PalArch's Journal of Archaeology of Egypt / Egyptology

Cartographic representation of Soil physical properties In Habbaniyah District using Geomatics techniques

Worood Ali Abdul-Aziz [1], *Dr. Khalid Akber Abdullah Al-Hamdani* [2]

[1,2] University of Anbar/ College of Education for the Humanities/ Department of Geographical

Corresponding Author[1:] Wro19h5026@uoanbar.edu.iq

Worood Ali Abdul-Aziz, Dr.Khalid Akber Abdullah Al-Hamadani, Cartographic representation of Soil physical properties In Habbaniyah District using Geomatics techniques. Palarch's Journal Of Archaeology Of Egypt/Egyptology xx (x), xx-xx. ISSN 1567-214x

Keywords: physical properties, soil, Cartographic representation, Geomatics.

ABSTRACT

This research deals with the cartographic representation of the physical properties of the soil in the Habbaniyah district by employing (Geomatics) techniques, and the study was carried out by the researcher collecting (23) surface soil samples at a depth of (0-30) cm, distributed over the district area, determined by relying on a device. GPS, And then have been conducted laboratory analyzes in order to obtain the physical properties of soil data were dropped coordinates and the results of analyzes on the map pattern of area study is not the product of maps of the spatial distribution of the physical properties of soil, it has been the process of spatial analyzes process depending on the spatial program (Arc Map 10.5). The show of the study that the highest percentage of sand in the area of the study amounted to (94%) within Al-mlahmh Province The highest rate for the silt was among the provinces Ghazwan and Al-Hamamiyat and Krtan part of Husaybah al-Sharqiyah by (62%) The percentage of the clay has reached the highest percentage of his (20.4%) in the southwest of Haswah al-Shamiya district, south of the study area, and it was found that there is little variation in the values of bulk density in the soils of the study area, as it reached its highest value.(1.716g/cm $^{-3}$) in the southeast of Haswah al-Shamiyah district, while its lowest value was (1.188Gm / cm $^{-3}$) In the southwest of Haswah al-Shamiya, which is the largest district of the Habbaniyah district by area, the actual density values are close, as the general average reached (2.520 g / cm $^{-3}$), while the average percentage of porosity in the soils of the study area was (41.698%).

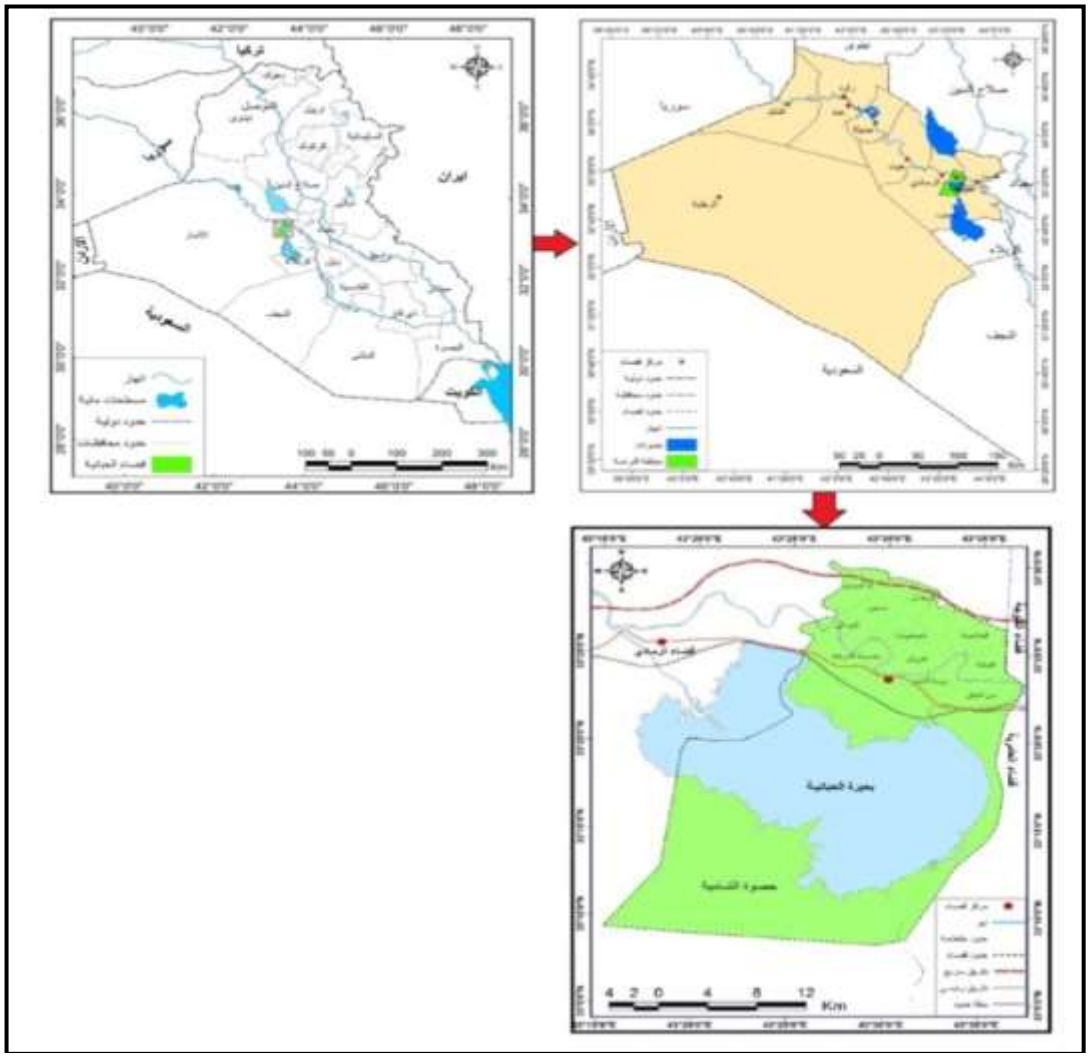
Research hypothesis:

1- There is a variation in the physical properties of the soil in the study area.
2- It is possible to depend on Geomatics techniques of preparing, drawing and producing maps representing the physical properties of the soil in the Habbaniyah district.

The boundaries of the study area:

It is represented by the administrative boundaries of the Habbaniyah district, which is located astronomically between the two display circles (033.09.0 ° - 33.31.00°) north, between longitude(43.15.00° - 43.37.00 °) to the east.
As for the geographical location of the study area, Habbaniyah district is located in the center of Iraq within the northeastern part of Anbar Governorate, and to the west of the capital, Baghdad, which is (90 km) away from it . Map (1).

Map (1) The location of Al-Rasa region in Iraq and Al-Anbar Governorate



Source: Ministry of Water Resources, General Commission for Survey, Map Creation Section, Iraq Administrative Map, scale1: 7,000,000, For the year 2010.

Discussion and conclusion

Physical soil properties can be define as those characteristics that can be seen and

smell, taste and the sense of the most comprehensive are those qualities that do not need the reactions of chemical discretion, such as (textures and Structure and color and permeability Consistence and others) [1].

The physical properties of the soils in the study area are as follows :

1- Soil Texture :

The texture is one of the most important constant properties in the soil, and it represents the evidence for the percentage of soil components or the mineral horizon represented by the separators whose size is less than (2 mm) (sand, Silt, Clay)[2] **.**

Through the data of Table (1) which shows the results of laboratory analyzes of the soil tissue of the study area, it is clear that the soil tissue varies from one region to another due to the origin of the parent rocks from which the soil was formed, as well as the nature of river sedimentation, the height from the river level and floods, as well as irrigation operations.

For sand separators its particles are loose and poorly coherent, because they are composed of minerals with strong hardness and high resistance to dissolution, the most prominent of which is quartz[3] . It is evident through the analysis of Table (1) and Map (2) that the highest percentage of sand was in the lands near Lake Habbaniyah, located within the Haswat al-Shamiya district and in the far north of the provinces (Al-Malahma, Krtan, Mahooz, Umm al-Rus) where the highest percentage of sand was (94.6%) in the province of Al-Malahma, followed by the province of Haswa al-Shamiya (%92.6%, 91.6%), and the reason for its rise is due to the geological formation factor in the study area and the climate factor, which has a major role in the processes of erosion and transport, as well as wind sedimentation, while the lowest percentage of sand appeared in the provinces (Ghazwan, Hammamiyat, Krtan, Mahooz, Al-Bubali and the southwestern regions). From Haswah al-Shamiya province, where the lowest percentage was (29.6%) within the Hammamiyat district , followed by Ghazwan and southwest Haswah al-Shamiya provinces with (31.6%) For each of them, while the general rate of sand percentage in the soils of the study area was (65.1%).

As for the silt separators which is characterized by its light weight, so that the water can carry it to great distances and settle it far from the river. It is evident from the data of Table (1) and Map (3) that the highest percentage of silt is (62%) in the districts of Ghazwan, Hammamiyat, Krtan, and part of the Husaybah al-Sharqiyah district. The reason for the high percentage of silt in these areas is attributed to river sediments resulting from the Euphrates River, as these provinces are located within the sediments of the flood plain. As for the lowest percentage of it was recorded in Haswah al-Shamiya district and the far north of the provinces (al-Malahma, Krtan, Mahooz, Umm al-Rus), where the lowest percentage of silt was (4%) within the Malahma district and (5%) in Haswah al-Shamiya district. The average percentage of silt in the soils of the study area was (29.8%).

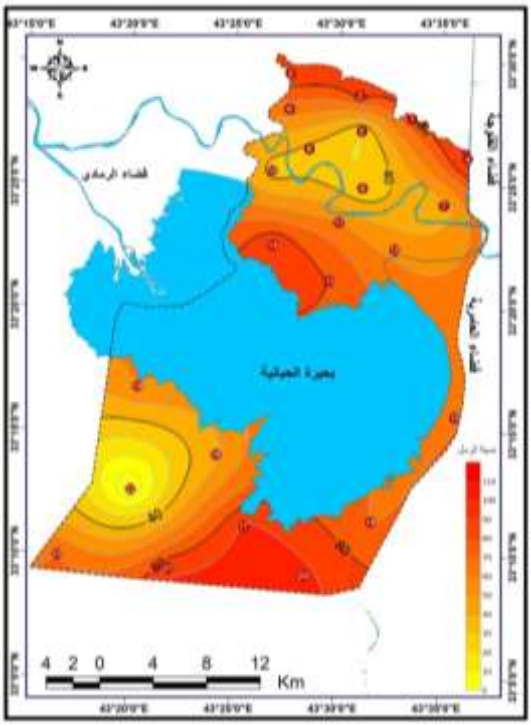
As for the clay separators, they are formed as a result of weathering processes that occur on the surfaces of sandy rocks and silt grains, resulting in ions that combine with each other to form soft-sized granules of clay. It is noted from the data of Table (1) and Map (4) that its percentage increased in the lands close to the water sources in the study area (Euphrates River and Habbaniyah Lake), where the highest percentage (20.4%) was within Haswah Al-Shamiya district, followed by Mahooz district at (16.4%), while the percentage of mud decreased in the northern regions of the study area and the southeastern parts. Among them, in addition to the central parts located on the northern coast of Lake Habbaniyah, where its percentage in these areas ranged between (1.4-2.4%), and its lowest value (1.4%) represented in the north of AL-Malahma district and in the Zawiyat al-Dhaban district. The average percentage of clay in the soils of Study area (5.1%).

Table (1) the percentages of soil separators and the type of tissue for the Habbaniyah district soil

class Tissue	% Soil separations			Geographical coordinates		Sample number
	Clay Clay	Silt Greene	Sand sand	Latitude	Longitude	
Sandy clay	1.4	20	78.6	33.4621966	43.5577588	1
Sandy clay	2.4	14	83.6	33.4776039	43.5158942	2
Sandy	2.4	10	87.6	33.4916690	43.4596057	3
Sandy	1.4	4	94.6	33.4355090	43.6030127	4
clay Silty	8.4	62	29.6	33.4533763	43.5176832	5
Sandy clay	2.4	32	65.6	33.4678576	43.4592791	6
clay Silty	4.4	51	44.6	33.4037963	43.5843331	7
clay Silty	6.4	62	31.6	33.4148692	43.5187849	8
Clay	16.4	46	37.6	33.4410456	43.4755400	9
Sandy clay	4.4	38	57.6	33.3735587	43.5453854	10
Sandy clay	1.4	36	62.6	33.3916397	43.5002764	11
clay Silty	10.4	54	35.6	33.4258051	43.4462483	12
Sandy clay	2.4	18	79.6	33.3519871	43.4932406	13
Sandy	2.4	8	89.6	33.3757594	43.4472045	14
Sandy	2.4	28	69.6	33.2605799	43.5951182	15
Sandy	4.4	26	69.6	33.1893245	43.5289767	16
Sandy	2.4	6	91.6	33.1859041	43.4272633	17
Clay	8.4	44	47.6	33.2337031	43.4041949	18
Sandy	4.4	36	59.6	33.2791777	43.3404351	19
Sandy	2.4	5	92.6	33.1526370	43.4757271	20
Sandy	2.4	10	87.6	33.1563907	43.3667657	21
Clay	20.4	48	31,6	33.2095498	43.3357634	22
Sandy clay	2.4	28	69.6	33.1651126	43.2775995	23

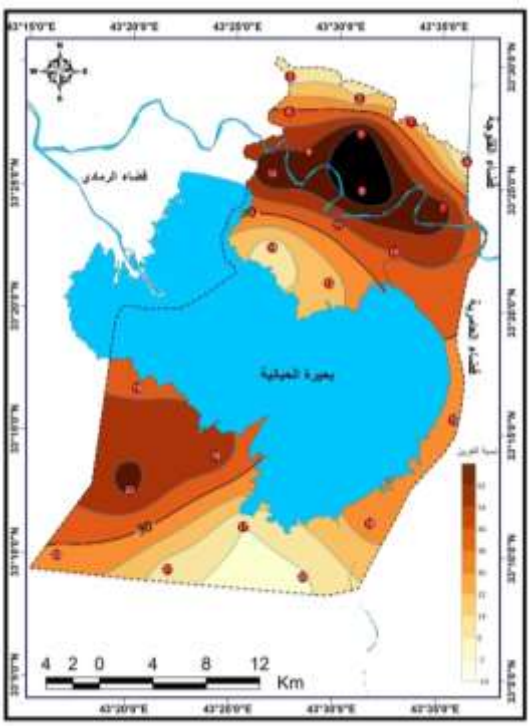
Source : From the researcher's work based on the results of laboratory analyze.

Map (2) Cartographic representation of sand ratio



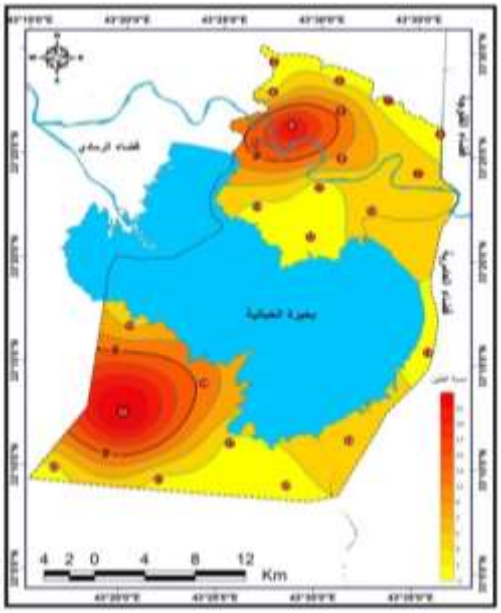
Source : based on Table(1)

Map (3**)** Cartographic representation of silt ratio



Source : based on Table (2)

Map (4) Cartographic representation of clay separators (%) in soils of the study area



Source : based on Table (1).

2- Bulk Density of the soil:

Reflect the apparent density of the ratio between the dry soil mass and the total size, in other words , it is the mass of unit sizes for dry land, and crosses size here on both the size of the solid material and pore size, usually measured by unit of measurement (g / cm^3).

It is evident from Table (2) and Map (5) that there is a slight variation in the values of bulk density in the soil of the study area, as it reached its highest value (1.716 g / cm^{-3}) in the southeast of Haswah al-Shamiya district, the reason for this increase is the decrease in the percentage of organic matter in these soils, and they appeared in dark purple on the map, while their values decreased in the provinces of (Haswah al-Shamiyah, Krtan and Husaybah al-Sharqiyah), where they reached the lowest value. The apparent density in the southwestern part of Haswa al-Shamiyah by (1.188 g/cm^{-3}) and appear on the map in pale purple color, while the average apparent density values were (1.471 g / cm^{-3}) in the soil of Habbaniyah district.

The reason for the discrepancy in the bulk density values is due to the proportions of soil separations in the study area (sand, silt, clay) and that the decrease in their values is affected by the presence of vegetation cover, which in turn leads to the cohesion of soil particles with each other, because they contain high proportions of organic matter in the soil, As well as agricultural operations, especially plowing and adding organic fertilizer to the soil, which reduces the bulk density values, especially the surface layer.[4].

3 - Particle Density:

It is the unit mass of volumes of soil particles, it is the relationship between the solid minutes weight to their size unit measured (g/cm^3) values ranging from (2.6 – 2.7)[5].

It is noticed from the data in Table (3) and Map (6) that the true density values are close in the soils of the study area, as it is noticed that they are high in the two districts (Haswa al-Shamiya and Al- Malahma), where the highest value for it is (2.729 g/cm^{-3}) in the southwest of Haswah al-Shamiya district, while its values decreased in the provinces (Haswa al-Shamiyah, Krtan, Sun al- Dhaban, Husaybah al-Sharqiyah, Mahooz) and reached the lowest true density value (2.358 g/cm^{-3}) in the south of Haswa al-Shamiya, it has reached the general average of the values of the real density in soils study area (2.520 g / cm^{-3}).

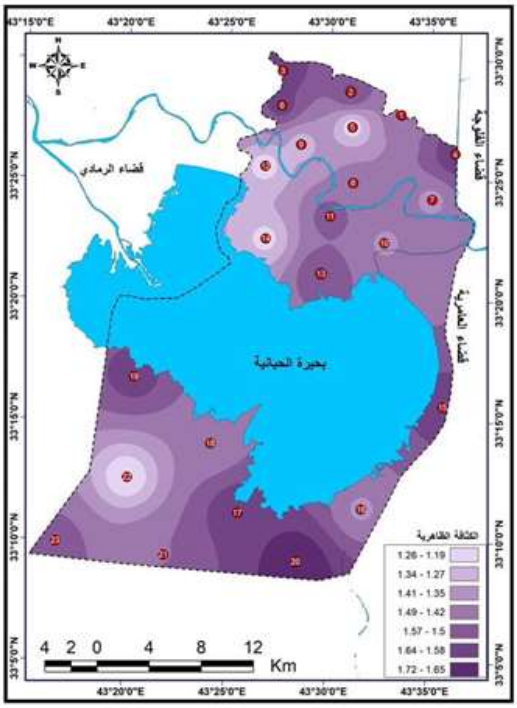
Table (2) bulk density, real density and porosity ratio in the soil of the study area

%Porosity	True density g / cm^{-3}	Bulk density g / cm^{-3}	Sample number
41.565	2.444	1.428	1
39.332	2.608	1.582	2
33.782	2.487	1.647	3
38.614	2.693	1.635	4
48.507	2.364	1.217	5

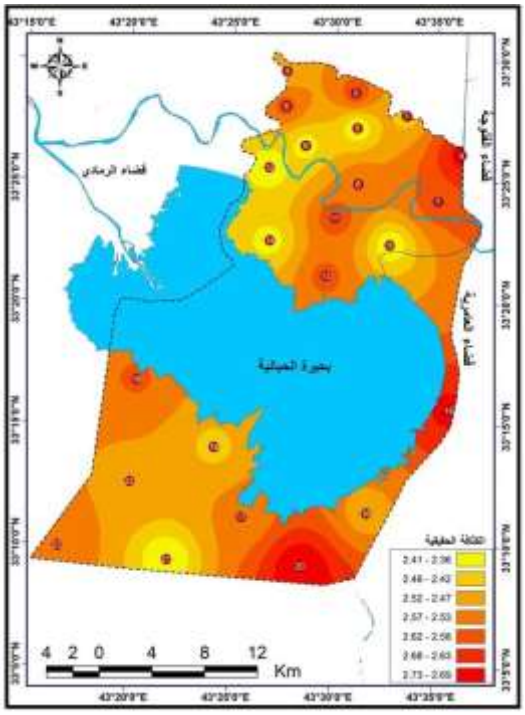
37.942	2.595	1.610	6
46.458	2.603	1.394	7
43,525	2.575	1.454	8
45.561	2.386	1.299	9
40.611	2.367	1.406	10
40.956	2.617	1.545	11
48.408	2.367	1.221	12
39.242	2.590	1.574	13
48.257	2.390	1.237	14
40.490	2.687	1.599	15
43.695	2.491	1.403	16
35.107	2.531	1.642	17
42.223	2.449	1.415	18
37.634	2.577	1.607	19
37.120	2.729	1.716	20
36.852	2.358	1.489	21
52,547	2.50	1.188	22
40.643	2.557	1.518	23
41.698	2.520	1.471	A rate

Map (5) Cartographic representation of values density virtual

Map (6) of the cartographic representation of the real density value



Source : based on Table (2).



Source : based on Table (2).

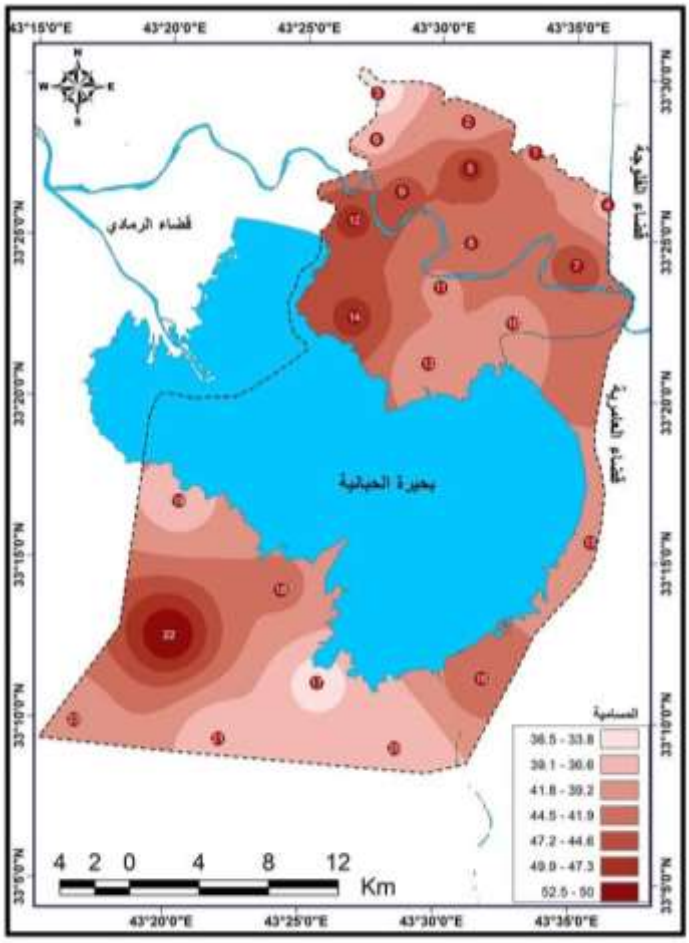
4 - Soil porosity:

It refers to the volume of voids in the soil, increase soil porosity increased the proportion of organic matter they contain, as well as good infrastructure provides soil, while less porous soil as a result of increased depth to increase the pressure off from the upper layers[6] **.**

It is evident through the analysis of the data of Table (2) and Map (7) the high percentage of soil porosity in the south- west of Haswah al-Shamiya district and the districts of Krtan and Husaybah al-Sharqiya, where the porosity ratio reached.

(52,547%,48.507%,48.257%) respectively, and the reason for the increase in the porosity percentage in these areas is due to the high percentage of organic matter in them, while the lowest percentage of porosity was in the provinces of Umm Al-Rus and the south of Haswah Al-Shamiya district near Lake Habbaniyah, as a result of the low percentage of organic matter in the soil of these areas, as reached (33.782.%, 35.107%) For each of them respectively, while the average percentage of porosity in the soils of the study area (41.698%) .

Map (7) Cartographic representation of the porosity percentage (%) in the soils of the study area



Source : From the researcher's work based on Table (2).

5- Soil Color:

Soil color is defined as a group of electromagnetic waves that are subject to all the laws of light, in terms of the color of the dominant spectrum, which in turn depends on the length of the light wave and the degree of color intensity, as it depends on the amount of reflected light and its contrast to give us a range of colors[7] .

Through the analysis of the data of Table (3) and Map (8), it becomes clear that the very pale brown color is widespread in Haswah al-Shamiyah district, as it appears in its northern and southern parts, as well as some of its western parts near Habbaniyah Lake, while the light brown color prevails in the provinces (Ghazwan, Sun al- Dhaban, Husaybah al-Sharqiya, and southeast Haswah al-Shamiya) and gray prevails in the district of al-Malahma. As for brown, it prevailed in provinces (Umm al-Rus and Al-Nammala and the eastern part of Haswat al-Shamiyah near Lake Habbaniyah), while the dark yellowish brown color has spread in the provinces of Umm Al-Rus and Krtan), while the yellowish brown color has spread widely in Mahooz district and separate parts of Haswa al-Shamiya district, while the light yellow brown color prevails in Mahooz and Zawiyat al-Dhaban districts.

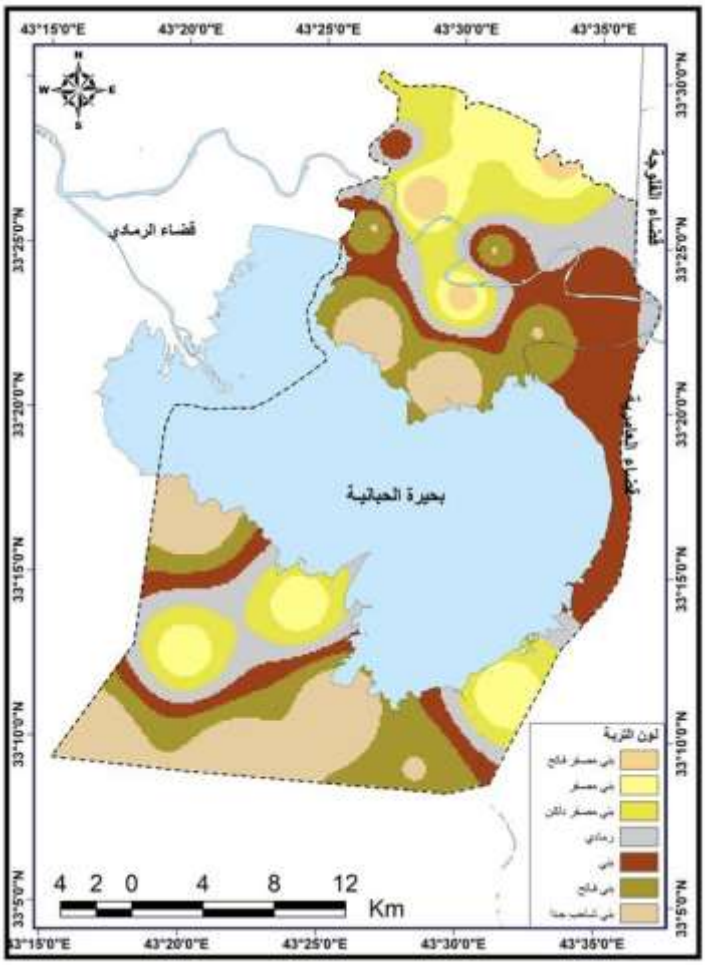
The apparent variation in the colors of the soil of Habbaniyah district is due to the effect of the physical and chemical properties of the soil, such as organic matter and salt concentration, as well as the presence of mineral substances in it.

Table (3) the color of the soil in the study area

Soil color		Sample number		Soil color		Sample number
Color name	Color code			Color name	Color code	
Very Pale brown	10YR7 / 3	13		Light yellowish brown	10YR6 / 4	1
Very Pale brown	10YR8 / 3	14		yellowish brown	10YR5 / 4	2
Brown	10YR5 / 3	15th		Dark yellowish brown	10YR4 / 4	3
yellowish brown	10YR5 / 8	16		Grayish	10YR5 / 2	4
Very Pale brown	10YR7 / 4	17		Dark yellowish brown	10YR4 / 4	5
yellowish brown	10YR5 / 6	18		Brown	10YR5 / 3	6
Very Pale brown	10YR7 / 4	19		Brown	10YR5 / 3	7
Pale brown	10YR6 / 3	20		Pale brown	10YR6 / 3	8
Very pale brown	10YR8 / 3	21		yellowish brown	10YR5 / 4	9
yellowish brown	10YR5 / 8	22		Pale brown	10YR6 / 3	10
Pale brown	10YR7 / 4	23		Light yellowish brown	10YR6 / 4	11
				Pale brown	10YR6 / 3	12

Source : From the researcher's work based on the results of laboratory analyzes of soil samples in the study area.

Map (8) A cartographic representation of the soil color in the study area



Source : From the researcher's work based on Table (3).

Conclusions :

1- The study concluded that the highest percentage of separators of sand was (94%) in the district of Al-Malahma, while the highest percentage of separated silt was within the districts of Ghazwan, Hamamiyat, Krtan, and part of Husaybah Al Sharqiya, at (62%). As for the percentage of clay, the highest percentage was (20.4%) in Southwest of Haswa al-Shamiyah district .

2- The study revealed that the highest apparent density value was (1.716 g / cm $^{-3}$) in the southeast of Haswah al-Shamiyah province, while the lowest value was (1.188 g/ cm $^{-3}$) in the southwest of Haswa al-Shamiyah , which is located south of the study area .

3- It turns out that the highest value of the true density was (2.729 g /cm $^{-3}$) in the southwest of Haswah al-Shamiya district, while its values decreased in the provinces (Haswa al-Shamiyah, Krtan, Sun al- Dhaban, Husaybah al-Sharqiya, Mahooz) and reached the lowest true density value (2.358 g /cm $^{-3}$) in southern Haswa al-Shamiya .

4- It became clear that the highest porosity rate in the soils of the study area was recorded in the western province of Haswah al-Shamiya, reaching (52,547%) , while the lowest percentage of porosity was in the provinces of Umm al-Rus and the south of Haswah al-Shamiyah district near Lake Habbaniyah, reaching (33.782.% , 35,107 %) For each of them in succession.

Recommendations :

1- The necessity of using modern technology represented by geomatics techniques in applied studies and benefiting from its high efficiency and accuracy in monitoring, documentation, analysis, linking spatial relationships and giving the final results, in accordance with the field study of the region .

2. Make use of Maps that have been prepared and produced in this study by stakeholders from legislators and planners to determine the optimal and appropriate use of the land in the study area and the possibility of investing in the agricultural side , industrial or residential .

References

[1] Abdul Hadi, Yousef Muhammad, Soil Physics, 1st Edition, Dar Wael for Printing and Publishing, Amman, Jordan, 1998.

[2] Abbas, Muhammad Khader, Emergence and Morphology of Soils, Dar Al Kutub for Printing and Publishing, Mosul, Iraq, 1989.

[3] Al-Hamdani, Khalid Akber, Hanan Kareem Mutlak, Physical and Chemical Characteristics of Desert Soils in Heet District, Anbar University Journal of Human Sciences, Issue 2, Volume 2, 2015 .

[4] Salman, Ismail Dawood Salman, contrast the spatial characteristics of the soil in my part Buhriz and Bani Saad and its relationship with spatial climate and resources of water, a message Master (not published), Faculty of Education Ibn Rushd, University of Baghdad, 2005.

[5] Yuxin Ma, Budiman Minasny, Chunfa Wu, Mapping key soil properties to support agricultural production in Eastern China, Geoderma Regional Journal , 10,2017.

[6] Al-Jubouri, Salam Hatif, Soil Problems, 1st Edition, Dar Amjad for Publishing and Distribution, Amman, Jordan, 2021.

[7] Rahim, Najm Abdullah, The effect of soil color on the reality of agricultural production of some soil sites on the banks of the Shatt al-Arab and the Western Plateau and their basins, Al-Khaleej Al-Arabi Journal, Volume 39 , Issue (1-2) , 2011.