared to either first order and second order equation, where RMSE 5.36 meter (0.268) pixels in first order, RMSE 3.19 meters (0.159 pixels) in second order and RMSE 3.05 meter (0.153 pixels) in third order.

- Above mentioned using the suggested factors enhanced the accuracy of image correction, the geometric correction, of the studied image led to rotation of the distorted image by 11^{o} eastward.
- Image analysis was first under taken for the preparation of the image-interpretation map using the PCI software analysis. The map then checked in the field by the different colors and for detecting the different mapping units. A subset of both arable land and bare soil had take to be under study. Sites of profiles were selected to represent the different mapping units. The soil profiles were carefully described in sites, their morphological features were recorded and samples were collected for laboratory analyses.
- The soil analyses aimed to assess the physical and chemical properties of these soils for the purpose of their mapping, as mapping of salt crust, water logging index, brightness index, color index and vegetation index of concerned area. The obtained analytical data had been used for monitoring and classification of soil productivity by using new modeling of equation and classification the image in it as for aiming.

1- According to the waterlogging index (WI) the studied area could classified in to the following classes: -

a) Fish ponds 2171.1 feddan (19922.822 pixel) 9.24% in total area.

b) Water logged area 759.26 feddan (6963.25 pixels) 3.23% in total area and this region besides the fish ponds.

2- According to the color Index (CI) the studied area could classified in to the following classes: -

a) Saline soil 5219.88 feddan (4.7871.12 pixel) 22.206% in total area.

b) Sodic soils 4197.65 feddan (38497.15 pixel) 17.86% in total area.

c) Saline sodic soils 8368.35 feddan (76747.03 pixel) 35.6% in total area.

3-Soil Brightness index (SBI) it could be identified the areas reached in either CaCO3 or salts.

4- According to the new channels (WI, CI and SBI) the studied area was classified in to the following subdivision.

a) **Very strong saline soils** EC > 100 dS/m at 210.75 feddan (1932.419 pixels) 0.9% in total area.

b) **Strong saline soil** EC (50-100 dS/m) 459.49 feddan (45213.26/pixels) 1.94% in total area.

c) **Moderately saline soils** EC (16-50 dS/m) 990.97 feddan (9088.282 pixels) 4.215% in total area.

d) **Slightly saline soils** EC (4-16 dS/m) 14563.49 feddan (133563.328 pixels) 61.95% in total area.

e) **Very slightly saline soils** EC < 4 dS/m 2475.24 feddan (2270.737 pixels) 10.53% in total area.

- The analytical data of the studied soil profiles could be summarized in the following points:

a) The texture in this area is medium to heavy textured clay, silt loam, loam, silt clay and silty clay loam

b) The calcium carbonates content of area has a wide range, as it ranged from 0.0-3.2%

c) The organic matter content of the study area, ranged between 0.08 and 2.29%

d) The total soluble salts content differs widely from location to another and has a wide range as it ranged between 3.36 and 140.1 dS/m in the study area in soil past.

e) The cation exchange capacity (CEC) differs from site to another due to the content of clay fraction and organic matter content, where it ranges between 18.9-47.2 meg/100 gm soils.

- The final goal of the current study is monitoring of soil productivity index was used for evaluation of soil productivity on the bases of weight factors as determining soil productivity, viz:

1- Moisture (H)

2- Drainage (D)

3- Effective depth (R)

4- Texture/structure (T)

5- Soluble salt concentration (S)

6- Organic matter content (D)

7- Mineral exchange capacity nature of clay (A)

8- Mineral reserve (M)

- An attempt has been made to evolve a mathematical formula expressing productivity as a resultant of the various factors, the formula is

- Productivity index = H X D X P X T X S X O X A X M. (Riquier et al., 1970).

- Using the model of productivity to assessment the rating of soil in the studied area most of soil located in the third order (65 % in total area), and fourth order (30 % in total area).
- Geographic information system (arc view software) were used to monitor kind of crops in arable lands and mapping soil vegetation index by modeling of normalized difference vegetation index (NDVI)

$$\text{NDVI} = \frac{\text{XS}_3 - \text{X S}_2}{X\ S_3 + \text{X S}_2} \text{ (Marshet al., 1992 and Larsn 1993)}$$

- Surface and ground water analysis had been evaluated: The obtained results showed that.
- The total soluble salts of ground and surface water varied also due to profile position as it ranged:
    1) 0.99 – 5.42 dS/m in irrigation water
    2) 1.46 – 22.6 dS/m in drainage water
    3) 12.41 – 122.8 dS/m in water table
- SAR varied as follows: -
    1) 2.72 – 12.09 in irrigation water
    2) 3.49 – 30.89 in drainage water
    3) 12.75 – 68.65 in water table