Pak. j. life soc. Sci. (2024), 22(1): 2483-2493 E-ISSN: 2221-7630;P-ISSN: 1727-4915

Pakistan Journal of Life and Social Sciences
www.pjlss.edu.pk

https://doi.org/10.57239/PJLSS-2024-22.1.00185

RESEARCH ARTICLE

Evaluation of the Suitability of the Soils of the Banks of the Tigris River in the Districts of Qal'at Saleh and Qurna for Wheat Production according to the (Sys) Standard

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ARTICLE INFO

Received: May 22, 2024

Accepted: Jul 3, 2024

Keywords

Qal'at Saleh

Qurna

(SYS) standard

Misan Governorate

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ABSTRACT

The study aims to assess the suitability of the soils of the banks of the Tigris River in the districts of Qal'at Saleh and Qurna to produce wheat crop according to the standard (SYS), as the study showed the suitability of the soil of the study area for the cultivation of wheat crop has been used in which a mathematical equation by giving a value to the requirements of its cultivation to reach the determination of appropriate categories for the crop, and the study concluded that wheat at its general rate is located in one category (very appropriate) and this indicates the suitability of the soil of the study area to grow this strategic crop and important for the population.

Soil suitability: It is the process of evaluating certain types of soil into categories related to their suitability for a particular type of soil use. Tigris river banks: They are the areas adjacent to the course of the Tigris River, which can accommodate a distance of about 500 to 1000 meters, characterized by soil with good physicochemical properties suitable for agriculture. Qurna District: It is one of the districts of the Great Governorate of Basra and is located about 80 km north of the city of Basra, in which the Tigris and Euphrates rivers meet to form together the course of the Shatt al-Arab. Qalaat Al-Saleh District: It is one of the districts of Misan Governorate in southern Iraq, located about 45 km south of the city of Amara and bounded from the southern side Qurna district in Basra Governorate.

INTRODUCTION

Soil is one of the most important basic natural resources on which agricultural production depends, and to achieve full benefit when exploited, it is necessary to apply modern scientific methods that help increase its productivity and maintain

Its fertility and the suitability of the land is one of the best means of soil assessment, which indicates the extent to which the characteristics of the soil match to meet the needs of the proposed crop under the current soil and land conditions or after making some improvements, which ensures sustainable

production, and based on the foregoing, the research seeks to show the suitability of the soil of the study area for the cultivation of wheat crop according to the Belgian classification (SYS) through its requirements of physical and chemical properties of the soil of the banks of the Tigris River in the districts of Qal'at Saleh and Qurna, which occupies an area of (294.79) km2.

First:

Location of the study area: The study area is located in the southern part of Misan Governorate and the northern part of Basra Governorate in southeastern Iraq, either its location from the districts of Qal'at Saleh and Qurna, it is located on both sides of the Tigris River, as the area of the banks of the Tigris River in the Great Hungary district represents the northern border of the study area and the area of its confluence with the Euphrates River

To be the Shatt al-Arab in the center of the Qurna district to represent its southern borders, while the eastern and western borders were represented by the extent of the breadth of the banks on both sides of the Tigris River depending on the topographic criterion that shows the breadth of the banks area as the highest values of the contour lines in the region are the closest to the course of the river, either astronomically it is located between two latitudes (30°99′4″ - 31°37′0″) north and longitude (47°30'0' -47°12'0")East map(1)

Second:

Wheat cultivation in the areas of the banks of the Tigris River in the districts of Qal'at Saleh and Qurna: It is clear from Table 1 and Figure 1 that the district of Al-Uzair ranked first in terms of area in the cultivation of wheat crop amounted to (21895) Acres and came in second place towards Imam Al-Qaim, with an area of (12854) Acres, then came the district of Qal'at Saleh in third place with an area of (6583) Acres, while the district of Qurna ranked last with an area of (5663) Acres of the total area of (46995) Acres. In terms of production, the total reached (34098) tons, as the district of Al-Uzair ranked first in terms of production, as it reached (16902) tons and its productivity amounted to (772) kg / dunum, while the district of Qal'at Saleh ranked last with a production of (4311) tons and a productivity of (655) kg / Acres.

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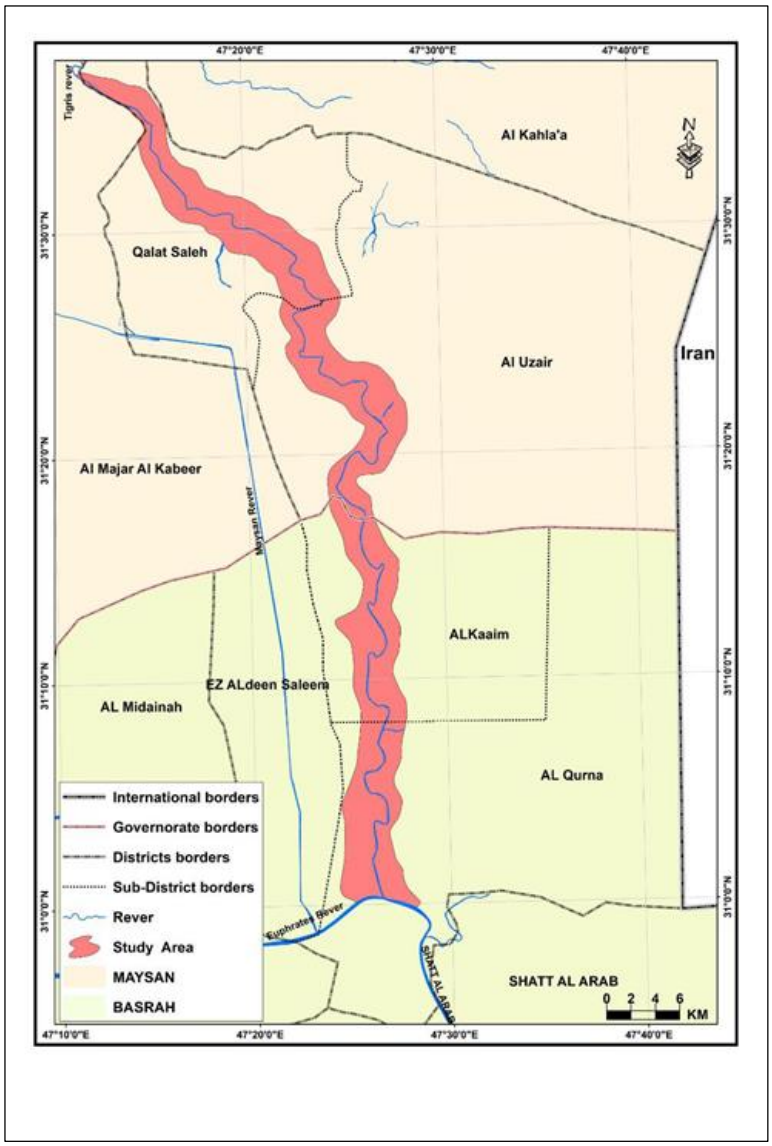


Map 1: Location of the study area, including Qalaat Saleh and Qurna districts, according to their administrative units

Source:

1- Ministry of Water Resources, General Directorate of Survey, Map Production Department, Digital Unit, Misan Administrative Governorate Map, scale (250,000: 1) Baghdad, 2020

2- Ministry of Water Resources, General Directorate of Survey, Map Production Department, Digital Unit, Basra Governorate Administrative Map, scale (250,000: 1) Baghdad, 2020.

Table (1) Cultivated areas/dunum, production/ton, and yield in kg/dunum of wheat crop for the agricultural divisions in the study area for the season (2022-2023)

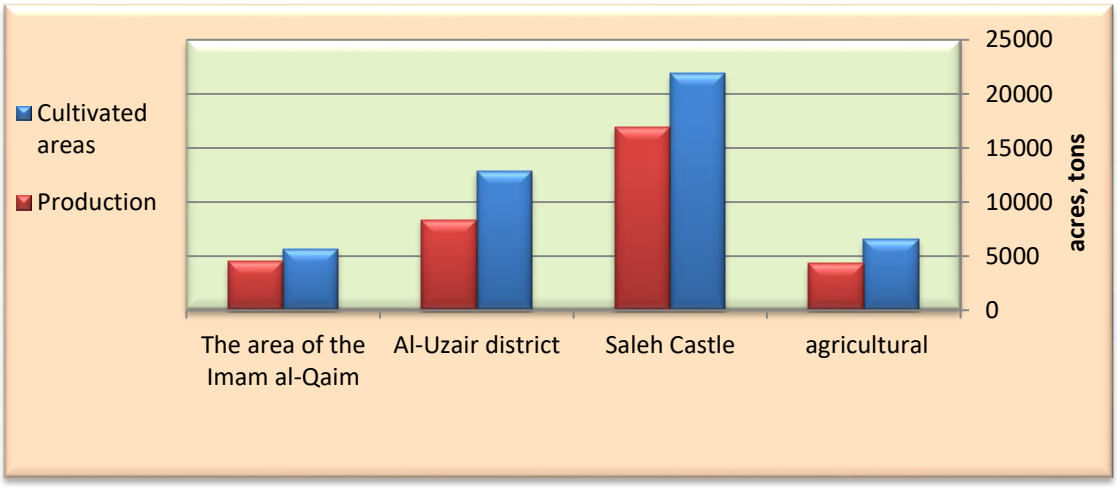
Division agricultural	Cultivated areas (acres)	Production/ton	Yield (kg/acre)
Saleh Castle	6583	4311	655
Al-Uzair district	21895	16902	772
The area of the Imam al-Qaim	12854	8355	650
Gourna	5663	4530	800
The total	46995	34098	719.25

Source: The researchers based on:

(1) Republic of Iraq, Misan Agriculture Directorate, Planning and Follow-up Division, Lands Department, unpublished data, 2023.

(2) Republic of Iraq, Basra Agriculture Directorate, Planning and Follow-up Division, Lands Department, unpublished data, 2023.

Figure (1) Cultivated areas/(acres) and production/tons of wheat crop for the agricultural divisions in the study area for the season (2022-2023)



Source: The researchers, based on Table 1.

Third: The suitability of the soil of the study area for the cultivation of wheat crop: Soil suitability means that the properties of the soil (physical, chemical) correspond to the need for growth and production of the crop grown in it, or estimate the productivity of the soil, and is also an estimate of the effectiveness of the soil when planted with a particular crop, and the needs (requirements) of the crop itself were relied upon to determine its suitability prepared by the Food and Agriculture Organization of the Land Assessment System (1983), and the experiments of both SYS et ... at.1991) and (, 2017 Okiror, p.et.. Al) laboratory and others conducted on the selected crops, has been using the equation depending on the necessary needs of the physical and chemical properties of the soil, which was divided into (4) categories and each category of which has a special guide used with the equation, and when applying the equation is a comparison between the results and a table for

assessing suitability depends mainly on the requirements (needs) of the crop of soil properties (qualities), either the equation used is: -

Suitability=A*B*C*…….

Whereas:-

Suitability means (fit)

A, B, C means (crop requirements)

This equation is applied when comparing the qualities or characteristics of the soil with the categories of crop needs and the evidence is given in the light of the category where the trait is located and after the process of multiplying the evidence together and extracting the value we compare it with the suitability assessment table to determine the assessment of its suitability, which includes four categories (highly appropriate, somewhat appropriate, marginal suitability, inappropriate) Table 2.

Fourth: - The suitability of the soil of the study area for the cultivation of wheat crop according to the standard (SYS): To show the suitability of the soil of the study area for the production of wheat crop based on its requirements Table 3 of the soil characteristics Table 4. The following equation was used:

$$\text{Suitability} = A * B * C * D * E * F * G * H * I$$

Table 2: Evaluation of soil suitability for crops based on its requirements

Suitability assessment	**Equation value (degree of suitability**)
Very convenient	(0.2) more than
Fairly convenient	(0.2 -0.1)
Marginal fit	(0.001- 0.1)
Inappropriate	(0.001)less than

Mongkolsawat, c.p.and Kuptawutinan.P.Land evaluation for combining economic crops using GIS And remotely sensed data.Gisdevelopment, aars, agriclclture/soil, Khon Kaen university, 1999, pp.3-4.

Whereas:- (A) Drainage Guide, (B) Texture Guide, (C) Depth Guide, (D) Lime Guide, (E) Gypsum Guide, (F) PH Guide, (G) O.M Guide, (H) EC Guide, (i)ESP Manual.

It is clear from Table 5 that the general rate of suitability of the soil of the study area to wheat crop requirements was (0.64), and when compared with Table 2 for evaluating the suitability of the soil, it becomes clear that it falls within the (very suitable) category, and it became clear by applying the aforementioned equation mentioned above. Concerning the wheat crop, there are three categories for the suitability of the soil to the requirements of the wheat crop, which are:

1-1- Extremely Suitable Category: This is the category with the first rank in the number of its samples in terms of dominance over the soil of the study area, as it reached the highest value for the degree of suitability of its soil to the requirements of the wheat crop (1), in sample No. (32) Within County No. (64). Administratively affiliated with the Qurna District, while the lowest value was recorded in the two samples No. (16, 21), the first is located within District No. (8) Administratively affiliated with

the Al-Uzair District in the Qala Saleh District, and the second is within District No. (16) Administratively affiliated with the Al-Uzair District in the Qalaa District. Valid, as it reached (0.4) for each.

1 -2- Suitability category to some extent: - This category recorded its highest value for the degree of suitability for growing the wheat crop in the soil of the study area (0.2) in sample no. (27), which is located within District No. (51) Administratively affiliated to Al-Qaim district in Qurna District, while the lowest value was recorded in the two samples no. (9, 12), the first of which is located within District No. (6) and the second within District No. (8), which are administratively affiliated to the Al-Uzair district in Qalat Saleh District, and amounted to (0.102) for each of them.

Table 3: Requirements for the crop (wheat) based on soil characteristics and the evidence given for each category

0.2	0.5	0.8	1	**Directory Adjective**
Incomplete	-	Normal	good	Drainage
Clay	Sand blend	Clay mix sand, Mixed sandy	Mix alluvial , alluvial clay , clay mix	Histology
Less than 10	25 – 10	50 – 25	100- 50	Depth/cm
More than 60	-	60 - 21	Less than 20	Lime(%)
More than 20	-	20- 3.1	Less than 3	Gypsum (%)
More than 8.2	-	-	8.2- 6.2	P.H
Less than 0.5	-	0.5 – 1	More than 1	O.M (%)
More than 15	15- 8.1	8 – 4.1	Less than 4	EC (decimens/m)
More than 40	40 - 30.1	30- 15.1	Less than 15	ESP(%)

Source: Salim Yavuz Jamal, Evaluating the Suitability of Land Characteristics for Wheat Cultivation in the Numaniyah District Center Using Remote Sensing and Geographic Information Systems, Journal of the College of Education, Al-Mustansiriya University, Fourth Issue, 2016, p. 422.

1-3- Marginal suitability category: - This category recorded its values for the degree of suitability for the wheat crop in two samples (11, 14), where the value of both of them reached (0.08). The first is located within County No. (6) And the second is within County No. (8), which are administratively affiliated to Al-Uzair district in Qalat Saleh district.

1-3- Marginal category of suitability: - This category recorded its values for the degree of suitability of wheat crop in two samples, namely (11, 14), where the value of both (0.08). The first is located within Province No. (6) and the second within Province No. (8) Administratively affiliated to Al-Uzair district in the district of Qal'at Saleh.

Table 4: Physical and Chemical Properties of the Soil of the Study Area

K mg/kg	PO_4 mg/kg	NO_3 mg/kg	OM gm/kg-1	ESP %	$CaSO_4$ %	$CaCO_3$ %	EC Ds/m	drainage	Histology	County number	Sample number
Saleh Castle											
150.74	17.43	19.43	1.34	17.12	5.01	13.43	6.43	Good	Alluvial mixture	2	1
38.88	0.41	16.67	1.15	13.34	2.57	10.32	6.55	Good	Alluvial mixture	2	2
32.41	0.65	16.38	1.13	10.76	4.45	2.95	6.08	Good	Alluvial mixture	1	3
153.72	5.71	32.33	2.45	13.65	4.40	9.58	5.35	Incomplete	Alluvial	12	4
174.96	23.26	34.2	2.23	4.42	3.99	12.53	6.45	Incomplete	Alluvial	5	5
71.28	18.12	31.61	1.11	6.23	5.08	6.63	6.82	Good	Alluvial mixture	14	6
64.81	0.71	7.10	0.49	9.78	4.84	8.55	4.65	Good	Alluvial mixture	13	7
163.83	4.71	16.38	1.13	11.35	7.17	5.9	7.57	Good	Alluvial mixture	11	8
153.31	19.32	12.61	0.87	8.65	3.87	9.42	6.01	Incomplete	Alluvial	6	9
87.11	12.7	13.19	0.91	6.36	5.32	7.18	6.76	Good	Alluvial mixture	5	10
Al-Uzair district											
213.84	33.28	16.09	1.11	6.61	7.74	11.8	11.7	Incomplete	Alluvial	6	11
71.28	16.62	9.42	0.65	10.11	4.21	10.54	7.63	Incomplete	Alluvial	8	12
19.44	20.47	20.11	1.18	14.28	6.34	15.89	6.87	Good	Alluvial mixture	6	13

64.81	2.74	17.25	1.19	7.88	5.60	7.37	10.95	Incomplete	Alluvial	8	14
193.18	14.21	13.92	0.67	8.72	3.75	9.81	6.46	Good	Alluvial mixture	6	15
108.91	9.73	12.03	0.83	12.43	2.98	13.98	8.37	Incomplete	Alluvial	15	16
71.28	2.81	16.67	1.15	21.56	5.03	11.21	16.21	Good	Alluvial mixture	6	17
35.92	15.5	36.10	2.36	10.45	3.25	14.16	2.77	Good	Alluvial mixture	9	18
75.26	11.86	11.02	0.76	19.67	4.32	9.31	7.23	Good	Alluvial mixture	6	19
164.45	10.43	21.02	1.45	7.24	6.76	16.75	6.67	Incomplete	Alluvial	9	20
8.56	7.79	0.94	0.94	6.67	2.87	10.56	8.56	Good	Alluvial mixture	16	21
The area of the Imam al-Qaim											
7.32	7.84	0.85	0.85	7.23	5.75	15.74	7.32	Good	Alluvial mixture	51	22
2.22	8.04	1.17	1.17	18.37	4.21	10.32	2.22	Good	Alluvial mixture	51	23
6.76	7.75	0.76	0.76	8.67	3.89	13.27	6.76	Good	Alluvial mixture	51	24
2.43	7.78	0.64	0.64	9.11	5.43	17.45	2.43	Good	Alluvial mixture	51	25
5.93	7.81	2.19	2.19	16.13	6.10	4.42	5.93	Good	Alluvial mixture	51	26
1.32	8.18	1.13	1.13	5.58	2.03	14.45	1.32	Incomplete	Alluvial	51	27
Gourna											
1.21	7.79	1.45	1.45	10.42	6.02	10.21	1.21	Incomplete	Alluvial	64	28

2.54	7.76	0.53	0.53	15.56	3.15	16.84	2.54	Good	Alluvial mixture	49	29
1.46	7.89	2.18	2.18	7.67	4.40	8.26	1.46	Good	Alluvial mixture	64	30
1.67	7.79	0.96	0.96	9.43	5.51	15.8	1.67	Good	Alluvial mixture	48	31
1.52	8.06	1.13	1.13	9.18	2.30	19.17	1.52	Good	Alluvial mixture	48	32
97.84	10.67	17.36	10.76	4.63	11.4	5.95	1.44	Good	Alluvial mixture	Study area	General Average

Source: Results of physical and chemical analyses, Marine Science Center, Marine Sedimentology Department, Marine Chemistry Department, University of Basra, 2024.

Table 5: Evaluation of the suitability of the soil of the study area for growing wheat with its evidence

Suitability assessment	Degree of suitability	Guide Esp	Guide Salinity	Guide O.m	Guide Ph	Gypsum guide	Lime guide	Depth guide	Textile guide	Drainage guide	Administrative unit	County number	Sample number
Very convenient	0.512	0.8	0.8	1	1	0.8	1	1	1	1	Saleh Castle	2	1
	0.8	1	0.8	1	1	1	1	1	1	1	Saleh Castle	2	2
	0.64	1	0.8	1	1	0.8	1	1	1	1	Saleh Castle	1	3
	0.64	1	0.8	1	1	0.8	1	1	1	1	Saleh Castle	14	6
	0.64	1	0.8	1	1	0.8	1	1	1	1	Saleh Castle	11	8
	0.512	1	0.8	0.8	1	0.8	1	1	1	1	Saleh Castle	5	10
	0.64	1	0.8	1	1	0.8	1	1	1	1	Al-Uzair	6	13
	0.512	1	0.8	0.8	1	0.8	1	1	1	1	Al-Uzair	6	15
	0.4	1	0.5	0.8	1	1	1	1	1	1	Al-Uzair	15	16
	0.64	1	0.8	1	1	0.8	1	1	1	1	Al-Uzair	9	18
	0.4096	0.8	0.8	0.8	1	0.8	1	1	1	1	Al-Uzair	6	19
	0.4	1	0.5	0.8	1	1	1	1	1	1	Al-Uzair	16	21
	0.512	1	0.8	0.8	1	0.8	1	1	1	1	thagar	51	22

	0.64	0.8	1	1	1	0.8	1	1	1	1	thagar	51	23
	0.512	1	0.8	0.8	1	0.8	1	1	1	1	thagar	51	24
	0.64	1	1	0.8	1	0.8	1	1	1	1	thagar	51	25
	0.512	0.8	0.8	1	1	0.8	1	1	1	1	thagar	51	26
	0.512	0.8	1	0.8	1	0.8	1	1	1	1	Gourna	49	29
	0.8	1	1	1	1	0.8	1	1	1	1	Gourna	64	30
	0.64	1	1	0.8	1	0.8	1	1	1	1	Gourna	48	31
	1	1	1	1	1	1	1	1	1	1	Gourna	48	32
Fairly convenient	0.128	1	0.8	1	1	0.8	1	1	1	0.2	Saleh Castle	12	4
	0.128	1	0.8	1	1	0.8	1	1	1	0.2	Saleh Castle	5	5
	0.128	1	0.8	0.2	1	0.8	1	1	1	1	Saleh Castle	13	7
	0.1024	1	0.8	0.8	1	0.8	1	1	1	0.2	Saleh Castle	6	9
	0.1024	1	0.8	0.8	1	0.8	1	1	1	0.2	Al-Uzair	8	12
	0.128	0.8	0.2	1	1	0.8	1	1	1	1	Al-Uzair	6	17
	0.128	1	0.8	1	1	0.8	1	1	1	0.2	Al-Uzair	9	20
	0.2	1	1	1	1	1	1	1	1	0.2	Thagar	51	27
	0.16	1	1	1	1	0.8	1	1	1	0.2	Gourna	64	28
Margin of suitability	0.08	1	0.5	1	1	0.8	1	1	1	0.2	Al-Uzair	6	11
	0.08	1	0.5	1	1	0.8	1	1	1	0.2	Al-Uzair	8	14
	Very convenient	0.64	1	0.8	1	1	0.8	1	1	1	1	Study area	General Average

Source: The researchers based on Table 2, 3, and 4.

REFERENCES

1. Soil suitability and soil evaluation, journal of geographic information and decision analysis, vol.1, no.2, 1997.

2. Dodeyne, S. & Deckers.J.D.Raes, land evaluation for irrigated rice in the West African Sahel, institute for land and water management, Catholic University of Leuven, vital decostertraat 102, B-3000, Leuven, Belgium, 1997.

3. Mongkolsawat, c.p.and kuptawutinan.p.land evaluation for combining economic crops using-GIS and remotely sensed data.Gisdevelopment, aars, agricultural culture/soil, khon kaen university, 1999.

4. Mostafa M.Ahmed, et…al, Soil Suitability Assessment for Twenty Crops in East Edfu Soils, Aswan, Assiut Journal of Agriculture Science 53 (5), 2022.

5. Perveen, P.F.Nagasawa, R.Crop-land suitability analysis using a multicriteria evaluation & GIS approach, United Graduate School of Agricultural Sciences, Tottori University, Japan, 2003.

6. Xiaoling, H.l.et al, Assessment of soil quality using GIS & RS, surveying mapping and remote sensing, Wuhan University, Wuhan, China, 2005.

7. Salim Yavuz Jamal, Evaluating the suitability of land characteristics for wheat cultivation in the Numaniyah district center using remote sensing and geographic information systems, Journal of the College of Education, Al-Mustansiriya University, fourth issue, 2016.

8. Republic of Iraq, Misan Agriculture Directorate, Planning and Follow-up Division, Lands Department, unpublished data, 2023.

9. Republic of Iraq, Basra Agriculture Directorate, Planning and Follow-up Division, Lands Department, unpublished data, 2023.

10. Ministry of Water Resources, General Directorate of Survey, Map Production Department, Digital Unit, Misan Administrative Governorate Map, scale (250,000: 1) Baghdad, 2020

11. Ministry of Water Resources, General Directorate of Survey, Map Production Department, Digital Unit, Basra Governorate Administrative Map, scale (250,000: 1) Baghdad, 2020.

12. Results of physical and chemical analyses, Marine Science Center, Marine Sedimentology Department, Marine Chemistry Department, University of Basra, 2024.