Using GIS towards soil mapping of Latifia project /Baghdad, Iraq

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Abstract. A cartographic analysis of the Latifiya area project map was carried out using GIS for an estimated total area of 48001.94 ha, whose coordinates are between 32, 99 90233 60388 north, 44 37219, 44 34 056 east, where a picture of the map was taken by the scanner. The results of the analysis have shown that the highest frequent soil series was DM87 series, with the largest area of 10142.58 ha, with an area of 22.46% and a frequency of 55, while the series MW9 has the smallest area that reached 924.60 hectares with an area of 2.04% at 8 appearance Aruqub area reached 6419.89 hectares by 14.21% area of the total area, as well as have been identified or soil association units and reached number7 Repetition Soil units associated by a series of DM87 the largest area where the units associated to DW56,DW85, DW33, DW3.

1. Introduction
Cartography is the science that includes mapping operations starting with basic maps in the field using flat and topographic methods or using aerial space methods to print and publish them. In addition to converting primary field maps to map or transfer topographical details from Aerial images and satellite images to a previously printed map, and the method of mapping small scale maps to large scale [1]. These maps reflect the nature of geographical distribution of soil types within a given geographical area, depending on the factors and processes of soil formation that [2] explained in his Equation Developed by the general formula of soil composition. Cartography is one of the most important sciences that has helped the emergence of Geographic Information System (GIS) and other systems in the production of maps. Therefore, GIS has taken many definitions, the most important of which is considering the direction of maps focusing on the possibility of GIS in Drawing and producing maps of modern art in the drawing and representation of cartography, and this system is a system for processing maps and analysis and presentation and the development of new information through the calculations carried out by specialists in this area. [3] said that geographic information systems coordinate the map and store analyzed information and the possibility of linking complex analyzes with descriptive information, which gives the power of geographic information and prepares an appropriate system for evaluating the earth.

The quality of the diagnosis of the map units varies according to their purpose and the possibilities of analyzing the ground perspective and diagnosing its contents [4].
[5] explained that the soil units differ in their forms and types of distribution and require cartographic studies to know how these soils are formed and to help in the completion of soil surveys accurately.

[6] concluded in his study to cultivate the Sheikh Saad Agricultural Project by using five criteria for cartographic analysis, two of which are geological and three geological. The forms of the map units are simple forms of the project. Depending on the shapes and patterns of tissue, the sedimentation process can be learned.

Land-based information such as elevation, tilt, and landscape maps derived from the Digital Elevation Model (DEM) can be used with satellite imagery to improve the capacity for soil mapping [7]. The success of computational methods for determining the geographical units of the Earth's surface characteristics from DEM-derived space image data.

2. Materials and Methods

Al-Latifiya area is located south of Baghdad governorate and about 40 km from the center of Baghdad governorate, which is located between coordinates 9029932, 3886033 north and 44 37 219,056 3444 East. The map of the project completed by [8] and Figure (1) And the map of the project's soil chains. The steps were as follows:

Satellite Image

The satellite image taken from Sentinel-2A industrial satellite was taken from the official site Global Visualization USGS. The map was taken from a previous study done by [8].

Isolation of units

The old map that was used as a base map (done in previous study of [8]) was outlined using the protocols followed by Arc GIS, Arc Map 10.3. The resulted map was depended to accomplish the next step of analysis.

Identifying association units.

Three circles were worked in three parts of the map so that each circle takes one-third of the map and in locations where there is a geomorphologic complexity and then a line of Drawing was chosen to cut the circle into four parts.

Figure1. shows the map of the project

3. Results and discussion

The cartographic analysis and the production of maps are the work of the surveyor in addition to the use of space visuals and modern technologies as GIS for short time, effort and cost. After obtaining
the map of the previously completed soil units, the soil units were isolated as well as the existing ones and calculating the area of each series of cartography using Arc Map. Figure (2) shows the unit map. The series varied in area and frequency depending on soil composition factors and processes and sedimentation conditions in the study area, which was the highest of the DM87 series and the largest area of 10142.58 ha of the total area. With a total of 5,158.1 hectares, 22.46% and 55.58.1 respectively. The DW56 series arranged second with 8722.15 ha, 19.31% and 52 frequency, while MF11 arranged third with 8010.95 ha, 17.73% and 46 frequency, followed by DW37 and 2550.90. Followed by the TWR16 series with an area of 1763.54 ha, with an area of 3.90% and a frequency of 15, followed by the TW554 series with an area of 1226.69 hectares, with a ratio of 5.64% and 16 frequency, followed by the DW85 series with an area of 2215.11 ha, with an area of 4.90% and a recurrence of 55. Ha with an area of 2.71% and a frequency of 13, followed by The series DF127 with an area of 1188.79 hectares with an area of 2.63% and a frequency of 12, while the series MW9 had the smallest area and amounted to 924.60 hectares by 2.04% frequency 8, and the area of Arqub was 6419.89 hectares, an area of 14.21% of the total area.

Figure 2 shows the unit map.

| Table 1. Soil series, frequency, and areas. |
|-------------------------------------------|
| Frequency | Frequency | Area / % | Area / ha | Series Area |
|-----------|-----------|----------|-----------|-------------|
| 18.45     | 55        | 22.46    | 10142.58  | DM87        |
| 17.44     | 52        | 19.31    | 8722.15   | DW56        |
| 15.43     | 46        | 17.73    | 8010.95   | MF11        |
| 5.36      | 16        | 5.64     | 2550.90   | DW37        |
| 18.45     | 55        | 4.90     | 2215.11   | DW85        |
| 8.72      | 26        | 4.41     | 1992.90   | DW33        |
| 5.03      | 15        | 3.90     | 1763.54   | TWR16       |
| 4.36      | 13        | 2.71     | 1226.69   | TW554       |
| 4.02      | 12        | 2.63     | 1188.79   | DF127       |
| 2.68      | 8         | 2.04     | 924.60    | MW9         |
| -         | -         | 14.21    | 6419.89   | Arqub       |
| 99.94     | 298       | -        | 45158.1   | Total       |
3.1. Soil association units

The results of the soils units gave a clear consideration of the effect of soil factors and processes on the area, as well as sedimentation processes and the nature of the present texture. Figure 3 shows that all the four parts of the circular shape have given the largest unit. The first association units DM87 is accompanied by DW56, DW85, DW33, MF11, and TW554, the second DM87, DW11, DW85, MF11, TWR16 and TW554. units. The third circular shape on the map was DM87 with DW56, DW85, MF11, DW33, which gave a clear picture of the accompanying unit DM87, which is fine or medium-fine texture, and medium of

![Figure 3](image)

**Figure 3.** shows the map of the Associate Units of soil unit Series of the study area

Exchange with good drainage and medium roughness and coarse units, as well as with the poorly drainage units, giving explanation about the nature of the decline of the region as well as the high bit and low-lying areas

Figure 4 shows the digital elevation model of the studied area. It is obviously shows three classes of elevation range from 25-33, 33-39, and 39-54 meter above sea level. Transects of study tried to pass through most of these classes although we didn’t reach the highest level because it belongs to desert soil which is not affected by the precipitation of the river loads, where they are considered as aeolian deposits and wind loads deposited in different times. Transects pass through the main physiographic units levees, basins and depressions.
Figure 4. showing the digital elevation model showing the study transects

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