



JOURNAL

OF THE GENERAL UNION
OF ARAB ARCHAEOLOGISTS

JGUA2 is a semi-annual peer-reviewed academic journal



Volume 4/1

Cairo
2019

ISSN: 2537-026X





JOURNAL

OF THE GENERAL UNION OF ARAB ARCHAEOLOGISTS

**Semi-annually peer-reviewed international academic
journal - dedicated to the publication of researches
and specialized studies in the fields of Archaeology
and Museums, Restoration and Arab World
Civilizations**

PUBLISHED BY

The General Union of Arab Archaeologists

AND

The Association of Arab Universities

FOURTH ISSUE - JANUARY EDITION

CAIRO, 2019

**DEPOSIT NO.
INTERNATIONAL & DOMESTIC**

January Edition

2019/ 12894

ISSN 2537-026X

Management of the Association of Arab Universities



Prof. Amr Ezzat Salama

Secretary-General of the Association of Arab Universities



Prof Khamisi Hamidi

Assistant Secretary-General of the Association of Arab Universities



Prof Abdelrehim Ahmed Al-Hunaiti

Assistant Secretary-General of the Association of Arab Universities

Editorial Board of the Journal of the General Union of Arab Archaeologists



Editor-in-Chief

Prof. Ali Moussa Radwan

Chief of the General Union of Arab Archaeologists



Managing Editor

Prof. Mohamed Mohamed El Kahlaway

Secretary-General of the General Union of Arab Archaeologists

Editors

Prof. Abdelgadir Mahmoud Abdalla

Khartoum University



Prof. Abd El Rahman Al Tayeb Al Ansari

King Saud University



Prof. Ahmed Amin Selim

Faculty of Arts - Alexandria University



Prof. Antoño Momplet

Universidad de complutense de madrid



Prof. Bernard O'Kane

AUC



Prof. Carlo Alberto Garzoni

University of Florence, Firenze



Prof. Fayza Mouhamed Heikal

American University



Prof. Jeffrey King

University of the Arts London

Prof. Laurent Bavay

*Director of the Institut français d'archéologie
orientale au Caire (IFAO).*



Prof. Mohamed Abdel-Raouf El-Gohary

Faculty of Archaeology - Sohag University



Prof. Mona Abd El -Ghany Haggag

Faculty of Arts - Alexandria University



Prof. Mona Fouad Ali

Faculty of Archaeology, Cairo University



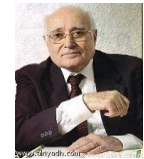
Prof. Sabah Abboud Jasim

*Prof. of Near Eastern Archaeology, Dept. of
History, University of Sharjah, United Arab
Emirates*



Prof. Saleh Lamai Moustafa

*Director of Centre for Conservation & Preservation
of Islamic Architectural Heritage*



Prof. Shafia Abdel - Latif Bedair

Ain-Shams University



Prof. Shatadill Man

DAI

Prof. Stephan Johannes

*Director of the German Archaeological Institute,
Cairo Department*



Prof. Yousef Mukhtar Al Amin

King Saud University



Prof. Zahi Hawass

Former Minister of Antiquities



Prof. Zeidan Abdelkafi Kafafi

*Department of Archaeology
Faculty of Archaeology and
Anthropology, Yarmouk University*



Peer-Reviewers

Prof .Abdel Monsef Salem Hassan

Professor of Islamic Archeology,
Faculty of ART, Helwan University

**Prof. Gamal Abdelrehim
Ibrahim**

Professor of Islamic Archeology,
Faculty of Archaeology, Cairo
University

Prof .Mervat Mahmoud Eissa

Professor of Islamic Archeology,
Faculty of ART, Helwan University

Prof .Mohammed Ibrahim Bakr

Professor at Faculty of ART Zagazig
University

Prof .Munir Abdu Galil Al- Arika

Professor of Ancient near east
Archaeology Faculty or Arts, IBB
University (yemen)

prof. Wagdy Ramdan mohamed

Faculty of Arts, Minia University

Scientific Reviewers

Prof. Ahmed Mahmoud Dokmak

Prof .Mohsen Mohamed Nagm Aldin

Prof. Yasser Ismail Abdel Salam

Dr. Ahmed Abdel Kawy Mohamed

Miss Mariam Mahmoud Arafa

Journal Secretarial Board

Miss Nehal Adel

Miss Samira Essam

Miss Nayira Ahmed

Mr. Abdel Rehim Hanafi

Editorial Guidelines for the authors of the Journal of the General Union of the Arab Archeologists

Authors are expected to read and to respect strictly the following rules:

- Manuscripts must be new and not published before in any other journal and not a part of a scientific thesis.
- The manuscript must include new scientific results adding to the archeological, museological, architectural renovation and strict restoration.
- The manuscript must be written in 25 pages; five of them include photographs. The contribution should not exceed 35 pages (minimum 5000 words and maximum 7000 words). Each extra text's page costs 15 Egyptian pounds and 20 Egyptian pounds are paid for each extra photographs' page.
- researches are sent through the official website of the General Union of Arab archaeologists Magazine: <http://jguaa2.journals.ekb.eg/>
- where the researcher logs on the magazine site and fill out the complete personal data and raise the research without any reference to his name registered on a search to send directly to the jury, In addition to file separate from the search personal data.
- The manuscript should be submitted in both MSWord and in Pdf files. Both printout and CD copies must be similar and include author's name, affiliation and email. Pdf copy is required without the author's name to be sent immediately to reviewers.
- All pages must be numbered with one serial number including tables and photographs of the manuscript.
- Footnotes' references' numbers should be placed at the foot of each page of the manuscript according to one serial number.
- The title of the contribution must not include any footnote except for the acknowledgement that can be mention without any sign before the first footnote.

- Ensure that the numbers of the footnotes, figures, maps, ect ... are the same as in the text that must be read by a native speaker, before submission, to be sure that the language of the contribution is correct.
- The author must follow the corrections required by reviewers and send the corrected final version to the Editorial Board within maximum 15 days.
- Normal Format of the paper is (height: 24 cm – width: 17.5 cm).
- Standards publication size of the page is: (left: 2 cm; right: 2 cm; top: 2 cm; bottom: 2.5 cm).
- Submitted papers must be preferably written with 14 point size (Times New Roman for Latin texts and Arabic Transparent for Arabic text), 16 bold point size for the main title, 12 point size for Arabic footnotes and 10 point size for Latin footnotes.
- Manuscripts including non-Roman or Unicode fonts must be submitted with the text.
- The Editorial Board reserves the right to not send the refused contributions by the viewers to the authors.
- Each contribution must be submitted with two abstracts in Arabic and in English (maximum 300 words for each) and a list of keywords.

For photographs:

- 1-The captions should include any necessary copyright information. Permissions are the author's responsibility and not that of the series editor or publisher.
- 2-TIFF and JPEG original and scanned images are required at 300 dpi high resolution at least and must be in line with text.
- 3-Electronic figures, charts and graphs must be printed to appear black and white by using one of the followings: Adobe Illustrator – Photoshop – Acrobat.
- 4-Maps, diagrams and photographs must be numbered alone according to each type by precising the direction of reading.
- 5-A first version of the contribution must be submitted including all used figures in the size it is intended to appear.

Referencing:

***Footnotes:**

- 1-Article in a journal: Author's name, title between quotations, page number. (Ex.: Yaser Ismail Abd El-Salam, "al-Anmat al-mi'mariya", p. 495).
- 2-Book: Author's name, abbreviated title, page number. (Ex.: Hasan El-Basha, al-Alqab al-islamiya, p. 22-23).
- 3-Thesis: Author's name, abbreviated title, page number.
- 4-Translated books: Author's name, abbreviated title, page number: (Ex.: Nelly Hanna, Biyut al-Qahira, p. 34).
- 5-Electronic references: The whole website must be mentioned. (Ex.: [http:// www.ifao.egnet. net/bifao](http://www.ifao.egnet.net/bifao)).

***Bibliography:**

- 1-It must be divided as follows: Arabic sources – Arabic references – foreign sources– websites.
- 2-Article in a journal: Author's name, title between quotations, journal title and number, place and date of publication, page of the article in the volume.
- 3-Book: Author's name, title, publisher, place and date of publication.
- 4-Thesis: Author's name, title, M. A. or PhD., Faculty / University, year.
- 5-Electronic references: Website and date of visit must be mentioned. (Ex.:[http:// www.ifao.egnet.net/ bifao](http://www.ifao.egnet.net/bifao)-30-8-2016).
- 6-The following abbreviations must be used in case of missed documentation:
 - Without date of publication (w. d.)
 - Without place of publication (w. p.)
 - Without name of publisher (w. pub.).
 - Without pages' numbers (w. p.n.).

These rules are also required for foreign contributions.

The Editorial Board apologize not to receive contributions that do not meet the above required standards and can't accepted them for publication

**The Journal is biannually issued in English and Arabic
in two separate issues in January and June**

The work stages are as follows:

Work Stages	Staring	Ending
Receiving research articles (Open)	1st of January	31st of December
Research articles refereeing and researchers' modifications	Upon receiving the research articles	
Preparation and revision	Two months prior to each issue printing	
Printing and uploading on website(for two months)	The beginning of November and May	The beginning of January and June

INDEX

N	Name	Title	Country	Page Numbers
1.	Dr. Badr Abdelaziz Mohammed Badr	The Bagouria Barrage 1281 AH / 1864 AD An Archaeological Architectural Study	Egypt	1-52
2.	Dr.Mohamed Ahmed Abdel Rahman	Kamran Island in Yemen during the Islamic era Cultural and archaeological study	Egypt	53-86
3.	Noha Kamel Moussa	The Contribution of the Domesticated Camel and Advanced Irrigation Techniques (the Horizontal Well/Falaj System) to the Iron Age Economy and Settlement Patterns of the Oman Peninsula and Arabia.	Egypt	87-115

***note : this index is arranged according to the alphabetical order of names**

The Bagouria Barrage 1281 AH / 1864 AD An Archaeological Architectural Study

Dr. Badr Abdelaziz Mohammed Badr*

Abstract:

The Bagouria Barrage is one of the most important establishments that were built in the field of irrigation engineering in the governorate of Menoufia during the reign of Khedive Ismail in 1281 AH/ 1864 AD. The Bagouria Barrage consists of five openings with semi-circular arches. It is noted that the Barrage arches are based on stone pillars separated from each other by openings equipped with iron gates used to open and close the barrage. On the left of the barrage, from the eastern side, there is a lock dedicated to the passage of ships and boats on the Bagouria canal. The Bagouria Barrage contributed to the development of irrigation and agriculture system in Menoufia through supplying the agricultural lands with summer irrigation water and improving the navigation system in the Bagouria Canal. Most notably is the large number of the Nilometers which were established in the vicinity of the Bagouria Barrage for defining the flood level and the necessary balances of the Bagouria Barrage. In addition, the artistic and decorative elements that adorn the Bagouria Barrage are rare because of the nature of the construction that is located in the middle of one of the waterways, The research ends with a table showing the architectural, technical and structural terms used in the research, then the most important results and recommendations followed by a list of the sources and references consulted, and a catalog which includes the illustrative figures and plates used.

Key words:

The Bagouria Barrage, lock, piers, bedding, Iron gates, crane, weir

* Assistant Professor of Islamic Archeology, Department of Archeology, Faculty of Arts, Port Said University, szabadr@yahoo.com

Introduction:

The River Nile is the main source of Egypt's fortune and the nucleus of its life. If the flood came low in a year, it would be a severe drought year, and if the flood increased significantly, it would flood Egypt with its excessive water, so the damage would be greater and the matter severer. As the population of Egypt was increasing and multiplying, it was necessary to carry out a series of water projects to provide irrigation water to cope with the increase in population on the one hand, and to increase the area of agricultural land on the other. The way to do this was to build irrigation barrages ⁽¹⁾.

The Menoufia Governorate in the Mohammed Ali Pasha era witnessed significant progress in the irrigation and agriculture system. The irrigation system was transformed from basin irrigation system into permanent irrigation system and the dissemination of summer irrigation which was suitable for irrigation of new crops presented to Egypt by Mohammed Ali, such as cotton and rice. Menoufia is one of the most important governorates that have been abundant in water sources by virtue of its location between the Nile branches at the head of Delta. The governorate is bordered by the Damietta branch on the east side, and the Rosetta branch on the west side, in addition to a network of canals that run through its land, flowing from these two branches. There was a significant interest in irrigation system in Menoufia during the 19th century due to the quality of its land and its close proximity to the capital of Egypt ⁽²⁾.

⁽¹⁾Mahmoud El-Gendy, *Edafat Gadida fi Dirasat Qanatir Zeftaa Alkubraa Wamulhaqatuha ala Alnil (1319-1320 H/ 1901-1902 AD) Megalat Kuliyat Al'adab b Qena, Aleadad 33, 2010 AD, p. 466.*

⁽²⁾Yasser Al Mahareq, *El Menoufia fi Alqarn Althamin Ushar, Silsilat Tarikh Almisryien, Aladad 184, Alhayya Almisria Aleama l Ilkitab, Cairo, 2000 AD, P 220-240.*

Frist: Types of Barrages and their architectural composition:

Barrage is an artificial barrier across a river or estuary to prevent flooding, aid irrigation or navigation, or to generate electricity by tidal power ⁽³⁾. Barrage - in Arabic means "Qantara" (plural: "Qanater") - is a superstructure in the form of arches or a curved embankment built over the river to pass across it, and the water barrage is a canal for transferring water over huge arches, and it is a name given to each arched structure of any kind. Thus, the name "Qantara" is given to any arched structure that embanks the waterways to raise the water level and transfer it to a certain direction after storing. The construction of barrages is the best way to divide the watercourse into several narrow channels by the openings of arches. Thus it is easy to control these openings through opening and closing them by iron gates ⁽⁴⁾. While the aqueduct is an artificial channel for conveying water, typically in the form of a bridge across a valley or other gap⁽⁵⁾.

The barrage is also defined as a brick or stone structure with one or more openings. It consists of foundations across of the waterway on which it is built. It is called Farsh (bedding). On the bedding, pillars are constructed and called Beghal (piers), which are built as a base for arches. The arches were of different forms, under which the water passes and bear the roof of the barrage. The rulers took care of these barrages and built them up to be of strong structure in order to fulfill the purpose for which they were established, and their locations were often places for picnic

⁽³⁾<https://en.oxforddictionaries.com/definition/barrage>

⁽⁴⁾Assem Rizk, Moagam Mustalahat Aleamara w Alfunun Alaislamia, Aaktabat Madbuli, Cairo, 2000 AD, P.244.

⁽⁵⁾<https://en.oxforddictionaries.com/definition/aqueduct>

and entertainment, where people gather to see the navigation and the boats crossing the barrage ⁽⁶⁾.

The types of barrages according to the distribution of the irrigation network are as follows:

1. The first type: Large barrages constructed on rivers such as the Nile River to control the water passing through their openings and to raise the water levels in front of them in an appropriate manner to feed the main and large canals used basically for irrigation of agricultural lands.

2. The second type: Influx barrages, which are constructed at the entrances of the main canals taking from the great barrages, in order to control the water levels behind them according to their design.

3. The third type: Reservoir and distribution barrages, identified by function; this type of barrages is constructed at different distances alongside long and extended canals such as the irrigation canals and the main canals. These barrages are constructed in time of creating new side canals taking from the great canals to control the water levels and regulating the flow of water as well as providing the sub-canals that take their water in front of these barrages.

4. The Fourth type: Estuary barrages which are erected at the end of the main and great canals to control the water in excess of agriculture and irrigation need and transfer it to natural or industrial drainage canals.

5. The fifth type: Division barrages, sometimes also called distribution barrages. They are a multi-purpose barrages set up in one location; their aim is to reserve and distribute water through several barrages that are created in one location.

⁽⁶⁾Abdelrahman Abdeltawab, *Munshatuna Almaeya Abr Alttarikh*, Dar Alqalam, Almaktaba Althaqafia, No. 69, Wizarat Althaqafa w Alershad Alqawmii, Cairo, 1963 AD, P. 9.

These are the main types of irrigation barrages used in the Egyptian irrigation system. There is no study of the barrages that does not include any of these types of barrages; despite the multiplicity of types of barrages and the diversity of their names, the main structure and the architectural configuration of all the barrages are the same in all of them except for locks that do not generally exist in the small barrages where the waterway does not allow navigation. In any case, the general body of the barrage consists of beddings, piers, pillars, openings of the arches, surface of the barrage, iron gates and hydraulic equipment such as cranes and operating devices ⁽⁷⁾.

Second: The role of the Menoufi main canal and the Bagouria canal in the construction of the Bagouria barrage:

The construction of the Bagouria barrage was associated with the Menoufi main canal (Rayah Al Minoufia) ⁽⁸⁾, and the Bagouria canal. One of the most important manifestations of this connection is the balance and consistency between the size of the Bagouria barrage and the amount of water flowing from the Menoufi main canal to the Bagouria canal. There is no doubt that the hydraulic design of the Bagouria barrage has been associated with both of waterways that intersect with it; as there is a direct and reciprocal effect between the Bagouria barrage and the Menoufi main canal and the Bagouria canal. The effect of both them on the Bagouria barrage is as follows:-

1- The role of the Menoufi main canal in the construction of the Bagouria barrage:

The Menoufi main canal extends from El-Qanatir El-Khairiya at the head of the delta, penetrating the Menoufia governorate till it

⁽⁷⁾Gamal Fathy, *Munshaat Alnil Almaeyia b Misr fi Asr Al'usra Aleilawia 1805-1952 AD*, Dirasa Atharia Moqarna, Risalat Dukturah, Qism Al'athar Al'iislamia, Kuliyyat Al'athar, Gamieat Al Qahera, 1430 AH / 2009 AD, PP. 323 – 324.

⁽⁸⁾Rayah: Main canal or large branch, look:-

- Annual reports during the years 1919-1924 on the work of the irrigation department, government press, ministry of public works, Cairo, 1923, 1925, 1928, PP. 2 – 4.

connects with the canal of Bahr ⁽⁹⁾ Shebin El Koum at the Al-Qarinein barrage and so they become one canal which pours into Burullus Lake. The Shebin canal has taken its waters before digging the Menoufi main canal from the Damietta branch directly at the village of Al-Qarainin ⁽¹⁰⁾. Then, Said Pasha, ruler of Egypt, gave order to Fadel Pasha ⁽¹¹⁾, the governor of the Rawdat Al-Bahrain governorate ⁽¹²⁾ to dig the Menoufi main canal and make it Nilotic until Al Pharaonia village, then Hassan Rasim Pasha ⁽¹³⁾, Inspector General of Lower Egypt, in the year 1281 H / 1864 AD, erected a summer waterway in the Menoufi main canal with a width of 15 m till the Bagouria canal. In 1282AH / 1865AD, Khedive Ismail, the ruler of Egypt, ordered

⁽⁹⁾Bahr: An old branch of the Nile used as a canal, look:-

- Annual reports during the years 1919-1924 on the work of the irrigation department, government press, ministry of public works, Cairo, 1923, 1925, 1928, PP, 2 – 4.

⁽¹⁰⁾Al-Qurainin is located on the western side of the Damietta branch. It was old village that belonged to Menouf town.

- Mohamed Ramzy, Alqamus Algughrafi l Elbilad Almisria min Ahd Qudama' Almisriiyn 'iilaa Sanat 1945 AD, Alhayyat Almisria Aleama l Ilkitab, Cairo , 1994 AD, P. 214.

⁽¹¹⁾Fadel Pasha was born in Cairo in 1830. He studied with the Egyptian mission in Paris. He was appointed as Minister of Education in 1862, then the Ministry of Finance in 1864 and Justice in 1871. During the reign of his brother Khedive Ismail he was the owner of the right to ascend the Throne. But Ismail confiscated his property and ordered his deportation to Constantinople and died in 1875.

- Amal Muhamad Fahmi, Omara' Al'usrat Almalika Wadawruhimi fi Alhaya Almisria, 1882 – 1928AD, Alhaya Almisria Alama l Ilkattab, 2006 AD, P 27 , 28.

- Ahmad Abdelrhym Mustafaa, Elaqaat Misr b Turkia fi Ahd Alkhadiwi Ismaeil, 1863 - 1879 AD, Dar Almaearif, 1967 AD, PP 58 - 69.

⁽¹²⁾Rawdat Al-Bahrain governorate: that name was given to the governorate of Menoufia during the reign of Said Pasha, due to its location between the Damietta and Rosetta branches at the head of the Delta, look:-

- Ali Mubarak, Al khetat Al Tawfiqya Al Gadida l Misr wal Qahira w Mudnuha w Biladiha Al Qadima w Alshahira, Part 19, Silsilat Alturath, Cairo, 1432 H / 2008 AD, PP. 23 – 24.

⁽¹³⁾Hassan Rasim Pasha was of a Greek origin, He was appointed inspector General of the Lower Egypt, then governor of Damietta from 1861 to 1864 and then governor of Alexandria in the years 1868, 1873, 1874 and 1876. He then assumed the presidency of the Shura Assembly and died in Constantinople in 1883.

- Ahmed Zaki, Kalema Maa Reyad Pasha w Safhaa min Tarikh Masr Alhadeeth, Moasasat Hendawi l Eltaleam w Althaqafa, Cairo, 2014, P 26 .

- <https://www.shobramiles.yoo7.com>

- <https://www.vetogate.com>

- <https://www.egyptiantalks.org>

Ali Pasha Mubarak, head of El-Qanatir El-Khairiya, to re-dig the Menoufi main canal for the second time, starting from the influx of the Menoufi main canal at the head of the Delta to the Bahr Shebin in the village of Al Qarinin. The digging operation was conducted by 80,000 men during a period of 60 days, with capacity of 12 million cubic meters.

In the year 1285 AH / 1868 AD, the Menoufi main canal was widened to its present state, and then it reached 64 meters and made it sloped down 5 cm in every 1000 m. As a result, all the influxes of irrigation canals that had taken water directly from the Damietta branch in-between El-Qanatir El-Khairiya and the village of El Qarinin in Menoufia were transferred to the Menoufi main canal. The first and most important barrages that were erected at the intersection of the Menoufi main canal with the Bagouria Canal are the Bagouria and the Sersawya barrages⁽¹⁴⁾.

From the foregoing, it is clear that the important role played by the Menoufi main canal in supplying the Bagouria Canal with the Nile water necessary for irrigating the agricultural lands located in the area of the Bagouria Canal in Menoufiya governorate. And this has contributed to transform the irrigation system from basin irrigation to permanent irrigation and flourish the cotton cultivation in Menoufiya during the era of Muhammad Ali Pasha's family.

2- The role of the Bagouria Canal in the construction of the Bagouria Barrage:

The Bagouria is considered one of the most important canals that irrigated a large surface of the agricultural lands in the Minoufiya and Gharibiya governorates due to the fact that it was 114 km long⁽¹⁵⁾. The length of the Bagouria Canal in Minoufiya is 67000

⁽¹⁴⁾Ali Mubarak, Alkhitat Al tawfiqya Algadida, Part 19, PP. 23, 24.

⁽¹⁵⁾Mukhtar El Qazaz, Munshat Alry w Alsarf Alziraeii fi Shrq Aldilta Khilal Asr 'Usrat Muhamad Ali fi Daw' Mbanay Gadida Lam Yasbiq Dirasataha min Qabl, Dirasa Athria

m, and the average width is 25 m. The water level during the flood period is 7 m high, while during the dryness period reaches 1.5 m. It is an old canal that was Nilotic till 1245AH /1829AD, where it was dug and made a summer canal, and its influx was in the Damietta branch near the village of Bir-Shams⁽¹⁶⁾. This influx has five-arch openings built after completion of the digging of the Bagouria Canal. The openings of its archways include a large arch opening in the center to facilitate the entry and exit of boats. After the Menoufi main canal had been dug up, it intersected with the Bagouria Canal and so the influx of the Bagouria Canal has become from the Menoufi main canal, near the Sersawya barrage, instead of the Damietta. However, because of the increase in the slopping of the Bagouria Canal, most of the waters of the Menoufi main canal were passing through it instead of the Shebin canal, except for a slight amount. Accordingly, in 1309 AH / 1892 AD, orders were issued to increase the water of the Shebin canal and to prevent the silt in the part of the Menoufi main canal that is located between Bagouria Canal and the Qarinin barrage.

It is noteworthy that the Bagouria canal passes through famous areas and villages like Abo-seneta, Bai El Arab, El-Bagour, Shoubra-zangi, Sers El-Layan, Al-Hamul, Sengerg, and Shoubra-bas in Monoufiya⁽¹⁷⁾. The old Sersawya barrage was used to

Miemaria, Risalat Majstir, Qism Alathar, Kuliyyat Aladab, Gamieat Helwan, 1436 H/ 2015 AD, P. 42.

⁽¹⁶⁾Bir Shams is located on the western side of the Damietta branch. It was old village that belonged to Menouf town.

- Mohamed Ramzy, Alqamus Algughrafi l Elbilad Almisria, P. 215.

⁽¹⁷⁾Abu Senita, Bai al-Arab and Shubra Zangi are old villages that belonged to Menouf town until 1813 and now they belong to Al-Bagour town. While Sers El-Layan, Hamoul and Shubra Bas were old villages belonging to Menouf and all these villages are located on the Bagouria canal.

- Ibn Algayean (Sharf al Deen Yahia), Altohfa Alsaniya b 'Asma' Albilad Almisria, Almaktaba Al'azharia, Cairo 1974 AD, P 110 .

- Ibn Mamati (Al'asaad Ibn Mamati), Qawanin Aldawawin, Maktabat Madbuli, Cairo, 1991 AD , PP. 95, 115, 188.

increase the water of the Menoufi main canal, and it was made as a supporting for the Bagouria barrage. As a result, the summer water has increased in the Shebin canal and also the governorates of Gharbia and Menoufiya have much benefited from this in increasing the surface of summer agricultural lands, which is the basis of the wealth of people ⁽¹⁸⁾.

Third: The descriptive study of the Bagouria Barrage:

1- Location:

This Barrage is located on the influx of the Bagouria Canal in the village of Kafr El-Ghunamiya ⁽¹⁹⁾, El-Bagour Town, Monoufiya Governorate at the intersection of the Bagouria canal influx with the Menoufi main canal in the village of Kafr El-Ghunamiya in the location where the Menoufi main canal begins to bend eastward in the direction to the Qarinin barrage where it connects with the Shebin canal (Figure no. 1, 2, 3, 4).

2- Founder and date of construction:

This Barrage was built in the reign of Khedive Isma'il in 1281 AH / 1864 AD⁽²⁰⁾, when Fadil Pasha was the governor of Rawdat Al-Bahrain, and its construction was supervised by Hassan Rasim Pasha, inspector general of Lower Egypt⁽²¹⁾.

-Mohamed Ramzy, Alqamus Algughrafi l Elbilad Almisria, pp, 213-215.

⁽¹⁸⁾Ali Mubarak, Alkhitat Al Tawfiqya Algadida, Part 19, PP 23, 24.

⁽¹⁹⁾Kafr El-Ghunamiya is one of the modern villages that belonged to the Bi-Arab village but now all of these villages belong to El Bagour town.

- Mohamed Ramzy , Alqamus Algughrafi l Elbilad Almisria, PP. 213-225.

⁽²⁰⁾Khedive Ismail took over Egypt from 1863 to 1879. During his rule, he developed Egypt's architecture, economy and administration; he was deposed by the Ottoman Sultan under the pressure of England and France on June 26, 1879. and died in 1895 in Istanbul, look:-

- Abdelrahman Al-Rafi'I, Asr Ismail, Dar Al-Ma'aref, Cairo, 1987. P. 47.

- Ahmed Yousef, Wagihat Alamaer Aldiynia w Almadania b Mudon Alqnah fi Asr Al'usra Alalwia, 1220 - 1372 H / 1805 - 1952 AD, Dirasa Atharia, Risalat Majistir, Qism Alathar, Kuliyyat Aladab, Gamieat Tanta, 1438 H/ 2016 AD, PP. 15 - 16.

⁽²¹⁾Ali Mubarak, Alkhitat Al Tawfiqya Algadida, Part 19, P. 23.

3- Architectural description:

The Bagouria barrage consists of five semi-circular arch openings, the middle opening is 3.80 m wide, as it is a large opening intended for the exit and entry of boats ⁽²²⁾, the width of the other four openings is 3 meters each, while the height of each opening from the level of the bedding floor to the top of the archway is 8 m. The arches of openings are directly rested on stone piers with a pointed front, starting from the floor level of the bedding to the highest level of the water level. Each pier extends inside the archway of the barrage to 1.70 m, each pier projects from the barrage by a distance of 4 m. (Figure No. 5, 6, 7, 8, 9, 10, 11) (Plate No. 1, 2, 3).

Iron gates were installed on the barrage openings and were fixed from the top in recesses called Dorondat, the gates have iron chains connected and installed on mechanically operated cranes, where the barrage was equipped with 2 diesel mechanical cranes based on iron bars, assigned for the passage of cranes to conduct the balancing process, the opening and closing of the iron gates. It is noted that the iron bars that carry the cranes are based on 6 square pillars of brick, the length of each side is 1 m. and its height is 2.90 m. The barrage was equipped from the front with a small iron viaduct of 1 m. wide and 7 m long. The viaduct was used by engineers and technicians to follow up the opening and closing of the iron gates and to perform the maintenance and restoration of the barrage. It was also used by sailors during the passage of their boats through the Bagouria lock (Plate No. 4, 5, 6, 7, 8).

In the eastern side of the barrage there is a navigational lock with a width of 8.20 m. and a length of 60 m. and above which is an iron bridge of 7m. Long and 8.20 m. width, the lock contains a pair of iron gates; one located on the front side of the lock and

⁽²²⁾Ali Mubarak, Alkhitat Al Tawfiqya Algadida, Part 19, P. 23.

the other pair on the back side were opened and closed during the passage of ships in the lock. Each of the pair gates of the lock has an iron crane, to open and close the gates during the passage of boats, and a set of Manuel tools used in the function of lock (Plate No. 9, 10, 11, 12, 13, 14, 15, 16, 17).

As for the western part of the Bagouria barrage, it contains an arch opening of a barrage at the influx of Bai Al Arab irrigation canal, and the width of this semi-circular arch opening is 3 m. It is built of brick and stone and separated from the Bagouria barrage. This one arch barrage was used for irrigating agricultural land in the villages of Kafr al-Ghunamiya and Bai al-'Arab (Plate No. 18).

To the right side of the Bagouria barrage and on the western side of the Menoufi main canal, there is the Sersawya barrage, which consists of two arch openings, and was built of red brick and Dostour stone⁽²³⁾ in the year 1287 AH / 1871 AD⁽²⁴⁾ (Plate No. 19)

The back of the Bagouria barrage is an upper road covered with a layer of asphalt. The width of this road is 8 m. while its length is 116 m. On either side of the road there is a balustrade made of stone and brick, pair of cranes are based on the southern balustrade. The balustrade is decorated with a group of decorative stone mouldings.

⁽²³⁾Dostour is a smooth, well-sculpted solid smooth stone that has been used in covering piers and facades of arches, look:-

- Mohamed Fahmy, Aemal Gany Bik Almieamaria 830 AH/ 1427 AD, Dirasa Atharia, Risalat Majstyr, Kuliyyat Alathar, Gamieat Alqahira, 1988 AD, P. 164.

- Mohamed Abdelhafeez, Almustalahat Almuemaria fi Wathaeq Ahd Muhamad Ali Wakholafaoh 1805-1879, Altabea Al'uwlaa, Cairo, 2005 AD, P. 69.

⁽²⁴⁾Ali Mubarak, Alkhitat Al Tawfiqya Algadida, Part 19, P. 23.

Fourth: The Analytical Study of the Bagouria barrage:

1. Architectural and constructional units and elements:

A. Semi-circular arches:

The semi-circular arches were used in the capping of the arch openings between the piers from the front and the back. The width of the middle opening is 3.80 m. while the four side arch openings are 3 m. wide, and the archivolt has been covered with stones ⁽²⁵⁾. These arches are constructionally functioning in carrying the body of the barrage and the upper road which represents the ceiling of the barrage, as well as in crowning the openings. These arch openings are connected together below the vaults from the front and back, and they represent compact waterways side by side ⁽²⁶⁾.

It is worth noting that the openings of the Bagouria barrage have a semi-circular vault in accordance with the outer shape of arches of the openings. The facades of the arches are similar from the front and back in the Bagouria barrage (Plate No. 3).

B. Piers (central pillars):

The piers are one of the important architectural elements that are used in the construction of the barrage, which are the central pillars bearing the body of the barrage, the arches and the upper road that is located above the ceiling of the barrage, in addition to the fact that they represent the sides of the water passage openings ⁽²⁷⁾.

The piers were built from red bricks covered with stone. Concerning the shape of them, the front part of the pier came in a pointed shape, and it is the most appropriate to face the currents

⁽²⁵⁾Magdy Elwan, *Munshat Alry b Asiout Ibban Asr Muhamad Ali 1220-1372 H / 1805-1952 AD*, Dirasa Atharia, Alnadwa Aleilmia fi Zikraa Alealam Aljalil Al'ustaz Alduktur/ Abdaleziz Salem, Kuliyyat Aladab, Gamieat Al'iiskandaria, 2008 AD, P. 283.

⁽²⁶⁾Mahmoud El Gendy, *Edafat Gadida fi Dirasat Qanatir Zeftaa Alkubraa*, P. 485.

⁽²⁷⁾Mahmoud El Gendy, *Edafat Gadida fi Dirasat Qanatir Zeftaa Alkubraa*, P. 485

of water rushing towards the waterways. The piers start from the lowest floor level of the bedding to the highest level of the water, the length of each pier is 7 m, and they project in front of the openings of the barrage by 4 m.

In fact, the shape of piers, whether in front of the structure or behind it, depends on several key factors during the process of balancing, and the most important of which is to observe the stability and consolidation of the bases of the piers because the pressure of water affects their structural balance⁽²⁸⁾. Therefore, the piers were made pointed, at the front of the Bagouria barrage, to withstand the pressure of water during its entering into the openings. The piers are also topped with massive square pillars.

C. Side walls:

These are supporting walls on both sides of the barrages and navigational locks to strengthen them and they are built of stone, and usually their outer face is vertical, and from the interior they are graded or steep⁽²⁹⁾.

D. Ceiling of the barrage:

The ceiling of the barrage is one of the most important architectural elements of the structure, as it is considered the backbone of the barrage; it also contains the upper road which includes several important architectural elements: the floor of the road, balustrades and the entrances of structure. The ceiling of the barrage is often based on semi-circular vaults of brick above the arch openings, and they are connected horizontally, and covered from the top with stone or black basalt slabs. Sometimes the ceiling of the barrage may have been of reinforced concrete⁽³⁰⁾.

⁽²⁸⁾Magdy Elwan, *Munshat Alry b Asiout Ibban Asr Muhamad Ali*, P. 283.

⁽²⁹⁾Mahmoud El Gendy, *Edafat Gadida fi Dirasat Qanatir Zeftaa*, P. 486.

⁽³⁰⁾Gamal Fathy, *Munshaat Alnil Almaeyia b Misr fi Asr Al'usra Aleilawia*, PP. 327, 328.

Concerning the upper road, which represents the ceiling of the Bagouria barrage, it is about 116 m. long and 8 m. wide. It connects the villages located in the western part of the Bagouria barrage and the other villages located in the eastern side of it. The road is nowadays paved with a layer of asphalt to be used for public transportation. On either side of the barrage there is a balustrade built of brick and stone. (Plate No. 22)

E. Balustrade of the Barrage:

The side balustrade of the barrage represents an aesthetic aspect that helps in the appearance of the body and the ceiling of the barrage as a structural element of functional and technical importance. Functionally, the balustrade protects the pedestrians and means of transport above the barrage from falling into the water, while technically it takes a vertical shape over the ceiling of the barrage extending from west to east, making the upper road in the form of a street bound on both sides. The balustrade of the Bagouria barrage rises up from the level of the road ground by an appropriate amount, and it is built from the bottom with bricks and covered from the top with stone⁽³¹⁾.

The balustrade was used in more than one technical function. In addition to protect against falling into the water, the southern balustrade was used as a channel for the iron bars required for the passage of cranes for the process of opening and closing of iron gates. In the sides of this balustrade, iron links were installed to control and stabilize the iron bars that carry the cranes, in addition to the iron chains that carry the gates (Plate No. 23).

F. The Lock:

Locks are created in waterways at the sites which have an industrial or natural waterfall, and in areas where water decline is significant. Locks were made to raise the water at a level not more than 4 m. height. When designing the lock, the amount of

⁽³¹⁾Gamal Fathy, *Munshaat Alnil Almaeyia b Misr fi Asr Al'usra Aleilawia*, P. 330.

silt deposited on the bedding inside the basin and in front of the gates should be considered. It should also be taken into account that the locks are adjacent to the barrage and consist of one building⁽³²⁾.

The lock is considered one of the most important architectural elements of the barrage⁽³³⁾. It is a rectangular water basin made of stone for the passage of ships and boats in both directions, thus, the lock basin mediates two different levels of water⁽³⁴⁾. The lock basin contains two iron gates in both the front and back sides. The front gate, which overlooks the southern side of the Bagouria barrage, has to be opened so that ships and boats can pass through the front side of the barrage with the high-level of water, and at the same time, the back gate of the lock basin has to be closed, so that the water level in the front side of the lock is equal to the water level inside the lock basin. Then the front gate has to be closed and the back gate has to be opened. Afterwards, the ships or boats can move at the opening of the back gate until they can cross in accordance with the amount of water passing through the lock, in this moment the water level in the lock is then equal to the water level behind. But the opposite occurs when ships or boats pass from the backside of the lock to the front side⁽³⁵⁾. (Plate No.9, 10, 11)

It is noted that the back walls of the navigation lock have been extended to be suitable for navigation, and to prevent the dangers that may occur during the period of the Nile flood, and the lock consists of the following elements:

⁽³²⁾Hussin Sirry, Irrigation Science, Part II, the Government Press, Ministry of Public works, Cairo, 1931AD, PP. 14, 15.

⁽³³⁾Amen Sami, Molhaq Taqwim Alnil an Al Gusur w Alqanatir w Alkhazzanat ala Alnil w furuh b Misr w Al Suwadan min Fajr Alttarikh ilaa Al'an, Dar Alkutub Almisria, Cairo, 1355 H / 1936 AD, P. 100.

⁽³⁴⁾Gamal Fathy, Munshaat Alnil Almaeyia b Misr fi Asr Al'usra Aleilawia, P. 331

⁽³⁵⁾Charl Sakla, Handasat Alriy w Alsarf, Kuliyat Alhandasa, Gamieat Al Mansoura, 1991 AD, PP.24-25.

- The iron gates:

The lock basin contains two large iron gates, one is frontal and the other is back, which are opened and closed by manual tools, so that ships or boats can pass through the lock basin. Therefore, the gates are designed to completely isolate the water exited in the waterway from the lock and water within it, except at the time when the passage of ships and boats takes place during the opening of the lock for navigation. (Plate No.9, 14)

- The manual tools:

The Bagouria lock contains some manual or hydraulic tools that manage and operate the lock to be suitable for continuous navigation. The lock is operated manually through opening and closing the iron gates by a set of cranes, pedals, Khokha and latches that work for pulling or dragging those gates to carry out the process of opening and closing the lock. The clarification of the scientific concept of these devices is as follows:- (Figure No. 12, 13) (Plate No. 14, 15, 16, 17)

• Cranes:

Cranes are used to close and open the iron gates from the front side of the barrage to allow water to pass, they also allow the ships and boats to pass in the front and backsides of the lock.

•Pedals:

Pedals are an iron pipes that rests on supporting pillars used in the balancing process⁽³⁶⁾.

⁽³⁶⁾Linant de Bellefonds, Notes on the Great Public Works which have been achieved from the earliest ages until 1872, the Government Press, Cairo, 1949 AD, P. 262.

- **Khokha:**

Khokha is defined as penetrative between two things ⁽³⁷⁾. This name may have been taken from the fact that they block the boats between the two gates.

- **Latches:**

Latches are iron pieces used to close manually the iron gates ⁽³⁸⁾.

- **The Lock Bridge:**

It is an iron bridge with a balustrade and an upper iron cover based on 4 iron bars. It is called the bridge of the Bagouria lock. (Plate No.11, 12)

- G- The barrage gates:**

The iron gates consist of an iron structure of horizontal solid steel bars in accordance with the width of the arch opening and the size of the side cavities. This kind of gates moves vertically inside hollow ducts formed in the body of piers ⁽³⁹⁾. This type of gates was used in the openings of the Bagouria barrage and the two openings of Al Sersawya barrage, while the opening of Bai Al Arab barrage, adjacent to the Bagouria barrage, is a narrow one with an iron bar gate that closes and opens on it. (Plate No.2, 4, 5, 18, 19)

- H- Drondat (side recesses):**

Drondat are located on both sides of the barrage openings in the front side against water direction. These recesses have latches to which the iron gates are fixed according to the width of the openings. These gates move by massive metal chains connected

⁽³⁷⁾Ibn Manzoor, (Mohamed Ibn Makram), Lisan ELarab, Dar Sader, Beirut, 1414 AH / 1993 AD, PP. 403 – 455.

- Al-Fayrouz Abadi (Magdeldin Mohamed), Alqamus Al Moheet, Bayrut, 1429 H / 2005 AD, Madet Khokh.

⁽³⁸⁾Ministry of Education, Almaegam Alwasit, Wizarat Altarbia w Altaelim, Cairo, 1960 AD, Madet Mizlag.

⁽³⁹⁾Gamal Fathy, Munshaat Alnil Almaeyia b Misr fi Asr Al'usra Aleilawia, P. 334.

to mechanically operated cranes, and thus conducting the opening and closing the gates and helping in the balancing process⁽⁴⁰⁾. (Plate No. 5)

I- Balancing:

It is an engineering process that has been considered one of the functional purposes of the barrage and is also known as the water balancing. The function of balancing is to control the water levels and quantities in front of and behind the barrage through the iron gates installed on the openings of the barrage⁽⁴¹⁾.

J- The bedding:

The bedding is one of the basic structural elements that precede the construction of the barrage as it represents the foundation on which the structure is based. It is a preparation of the site prior to commencing the construction of the barrage units and the various architectural elements⁽⁴²⁾ The bedding consists of blocks of brick, rubble, stone or concrete in order to strengthen and stabilize the ground for building the barrage and various architectural elements; in addition to the preparation of the front and back area of the barrage to make the flow of water passing through the openings faster than its normal speed, as well as to facilitate the operation of iron gates that close and open the openings of the barrage⁽⁴³⁾.

K- The Weir:

It is an industrial structure consisting of stone blocks, rubble and bricks, existed behind the barrage. The weir helps increase the speed of slopping and passing of water. One or more weirs may be made according to the size of the barrage on the waterway and

⁽⁴⁰⁾Amen Sami, Molhaq Taqwim Alnil, P. 111.

⁽⁴¹⁾Amen Sami, Molhaq Taqwim Alnil, P. 111.

⁽⁴²⁾Hashim Abdelsalam & Hassan El Sherbini, 'Aemal Alry f Misr, Wizarat Al'ashghal Eleumumia, Aljuz' Al'awal, Almatbaea Al'amiria, Cairo, 1957 AD, P 108.

⁽⁴³⁾Magdy Elwan, Munshat Alry b Asiout Ibban Asr Muhamad Ali, P. 290.

the amount of balancing it contains ⁽⁴⁴⁾. It is noted that the Bagouria barrage contains only one weir. (Plate No. 20, 21)

L- The Cranes:

The Cranes are used to raise and move the iron gates. They operate through a manual arm in the shape of a wheel, and also it contains a set of pedals, gears and other metal parts ⁽⁴⁵⁾. The Crane is operated by a technical worker who closes and opens the iron gates from both the front and back sides of the lock to allow the crossing of ships and boats as well as the closing and opening of iron gates in front of the openings (Plate No.6, 14, 15).

M- The entrances to the Bagouria barrage:

There are two entrances on the upper road of the Bagouria barrage; one is located on the eastern side and the other on the western side of the barrage, in addition to two other entrances on the north side behind the barrage. While stone stairs lead to the southern side, in front of the barrage, and these stairs are located on the western and eastern side of the southern balustrade. All these entrances are simple and have on either side decorative stone mouldings (Plate No. 22, 23, 24, 25).

2. The artistic and decorative elements of the Bagouria barrage:-

The artistic and decorative elements used in the Bagouria barrage were characterized by rarity; they were limited to decorative stone mouldings that adorned both sides of the eastern and western entrances of the upper road of the barrage, the lock, the side entrances leading to the front and back of the barrage and stone staircase balustrade in the south-west of the upper road of the Bagouria barrage. This rarity is due to the nature of the

⁽⁴⁴⁾Magdy Elwan, Munshat Alry b Asiout Ibban Asr Muhamad Ali, P. 291.

⁽⁴⁵⁾Zoltan A. Vattai, construction equipment, lifting and transporting, Budapest university of technology and economics, department of construction technology and management, Budapest, 2010, PP. 4-17.

structure as it is a barrage locating on a waterway. (Figure No. 14, 15, 16, 17, 18, 19) (Plate No. 26, 27, 28, 29, 30, 31)

3. Nilometers of the Bagouria barrage:

The rulers of Egypt, in the era of Mohammed Ali Pasha's family, were interested in building Nilometers on the barrages in most parts of the country to recognize the level of flood Nile height due to its close relationship with the irrigation and agriculture system. The majority of the Nilometers contain marble scales of a width of 15 cm. and a thickness of 8 cm. It has a ruler slab divided into centimeters written in small, and meters written in large, and on each scale there are signs written with the meter level, the marble scales have to be installed on the side walls in front of and behind the barrage and locks in sites that are easy to read. Also there are stone or iron stairs next to the marble scales so that the water level can be read ⁽⁴⁶⁾.

It is interesting to note the existence of a group of marble Nilometers in the metric system on the eastern walls in front of and behind the Bagouria barrage and the lock. They are six Nilometers, one of which is located on the eastern wall of the lock from the front side, another three Nilometers are located in the eastern wall behind the lock and the 5th one is located on the eastern wall of weir behind the barrage, and the 6th and last is next to the Al-Sarsawya barrage. These Nilometers contain a marble slab fixed on the walls in a vertical position, and the marble slab is divided into a meter and a centimeter to measure the water level during the balancing and operating the lock. (Figure No. 20, 21) (Plate No. 32, 33, 34, 35, 36)

4. Building materials used in the Bagouria barrage:

The building materials used in the construction of the Bagouria barrage included the old components of the building material of brick, stones and Kasroumil (ash-dust), and the modern building

⁽⁴⁶⁾Hussin Sirry, Irrigation Science, Part II, PP. 38, 39.

components which are based on ordinary and reinforced concrete and steel as well as iron and wood. The main types of building materials used in the Bagouria barrage are as follows:-

A- Concrete:

Two types of concrete were used in the construction of the barrage architectural units and elements. The first is the ordinary concrete, consisting of a mixture of sand, cement and a small stone break, and used in the building of piers and arches. The second type is reinforced concrete used in the construction of bedding in the front and behind the barrage, as well as in the body of bridge and the upper road where some iron bars were placed ⁽⁴⁷⁾.

The concrete has contributed to strengthening and reinforcing the bedding and making a balance and stability in front of and behind the openings of the arches and in piers as well as the reduction in the water leakage. It is worth mentioning that concrete was used in Europe in 1271 AH / 1804 AD in civil establishments ⁽⁴⁸⁾.

B- Stone:

Stone is one of the most important building materials used in the erection of water constructions because it is characterized by being insoluble in water. Thus, the cased limestone was used in the composition of piers, arch openings and lock walls as well as the bedding ⁽⁴⁹⁾. Many types of stone, especially limestone, Dostour and rubble, were used in the Bagouria barrage for the casing of arches, facades, piers, supporting sidewalls, navigational lock walls and balustrade of the upper road, and a large part of them was used in the bedding.

⁽⁴⁷⁾ Mahmoud El-Gendy, Edafat Gadida f Dirasat Qanatir Zeftaa Alkubraa, P. 484.

⁽⁴⁸⁾ Magdy Elwan, Munshat Alry b Asiout Ibban Asr Muhamad Ali, P. 286.

⁽⁴⁹⁾ Magdy Elwan, Munshat Alry b Asiout Ibban Asr Muhamad Ali, P. 287.

C- Bricks:

Red brick⁽⁵⁰⁾, made in the Alexander Murdoch's factory located nearby, was used in great proportions for the construction of the Bagouria barrage, where it was used in the bodies of the arch openings, the piers, the side walls of the lock, the shoulders and the lower parts of balustrade.

D- The mortar:

Several types of mortar were used in the construction of the barrages, such as the regular mortar, consisting of lime and sand, used between the stones and in the casing works and the front bedding. Also the water mortar, which is composed of soft lime, sand and grinded red brick, was used to construct the parts covered with water such as bedding and piers. The cement mortar consisted of cement plus sand, was used for the bedding so as to strengthen it against the speed of the current and the rush of water behind the barrage⁽⁵¹⁾.

The Kasromil (Ash-dust), which is a kind of mortar composed of lime, grinded red brick and ash, was used in casing the bodies of arch openings and the lock walls, as this material is considered to be a moisture-proofing, and it prevents water intrusion⁽⁵²⁾.

The regular mortar, water mortar, cement mortar and Kasromil (Ash-dust) mortar were used in the construction of the Bagouria barrage. There is no doubt that the construction of the Bagouria barrage included many other building materials such as iron used

⁽⁵⁰⁾The Nile clay and the black mud of the agricultural soil were used in the making of red brick used for the construction works of the barrages, where they were mixed with water and then poured into wooden molds, afterwards these wooden molds would be removed immediately after pouring and then left to dry. After drying, the mud molds were collected to be burnt in special brick factories.

- Gamal Fathy, *Munshaat Alnil Almaeyia b Misr fi Asr Al'usra al Alawia*, P. 371.

⁽⁵¹⁾Gamal Fathy, *Munshaat Alnil Almaeyia b Misr fi Asr Al'usra al Alawia*, P. 371.

⁽⁵²⁾Madiha Hosny, *Qanatir Almiah fi Misr min Alasr Altuolunii ilaa Asr Osrat Muhammad Ali Basha*, *Dirasa Atharia Hadaria*, *Risalat Majstir*, *Qism Alathar Alaislamia*, *Kuliyat Alathar*, *Gamieat Alqahira*, 2004 AD, P. 187.

in the manufacture of iron gates, cranes, and iron chains, as well as wood and other materials.

5. Functional purposes of the Al-Bagouria barrage:

The barrages are one of the most important industrial irrigation constructions that have been set up to control, supply and distribute the water of the River Nile through reservation to raise the water levels in front of them or to form industrial ponds for irrigation and agriculture purposes ⁽⁵³⁾.

The barrages are made up of a set of openings equipped with iron gates that control the passage of the water where they are closed and opened as needed, and then the irrigation barrages are built for certain purposes ⁽⁵⁴⁾.

The Bagouria barrage has played an important role in controlling the water levels in front, as well as, water discharged or passed through the openings according to the reservation and distribution system. The Bagouria barrage also contributes to the supplying of irrigation canals and narrow waterways that branch out from the Bagouria canal with the irrigation water needed to cultivate the lands located nearby, sometimes the Bagouria barrage has had other purposes such as providing drinking water, in addition to navigation.

The other functional purposes of the Bagouria barrage are as follows:

A- The building of new sub-canals taking from the Bagouria canal, in addition to filling the exited sub-canals, side canals and sub-water courses with water to mainstream the permanent irrigation system, as well as paying interest in irrigation and transportation, and improving navigation in the canals connected to Bagouria canal.

⁽⁵³⁾Abdelazem Saudi, Tarikh Tatawor Alriy fi Misr (1182 - 1914 AD), Alhayya Almisria Aleama l Elkitab, Cairo, 2007 AD, P. 176.

⁽⁵⁴⁾Mahmoud El Gendy, Edafat Gadida fi Dirasat Qanatir Zeftaa Alkubraa, PP. 467, 468.

B- Reserving and distributing water through other barrages such as the barrage of Sersawya and the barrage of Bai Al Arab.

C- Regulating of the Nile waters in the Menoufi main canal to provide water needed for summer crops, especially the cotton, as well as the rearrangement of the irrigation system so that each region gains the proportion of water allocated to it on specific times ⁽⁵⁵⁾.

D- Supplying the areas located in the range of the Bagouria Canal with drinking water, in addition to navigational purposes where the Bagouria barrage includes a lock in the east side, and a large opening in the middle of the barrage to facilitate the crossing of boats ⁽⁵⁶⁾.

⁽⁵⁵⁾Abdelazem Saudi, Tarikh Tatawor Alriy fi Misr, P. 41.

⁽⁵⁶⁾Ali Mubarak, Alkhitat Al Aawfiqya Algadida, Part 19, P. 37.

A table showing the architectural, technical and structural terms used in the research

No.	Term	Meaning of the term	Explanation of the term
1	Badala	Pedal	An iron tube based on pillars used to pass water from one watercourse to a higher one.
2	Baghla	Pier	Central pillar bearing the body of the barrage and arches that coronate it, in addition, it forms the sides of the openings for passing water.
3	Bahr	Canal	An old branch of the Nile used as a canal
4	Drond	Recess	A runway or cavity located on either side of the arch openings in the front, where the iron gates are fixed according to the width of the openings.
5	Farsh	Bedding	The preparation of the site before the construction of the barrage, and this is done by preparing the bottom with bricks and stone or concrete to stabilize the ground on which the barrage is built.
6	Fom	Influx	The start of a waterway, main or branch
7	Haddar	Weir	An industrial construction consisting of stone blocks and bricks, and is built behind the barrage to increase the speed of the inclination and flow of water.
8	Haweess	Lock	In Arabic means basin, an industrial navigation waterway, which is located next to the barrage for the passage of boats from both sides.
9	Kasromil	Ash - dust	A kind of mortar composed of lime, red brick, ash and coal dust after burning it with fire, where it is mixed and left to brew, and then used in the casing of barrage openings
10	Khokha	Manual tool	It is defined as penetrative between two things. This name may have been taken from the fact that they block the boats between the two gates
11	Mizlag	Latch	A piece of iron used to close the iron gates manually.
12	Mowazna	Balancing	An engineering process to control the water levels and quantities in front of and behind the barrage, and the amount of water passing through the iron gates installed on the openings.

13	Rayah	Main canal	Main canal or large branch.
14	Shamaa	Metal beg	A metal peg installed on the side pavement of the lock used to tie the ropes of boats and ships during stopping in the lock between the gates.
15	Winch	Crane	A machine used to close and open iron gates from the front of the barrage to allow water passage, and from the front and backsides of the lock to allow passage of ships and boats.

Research Results:-

1- The Bagouria barrage has contributed to the transformation of the irrigation system in the areas within its scope from seasonal irrigation system into a permanent irrigation system and the provision of irrigation water in the summer. This leads to the flourishing of cotton cultivation in Menoufiya governorate during the era of Mohammed Ali Pasha's family.

2- The construction of the Bagouria barrage was connected with the then nature of the Menoufi main canal and the Bagouria canal. This correlation is reflected in the balance between the size of the Bagouria barrage and the amount of water flowing from the Menoufi main canal to the Bagouria Canal.

3- The Bagouria barrage is considered one of influx barrages as it was built at the intersection of the influx of the Bagouria Canal with the Menoufi main canal.

4-The Bagouria barrage has served as a reservation and distribution barrage through the supply of part of the water to the Sarsawya barrage of and Bai-Al Arab barrage.

5- The Bagouria barrage has facilitated the movement of transport and communication as its ceiling contains an upper road, with balustrade on either side, connected between the villages and areas located in the east and those located in the west.

6- The scarcity of the artistic and decorative elements is explicit in the construction of the Bagouria barrage, as it is confined to some decorative stone mouldings due to the nature of the establishment that mediates a watercourse.

7- The multiplicity of Nilometers, which were established in the Bagouria barrage area, is obvious. This shows the keenness of rulers of the era of Muhammad Ali Pasha's family to know the flood level and make balancing in the vicinity of the Bagouria barrage.

8- The marble stela which adorns the western wall of the Bagouria lock basin shows the renovation and restoration works that were carried out in the lock of the Bagouria barrage in 1329 AH / 1911 AD.

Recommendations:

1- The annexation and registration of the Bagouria barrage as an Islamic monument and the cooperation between the Ministry of Antiquities and the Ministry of Water Resources and Irrigation to work on the restoration of the Bagouria barrage due to its important archaeological, architectural and cultural value.

2- The Ministry of Water Resources and Irrigation should pay more attention to the maintenance of the Bagouria barrage and its lock, to cleaning the area surrounding the barrage and the lock from the front and the back, and to re-activating the lock by maintaining the cranes and the operating tools, and to case the walls of the construction.

3- The Ministry of Water Resources and Irrigation should work on putting an organized plan to remove the existing infringements within the scope of the Bagouria barrage and to disinfect the Bagouria canal .

Bibliography

- **Abdelazem Saudi**, Tarikh Tatawor Alriy fi Misr (1182 - 1914 AD), Alhayya Almisria Aleama l Ilkitab, Cairo, 2007 AD.
- **Abdelrahman Abdeltawab**, Munshatuna Almaeya Abr Alttarikh, Dar Alqalam, Almaktaba Althaqafia, No. 69, Wizarat Althaqafa w Alershad Alqawmii, Cairo, 1963 AD.
- **Abdelrahman Al-Rafi'**, Asr Ismail, Dar Al-Ma'aref, Cairo, 1987.
- **Ahmad Mustafaa**, Elaqat Misr bi Turkia fi Ahd Alkhadiwi Ismaeil, 1863 - 1879 AD, Dar Almaearif, 1967 AD.
- **Ahmed Yousef**, Wagihat Alamaer Aldiynia w Almadania b Mudon Alqnah fi Asr Al'usra Alalwia, 1220 - 1372 H / 1805 - 1952 AD, Dirasa Atharia, Risalat Majistir, Qism Alathar, Kuliyyat Aladab, Gamieat Tanta, 1438 H/ 2016 AD.
- **Ahmed Zaki**, Kalema Maa Reyad Pasha w Safhaa min Tarikh Masr Alhadeeth, Moasasat Hendawi l Eltaleam w Althaqafa, Cairo, 2014.
- **Al-Fayrouz Abadi** (Magdeldin Mohamed), Alqamus Al Moheet, Bayrut, 1429 H / 2005 AD.
- **Ali Mubarak**, Al khetat Al Tawfiqya Al Gadida l Misr wal Qahira w Mudnuha w Biladiha Al Qadima w Alshahira, Silsilat Alturath, Part 19, Cairo, 1432 H / 2008 AD.
- **Amal Fahami**, Omara' Al'usrat Almalikat Wadawruhimi fi Alhaya Almisria, 1882 - 1928, Alhayya Almisria Alama li Lkattab, 2006 AD
- **Amen Sami**, Molhaq Taqwim Alnil an Al Gusur w Alqanatir w Alkhazzanat ala Alnil Wafuruh b Misr w Al Suwadan min Fajr Alttarikh ilaa Al'an, Dar Alkutub Almisria, Cairo, 1355 H / 1936 AM.
- **Assem Rizk**, Moagam Mustalahat Aleamara w Alfunun Alaislamia, Maktabat Madbuli, Cairo, 2000 AD.
- **Charl Sakla**, Handasat Alriy Walsarf, Kuliyyat Alhandasa, Gamieat Al Mansoura, 1991 AD.
- **Gamal Fathy**, Munshaat Alnil Almaeyia b Misr fi Asr Al'usra Alalawia 1805-1952 AD, Dirasa Atharia Moqarna, Risalat Dukturah, Qism Al'athar Al'iislamia, Kuliyyat Al'athar, Gamieat Al Qahera, 1430 AH / 2009 AD.
- **Hashem Abdelsalam & Hassan El Sherbini**, 'Aemal Alry fi Misr, Wizarat Al'ashghal Aleumumia, Aljuz' Al'awal, Almatbaea Al'amiria, Cairo, 1957 AD.
- <https://en.oxforddictionaries.com/definition/barrage>
- <https://www.egyptiantalks.org>
- <https://www.shobramiles.yoo7.com>

- <https://www.vetogate.com>
- **Hussin Sirry**, Irrigation Science, Part II, the Government Press, Ministry of Public works, Cairo, 1931AD.
- **Ibn Algayean** (Sharf al Deen Yahia), Altohfa Alsaniya b 'Asma' Albilad Almisria, Almaktaba Al'azharia, Cairo 1974 AD.
- **Ibn Mamati** (Al'asaad Ibn Mamati), Qawanin Aldawawin, Maktabat Madbuli, Cairo, 1991 AD.
- **Ibn Manzoor** (Mohamed Ibn Makram), Lisan ELarab, Dar Sader, Beirut, 1414 AH / 1993 AD.
- **Linant de Bellefonds**, Notes on the Great Public Works which have been achieved from the earliest ages until 1872, the Government Press, Cairo, 1949 AD.
- **Madiha Hosny**, Qanatir Almiaah fi Misr min Alasr Altuolunii 'iilaa Asr Usrat Muhamad Ali Basha, Dirasa Atharia Hadaria, Risalat Majstir, Qism Alathar Alaislamia, Kuliyyat Alathar, Gamieat Alqahira, 2004 AD.
- **Magdy Elwan**, Munshat Alry bi 'Asyut 'Ibban Asr Muhamad Ali 1220-1372 H / 1805-1952 AD, Dirasa Atharia, Alnadwa Aleilmia fi Zikraa Alealam Aljalil Al'ustaz Alduktur/ Abdaleziz Salm, Kuliyyat Aladab, Gamieat Al'iiskandaria, 2008 AD.
- **Mahmoud El-Gendy**, Edafat Gadida fi Dirasat Qanatir Zafataa Alkubraa Wamulhaqatuha Ala Alnil (1319-1320 H/ 1901-1902 AD) Majalat Kuliyyat Al'adab b Qena, Aleadad 33, 2010 AD.
- **Ministry of Education**, Almaegam Alwasit, Wizarat Altarbia w Altaelim, Cairo, 1960 AD.
- **Ministry of public works**, Annual reports during the years 1919-1924 on the work of the irrigation department, government press, Ministry of public works, Cairo, 1923, 1925, 1928.
- **Ministry of Public Works**, Canals Sources, Bulletin No. 3, Cairo, 1959 AD.
- **Mohamed Abdelhafeez**, Almustalahat Almuemaria fi Wathaeq Ahd Muhamad Ali Wekholafaoh 1805-1879, Altabea Al'uwlaa, Cairo, 2005 AD.
- **Mohamed Fahmy**, 'Aemal Gany Bik Almieamaria 830 AH/ 1427 AD, Dirasa Atharia, Risalat Majstyr, Kuliyyat Alathar, Gamieat Alqahira, 1988 AD.
- **Mohamed Ramzy**, Alqamus Algughrafi l Ibilad Almisria min Ahd Qudamaa' Almisriiyn 'iilaa Sanat 1945 AD, Alhayyat Almisria Alama l Ilkitab, Cairo , 1994 AD.

- **Mukhtar El Qazaz**, Munshat Alry Walsarf Alziraeii fi Sharq Aldilta Khilal Asr 'Usrat Muhamad Ali fi Daw' Mbany Gadida lam Yasbiq Dirasataha min Qabl, Dirasa 'Athria Miemaria, Risalat Majstir, Qism Alathar, Kuliyyat Aladab, Gamieat Helwan, 1436 H/ 2015 AD.
- **Yasser Al Mahareq**, El Menoufia fi Alqarn Althamin Ushar, Silsilat Tarikh Almisryiiien, Aladad 184, Alhayya Almisria Aleama l Ilkitab, Cairo, 2000 AD.
- **Zoltan A. Vattai**, construction equipment, lifting and transporting, Budapest university of technology and economics, department of construction technology and management, Budapest, 2010

Maps, Figures and Plates Catalogue

Frist: Maps and Figures:-

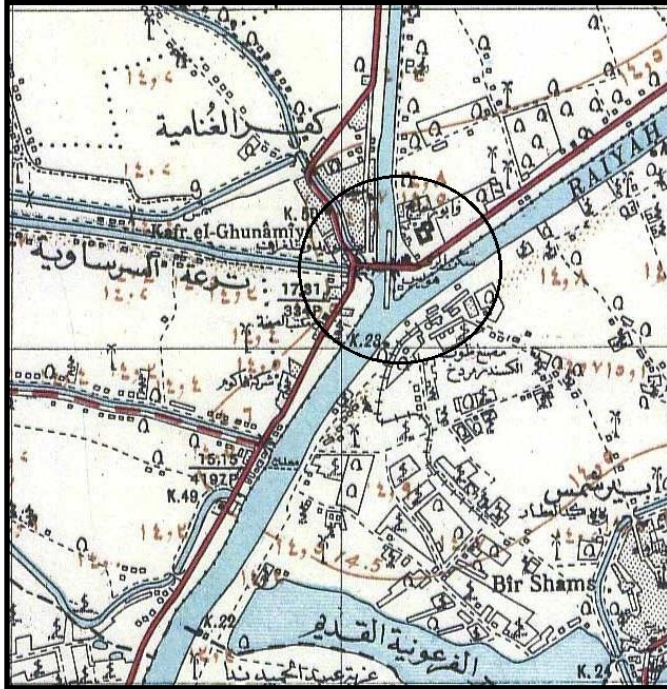


Figure 1

A map showing the location of the Bagouria barrage at the intersection of the Bagouria canal with the Minoufi Main Canal . (The Egyptian Survey Authority)



Figure 2

A map showing the location of the Bagouria barrage at the intersection of the Bagouria canal with the Minoufi Main Canal. (The Egyptian Survey Authority)

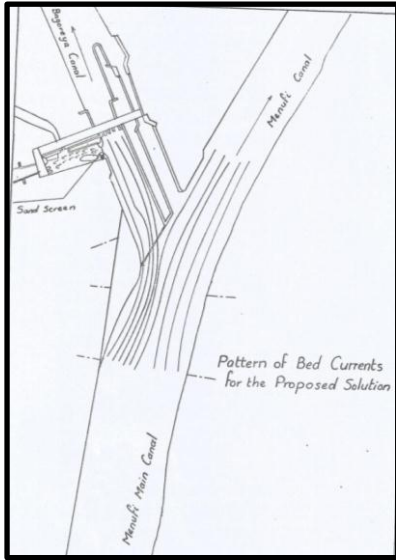


Figure 3

Illustrative drawing showing the connection of the Minoufi main canal with the Bagouria canal
(The Ministry of Public Works)

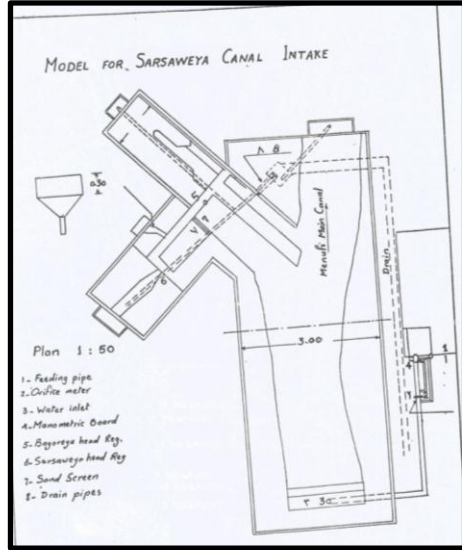


Figure 4

Illustrative drawing showing the level of water and silt at the connection of the Minoufi Main Canal with both the Bagouria and the Sarsawia Canals.
(The Ministry of Public Works)

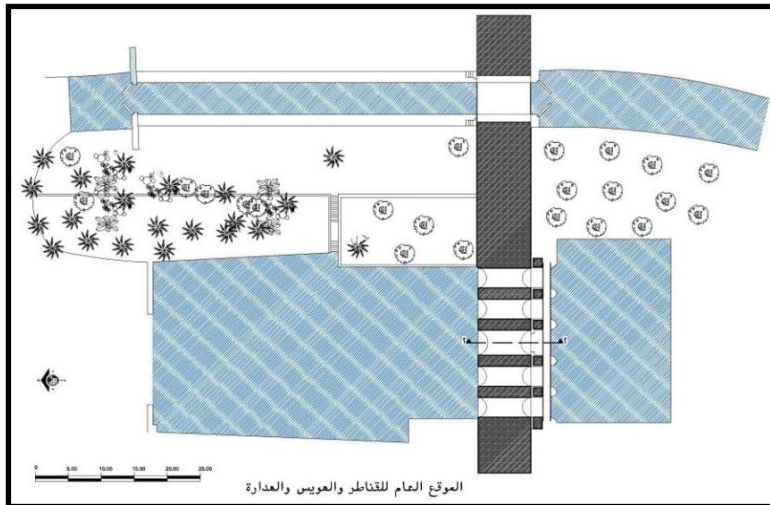


Figure 5

Horizontal plan showing the layout of the barrage, lock and weir of the Bagouria canal.
(Work of the researcher)

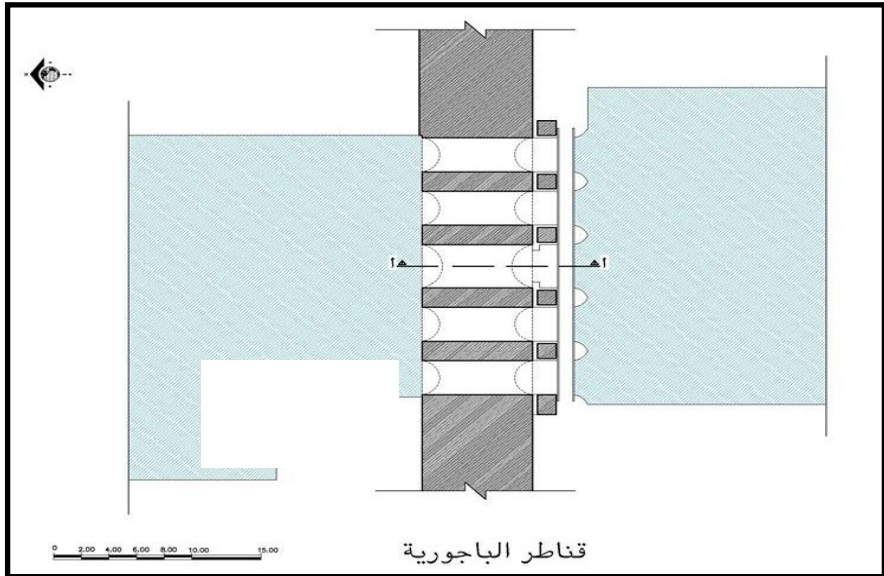


Figure 6

Horizontal plan showing the layout of the Bagouria barrage.
(Work of the researcher)

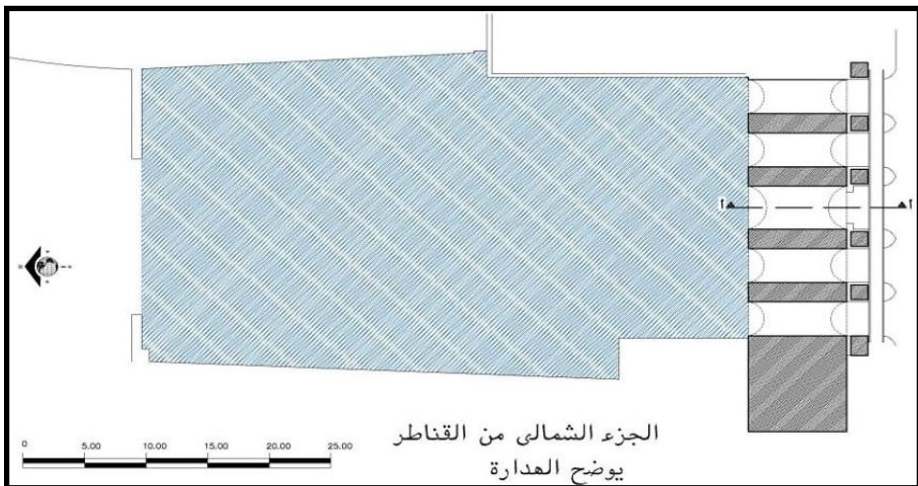


Figure 7

Horizontal plan showing the layout of the barrage and the weir of the Bagouria. (Work of the researcher)

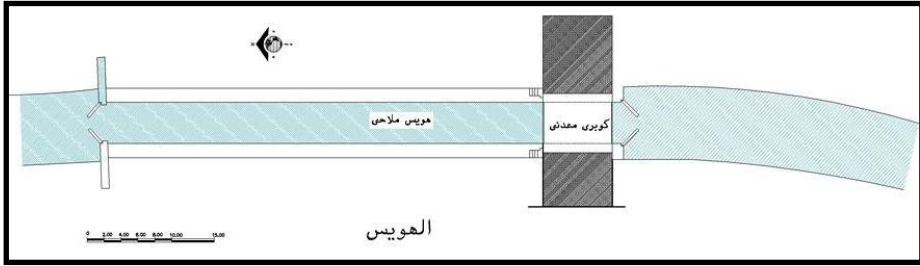


Figure 8

Horizontal plan showing the layout of the Bagouria lock.
(Work of the researcher)

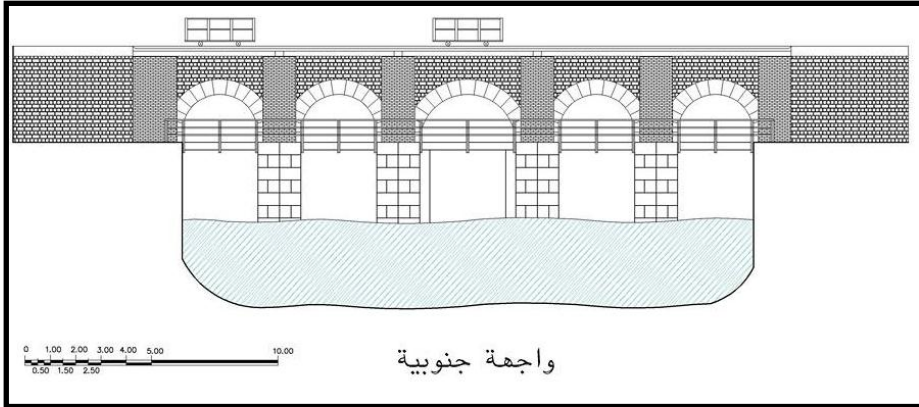


Figure 9

Horizontal plan showing the front façade of the Bagouria barrage.
(Work of the researcher)

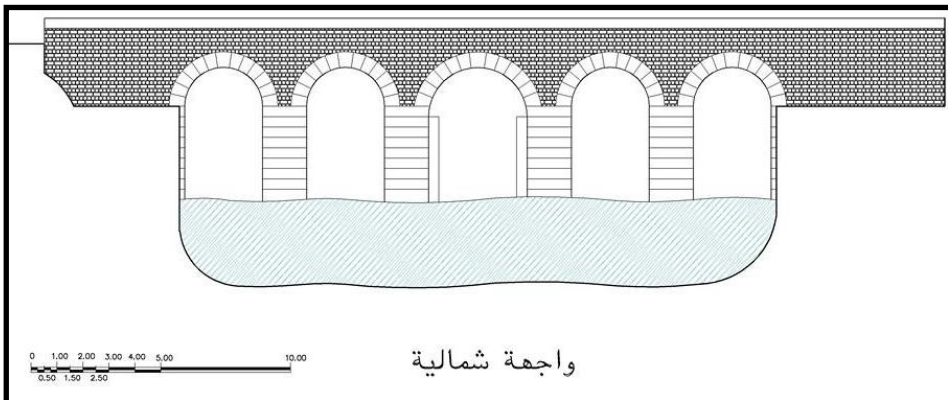


Figure 10

Horizontal plan showing the back façade of the Bagouria barrage.
(Work of the researcher)

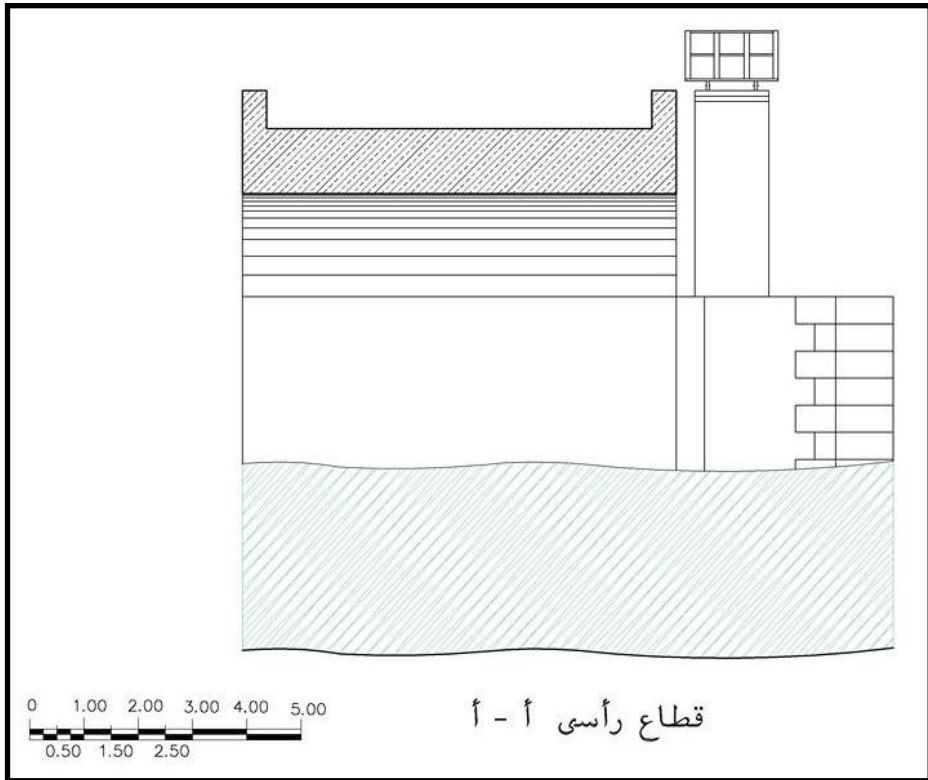


Figure 11
A vertical sector showing the Bagouria barrage.
(Work of the researcher)

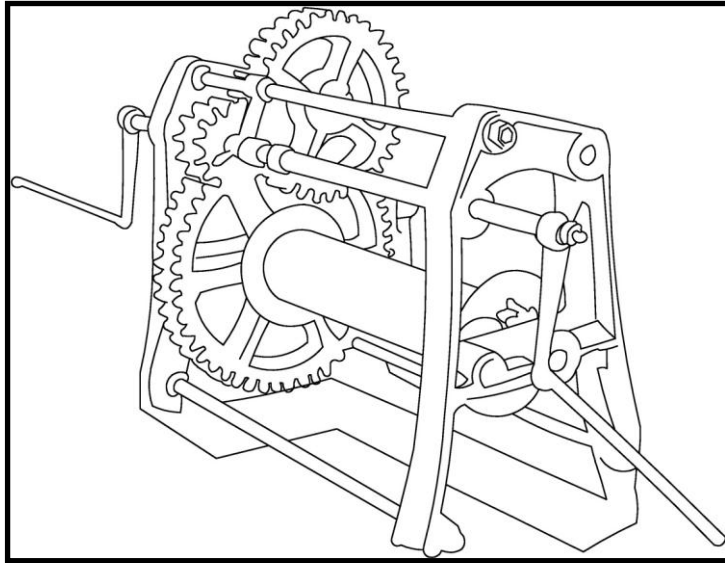


Figure 12

The Crane used in the Bagouria lock.
(Work of the researcher)

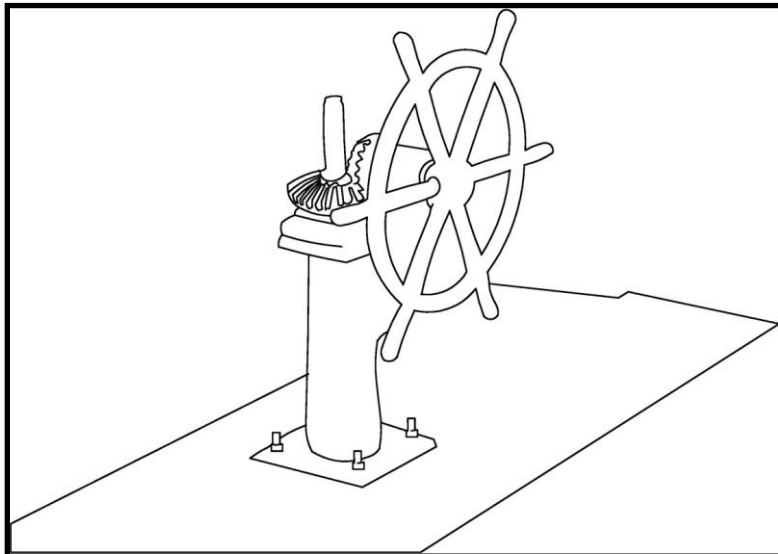


Figure 13

The manual tool used in the Bagouria lock.
(Work of the researcher)

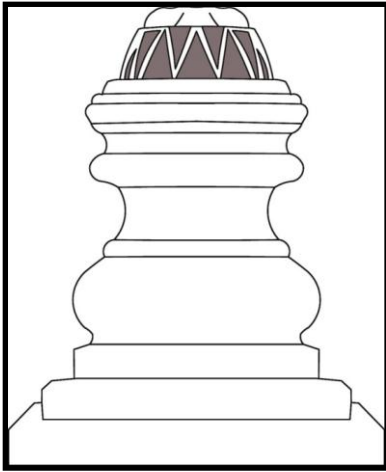


Figure 14

The shape of stone moulding that decorates the Bagouria barrage.
(Work of the researcher)

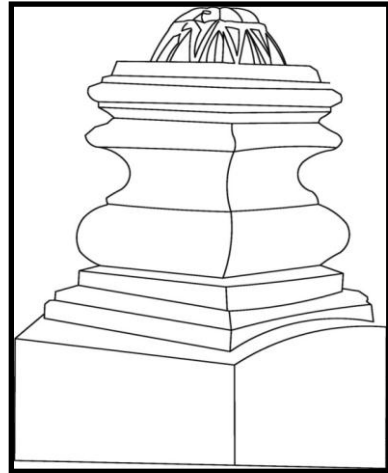


Figure 15

The shape of stone moulding that decorates the Bagouria barrage.
(Work of the researcher)

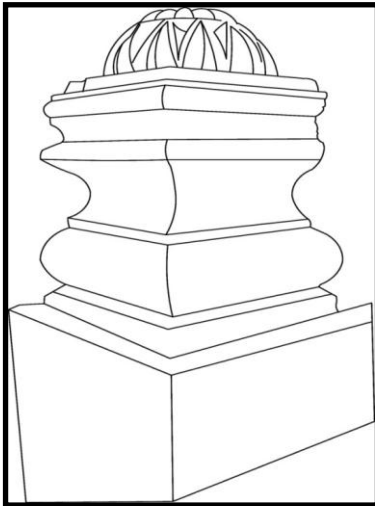


Figure 16

The shape of stone moulding that decorates the Bagouria barrage.
(Work of the researcher)

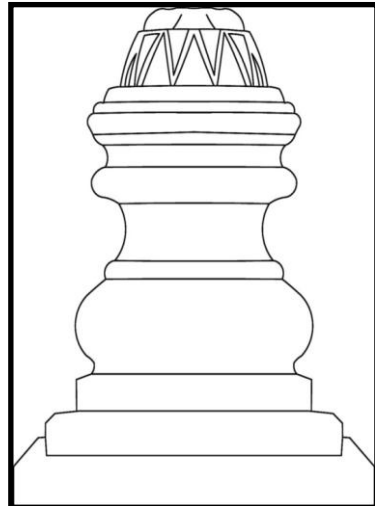


Figure 17

The shape of stone moulding that decorates the Bagouria barrage.
(Work of the researcher)

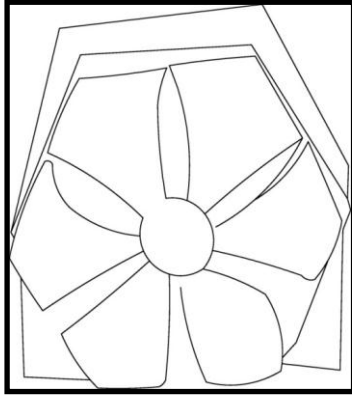


Figure 18

The decorations of stone moulding that adorn the Bagouria barrage.
(Work of the researcher)

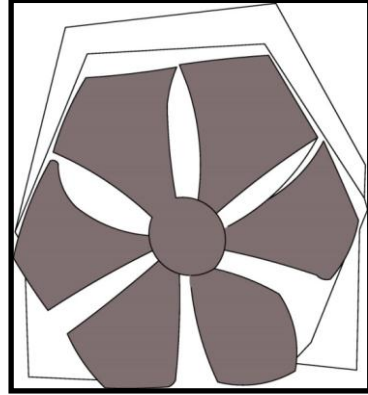


Figure 19

The decorations of stone moulding that adorn the Bagouria barrage.
(Work of the researcher)

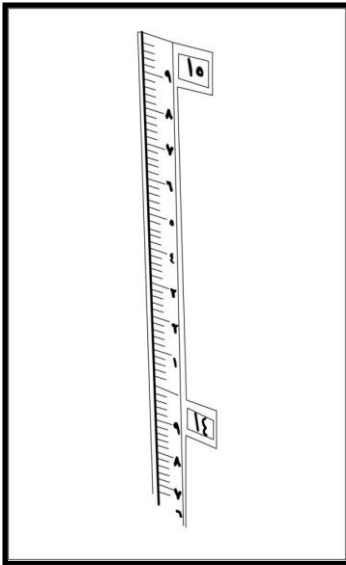


Figure 20

Showing the form of one of the Nilometers in the Bagouria barrage.
(Work of the researcher)

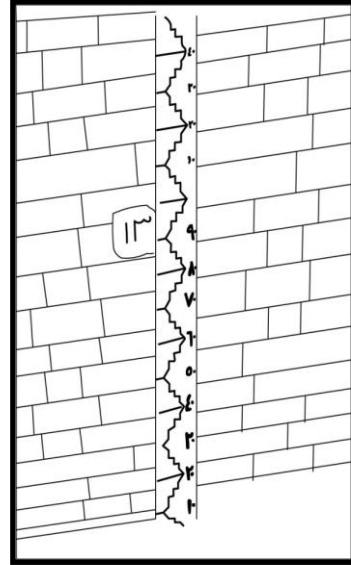


Figure 21

Showing the form of one of the Nilometers in the Bagouria barrage.
(Work of the researcher)

Second: Plates:-



Plate No. 1: General view showing the barrage and the lock of the Bagouria (Photographed by the researcher).

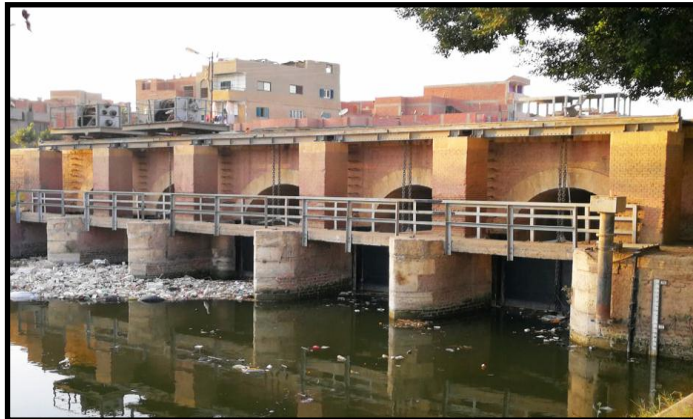


Plate No. 2: General view showing the front façade of the Bagouria barrage (Photographed by the researcher).

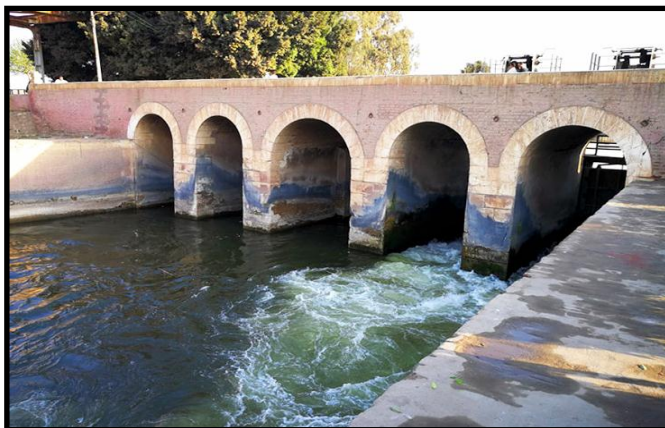


Plate No. 3: The back façade with semi-circular arches of the Bagouria barrage (Photographed by the researcher).

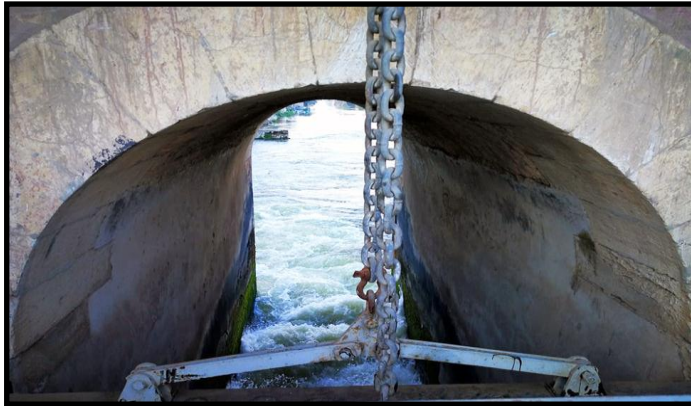


Plate No. 4: Tracked steel chains that carry iron gates for closing the openings of the barrage (Photographed by the researcher).

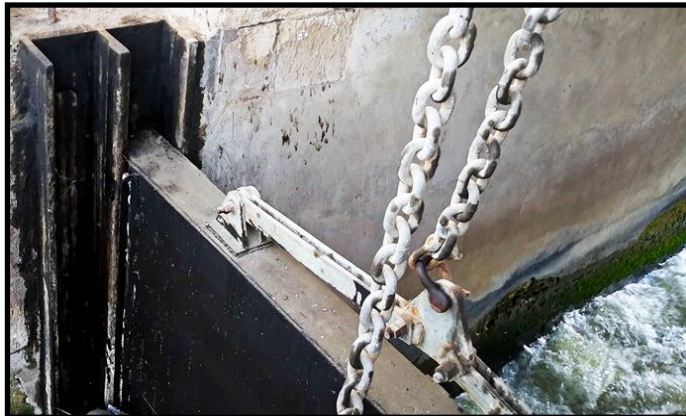


Plate No. 5: Recesses for the installation of iron gates of the Bagouria barrage. (Photographed by the researcher)



Plate No. 6: The cranes of the Bagouria barrage (Photographed by the researcher)



Plate No. 7: Viaduct with an iron balustrade adjacent to the front façade of the Bagouria barrage (Photographed by the researcher).



Plate No. 8: Viaduct and the shoulders located on the front façade of the Bagouria barrage (Photographed by the researcher).

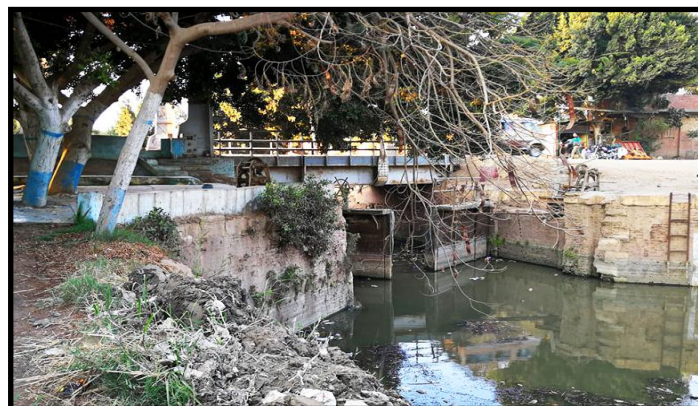


Plate No. 9: The front side of the Bagouria lock.
(Photographed by the researcher)



Plate No. 10: The back side of the Bagouria lock.
(Photographed by the researcher)



Plate No. 11: the bridge of the Bagouria lock
(Photographed by the researcher)



Plate No. 12: The upper part of the Bridge of the Bagouria lock.
(Photographed by the researcher)



Plate No. 13: Marble stela with the renovation date of the Bagouria lock in 1911
(Photographed by the researcher).



Plate No.14: Manual tools used in the Bagouria Lock.
(Photographed by the Researcher)



Plate No. 15: The crane used in Bagouria Lock.
(Photographed by the researcher)



Plate No. 16: Manual tool used in the Bagouria Lock.
(Photographed by the researcher)



Plate No. 17: A metal peg used to tie the ropes of boats and ships
at the Bagouria Lock. (Photographed by the researcher)



Plate No. 18: The barrage of Bai Arab.
(Photographed by the researcher)



Plate 19: A general view showing the eastern front façade of the Sersawya barrage (photographed by the researcher)

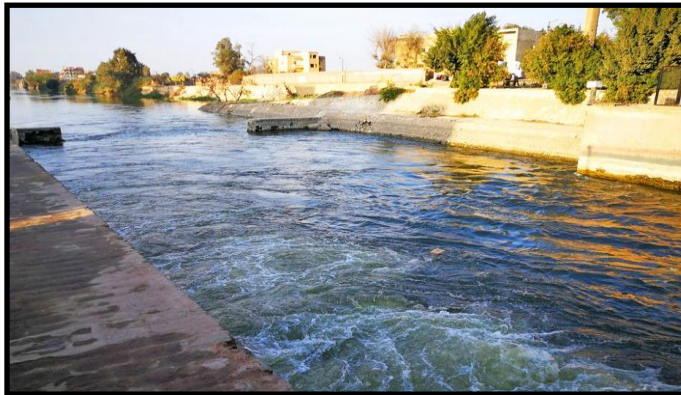


Plate No. 20: The weir of the Bagouria barrage.
(Photographed by the researcher)



Plate No. 21: The western pavement of the weir of the Bagouria barrage. (Photographed by the researcher)



Plate No. 22: The upper road of the Bagouria barrage.
(Photographed by the researcher)



Plate No. 23: The eastern entrance of the upper road of the Bagouria barrage
(Photographed by the researcher).



Plate No. 24: The embankment between the front entrance of the barrage and lock of
the Bagouria canal (Photographed by the researcher)



Plate No. 25: The embankment between the weir and the lock from the back side (Photographed by the researcher).



Plate No. 26: A decorative stone moulding adorning the Bagouria barrage (Photographed by the researcher)



Plate No. 27: A group of decorative stone mouldings adorning the Bagouria barrage (Photographed by the researcher).

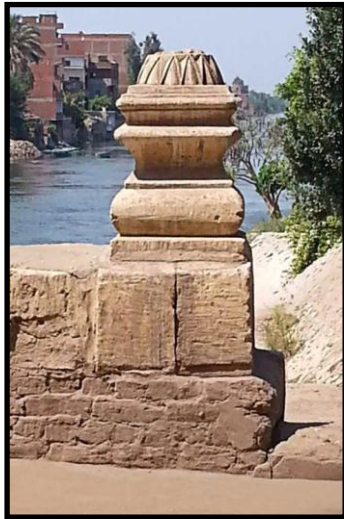


Plate No. 28: A decorative stone moulding adorning the Bagouria barrage (Photographed by the researcher).



Plate No. 29: A decorative stone moulding adorning the Bagouria barrage (Photographed by the researcher).



Plate No. 30: A decorative stone moulding adorning the Bagouria barrage (Photographed by the researcher)

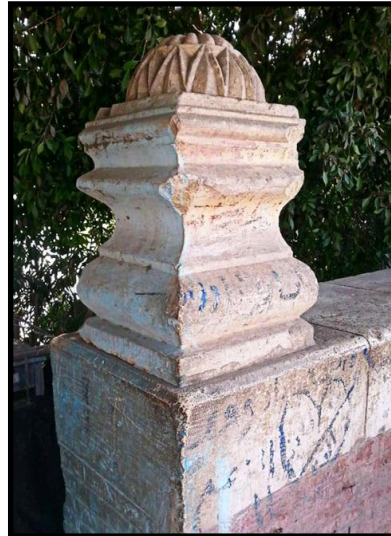


Plate No. 31: A decorative stone moulding adorning the Bagouria barrage (Photographed by the researcher)

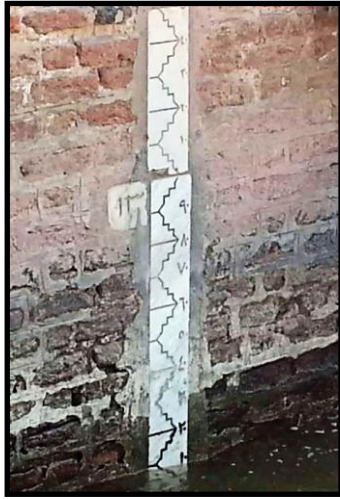


Plate No. 32: One of the Nilometers located at the wall of the pavement between the lock and the Bagouria barrage.
(Photographed by the researcher)



Plate No. 33: The Nilometer located at the entrance of the Sarsawiya barrage
(Photographed by the researcher)



Plate No. 34: Three Nilometers located at the eastern wall behind the lock of the Bagouria barrage
(Photographed by the researcher)



Plate No. 35: A Nilometer located at the eastern wall in front of the lock of the Bagouria
(Photographed by the researcher)



Plate No. 36: A Nilometer located at the eastern side of the front façade of the Bagouria barrage (Photographed by the researcher)

قناطر الباجورية ١٢٨١هـ / ١٨٦٤م (دراسة أثرية معمارية)

د. بدر عبد العزيز محمد بدر*

الملخص:-

يتناول هذا البحث بالدراسة والوصف والتحليل قناطر الباجورية، وتعد من أهم المنشآت المائية التي تم بناؤها في مجال هندسة الري بمحافظة المنوفية خلال عصر الخديوي إسماعيل سنة ١٢٨١هـ / ١٨٦٤م، حيث أسهمت في تطوير نظام الري والزراعة، علاوة على دورها في تحسين نظام الملاحة بترعة الباجورية، وتتكون قناطر الباجورية من خمسة فتحات ذات عقود نصف دائرية تتركز على دعائم حجرية يفصل بعضها عن بعض فتحات مجهزة ببوابات حديدية تستخدم في فتح وغلق القناطر، ويوجد بالجهة الشرقية من القناطر هويس ملاحى كان مخصصاً لمرور السفن والمراكب النيلية في ترعة الباجورية، ومن الملاحظ أن القنطرة تتكون من الفرش والبغال والأكتاف وفتحات العقود وظهر القنطرة، كما تحتوي على بوابات حديدية ومعدات هيدرولوكية مثل الأوناش وأجهزة التشغيل، أما سقف القناطر فيشتمل على طريق علوي مخصص للنقل والمواصلات؛ حيث يربط القرى والنواحي الواقعة بالجهة الشرقية من القناطر مع مثيلاتها الواقعة بالجهة الغربية منها، ومما يسترعي الانتباه كثرة عدد مقاييس النيل التي تم انشاؤها بمحيط قناطر الباجورية لمعرفة منسوب الفيضان وجراء الموازنات المائية اللازمة.

وفى نهاية البحث أهم النتائج التي تم التوصل إليها يليها قائمة المصادر والمراجع ثم الكتالوج الذى يشتمل على اللوحات والرسومات التوضيحية.

الكلمات الدالة:-

قناطر الباجورية؛ الهويس؛ البغال؛ الفرش؛ الهدار؛ البوابات الحديدية؛ الأوناش؛ المزليج؛ مقاييس النيل.

* أستاذ مساعد بكلية الآداب - جامعة بورسعيد. Szabadr@yahoo.com

Kamran Island in Yemen during the Islamic era Cultural and archaeological study

Dr.Mohamed Ahmed Abdel Rahman *

Abstract:

Kamran Island is one of the most important and largest islands on the Red Sea and the Gulf of Aden because of its distinguished location. It overlooks the most important sea lanes in the world, which reach the east and west. It is one of the most important nature reserves. It is the Pearl of the Red Sea Islands. Kamran Island is considered one of the most important and largest Yemeni islands on the Red Sea and the Gulf of Aden. It administratively follows the province of Al-Hodeidah.

The island includes a variety of archaeological, religious, military and civil monuments dating back to different historical periods since before Islam, and has been renewed more than once. The most important monuments are the Persian Castle, the Great Mosque, Jabbana Mosque, Mosque and shrine of the Iraqi, the palace of Queen Elizabeth II and others. These monuments were characterized by a variety of its styles; they varied from different Islamic styles to European models.

The researcher deals with Location and borders of Kamaran Island, The reason for naming Kamran Island by this name, the importance of the strategic location of Kamran Island. The history of the island and the most important historical periods and cultural role of this island, and a descriptive study of the remaining architectural monuments and analysis of the architectural and artistic styles of these monuments. Researcher followed many Approaches like Inductive, Descriptive, Finally comparative and analytical approach.

Keywords:

Kamran, Yemen, Al- Hodeidah, Queen Elizabeth's Palace, Mosque of AL Iraqi, and the Red sea

* Lecturer of Islamic architecture, Faculty of Archeology -Fayoum University, maa25@fayoum.edu.eg

Objectives of the study: The study aims to achieve a number of objectives:

- To highlight the historical and cultural role of Kamran Island through the historical ages.
- View and deal with the most important archeological structure in the island, which dates back to different ages.
- To study types of these archeological structures and their different architectural and artistic styles.

The Problem of the research: The problem of the study is that this subject has never dealt in an independent study. Most of the previous studies dealt with it sporadically; they focused on the cultural side and the strategic role of the island through the historical ages, and the archaeological aspect was addressed in a few fragments.

The Methodology of research:

the researcher relied on more than one curriculum in his study; **First, Inductive Approach**; he followed it in collection and extrapolation of information of the study. **Secondly, Descriptive Approach**; which included a description of remaining archeological monuments. **Finally, comparative and analytical approach**; which included analysis of the architectural styles of these monuments, the comparative approach has benefited in determining the history of some of these monuments.

Sections of the research;

A. The First Section:

B. the geographical and historical background Kamran Island, which includes a number of points;

- Location and borders of Kamaran Island.
- The reason for naming Kamran Island by this name.
- The importance of the strategic location of Kamran Island.
- History of Kamran Island through the historical ages.

B. The second Section: Descriptive and Analytical Study of the remaining archaeological installations on Kamran Island.

Finally; Conclusion and results of research.

A-The First Section: the geographical and historical background Kamran Island, which includes a number of points;

▪ Location and Limits of Kamaran Island.

It is a famous island of Yemeni Islands. It administratively follows a governorate of Al Hudaydah⁽¹⁾, located 350 km north of the Bab al-Mandab and about 2.5 kilometers from the coast of North of the republic of Yemen between Al-Hudeida in south and Al-Lohia⁽²⁾ in north⁽³⁾. **Map (1)**



Map (1)

site of Kamran island in the Red Sea

Source: <https://www.ye1.org/forum/threads/278528/>
https://www.marefa.org/images/e/ec/Kamaran_Island_NASA.jpg

(1) Al-Hodeidah (In Arabic: **الْحُدَيْدَة**); it is considered the largest and most important cities of Tihamah and the second and most important Yemeni ports after Aden port. It located on The Coast of Red Sea. Mohammed Ali Al-Arousi, Al- Hudaydah, The Yemeni Encyclopedia, Volume II, Al-Afif Cultural Foundation, Sana'a, first edition, 1992, p.1047.

(2) Al-Luhayyah (In Arabic: **اللُّحَيَّة**), it is a city and port located on The Red Sea coast north of the city of Al- Hodeidah 110km away. It dates back to the 7 AH. The historian al-Khazraji mentioned that Sheikh Ahmad bin Omar al-Zailai is the first one who built Al-Lohia. Mohammed bin Saied Abdul Wadood, Abstract in the history of the city of Al-Lohia, Al-Rehab Foundation, Sana'a, 2010, p.27

(3) Abo Mohammed Al-Hassan bin Ahmed Al-Hamdāni, description of the Arabian Peninsula, investigation of Muhammad ibn Ali al-Akwa al-Hawali, the Guidance Library, Sana'a 1, 1990, margin of 92, Ismail Al-Akwa, Yemeni Countries at Yakut Al-Hamwi, Al-Resalah Foundation Beirut, New Generation Library in Sana'a, p.77, Ruth Lapidoth-Eschelbacher, the red sea and the Gulf of Aden, Martinus Nijhoff Publishers, London, 1982, p.134.

▪ **Reason for naming Kamran Island by this name**

There were many opinions about reasons of naming; it was said as it related to "moons" in Arabic, "two moons". Therefore, it was called (Qumran) in Tihamah Arabic accent (In Arabic: قَمْرَان); which refers to the reflection of moonlight on the surface of the sea, so it was seen "two moons", not one moon⁽⁴⁾. For this reason, the island was named "Qumran Island" until it became known in English as Kamran and it was called "Kamran" since the British disbanded the island as "Kamaran" instead of "Qumran". Kamran has been called since then⁽⁵⁾. Another reason is that the daughter of one of kings of Yemen; She was called (Camarran), after suffering a severe illness, she went to this island to recover, and after her recovery the island was named by her name⁽⁶⁾.

Al-Hamdāni mentioned it by (Kamran); as he said (then turn the sea on the right west and north in Aden to pass through the coast of Lahj and Abyan and Qutayb, and it is a link and the coasts of Majid Tabn from Mandab, the coast of Elemira and to the coast of Zabid then to Kamran⁽⁷⁾).

▪ **The importance of the strategic location of Kamran Island.**

Kamran Island is considered one of the most important and largest Yemeni islands on The Red Sea and the Gulf of Aden. In fact, the Yemeni islands have special importance to the world powers; which want to impose their control over the southern Red Sea entrance to reach control of all the countries overlooking the Red Sea⁽⁸⁾. Kamran Island covers an area of 60km². It is distinguished by its privileged location, which overlooks the

(4) Shihab Mohsen Abbas, Yemen Islands, Abadi Center for Studies and Publishing, Sana'a, first edition, 1996, p.40.

(5) Al-Yamāmah, Issues 2114-2122, Al-Mamlakah al-‘Arabīyah Al-Sa‘ūdīyah, Mu’assasat al-Yamāmah al-Ṣaḥāfīyah, 2010, <https://www.britannica.com/place/Kamaran>

(6) NIGEL GROOM, The island of two moons: Kamaran 1954, the British Yemeni society, 2002. <http://al-bab.com/albab-orig/albab/bys/articles/groom02.htm>

(7) Hamdāni, description of the Arabian Peninsula, p.92.

(8) Raafat Ghonaimi Sheikh, Contemporary History of the Arab Islamic Nation 1412-1992, Dar al-Thaqafah for Publishing and Distribution, Cairo, 1st edition, 1992, p.182,191.

most important sea lanes in the world, which reach the east by the west. **Yaqoot al-Hamawi** describes Kamran Island as **(a fortress for the King of Yamani Tihamah)**⁽⁹⁾. The strategic importance of the island comes from being a fort overlooking the international shipping lines passing from its western side. It is considered a security belt for the port of As-Salif. So, there is a circular lighthouse on the island. It is located at the southern end of the island to facilitate the sighting of passing ships⁽¹⁰⁾.

In the past, Kamran Island is considered one of the most important islands for maritime navigation and was the first entrance to Yemen, whether for commercial vessels or for the pilgrims who were going to Saudi Arabia, as the island was the only quarantine in the region for all the ships of pilgrims going to Saudi Arabia⁽¹¹⁾.

Also, the Island has economic importance and a large commercial role, it was attributed to the Alkmrani Salt; which was used as a medical material for treatment of many diseases and does not owe anything of the other salt in its purity and hardness⁽¹²⁾. And Island is one of the most famous pearl markets in the Middle East, where pearl marketers come from the Gulf countries to market their products on the island. It is enough to show the great economic importance of the island; **The British Lord Valentine** recommended the importance of this island and stated that if the British were able to conquer it; makes them own trade in this region⁽¹³⁾.

(9) Yaqoot Al-Hamwi mentioned the location of Kamran Island (an island located off Zabid near the Indian coast). But this is not true since the island is not located near Zabid. It is located near Al-Hudaydah. See more, Yaqoot Hamwi, Dictionary of Countries, Vol2, Dar Sader, Beirut, 2nd Edition, 1995, p.139, Ismail Al-Akwa, Yemen Countries, p.77.

(10) Salem Saleh Mohammed, cities we inhabit them and cities inhabit us, the Arab Press Agency, Egypt, 2018.

(11) John Baldry, the Ottoman Quarantine Station on Kamaran Island: 1882-1914, Inst. of History of Medicine and Medical Research, 1978.

(12) Sayyed Ali Sadr al-Din al-Madani, Journey of Ibn Masoum al-Madani or Salwat Al-Gharib and oswat Al-Areeb, investigation by Shaker Hadi Shukr, The Arab Encyclopedia of Encyclopedias, Beirut, 1st edition, 2006, p.59.

(13) Shihab Mohsen Abbas, Yemeni Islands, p.71.

▪ History of Kamran Island through the historical ages.

The island has witnessed many political stages starting in 515AD with Axum's ambitions of Ethiopia. Then, remains of the Persians, who came to Yemen to help Saif Bin Thu Yazan against the Ahbash and ended their presence with entry Yemen into Islam, and those expelled from the Yemeni mainland settled on the island of Kamran. Then repeated attempts to invade the island; Mamluks entered it led by "**Hussein Kurdish**" in 921AH. Then, the Portuguese occupied it in 1512AD, and Mamluks liberated it in 1515AD. But the Portuguese returned again and occupied it in 1517AD under the leadership of "**Lopez Soliz**". Then Ottomans liberated it in 1620AD.

In the reign of Muhammad Ali Pasha, he wanted to expand his control and extend to Yemen he sent a military campaign to Yemen in November 1837AD under the leadership of Ibrahim Pasha Yakan, which took control of Al-Hudaydah and Al-Mukhka. The campaign realized the importance of Kamran Island. So, it took control of it and put up in it a military garrison⁽¹⁴⁾. Britain occupied the island in 1867AD, and ottomans expelled them in 1882AD⁽¹⁵⁾. After that, it remained under the control of the Ottomans. They used it during their reign in Yemen as a quarantine station for Muslim pilgrims; to check pilgrims coming from Asia and Africa across the sea before arriving at the Holy Sites⁽¹⁶⁾.

With the beginning of the First World War, Britain occupied the Island it in 1333AH /June 10, 1915AD, governing it from Aden. In fact, Britain's interest on the island comes from its interest in the Red Sea. Where Britain realized that the Red Sea was the natural route to the Far East or, as **Lord Salisbury** said (that the

(14) Raafat Ghonaimi Sheikh, Contemporary History of the Arab Nation, p.191.

(15) Sami bin Abdullah bin Ahmed Almgloth, Atlas of the history of the Mamluk era, Obeikan Library, Riyadh, first edition, 2013, p.251

(16) J.E. Peterson, The Islands of Arabia: Their Recent History and Strategic Importance, Arabian studies, university of Cambridge, 1985, Pp.24-25.

Red Sea route was Britain's sensitive tendon)⁽¹⁷⁾. Also, the British Consul described Kamaran Island as the most beautiful thing he saw in the Red Sea after Aden. He said that it is the most proper place to set up a British settlement on it and this reflects strategic importance of the island ⁽¹⁸⁾.

In 1923, the Treaty of Lausanne was signed to divide the property of the defeated Ottoman Empire; this Treaty stipulated the end of the Ottoman sovereignty over the island and the supervision of the British administration in the island and the health pilgrimage station. Britain depended on the Paris Convention in 1903AD for the establishment of this station ⁽¹⁹⁾. In 1949AD, Britain officially declared that the governor of Aden would become the ruler of the island of Kamran at the same time, although Kamran itself is not part of the colony of Aden. On 11 November 1967 Britain left the island and finally joined the island in 1972AD for the Arab Republic of Yemen ⁽²⁰⁾.

▪ **The Function of Kamran Island and current status:**

As before mentioned, the island was quarantine built by the Ottomans in 1882AD for pilgrims traveling to Mecca from the countries of the Far East and South-East Africa and continued quarantine receives the pilgrims - who number about fifty thousand every year during the British occupation. However, this quarantine stopped after Saudi Arabia built quarantine in the city of Yanbu⁽²¹⁾

On 30th November, 1967AD, Kamran became part of the Democratic Republic of Yemen (South Yemen) upon its

(17) Raafat Ghonaimi Al-Shaimi, Contemporary History of the Arab Islamic Nation, p.182.

(18) Sayed Mustafa Salem, The Red Sea and the Yemeni Islands History and Issue, Dar Al Mithaq Publishing and Distribution, Sana'a, 2006, p.50,106.

(19) Robert D. Burrowes, Historical Dictionary of Yemen historical dictionaries of Asia, Oceania and the middle east, no 072, the scarecrow press, Inc. Langham, Uk, 2nd Edition, 2010, p.213.

(20) <https://www.yemeress.com/algomhoriah/2053520>

(21) Jean-Jacques Perby, the Arabian Peninsula, the Holy Land of Islam, the Homeland of the Arabs and the Petroleum Empire, translated by Mohammed Khair Al-Beqa'i, Obeikan Library, Riyadh, 1st edition, 2002, p.180

independence from Britain. However, the Yemeni Republic of Yemen (North Yemen) seized it in 1972AD. Finally, Kamran became part of the unified Yemen in 1990, and there is a Yemeni military base in it to protect Yemeni coasts and islands. The island is inhabited by about 5,000 people of different nationalities from Yemen, Ethiopia, Somalia and India ⁽²²⁾, most of them engaged in fishing ⁽²³⁾.

Nowadays, Kamran Island is one of the governorates of Al-Hudaydah. Kamran has a beautiful shape of about 12 miles long and a width of just about five miles. It is divided into three population groups; **Kamran city** (the capital of the Directorate), It is located on mid-east of the coast of the island off As-Salif port, and it has the largest population of the island. **Makram Village**; It is the second population group on the island, located to the west of Kamran city in the Mid-west of the island (**Fig 1**). **The village of Yemen**; It is located at the south-east end of the island off Ras Issa Port and away from the capital of the Directorate about 9km ⁽²⁴⁾.



Fig (1)

Makram Village on the Island of Kamaran, Red Sea, 1833, by Rupert Kirk.

Source, Royal Geographical Society, London, UK / bridgemanimages.com

(22) There were many population groups in the cities of the Tihamah coast; one of the reasons for this multiplicity is the proximity of Tihamah from the continent of Africa. Mabrouk Mohammad Al-Dhomari, Castles in Tihamah, Yemen during the period (945-1336AH/1538-1918AD). Archaeological and Architectural Study, Hassan II University of Muhammadiyah, Faculty of Arts and Humanities, Casablanca, 2014, p.27

(23) V. Vaca, 'Kamaran,' Encyclopedia of Islam (II), First published online: 2012, 519.

(24) Salem Saleh Mohammed, Cities we inhabit them and cities inhabit us. The Yemeni Encyclopedia, Vol4 (K-J), Al-Afif Cultural Encyclopedia, Sana'a Yemen, Pp. 24566-2457.

Kamran Island is considered one of the most important nature reserves; it includes an open museum that combines all the elements of the tourist product (environmental and cultural). Unfortunately, the Yemeni island suffers from marginalization, neglect, and lack of tourist investment. It lacks infrastructure and requires safe transport from land to the sea, and tourist structures .
(25)

B. The second Section: Descriptive and Analytical Study of the remaining archaeological installations on Kamran Island.

Kamran Island has a number of archaeological structures dating back to different historical periods and has been renewed more than once. The following is a presentation of the most important kinds and styles of these remaining buildings and architectural styles. **Table (1)**

Monument Name	Foundation date	Type of the Monument	Current situation
1- Kamran citadel	between 575 and 620AD,	Military building	In bad condition.
2-The Great Mosque of Kamran	921AH/1515AD	Religious building	It was renovated several times.
3-Mosque and shrine of the Iraqi	505AH	Religious and funeral building	Still Remaining.
4- Al-Jabbana Mosque	10AH century / 18 AD century	religious building	In bad condition.
5- The palace of the Turkish ruler.	End of 12AH century/18AD century	Civil building	It renovated. and turned into a primary school
6- Kamran	End of 13AH century	Civil	In bad

(25) V. Vaca, 'Kamran,' Encyclopedia of Islam (II), First published online: 2012, P.519

International Airport	/ 19AD century	building	condition.
7-Water Desalination Plant, known as the "Al-Kundasa"⁽²⁶⁾	1895AD	Civil and charitable building	It was renovated by the British in 1934AD.
8- Queen Elizabeth Palace	middle of 14AH century / 20AD century	Civil building	It is used as a military garrison headquarters

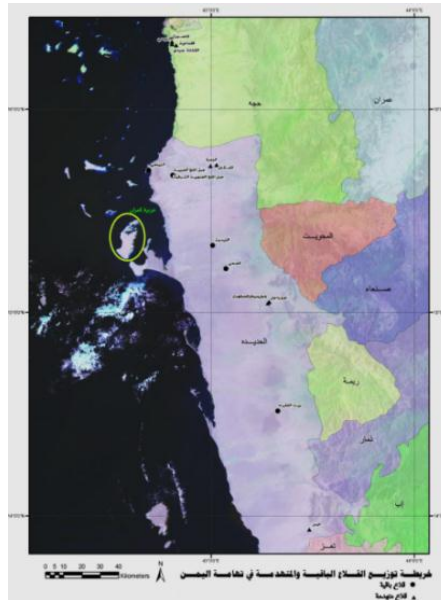
Table (1) Table of most important remaining structures on Kamran Island - the Researcher

First: Military Architecture:

2 - Kamran citadel: This citadel is an important example of coastal castles and fortifications on the coast of Tihamah. The coastal cities and islands have become famous for the necessity of presence the citadel overlooking the sea as a basic element in its architectural monuments such Al-Hudaydah, Al-Lohia, As-Salif, Al-Zydiah, Bayt Al-Faqih, and others. In general, Yemen was famous for the establishment of various citadels and forts and was particularly widespread during the Ottoman period; this is due to the many internal and external wars and conflicts that Yemen has afflicted it. The Red Sea was a permanent threat to Yemen, which has the largest coastal strip with many important islands⁽²⁷⁾. **Map (2)**

(26) Al-Kundasa is a seawater desalination plant and converted it into potable water. The term "Kundasa" is derived from the Latin word for condensate; which meaning water evaporation and condensation. The purpose of this unit was to support the island's freshwater sources. الكنداسة / <https://ar.wikipedia.org/wiki>

(27) Hossam Al-Din Muhsin bin Al-Hussein bin Qasim bin Ahmed bin Qasim bin Mohammed Abu Taleb (died 1170AH/1757AD), The history of Yemen in the era of independence from the Ottoman rule of the first year 1056-1106AH, investigation of Abdullah Al-Habashi, Almufadal lil'awfast printing presses, Sana'a, 1st edition, 1990, Pp.293-293



Map (2)

Sites of the remaining and rundown citadels in the Tihamah, Yemen using the ARC GIS program

Source, Mabrouk Al-Dhomari, citadels in Tihamah Yemen, p.489

Kamran citadel is considered the oldest and most famous landmark dating back to a pre-British occupation. This citadel has great historical and cultural significance; it was considered a protective shield for the island. Also, it reveals to us important aspects of the cultural stages and political situations that have passed through the island through the ages⁽²⁸⁾. **(Fig 2)**



Fig (2)

A general view of Kamran citadel

Source, https://twitter.com/kamran_land

(28) Mohammed Mohsen Al-Miqdad, Yemen between its shores of the Red Sea and the philosophy of the events of history, Dar Al- Alkutub, Yemen, 1st edition, 2015, p.9, 66.

History of the citadel: Many historical sources mention that this citadel dates back to the period of the Persian occupation of the island between the years 575-620AD, therefore it was known as the Persian citadel. Then, it was destroyed several times and was rebuilt in successive periods by Mamluks, Portuguese and Ottomans. The remaining parts are likely to date back to the Ottoman presence on Yemen; due to the big similarity between it and other Ottoman citadels built on the coast of Tihamah.

Architectural description of the citadel: This citadel is similar to the various citadels built along the coast of Tihamah. The importance of Kamran citadel appears in choosing the strategic site on which it was built; where it was built on a sandy hill and overlooks the island from the east side. (Fig 3, 4)

Unfortunately, the citadel is now in a very bad condition and large parts of it were destroyed. The citadel is characterized by features of the old Yemeni architecture also it affected by the style of ottomans fortresses and citadels. It is clear to us through extrapolating the remaining archaeological evidence of the citadel a lot of architectural Features Including the following;



Fig(3)

Kamran citadel before being demolished in 1834 by Rupert Kirk

. **Source,** Royal Geographical Society, London, UK / bridgemanimages.com

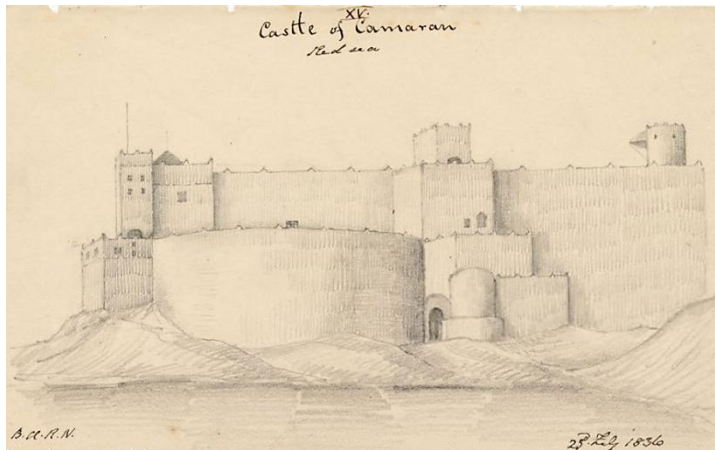


Fig (4)

Kamaran citadel before being demolished in 1834 by Rupert Kirk.

Source, Royal Geographical Society, London, UK / bridgemanimages.com

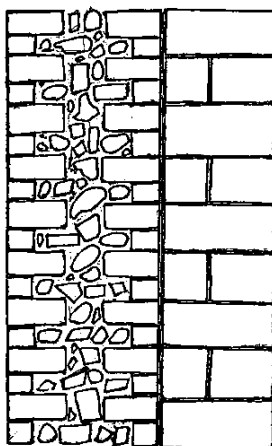
Building materials: Through the remaining foundations of the exterior walls of the citadel, we find the basic building material is limestone; limestone is considered the most common material in the construction of most of the citadels located near the coast due to the availability of this material in the surrounding environment. Also, Redbrick was used in building the upper floors of the citadel. Stucco was used to cover exterior walls and finally Al-Qadhadh⁽²⁹⁾; Yemeni material used much in coating all exterior walls.

The building method used in the citadel is a famous Yemeni method called (**Alzahara and albitana**) (In Arabic: الظهارة والبطانة)⁽³⁰⁾ (**Fig 5**). This method is using of unevenly cut stones in

(29) Al-Qadhadh; it is a famous Yemeni technique. It is a mixture of lime, which Yemeni called it "Noura" and special stucco. They use it to cover the walls of bathrooms, domes, houses and water reservoirs because it is characterized by its strength, durability and its superior ability to prevent water leakage. For more, Muthir Al'iiryanii, Al-Qadad, Yemen Encyclopedia, Volume II, Al-Afif Cultural Foundation, Sana'a, 1992, pp.770-772; Ahmed Mohamed Alhadiry, Art and Engineering of Building of Sana'a, General Authority for Book, Sana'a, first edition, 2006, Pp.109-112.

(30) Alzahara and albitana is a famous structural method used in the Tihamah area; Alzahara is The outer face of the wall, Which the architects were careful to take care of often because it is considered the visible part of the building, and albitana is the inner face of the wall. Mabrouk Mohammed Al-Dhomari, citadels in Tihamah Yemen, p.501.

building the walls; they were arranged in a horizontal form. Builders relied mainly on placing the large stones on both sides of the wall in the form of horizontal courses. And fill the gap between them by the medium-sized stones and small stones and sand or stucco⁽³¹⁾.



Fig(5)

illustration of the building method of Kamaran citadel (Alzahara and Albitana)

Source, Mabrouk Al-Dhomari, citadels in Tihamah Yemen, p.349

The Citadel takes a rectangular shape; it is surrounded by a wall supported by a number of towers and a number of large openings similar to Arrow slites⁽³²⁾ (**Fig 6**); which is suitable for the use of modern weapons developed by Ottomans. Also, numbers of entrances are opened in the outer wall. (**Fig 7**)

(31) Mabrouk Mohammed Yahya Al-Dhomari, citadels in Tihamah Yemen, p.252.

(32) Arrow Slites is an architectural term found in Islamic architecture in military buildings; to help the guards to defend them. Assem Mohamed Rizk: Glossary of Islamic Architecture and Art, Madbouli Library, 1st edition, Cairo, 2000, p.278.



Fig (6)

Distinctive shape of Arrow slits opening in wall of Kamran citadel.

Source, <https://www.youtube.com/watch?v=zKmvGtrB8g>

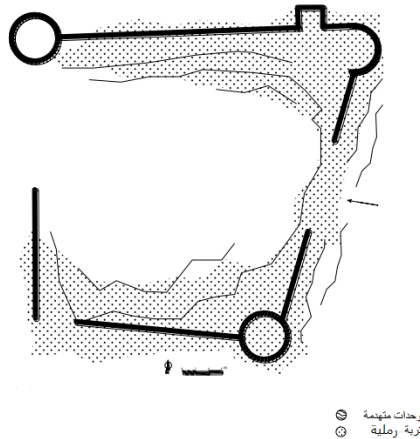


Fig (7)

Drawing for the remaining parts of Kamran citadel; which looks like Hiss citadel

. Source, Mabrouk Mohammed Al-Dhomari, citadels in Tihamah Yemen, p.350.

The main entrance: It is located on the eastern side. It is a type of direct entrances that lead directly to the inside of the structure; this type spread in the Yemeni architecture before Islam. This entrance is a huge portal with a pointed arch and in the middle of it the entrance opening which is also arched by a pointed arch and topped by a rectangular window opening. There are two circular medallions in the spandrel of the arch. It is likely that these medallions were decorated with different decorations. This

Portal resembles the gates of ancient Persian and ottomans citadel. **(Fig 8)**



Fig (8)

The main entrance of the citadel.

Source, <http://wikimapia.org/1803423/Kamaran-Island#/photo/434906>

The main entrance leads to a square Durka covered with a shallow dome; this Durka leads to components of the citadel. **(Fig 9)**



Fig(9)

Entrance Durka of the citadel.

Source, <https://www.youtube.com/watch?v=zKmyvGtrB8g>

The citadel consisted of three floors; it consisted of several separate rooms surrounded by guard posts (In Arabic; Nawbat). The rooms are a square area covered with shallow domes. Also, there are stores for the preservation of grain and food and great well water as well as a long corridor and other architectural units. **(Fig 10)**



Fig(10)

the well water of the citadel.

Source, <https://www.youtube.com/watch?v=zKmvnGtrB8g>

Military events related to Kamran citadel: The citadel witnessed many events and different stages of the conflict throughout the ages. When the Portuguese tried to occupy the island in 1513, they targeted the third and second floors of the citadel and destroyed these two parts. Only one floor was left. They killed her scientist_Mohammed bin Noah with all his staff. The citadel used during the reign of the Zaydi imams used as a permanent prison for those outlaws. Persian swords were found in the ruins of the citadel and are now in the National Museum of Sana'a⁽³³⁾.

The current status of the citadel: Kamran Castle and other archaeological castles in the various Yemeni islands in the Tihamah coast are suffering from destruction and extinction. Unfortunately, there is nothing left of it except the small parts of a tower and entrances⁽³⁴⁾. **(Fig 11)**

(33) Mahayeb Kamali, Yemen's Kamran. Red Sea Cinderella and Pearl Mine, Al Etihad Magazine, Sunday, July 12, 2009, (<http://www.alittihad.ae/details.php?id=22944&y=2009>)

(34) Arik Makro, Yemen and the West Translation and Commentary Hussein bin Abdullah Al-Omari Dar al-Fikr, Damascus, 2nd edition, 1987, https://www.yemen-nic.info/tourism_site/locations/island/kamran.php



Fig 11

remains of Kamaran citadel.

Source, <https://www.youtube.com/watch?v=zKmvnGtrB8g>

Finally, Kamaran citadel is a model of coastal castles, like other many citadels of Tihamah coast in many architectural elements. One of the most similar models of this citadel is HISS citadel which located in the north of Hiss city; this citadel dates either to the period of the Ottoman presence or to the period of rule of the Qasimiyah state of Yemen. It is similar to Kamaran citadel in planning and many architectural details⁽³⁵⁾.

Second: Religious Architecture; the island Includes examples of Religious structures like mosques and mausoleum.

1- The Great Mosque of Kamaran: it considered one of the most important historical and archaeological monuments on the island. It is located near the sea, as it receives visitors coming to the island. (Fig 12, 13)



Fig (12)

location of Kamaran Mosque overlooking the island shore.

Source, https://www.google.com.eg/maps/place/Fkamaran_luoghi_01.jpg

(35) Mabrouk Mohammed Al-Dhomari, citadels in Tihamah Yemen, Pp.242: 359.

Date of the mosque: Many historical sources mention that beginning of its foundation was in 921AH/1515AD, by Hussein Al-Kurdi, commander of the Mamluk campaign on Yemen and reached Kamaran where he built a strong fortress and a cemetery to bury the Dead and Eid prayer (Musalla Al-Eid) and this mosque; In which Hussein Al-Kurdi and his officers prayed Eid Al-Adha⁽³⁶⁾.



Fig(13)

General view of Kamaran Mosque overlooking the island shore.

Source, https://www.google.com.eg/maps/place/Fkamaran_luoghi_01.jpg

The mosque has undergone frequent renovations and expansion; including what was done during the reign of the Zaydi imams. Also, the Island's wealthy merchants renovated the mosque many times; the most famous of these merchants Sayyed muhyi al-Din Nur Ahmed ⁽³⁷⁾. One of the most famous renovations of the mosque made by King Farouk, the former king of Egypt; as when he visited the island in 1948AD. He was impressed with this ancient archaeological complex and ordered by its restoration; he donated a sum of money to expand the mosque from the north side and restore, repair the minaret and multiple

(36) https://www.yemen-nic.info/tourism_site/locations/island/kamran.php, Shihab Mohsen Abbas, Yemen Islands, p.40.

(37) James L. Gelvin, Nile Green, Global Muslims in the Age of Steam and Print, university of California Press, 2014, Pp.69-72.

domes, therefore mosque was known by **(Farouk Mosque)**
(38). **(Fig 14)**



Fig (14)

General view of Kamaran Mosque with its minaret and multiple domes.

Source, <https://www.youtube.com/watch?v=zKmvGtrB8g>

Building materials: The basic building material is limestone, also blocks of Redbrick was used in the construction of some architectural elements like Minerat and domes. The mosque is covered by stucco then by Al-Qadad material in its distinctive white color which added to the mosque Beauty and strength. Therefore, the mosque is also known (the White Mosque). Walls of the mosque from exterior supported by a number of supporting pillars and a number of windows and entrances are opened in the walls of the mosque. The Yemeni character appears clearly in using of local raw materials, and in using some Yemeni architectural elements such as ribbed arches; which used in the decoration of entrance openings and windows.

The architectural style of the mosque: The mosque came similar to the style of mosques and schools of Yemen in the era Rasulids and Tahrids. It consists of two sections; the first is the sanctuary, which is covered by a large central dome and on sides, there are four lower domes in each side. The second section is the courtyard. It is covered due to the nature of the weather on the

island where the extreme heat and Heavy rain in the winter. (Fig 15, 16)



Fig (15)

General view of sanctuary of Kamaran Mosque. **Source,** <https://www.youtube.com/watch?v=zKmvnGtrB8g>

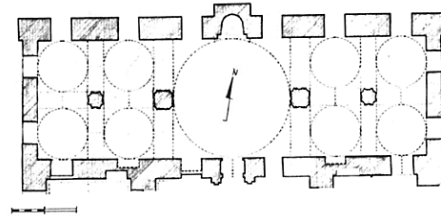


Fig (16)

Illustration of sanctuary of Kamaran Mosque. Researcher

The Minerat: It is located in the eastern side. It consists of a base and octagonal shaft and finally the pavilion which takes shape of a small pointed dome. There is also a wooden balcony for Al- Muezzin. This minaret follows the style of Tihamah and coastal plain Minerats with some simple differences; this style consists of a square base, topped by an octagonal shaft; which may be divided into two parts, such as the Great Mosque in Zabid, 582AH, or the shaft may be short and consists of one part such as the Mosque of Ash'ar in Zabid. Then the body rises only one balcony of the muezzin, the last part of the Minerat is the pavilion (Al-Jawsq); which may be either a ribbed dome or a smooth dome ⁽³⁹⁾. (Fig 17)

(39) For more about Yemen's minarets, see, Ali Said Saif, *Minerats of city of Sana'a until the end of 12 AH century /18AD century*, Editions of the Ministry of Culture and Tourism, Sana'a, 2004, Pp.78-79



Fig(17)

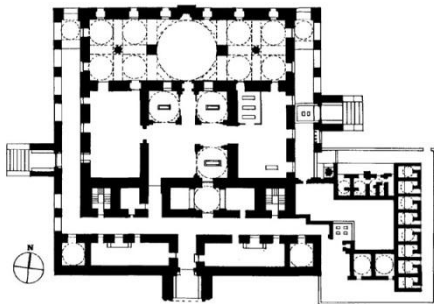
General view of Minerat of Kamaran Mosque.

Source, <https://www.youtube.com/watch?v=zKvmvGtrB8g>

This mosque is characterized by its multiple domes, which have been renovated more than once. The domes have been known as an architectural element in Yemen since early 4AH/10AD; they were used as a means of coverage in various buildings, like religious, civil, or funerary. There are several views about dating of the oldest dome in Yemen; some mentioned that it is the dome covering the tomb of the Imam Hadi Mosque in Şa`da 4AH/10AD, while many see that the dome covering the burial chamber in the mosque of Farwa Bin Musayk is the oldest dome in Yemen and dating (407AH/1016AD). It has been widely used in Yemen especially at Rasulid and Tahirid dynasty. There are many reasons for Use them heavily including; the geographical factor and attempt to overcome the warm environment, by reducing the heat of the atmosphere in the warm places through the movement of air in the dome vacuum. Also, finding a solution to preserve the buildings for extinction due to continuous rainfall in rainy places ⁽⁴⁰⁾.

(40) See more, Abdullah Al-Rashid, The Rasulid Architecture in Yemen, MCS, Faculty of Arts, Department of Archeology and Museums, King Saud University, 1992, Pp. 289-290,

Analysis and compare of the architectural style of the mosque: In fact, the plan of the mosque was similar to the style of the Yemeni schools, which were characterized by a unique style in the planning of sanctuary, which is considered one of the important elements in the planning of Yemeni mosques and schools. So, it has various shapes, including the model of this mosque; its sanctuary is a central dome in the middle covering the Mihrab and four smaller domes covering each side to the right and left of the central dome ⁽⁴¹⁾. The sanctuary of Kamaran mosque is very similar to the sanctuary of Al-Ashrafiyya great madrasa in Ta'iz (626-858AH/1228-1454AD), which dates back to the Rasulid dynasty; which Described in accordance with the school's Waqfiyya (A large dome above the Mihrab stands on four arches and two wings at the east and the west; each wing has four domes) ⁽⁴²⁾. **(Fig 18, 19)**



Fig(18)

Plan of Al-Ashrafiyya madrasa in Ta'iz.

Source,

https://archnet.org/sites/3814/media_contents/373



Fig (19)

General view of Al-

Ashrafiyya madrasa in Ta'iz.

Source,

https://archnet.org/sites/3814/media_contents/373

Abdullah Al-Haddad, Introduction to Islamic Archeology, Dar al-Shawkani, Sana'a, 1st edition, 2003, Pp.110-111.

(41) Mohammed Saif Al-Nasr Abu Al-Fotouh, Yemeni Schools Overview of their Layouts, Al'iiklil magazine, First Issue, Third Year, 1406AH/1985AD, p.104

(42) Ismail Al-Akwa, Islamic schools in Yemen, Sana'a University Press, Sana'a, 1980. P.197-199, Mustafa Abdullah Shiha, Introduction to Islamic architecture and arts in the Yemen Arab Republic, ESCRIN Agency for Press, Cairo, 1987, p.90.

2- Mosque and shrine of the Iraqi (In Arabic: مسجد وضريح العراقي): This mosque is attributed to Sheikh Abu Abdullah bin Mohammed bin Hussein bin Abdawih; he is one of the famous imams of Iraq known for his Piety and asceticism, Learned by Sheikh Abu Ishaq Shirazi in Baghdad. He came to Yemen and settled in the city of Zabid, and then came to the island and built this mosque ⁽⁴³⁾. He has great stature and people and students from all vicinity of the island came to learn on his hands. He had a great trade spent from it on the students. He writes many books like (Al'irshad)⁽⁴⁴⁾ ; it is a book in the fundamentals of jurisprudence. He died in 525AH and buried in the dome attached to this mosque; this dome became one the famous domes in Yemen and Yemeni people are keen in visiting and blessing it. This mosque dates back to beginning of 6 Hijra centuries. **(Fig 20)**

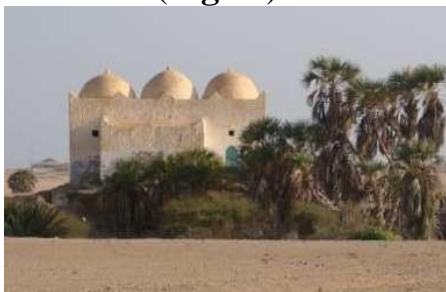


Fig (20)

General view of Mosque and shrine of the Iraqi.

Source, <https://www.youtube.com/watch?v=xkjycg9t7km>

Architectural description of the mosque: The mosque consists of two parts; first is the sanctuary; it is a rectangular area covered with three domes, in the northern side of the sanctuary is an additive rectangular area advanced the Qibla wall; it's the

(43) Sayyed al-Madani, Journey of Ibn Masoum Al-Madani, Pp.62-63, Kamal bin Mohammed Al-Riyami, famous Arab travelers, treasures for publication and distribution, Cairo, 1st edition, 2013, p.102, https://www.yemen-nic.info/tourism_site/locations/island/kamran.php

(44) Sayyed al-Madani, Journey of Ibn Masoum al-Madani, p.59.

mausoleum of the Sheikh. The second part is the courtyard; it is located in the south. The mosque is built with stones and covered by stucco and Al-Qadad. It has no minaret. It is likely that the layout of this mosque was the original plan since its early building; where this plan was common in Yemeni cities during 6-7Hijra centuries, especially in the construction of small Mosques or Zawaya Dedicated to Scientists. People of Kamaran are interested in continuously maintaining and renovation the mosque and the dome ⁽⁴⁵⁾. **(Fig 21)**

The mausoleum: it was built later on to the mosque. It is located on the north side advanced the Qibla wall. It is a rectangular area covered by a flat roof. The mausoleum has a simple stone cenotaph which rises above the grave of Sheikh Iraqi and his son, who is known Abdullah; He was a scientist of science of speech and assets. He died before his father in 523AH, and buried in this dome. This cenotaph was advanced by simple tombstone ⁽⁴⁶⁾. **(Fig 22)**

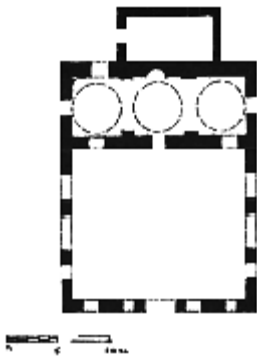


Fig (21)

Illustration plan of Mosque and shrine of the Iraqi. Researcher



Fig(22)

Mausoleum the Iraqi from interior.

Source,

<https://www.youtube.com/watch?v=xkjycg9t7km>

(45) Yusuf bin Ismail al-Nabhani (died in 1350AH), 'Jamie karamat al'awlia', Vol 1, C1, Investigation by Abdel-Wareth Mohamed Ali, Dar Al-Kuttab Al-Alamia, Beirut, p.150.

(46) Sayyed al-Madani, Journey of Ibn Masoum al-Madani, p.59.

Third: civil Architecture; Kamran island contained many historical civil monuments which date back to different historical periods. Most of these domestic structures located to the north-east of the island. (Fig 23) And a lot of them date back to the period of British presence on the island. The most important of these monuments are:



Fig (23)

General view of historical civil monuments in the island. **Source,**
<https://www.youtube.com/watch?v=xkjycg9t7km>

- The palace of the Turkish ruler of the island, which was later, converted into a primary school.
- The palace of the British military governor of the island and a remaining tower standing in front of the courtyard of this palace, as well as remains of lion statues decorating the entrance to this palace. This palace is characterized by its European style and its gabled roof which spread in many building in Aden during British occupation. (Fig 24)



Fig (24)

The palace of the British military governor of the island. **Source,**
<https://www.youtube.com/watch?v=xkjycg9t7km>

- Al-Kundasa; The water desalination plant which was established by Ottomans in 1895AD and rebuilt by the British in 1934AD. This station is very important because the island suffers from the availability of fresh water sources. It functions based on a distillation of fresh water from seawater.

- Also, Island includes a number of bridges and small sidewalks date back to Ottoman and British presence on the island.

- **Palace of Queen Elizabeth II**; It is considered one of the most famous buildings on the island; the story of building this palace begins when Queen Elizabeth II chose Kamaran Island to be one of the places that she visited in Yemen for celebration of her honeymoon; The reason for choosing the island is due to its distinctive site; as it is one of the most beautiful islands that is characterized by all the elements of tourism in terms of tranquility and the beauty of its coral reefs and nature reserves. **(Fig 25, 26)**



Fig 25

Archival picture of the Queen Elizabeth II the show of the guard of honor in Aden **Source,**

http://alamree.net/aden_9_021.htm



Fig 26

The official picture of Queen Elizabeth II and her husband during their visit to Aden. **Source,**

http://alamree.net/aden_9_015.htm

The British community on the island built the palace dedicated to Queen Elizabeth, Which was designed in classical style; on the European style; it came like the basilica style. It was surrounded by huge wall; this wall takes a triangular shape open by the sea and water surrounded it from three sides. **(Fig 27, 28)**



Fig(27)

Site of The palace of Queen Elizabeth II.

Source, <https://www.youtube.com/watch?v=xkjycg9t7km>



Fig (28)

The palace of Queen Elizabeth II.

Source, NIGEL GROOM, The Commissioner's Office, The island of two moons: Kamaran 1954, the British Yemeni society, 2002

The plan of the palace is a rectangular area advanced by a portico consists of one arcade which consists of circular arches depends on huge piers. This portico revolves around the four facades of the palace. **(Fig 29)** The palace consists of two floors. The first floor: is a central hall with a number of rooms. The second floor: consists of several rooms overlooking the sea. The roof of the palace is a gabled roof. This ceiling was used commonly in Europe during the 19-20 Centuries AD.

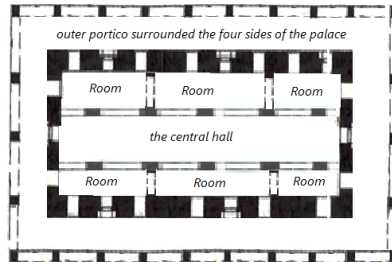


Fig (29)

Illustration plan of The palace of Queen Elizabeth II in Island. Researcher **Style of the palace:** The palace is designed in the style of the new classic style; this style spread in Europe in the second half of the eighteenth century, an antithetical model of the art of Rococo and Baroque. The term classical means the revival of Greek and Roman art mainly, and this style has spread in particular in England in the design of palaces and various structures⁽⁴⁷⁾.

This palace was considered one of the important attractions that attract many tourists and visitors due to its historical value, and Queen Elisabeth was keen to visit the island every year and reside in this palace during her summer vacation⁽⁴⁸⁾.

Kamaran Airport: the remains of the airport located in the north of the Island. This airport was developed by the British during the period of occupation of the island, but they destroyed it when they left the Island. It was considered one of the most important means of transportation to the island. It consisted of two floors. It is unused and his condition is very bad. The outer walls were the only remaining parts, also there is a wooden panel showing the name of the airport and the main destinations which were travel to and from the island⁽⁴⁹⁾. **(Fig 30, 31)**

(47) Nemat Ismail Allam, Western art in modern times, Dar Al Ma'arif, Cairo, 1st edition, 1983, p.21-22.

(48) Jabber Saber, The Yemeni Island in which Queen Elizabeth spent her honeymoon, Marib Press, Yemen, March 2, 2010, http://marebpress.net/news_details.php?sid=22828

(49) <http://marebpress.net/articles.php?id=6639>



Fig(30)

Remains of Kamran Airport after its destruction. **Source,**

<http://marebpress.net/articles.php?id=6639>



Fig(31)

An archival image of Kamran Airport. **Source,**

<http://marebpress.net/articles.php?id=6639>

Conclusion and Results: Kamran Island played a very important role in the history of Yemen; it has great political, strategic, and economic and tourist importance. This paper deals with the remaining archeological structures on the island during the Islamic era using a large number of archival images and maps. The researcher studied Kamran citadel and described it and attributed the remaining part of it to the Ottoman era. Also, the researcher studied the Great Mosque of Kamran and described it and analyzed its architectural style and compared it with other examples. The researcher studied various architectural styles of some of the remaining structures in the island which characterized by a variety of its styles; Islamic and European; some are designed on European architecture models that came with the British occupation of the island and other the local Yemeni models, it has maintained the local Yemeni character and identity. Unfortunately, Island and its structures suffer today from the severe neglect and lack of services and destruction of many of its archaeological structures. The researcher recommends more attention to the island and its structures by the Yemeni authorities.

References:

- Abdullah Al-Haddad, Introduction to Islamic Archeology, Dar al-Shawkani, Sana'a, 1st edition, 2003.
- Abdullah Al-Rashid, The Rasulid Architecture in Yemen, MSc, Faculty of Arts, Department of Archeology and Museums, King Saud University, 1992.
- Abo Mohammed Al-Hassan bin Ahmed Al-Hamdāni, description of the Arabian Peninsula, investigation of Muhammad ibn Ali al-Akwa al-Hawali, the Guidance Library, Sana'a, 1st edition, 1990.
- Ahmed Mohamed alhadiry, Art and Engineering of Building of Sana'a, General Authority for Book, Sana'a, 1st edition, 2006.
- Ali Said Saif, Minerats of city of Sana'a until the end of 12th century AH/18th century AD, Editions of the Ministry of Culture and Tourism, Sana'a, 2004.
- Al-Yamāmah, Issues 2114-2122, Al-Mamlakah Al-‘Arabīyah Al-Sa‘ūdīyah, Mu’assasat Al-Yamāmah Al-Şaĥafīyah, 2010.
- Arik Makro, Yemen and the West Translation and Commentary Hussein bin Abdullah Al - Omari Dar Al – Fikr, Damascus, 2nd edition, 1987.
- Assem Mohamed Rizk, Glossary of Islamic Architecture and Art, Madbouli Library, 1st edition, Cairo, 2000.
- Hossam Al-Din Muhsin bin Al-Hussein bin Qasim bin Ahmed bin Qasim bin Mohammed Abu Taleb (died 1170AH/1757AD), The history of Yemen in the era of independence from the Ottoman rule of the first year 1056-1106AH, investigation of Abdullah Al-Habashi, Almuḥadall lil’awfast printing presses, Sana'a, 1st edition, 1990.
- Ismail Al-Akwa, Yemeni Countries at Yakut Al-Hamwi, Al-Resalah Foundation Beirut, New Generation Library in Sana'a.
- Ismail Al-Akwa, Islamic Schools in Yemen, Sana'a University Press, Sana'a, 1980.
- Jabber Saber, The Yemeni Island in which Queen Elizabeth spent her honeymoon, Marib Press, Yemen, March 2, 2010.
- James L. Gelvin, Nile green, Global Muslims in the Age of Steam and Print, university of California press, 2014.
- Jean-Jacques Perby, The Arabian Peninsula, the Holy Land of Islam, the Homeland of the Arabs and the Petroleum Empire, translated by Mohammed Khair Al-Beqa'i, Obeikan Library, Riyadh, 1st edition, 2002.
- J.E. Peterson, The Islands of Arabia: Their Recent History and Strategic Importance, Arabian studies, university of Cambridge, 1985.
- John Baldry, the Ottoman Quarantine Station on Kamaran Island: 1882-1914, Inst. of History of Medicine and Medical Research, 1978.
- Kamal bin Mohammed al-Riyami, famous Arab travelers, treasures for publication and distribution, Cairo, 1st edition, 2013.

- Mabrouk Mohammad Yahya Al-Dhomari, Castles in Tihamah, Yemen during the period (945-1336AH/1538-1918AD), Archaeological and Architectural Study, Hassan II University of Muhammadiyah, Faculty of Arts and Humanities, Casablanca, 2014.
- Mahayeb Kamali, Yemen's Kamran. Red Sea Cinderella and Pearl Mine, Al Etihad Magazine, Sunday, July 12, 2009,
- Mohammed Ali Al-Arousi, Al- Hudaydah, The Yemeni Encyclopedia, Volume II, Al-Afif Cultural Foundation, Sana'a, 1st edition, 1992.
- Mohammed bin Saied Abdul Wadood, Abstract in history of the city of Al-Lohia, Al-Rehab Foundation, Sana'a, 2010.
- Mohammed Mohsen al-Miqdad, Yemen between its shores of the Red Sea and the philosophy of the events of history, Dar Al- Alkutub, Yemen, 1st edition, 2015.
- Mohammed Saif Al-Nasr Abu Al-Fotouh, Yemeni Schools Overview of their Layouts, Al'iiklil magazine, First Issue, Third Year, 1406AH /1985AD.
- Mustafa Abdullah Shiha, Introduction to Islamic architecture and arts in the Yemen Arab Republic, ESCRIN agency for press, Cairo, 1987.
- Muthir Al'iiryani, Al-Qadad, Yemen Encyclopedia, Volume II, Al-Afif Cultural Foundation, Sana'a, first edition, 1992.
- Nemat Ismail Allam, Western art in modern times, Dar Al Ma'arif, Cairo, 1st edition, 1983.
- Nigel Groom, The Island of two moons: Kamaran 1954, the British Yemeni society, 2002.
- Raafat Ghonaimi Sheikh, Contemporary History of the Arab Islamic Nation 1412-1992, Dar Al-Thaqafah for Publishing and Distribution, Cairo, 1st edition, 1992.
- Robert D. Burrowes, Historical Dictionary of Yemen historical dictionaries of Asia, Oceania and the Middle East, no 072, the scarecrow press, Inc. Langham, UK, 2nd Edition, 2010.
- Ruth Lapidoth-Eschelbacher, the red sea and the Gulf of Aden, Martinus Nijhoff publishers, London, 1982.
- Salem Saleh Mohammed, Cities we inhabit them and cities inhabit us, the Arab Press Agency, Egypt, 2018.
- Sami bin Abdullah bin Ahmed Almgloth, Atlas of the history of the Mamluk era, Obeikan Library, Riyadh, 1st edition, 2013.
- Sayyed Ali Sadr al-Din al-Madani, Journey of Ibn Masoum al-Madani or Salwat Al Gharib wa'aswat al'arib, investigation by Shaker Hadi Shukr, The Arabic Encyclopedia of Encyclopedias, Beirut, 1st edition, 2006.
- Sayed Mustafa Salem, the Red Sea and the Yemeni Islands History and Issue, Dar Al Mithaq Publishing and Distribution, Sana'a, 2006.
- Shihab Mohsen Abbas, Yemen Islands, Abadi Center for Studies and Publishing, Sana'a, 1st edition, 1996

- V. Vaca, Kamaran, Encyclopedia of Islam (II), first published online: 2012.
- Yaqoot Hamwi, Dictionary of countries, Vol2, Dar Sader, Beirut, 2nd Edition, 1995.
- Yusuf bin Ismail al-Nabhani (died in 1350AH), Jamie karamat al'awlia', Vol 1, Investigation by Abdel-Wareth Mohamed Ali, Dar al-Kuttab Al-Alamia, Beirut

Internet websites:

- <https://www.britannica.com/place/Kamaran>
- <http://al-bab.com/albab-orig/albab/bys/articles/groom02.htm>
- <http://marebpress.net/articles.php?id=6639>
- <https://www.yemeress.com/algomhoriah/2053520>
- <https://ar.wikipedia.org/wiki/الكنداسمة>
- <http://www.alittihad.ae/details.php?id=22944&y=2009>
- https://www.yemennic.info/tourism_site/locations/island/kamran.php
- <http://wikimapia.org/1803423/Kamaran-Island>
- https://www.yemennic.info/tourism_site/locations/island/kamran.php,
- https://www.yemennic.info/tourism_site/locations/island/kamran.php
- <https://www.youtube.com/watch?v=xkjycg9t7km>
- https://archnet.org/sites/3814/media_contents/373
- https://www.google.com.eg/maps/place/Fkamaran_luoghi
- <https://www.ye1.org/forum/threads/278528/>
- https://www.marefa.org/images/e/ec/Kamaran_Island_NASA.jpg
- https://twitter.com/kamaran_land
- <http://republicanyemen.com/archives/2172>
- <https://www.facebook.com/king.farouk.faroukmisr/posts/141191385557658>
- Royal Geographical Society, London, UK/bridgemanimages.com

جزيرة كَمَران اليمنية خلال العصر الإسلامي دراسة آثارية حضارية

د/ محمد أحمد عبد الرحمن

المخلص:

تُعتبر جزيرة كَمَران من أهم وأكبر الجزر اليمنية على البحر الأحمر وخليج عدن؛ نظراً لموقعها المتميز فهي تُشرف على أهم الممرات البحرية في العالم والتي تصل الشرق بالغرب، وهي واحدة من إحدى أهم المحميات الطبيعية فهي لؤلؤة جزر البحر الأحمر، وكانت كَمَرانَ كانت محط أنظار الغزاة وقبلة أطماعهم باليمن منذ عصر الفرس عام ٥١٥م.

وتشتمل الجزيرة على عدد متنوع من المعالم الأثرية الدينية والحربية والمدنية التي تُرجع لعصور تاريخية مختلفة ومن أهم المنشآت المتبقية بها قلعة كَمَرانَ الفارسية والجامع الكبير وجامع الجبانة وغيرها من المنشآت.

ويتناول الباحث في هذا البحث تاريخ هذه الجزيرة وأهم الفترات التاريخية التي مرت بها والدور التاريخي والحضاري لهذه الجزيرة، ودراسة وصفية للمنشآت المعمارية المتبقية بها وتحليل الطرز المعمارية والفنية لهذه المنشآت.

كلمات افتتاحية:

كمران ؛ اليمن؛ الحُدَيْدة؛ قصر الملكة إليزابيث؛ جامع العراقي؛ البحر الأحمر.

The Contribution of the Domesticated Camel and Advanced Irrigation Techniques (the Horizontal Well/Falaj System) to the Iron Age Economy and Settlement Patterns of the Oman Peninsula and Arabia.

• **Noha Kamel Moussa**

Abstract:

Iron Age II is considered the classical period of the Iron Age (figure: 2⁽¹⁾). This period shows sudden increase in distribution and diversification in settlement pattern, in South-eastern Arabia⁽²⁾. The settlements during this period expanded to include inland⁽³⁾, mountains⁽⁴⁾ and coastal sites⁽⁵⁾. Settlements became more diverse to include non-residential architecture. An appearance of irrigation technology (*Falaj*) along with camel domestication coincides with this increase. This increase was accompanied by

• MA Archaeology of Arab and Islamic World, University College London, Qatar.
n.moussa@ucl.ac.uk

Acknowledgment: My deep appreciation to Professor Robert Carter, Professor of Near Eastern Archaeology, UCL for reviewing the content and to Iman Khamis for her help in editing.

⁽¹⁾ MAGEE, P. Beyond the Desert and the Sown: Settlement Intensification in Late Prehistoric South-eastern Arabia. *Bulletin of the Late Prehistoric Southeastern Arabia*. 2007, p.85

⁽²⁾ MAGEE, P. Settlement patterns, polities and regional complexity in the southeast Arabian Iron Age Paléorient 24. PERSEE Program: 1998b, p.49

⁽³⁾ HERRMANN, J.T., J. CASANA. & H.S. QANDIL. A sequence of inland desert settlement in the Oman peninsula: 2008-2009 excavations at Saruq al-hadid, Dubai, UAE *Arabian Archaeology and Epigraphy* 23. Wiley-Blackwell: 2012, p.50–69.

⁽⁴⁾ Haser in AVANZINI, A. (ed.) *Eastern Arabia in the First Millennium BC*. Italy: 'L'Erma' di Bretschneider. 2010, p.162

⁽⁵⁾ MOUTON, M. & J. SCHIETTECATTE. *In the Desert Margins: The Settlement Process in an Ancient South and East Arabia*. Italy: 'L'Erma' di Bretschneider. 2014

regional ⁽⁶⁾(between the varied types of settlements) and trans-regional contact (with south Arabia) and goods exchange^{(7) (8) (9)}. The layout, the location, the structure and the material culture excavated from this period reflects a complex community ⁽¹⁰⁾ ⁽¹¹⁾. This manifested in the appearance of a belief system related to both irrigation and bronze production (the snake cult) ⁽¹²⁾, specialized labour in pottery ⁽¹³⁾, metal production ^{(14) (15)} and administration systems ⁽¹⁶⁾, fortification structures related to the agriculture activity ⁽¹⁷⁾, symbolic (axe heads on the stamp seals) and prestigious goods for elites ⁽¹⁸⁾.

This paper argues that irrigation technology was responsible for creating a social elite class. This class was responsible for cyclic production, the expansion and the diversification of settlement patterns using the domestication of the camel.

⁽⁶⁾ BENOIST, A. & S. MÉRY. Initial results from the programme of petrographic analysis of Iron Age pottery from the United Arab Emirates *Arabian Archaeology and Epigraphy* 23. Wiley-Blackwell: 70–91.2012, p.88

⁽⁷⁾ MAGEE, P. The impact of southeast Arabian intra-regional trade on settlement location and organization during the Iron Age II period *Arabian Archaeology and Epigraphy* 15. Wiley-Blackwell: 24–42. 2004

⁽⁸⁾ MAGEE, P. The production, distribution and function of Iron Age bridge-spouted vessels in Iran and Arabia: Results from recent excavations and geochemical analysis *Iran* 43. JSTOR. 2005, p.93

⁽⁹⁾ Magee.2007

⁽¹⁰⁾ MAGEE, P. & E. THOMPSON. 2001. Excavations at Muweilah 1997-2000 *Proceedings of the Seminar for Arabian Studies* 31. Archaeopress: 115–30. <http://www.jstor.org/stable/41223675> 2001, p.129

⁽¹¹⁾ Magee.1998b, p.54

⁽¹²⁾ BENOIST, A. An iron age II snake cult in the Oman peninsula: Evidence from Bithnah (Emirate of Fujairah) *Arabian Archaeology and Epigraphy* 18. Wiley-Blackwell: 34–54.2007, p.50

⁽¹³⁾ Benoist & Méry. 2012, p.88

⁽¹⁴⁾ MAGEE, P. New Evidence of the Initial Appearance of Iron in Southeastern Arabia *Arabian Archaeology and Epigraphy* 9. Wiley-Blackwell.1998a, p.114

⁽¹⁵⁾ Nashef in AVANZINI, A. (ed.) 2010. *Eastern Arabia in the First Millennium BC*. Italy: ‘L’Erma’ di Bretschneider.2010, p.215

⁽¹⁶⁾ Al- TIKRITI, W. in A. Avanzini (ed.) *Eastern Arabia in the First Millennium BC*. Italy: ‘L’Erma’ di Bretschneider. 2010, p.240

⁽¹⁷⁾ Magee. 2014, p.237

⁽¹⁸⁾ Magee. 1998b, p.56

Key words: Iron Age II; Settlements Pattern; Irrigation Technology; *Falaj*; Domesticated Camel; Economy.

The Iron Age is divided into three sub periods based on ceramic evidence from Tell Abraç: I (1200–1000 BC), II (1000-600 BC) and III (600-300BC)⁽¹⁹⁾

Table 1: Brief description of the settlement patterns and economy of Iron Age I and III:

	Iron Age I (1300-1000BC)	Iron Age III (600-300 BC)
Settlement Patterns	Known sites are Shimal, Tell Abraç, al- Hamriyah and possibly Kalba; on the Gulf coast, and the East Coast (Fig. 1 ⁽²⁰⁾) ⁽²¹⁾ .	One-third reduction in number of sites when compared with Iron Age II. Known sites are Tell Abraç, Shimal, Rumeilah, Hili17, Hili 2, Nud Ziba, al-Thuqaibah, graves in the Wadi al-Qawr and Dibba oasis ⁽²²⁾ .
Economy	a) Dependency of the inhabitants on fish and shellfish ⁽²³⁾ . b) Metrical and technological analysis suggest that pottery was produced on a part-time or occasional basis with non-	Little is known about Iron Age III. However, excavations in Thuqaibah shows that the economy consisted of agriculture, stock breeding and goods exchange with the

⁽¹⁹⁾ Magee. 2001, p.115

⁽²⁰⁾ Magee. 1998b, p.51

⁽²¹⁾ POTTS, D.T. Before the Emirates: an Archaeological and Historical Account of Developments in the Region c. 5000 BC to 676 AD, in P. Vine, P. Hellyer, I. Al-Abed, & I.A. Abed (ed.) *The United Arab Emirates: A New Perspective*. United Kingdom: Trident Press.2001, p.50

⁽²²⁾ Potts. 2001, p.50

⁽²³⁾ POTTS, D.T. *The Arabian Gulf in Antiquity: Volume I: From Prehistory to the fall of the Achaemenid Empire (Arabian Gulf in Antiquity)*. New York: Oxford University Press, USA.1990, p.103-109

	specialized labor, and that the main reason for production was to satisfy domestic needs ⁽²⁴⁾ .	coast ⁽²⁵⁾ .
Cause of decline in Number of sites and Economy.	May be due to: a) Drought conditions that impacted water resources, b) The decline of maritime trade which might have been caused by the Mesopotamian replacement of Omani copper production with that from Anatolia, c) The political instability in the Indus Valley during Aryan invasion which led scholars to speculate that this may have caused further disruption, through a cultural effect, in south-eastern Arabia ^{(26) (27)} .	May be due to: a) The limitation of archaeological surveys in some regions versus the intensive explorations of others restrict the knowledge about this period ⁽²⁸⁾ . b) The collapse of the Iron Age II Irrigation technology ^{(29) (30)}

⁽²⁴⁾ Magee. 2005, p.51

⁽²⁵⁾ DELCERRO, C. Accessed November 11. <http://www.anthropology.uw.edu.pl/07/bne-07-02.pdf>. 2015, p.23

⁽²⁶⁾ Brunswig in Potts.1990, p.29

⁽²⁷⁾ CARTER, R. The Wadi Suq period in south-east Arabia: a reappraisal in the light of excavations at Kalba, UAE *Proceedings of the Seminar for Arabian Studies* 27. Archaeopress: 87–98. <http://www.jstor.org/stable/41223590>. 1997, p.95-7

⁽²⁸⁾ Mouton & Schiettecatte. 2014, p.45

⁽²⁹⁾ Al-Tikriti. 2010, p.240

⁽³⁰⁾ Mouton & Schiettecatte. 2014, p.45

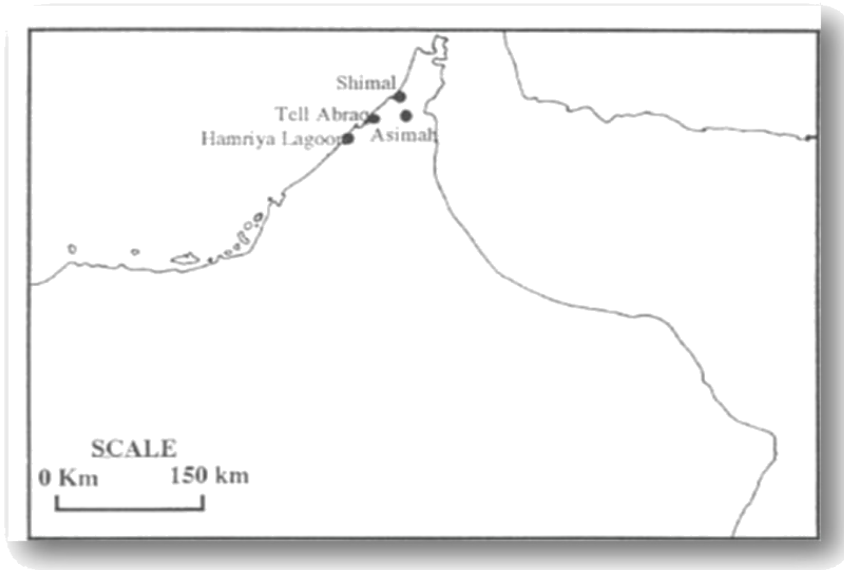


Figure (1)
Iron Age I sites.
The Iron Age II settlement pattern associated to *Falaj*

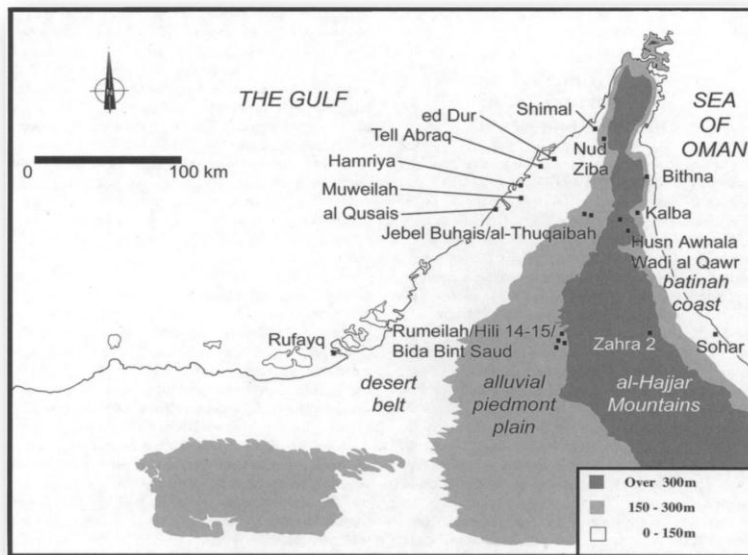


Figure (2)
Map shows Iron Age II sites in different environmental zones.

Excavations and surveys in al-Madam Region and Central Oman show relation between an irrigation technology (*Falaj*) and Iron Age II settlements. For example, Magee⁽³¹⁾ attributes two *Aflaj* (*Falaj plural*) to al-Thuqaibah, Tawi al-Hosun and Umm Sufah settlements. While the five Iron Age II settlements in the al-Ain region Hili 2, Hili 14, Hili 17, Rumeilah and Bint Saud survived on the western drainage area and alluvial plain of the mountains. Hili, Hili 2 and Rumeilah were founded beside the *Falaj* of Hili 15.

The same relation between settlements and *Falaj* technology in central Oman also existed. In the Wadi Bani 'Umar, there are three Iron Age II settlements: Zahra 2, al-Qarn al-Mu'allaq and a site referred to as (Point A'32) beside the remains of a *Falaj* located near al-Qarn al-Mu'allaq. Another settlement in Wadi Samad (Maysar) was located alongside a *Falaj* system. (Figure 3⁽³²⁾)

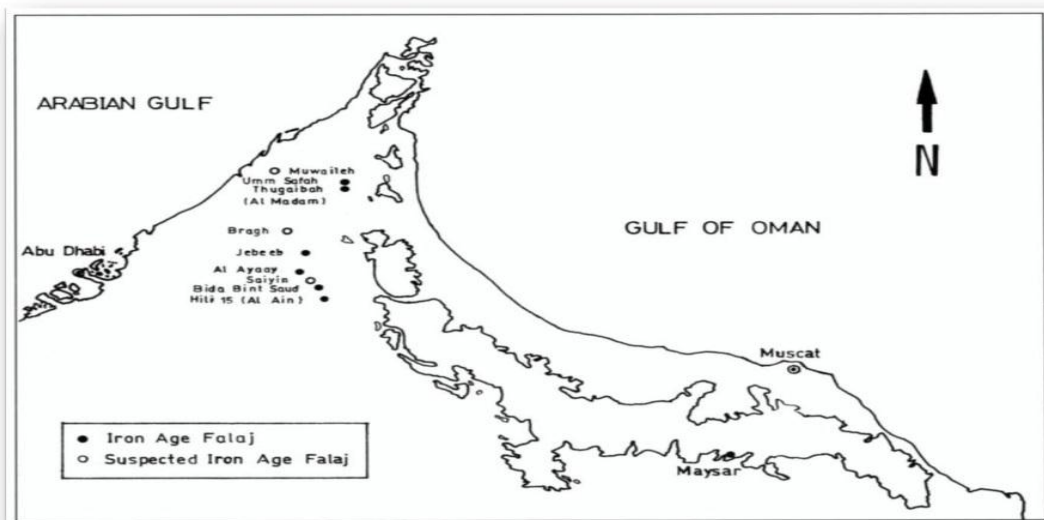


Figure (3)
Map shows the distribution of the Iron Age *Falaj*.

⁽³¹⁾ Magee. 1998b, p. 54

⁽³²⁾ Al-TIKRITI, W. The south-east Arabian origin of the *falaj* system Proceedings of the Seminar for Arabian Studies 32. Archaeopress Publishing:117–38.

<http://www.jstor.org/stable/41223728>. 2002, p.119

What is Iron Age irrigation technology?

Three reasons -along with camel domestication- have lead scholars to conclude that an irrigation technology was responsible for the increase, distribution and diversification of the settlement patterns.

- 1- The recovery of a *Falaj* beside Iron age II settlements.
- 2- The continuous aridity of the weather during Iron Age II⁽³³⁾.
- 3- Archaeobotanical evidence from Salut in central Oman provided evidence for cultivation of wheat, date palms, sesame and basil⁽³⁴⁾. The recovery of grinding equipment and agricultural tools suggest cereal cultivation was practiced⁽³⁵⁾.

Other scholars highlight camels' role in the growth of settlements because:

- 1-That camel domestication (900-800 BC) coincided with Muweilah occupation (850 BC), indicate that camels were one of the main reasons of Muweilah site existence⁽³⁶⁾;
- 2-The faunal and archaeobotanical analysis suggests goods exchange between inland agricultural settlements and coastal settlements⁽³⁷⁾.

Scholars debate over the type of irrigation technology. Al-Tikriti⁽³⁸⁾ and Magee⁽³⁹⁾ argue that *Falaj* is the Iron Age II irrigation technology. They built their argument on the following facts;

⁽³³⁾ Parker et al. in CHARBONNIER, J. Groundwater management in Southeast Arabia from the Bronze Age to the Iron Age: a critical reassessment *Water History* 7. Springer Science + Business Media: 39–71. 2015, p.50

⁽³⁴⁾ Bellini et al. in Magee. 2014, p.215

⁽³⁵⁾ Magee. 1998b, p.53

⁽³⁶⁾ MAGEE, P. Writing in the Iron Age: The earliest south Arabian inscription from southeastern Arabia *Arabian Archaeology and Epigraphy* 10. Wiley-Blackwell: 43–50.1999, p.47

⁽³⁷⁾ MAGEE, P. *The archaeology of prehistoric Arabia: Adaptation and social formation from the Neolithic to the Iron Age*. Cambridge: Cambridge University Press.2014, p.226

⁽³⁸⁾ Al-Tikriti. 2010, p.228

⁽³⁹⁾ Magee. 1998, p.53

1-*Falaj* is located alongside Iron Age II settlements such as: *Falaj* of Hili 15, which was found beside the Hili17 settlement, and a fortified structure named Hili 14;

2-Iron Age II pottery was found within the *Aflaj*.

However, Charbonnier ⁽⁴⁰⁾ who agrees with al-Tikriti on the inevitability of the presence of hydraulic structure, doubts the dating of the *Falaj* irrigation technology because:

1-The dating of the *Falaj* depended on its location beside Iron Age II settlements;

2-Is not stratigraphically related to the near Iron Age building as in the case of Hili 15;

3-The presence of Iron Age pottery within the *Falaj* may mean that these *Aflaj* cut through an Iron Age site. This means that some *Aflaj* do not necessarily date back to the Iron Age especially as some sites were repeatedly occupied during Islamic period leaving the dating of the *Falaj* questionable between Iron Age and Islamic period such as Umm Safah.

Mouton & Schiettecatte ⁽⁴¹⁾ prove that the underground water gallery (*Falaj*) of Am21 and the Iron Age settlement in Um Safah are related based on the evidence below:

1-The remoteness of the *Falaj* means that the pottery could not have been material scattered from the inhabited areas;

2-The excellent preservation of the pottery and “stratigraphic position inside the undisturbed waste dump”;

3-The remains of unintentionally buried snake during the digging of the channel.

All confirm the direct relationship between the *Falaj* and the Iron Age II sites.

Though Mouton & Schiettecatte ⁽⁴²⁾ agree with al- Tikriti on the relation between the Iron Age II sites and the irrigation

⁽⁴⁰⁾ Charbonnier. 2015, p.50

⁽⁴¹⁾ Mouton & Schiettecatte. 2014, p.38

⁽⁴²⁾ Mouton & Schiettecatte. 2014, p.38

technology, they disagree on the technology type and believe they are underground water galleries.

Boucharlat describes *Falaj* or *Qanat* technology as it taps into the deep aquifers of the ground water through a vertical tunnel called a Mother well, it has a series of vertical shafts for maintenance and a horizontal sloping channel that transports the underground water to lower-lying areas for cultivation (figure 4⁽⁴³⁾) ⁽⁴⁴⁾. On the other hand, the underground water galleries follow the same process, though the shaft does not tap the aquifer deeply and depends on collecting the rainfall in the main shaft, then directs collected water in the same way to the lower-laying areas.

Given this debate it can be concluded that, the Iron Age irrigation technology is *Falaj*, because Iron Age II suffered climate deterioration during. So it is hard to believe that irrigation technology depended mainly on the rainfall, rather than tapping the aquifers.

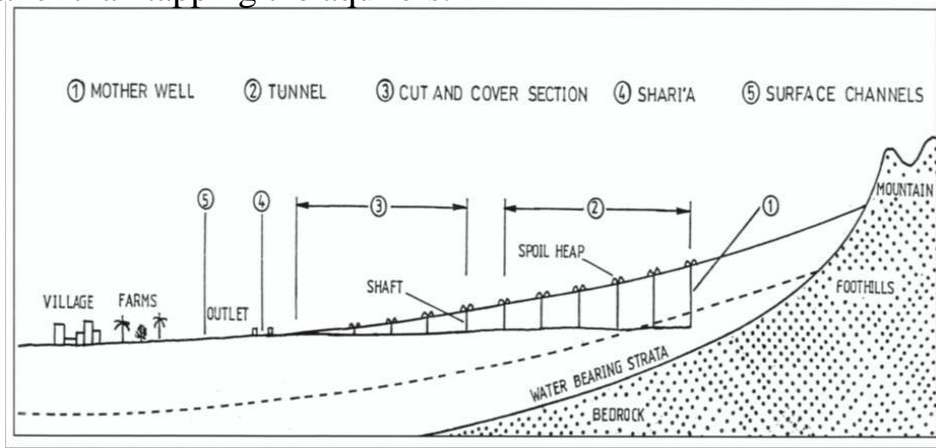


Figure (4)

Standard *Falaj*

How an irrigation system could theoretically impact the diversity and distribution of settlement patterns?

⁽⁴³⁾ Al-Tikriti. 2002, p.118

⁽⁴⁴⁾ Charponnier. 2015, p.40

Lees ⁽⁴⁵⁾ illustrates that irrigation plays a direct role in creating wealth and power. The wealth and power stems from those who control the critical resources on which agriculture depends, managing human collaboration of sharing water and the tasks of constructing and maintaining water conveying facilities. In addition, the management of water resources often requires technical expertise that is limited to only a few. So the power remains for those who control the water access and the knowledge of the technology. This class usually becomes the elite of any society.

Gamble explains the importance of elites in motivating agricultural production surplus, bringing potential surplus into life and creating social stability, because the success of managing the surplus ensures the wealth continuity ⁽⁴⁶⁾.

Blanton et al. ⁽⁴⁷⁾ explain that surplus very often entails complexity. They define complexity as “the extent to which there is functional differentiation among societal units, dividing such units horizontally” (e.g. specialization of production) and “vertically” (e.g. ranking, stratification). In this context surplus causes a division in labour (specialization), presence of a hierarchy, and a belief system that create communal solidarity.

Diaz-Andreu claims that identifying complexity in archaeology relies on the existence of fortified settlements, hierocracy between settlements, the unequal distribution of luxury objects and specialized production ⁽⁴⁸⁾. This means that settlement patterns explains the communal complexity.

⁽⁴⁵⁾ LEES, S. Irrigation and society, *Journal of Archaeological Research* 2. Springer Science + Business Media: 361-78. 1994, p.362

⁽⁴⁶⁾ CHAPMAN, R. & C. ROBERT. *Archaeologies of complexity*. New York: Taylor & Francis.2003, p.166

⁽⁴⁷⁾ Blanton et al.1981, p.21in Chapman & Robert. 2003, p.165

⁽⁴⁸⁾ Chapman & Robert. 2003, p.165

The impact of *Falaj* on settlement patterns:

The layout of settlements dramatically changed from Bronze Age. The circular stronghold buildings of the Bronze Age, were replaced by open villages comprised of separate units of multi roomed houses (figure 5⁽⁴⁹⁾).

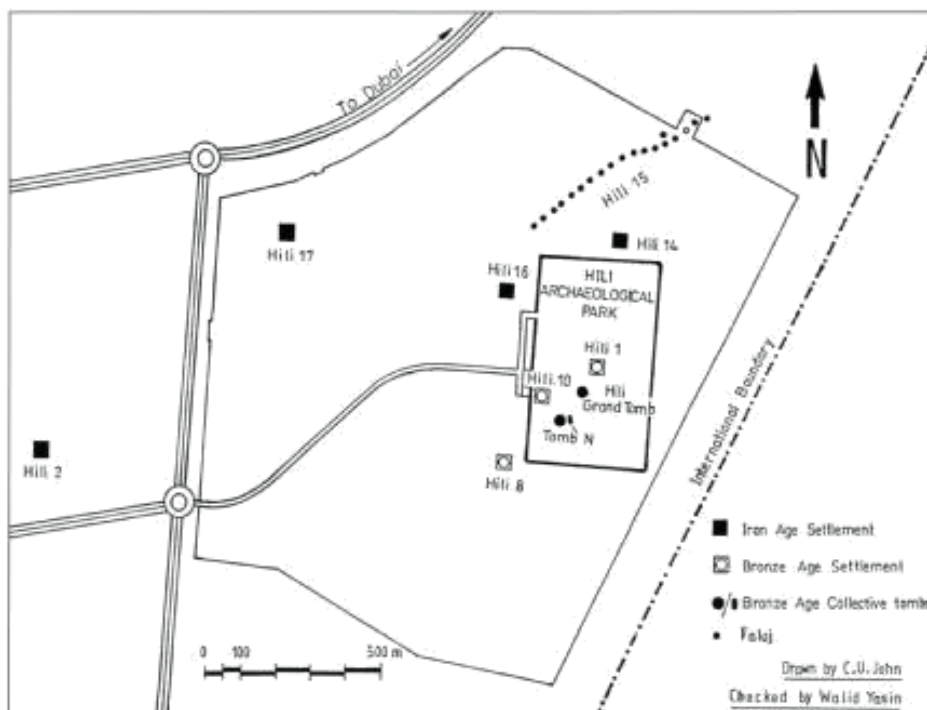


Figure (5)

Map shows differences between Bronze Age and Iron Age settlement pattern at Hili.

In Bronze Age the fortified buildings were built around wells as in the Hili settlements, such as site 1 (called site 1066, Hili 82 and Hili 103. and Bidya in FujairaW, at Tell Abra q and Kelba). While after the introduction of the *Falaj* the settlement patterns changed and became open villages, especially those located in

⁽⁴⁹⁾ Al-Tikriti. 2002, p.121

the oases where a *Falaj* were in operation. This became the main architectural character of the Iron Age ⁽⁵⁰⁾.

Also, *Falaj* had an impact on the direction and shape of Iron Age settlement patterns. The availability of underground water was the determinant for constructing the *Falaj*. This resulted in settlements following the availability of the underground water resources.

For example, due to the decline of the underground water in Hili oasis, settlements extended west where the underground water was available, rather than concentrating around the Bronze Age sites of Jebel Huglah. Also, the shape of linear settlements from Hili in the south to Dubai and Qusais in the north was influenced by the availability of water pockets and underground water near the mountains.

In addition to the inland distribution, *Falaj* might have played a role in the coastal distribution of sites. Coastal sites exchanged goods with the inland sites. These communities were exchanging fish, shells and sea products with the agriculture products of the inland settlements. This means that inland settlements that were constructed beside the *Falaj* played an important economic role for the coastal settlements. So the location of the coastal sites were concentrated as near as possible to the inland settlements. This may explain the decline in number of coastal sites in the western province of Abu Dhabi compared to the northern province where the distance between al-Madam and the sea was only 50 km in the north compare to 130 km between Al-Ain and Abu Dhabi in the west ⁽⁵¹⁾.

The impact of Falaj on Non-residential architecture:

The Iron Age II witnessed the construction of non-residential fortified structures often built of stone or mudbrick. Stone strongholds can be found in the mountain as in, Jebel Buhais,

⁽⁵⁰⁾ Al-TIKRITI, W. *Archaeology of the Falaj: a field study of the ancient irrigation systems of the United Arab Emirates*. 1st ed. Abu Dhabi: Department of Historic Environment, Abu Dhabi Culture & Heritage.2011, p.150

⁽⁵¹⁾ Al- Tikriti. 2010, p.239

Husn Madhab and Lizq⁽⁵²⁾. They probably defended the *Falaj* and the agriculture area around it⁽⁵³⁾. Large mudbrick fortified buildings occur around the *Falaj* on the alluvial plain. For example, building in Bida Bent Saud has a columned hall, measuring 10 x 13 meters length. This hall has a staircase leading to a narrow room which opens onto the *Falaj* itself. The purpose of this building may be to administrate and control water distribution (figure 6⁽⁵⁴⁾).

Al-Tikriti⁽⁵⁵⁾ believes that these buildings are *Beit el Falaj*, the house of Falaj. They are assumed to have had a social and commercial function because of the large amount of storage jars found there. For example, storage jars from Hili 17.

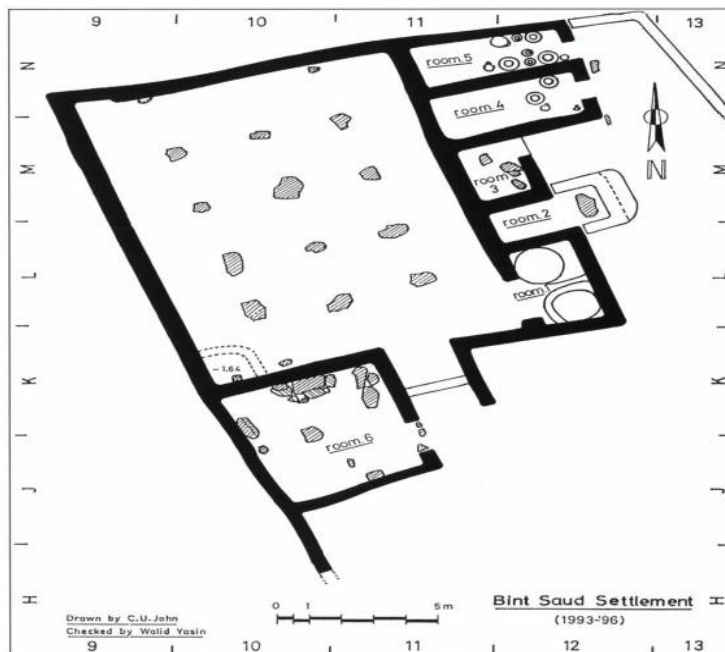


Figure (6)
Plan of Beit al Falaj at Bida bint Saud.

⁽⁵²⁾ Magee. 2014, p.215

⁽⁵³⁾ Magee. 1998b, p.53

⁽⁵⁴⁾ Al-Tikriti. 2002, p.133

⁽⁵⁵⁾ Al-Tikriti. 2010, p.240

Religious centres:

Cultic centres are represented in a number of buildings which have platforms and open-air alters. These sites appear from the East to the West Coast and are identified by the representation of applique of snakes on ceramics and bronze materials. For example, a long rectangular building made out of beach rock called the mount of serpents had a wide variety of ceramics with the representation of snake applique. Other examples are al Qusais on the west coast, Sarouq al-Hadid in the desert, Raki 2, Masafi and Bilad al-Madain, located in the central Oman Mountains, also Bithna at the interface of the mountains and the east coast. During Iron Age II these sites provided evidence for extraction of copper or refining and producing copper objects. These site locations suggest that it played a role in binding cultic activity with copper production and trade (figure 7 ⁽⁵⁶⁾ & 8 ⁽⁵⁷⁾).

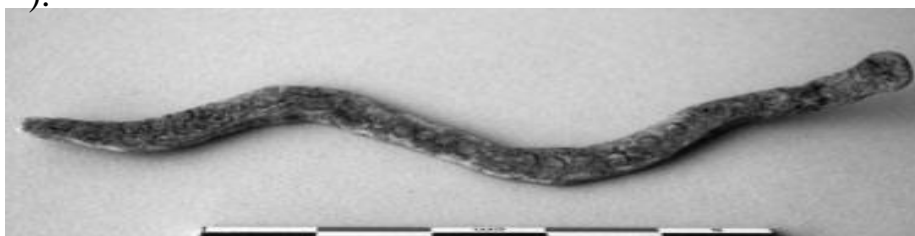


Figure (7)
Copper snake the Iron Age sanctuary at Masafi

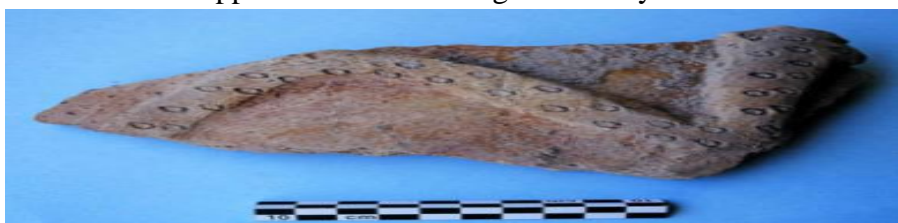


Figure (8)
Iron Age ceramic fragment decorated with snake from sanctuary at Bithnah.

⁽⁵⁶⁾ MUTON, M., A. BENOIST. & J.M. CORDOBA. The Snake Figuration in Iron Age Society. *Journal of National center of Documentation and Research*. <http://www.na.ae/en/Images/LIWA05.pdf>. 2011, p.5

⁽⁵⁷⁾ Muton et al. 2011, p.6

The representation of snakes and their attribution to ritual activities have had several interpretations. Benoist argues that snake as a cultic symbol may represent the Levantine approach, in that the toxicity of its poison is seen as a power over life. Conversely, the south-western Arabia and Bahrain approach see the snake as a symbol of healing, representing the God Wadd. In south Arabian temples bronze snakes have also been interpreted as votive offerings⁽⁵⁸⁾.

Other scholars like Mountain and al-Tikriti attributed the snake cult to Falaj technology. First, because of the ceramics decorated with snakes in the administration buildings of the *Falaj*. Second, they claim that the zigzagging in the underground channels of the *Falaj* imitates the shape of snake and is a symbol for the snake cult (figure 9⁽⁵⁹⁾). Finally, snakes may reflect the Middle Eastern approach of snakes as a symbol of fertility which is related to water, soils, and granaries⁽⁶⁰⁾.

Giving these different approaches, the snake cult may have acted as a common belief system which was used as social cohesion for the Iron Age community with its diverse classes including farmers, craftsmen, traders and communities along the coast.

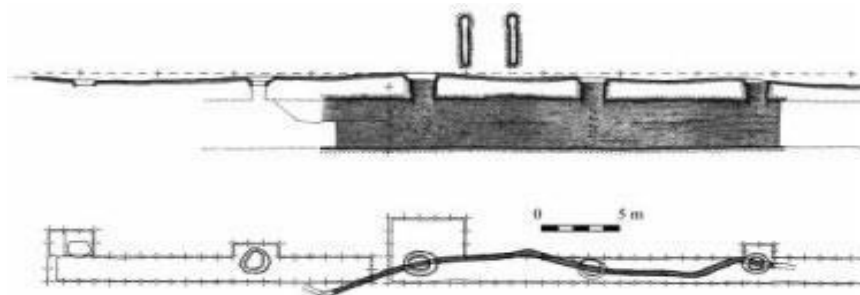


Figure (9)

Section of the *falaj* of Tuqeibah, al-Madam shows the zigzagging in the underground channels

The impact of *Falaj* on Iron Age II economy:

⁽⁵⁸⁾ Magee. 2014, p.239

⁽⁵⁹⁾ Muton et al. 2011, p.13

⁽⁶⁰⁾ Mouton & Schiettecatte. 2014, p.43

Falaj allowed intensive and year-round agriculture in the small 20-30 km strip of alluvial piedmont that flanks the al-Hajjar Mountains to the east and west⁽⁶¹⁾. The new technology created agricultural surplus⁽⁶²⁾. Petrographic analysis from the internal structure of the piedmont settlements shows the existence of craft specialist in the form of ceramic producers⁽⁶³⁾. This means that *Falaj* technology's surplus permitted a differentiation in labour structure.

Pottery and bronze specialization:

Specialization in labour was one of the results of the advanced irrigation technology that brought surplus. Iron Age II bowls and storage jars are decorated and shaped differently than they were in the pre-Iron Age period. For example, Al Ain was a centre for sandy ware ceramic production and the local imitations of the Iranian bridge-spouted vessel⁽⁶⁴⁾ ⁽⁶⁵⁾.

Iron Age II also shows specialization in Metal production including iron, bronze and gold. Large quantities of Iron have been discovered in Saruq Al-Hadid. Objects such as spears, arrows, axe heads, daggers and hilts coated with bronze were found. Also gold wasters have been discovered suggesting that gold was manufactured within the same area. Absence of stone structures from the site suggests that Saruq al-Hadid was an industrial area occupied by industrial activities while the living occupation and public administrative structures were not far from the site⁽⁶⁶⁾. This presents further strong evidence for labour specialization during Iron Age II.

The impact of camel domestication on economy:

The domestication of the Arabian camel (Dromedary) appeared at 800-900 BC based on faunal remains from Tell

⁽⁶¹⁾ Magee. 2007, p.90

⁽⁶²⁾ Al-Tikriti. 2011, p.151

⁽⁶³⁾ Magee. 1998b, p.50

⁽⁶⁴⁾ Magee. 2014, p.215

⁽⁶⁵⁾ Benoist & Méry. 2012, p.72

⁽⁶⁶⁾ Nashef in Avanzini. 2010, p.215

Abraq ⁽⁶⁷⁾. The camel could convert useless fibrous and salty plants into nutritious food like meat and milk ⁽⁶⁸⁾, though during Um Al Nar period wild camels were used as a game camel. Iron Age II communities approached the benefits of the domesticated camel differently. Faunal analysis from Tell Abraq shows that cattle during Iron Age II had the same economic impact and remained to supply the community with meat and milk. While domestic dromedaries provided all the advantages of the possession of a strong load- carrying animal ⁽⁶⁹⁾. This animal can roughly travel between 25 and 30 km a day ⁽⁷⁰⁾. The discovery of large numbers of camel figurines in Rumeilah and a camel figurine with a saddle from Muweilah, explain the use of the camel as a mean for transportation ⁽⁷¹⁾. Camels facilitated the rapid transportation of water and food, by taking fresh fish and shell fish to the interior, or cereals and dates to the coast ⁽⁷²⁾. The domesticated camel opened up new possibilities for inland trade including regional and transregional.

Evidence of regional trade:

1-Petrographic analyses of potsherds from various Iron Age II sites suggests the existence of regional trade networks. For example, the exportation of sandy buff ware of Al Ain to al-Madam, Muweilah and Kalba ⁽⁷³⁾,

The hypothesis of the FRPW Iranian origins in the spotted jars is taken up after the confirmation of the Omani origin of the FRPW

⁽⁶⁷⁾ UERPMANN, M. The appearance of the domestic camel in south-east Arabia. https://www.academia.edu/15648682/The_Appearance_of_the_Domestic_Camel_in_South-east_Arabia. 2015, p.235

⁽⁶⁸⁾ Köhler-Rollefson, I. Camels and Camel Pastoralism in Arabia the Biblical Archaeologist 56. American Schools of Oriental Research: 180–88. <http://www.jstor.org/stable/3210371> 1993, p.185

⁽⁶⁹⁾ UERPMANN, M. Remarks on the animal economy of tell Abraq (Emirates of Sharjah and Umm al-qaywayn, UAE) *Proceedings of the Seminar for Arabian Studies* 31. Archaeopress: 227–33. <http://www.jstor.org/stable/41223685>. 2001, p.232

⁽⁷⁰⁾ Magee. 2004, p.26

⁽⁷¹⁾ Benoist. 2007, p.50

⁽⁷²⁾ Uerpman. 2001, p.232

⁽⁷³⁾ Benoist & Méry. 2012, p.88

and that the parallels between the Omani and the Iranian jars are only stylistic parallels. This may confirm the importance of the inland trade over the maritime trade during this period. While, Sandy Buff Ware (SBW) could have been produced in Hili-17 where wasters were found at the oasis of Al Ain and exported to other parts of the UAE (e.g. al-Madam, Muwailah, Kalba, Husn Madhab and Rafaq) through regional trade systems.

2-Communication with the coast suggested by the faunal analysis for Iron Age II and III from a central settlement like al-Madam-Thuqeibah. The settlement is 80km far from the Indian Ocean and 70km from the Persian Gulf though it contained fifty marine species, six mother-of-pearl shells (*Ostrea sp*) used as pigment containers, and some gastropods worked into ornaments. The high consumption of marine molluscs' al-Madam– Thuqeibah portrays the quantity of the goods movement between the central and coastal zones ⁽⁷⁴⁾.

Evidence of Trans-regional trade:

The camel domestication facilitated Trans- regional inland trade and this is shown in the material culture for examples ;(Table 2: shows three examples of trans-regional trade).

⁽⁷⁴⁾ Del Cerro. 2015, p.25

In Muweila	Rumeilah	Saruq al-Hadid
<p>a) The recovered camel figurine with a saddle on the back imitates the north Arabian suggests contacts with north Arabia.(figure:10⁽⁷⁵⁾)</p>	<p>One yellow sherd of ‘Mesopotamian’ pottery indicates the existence at the end of the Iron Age of trans-regional caravan</p>	<p>Communication with Northern Arabia and Assyria suggested by recovery of a variety of highly decorated iron and golden</p>
<p>b) The discovery of locally produced storage jars with three Sabaen letters (figure 11⁽⁷⁶⁾) and the recovery of a highly decorated incense burner with a painted figurine of a humped zebu bull was found in a columned hall (figure 12⁽⁷⁷⁾). These discoveries suggest that South-Eastern Arabia was in contact with South Arabian kingdoms⁽⁷⁸⁾.</p>	<p>trade linking Rumeilah to the Mesopotamian World⁽⁷⁹⁾.</p>	<p>objects including jewelry, beads, coils and leaf parallels to northern Arabia and Assyria⁽⁸⁰⁾. Also, excavations revealed large amount of metal working slag and rich metal artefact. It included large amount of bronze objects, iron spears and swords, a highly decorated tripod representing a snake which draws parallels to bronze tripods from Assyria and Urartu.</p>

⁽⁷⁵⁾ Magee. 2014, p.210

⁽⁷⁶⁾ Magee. 1999, p.44

⁽⁷⁷⁾ Magee. 2007, p.98

⁽⁷⁸⁾ Magee. 2014, p.210

⁽⁷⁹⁾ Benoist & Méry. 2012, p.89

⁽⁸⁰⁾ Potts. 2001, p.49



Figure (10)
Camel with a saddle on the back

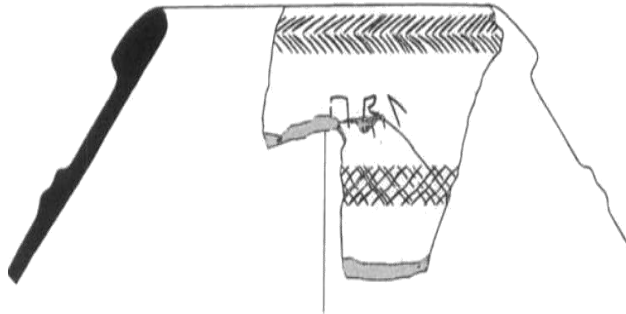


Figure (11)
Storage jar with three Sabean Letters from Muweilah



Figure (12)
Decorated Incense burner from Muweilah

The impact of camel domestication on settlement pattern:

The increase in intra-regional trade in raw materials and finished goods and the importation of goods from other areas of Arabia and the Middle East had an impact on settlement pattern and location.

For example, Saruq al-Hadid was an industrial complex for metal production located in a desert zone. Though the site is located 50-100 km far from ore, water or fuel sources⁽⁸¹⁾, its location between the inland oases and coasts facilitated the transportation of refined copper from the mountains and exportation of fabricated bronze objects to local and regional markets. The domesticated camel enabled such cycles to exist. Muweilah is another example of an emerged settlement as a result of domesticated camel. Muweilah is located nearly 50 km from the inland oasis of al-Madam and nearly 15 km from the present-day coastline. Architectural and ceramic analysis from Muweilah shows that it was receiving ceramics from multiple local and foreign production centres. Muweilah's played the role of caravan serai which was controlling and restricting the movement of goods to and from coast⁽⁸²⁾. (Figure 13⁽⁸³⁾)

⁽⁸¹⁾ Hermann *et al.* 2012, p.50

⁽⁸²⁾ Magee. 2004, p.41

⁽⁸³⁾ Herrmann *et al.* 2012, p.51

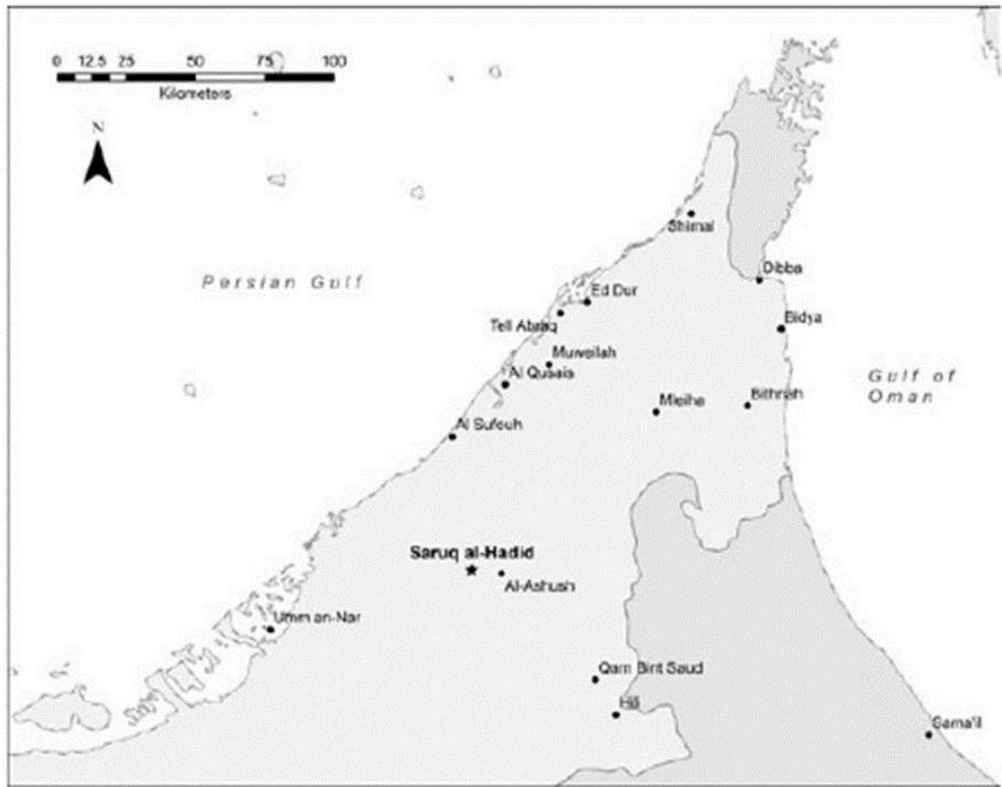


Figure (13)

Map shows the location of Muweilah and Saruq al-Hadid in the desert zone.

Elite class and the rise of complex society:

The Fortified structures in piedmont (as in Hili 17) and desert zones (Muweilah), tradition of stamp seal manufacture as in Rumeilah, Tell Abraq and Bint Saud, distribution of ceramics which imitate Iranian ones (bridge spouted jars) (figure 14⁽⁸⁴⁾) and other classes of objects that represent status and authority suggest status differentiation and the rise of elite class during Iron Age II. Also, other objects from coastal, mountains and desert zones suggest connection with foreign centres of power, such as, a local soft-stone vessel decorated with Assyrian griffins and imported Assyrian cylinder seals. In Rafaq, a decorated bronze bowl with Assyrian parallels iconography,

⁽⁸⁴⁾ Magee. 2000, p.123

'Nimrud bowls' in ed-Dur⁽⁸⁵⁾, the south Arabian inscription and north Arabian imitation of camel figurine and the iron elements which is reflected as symbols of strength and power but also as a statues and prestigious item in Muweilah⁽⁸⁶⁾.

The distribution of these goods suggests that elite's class existed in piedmont, desert and on the coastal zones.

Also, a historical evidence from an Assyrian cuneiform inscription speaks of king of Qade who lived at Is-ki and sent a tribute to the Assyrian emperor Assurbanipal around 640 BC⁽⁸⁷⁾. In this context, Oman seemed that it reached a level of social and economic complexity during Iron Age II which caused not only the emergence of elite class but also rise in political figures like the king of Qade.



Figure (14)

Bridge spotted jars found in Muweilah

Elite class and production cycle:

The decline in maritime trade and the decline in water resources were two challenges faced Iron Age communities. These challenges seemed that it pushed the community to interact internally⁽⁸⁸⁾ and combine their previous irrigation techniques, inherited from a

⁽⁸⁵⁾ Magee. 1998b, p.56

⁽⁸⁶⁾ Magee. 1998, p.116

⁽⁸⁷⁾ Potts. 1990, p.393

⁽⁸⁸⁾ Al-Tikriti. 2010, p.245

previous local sedentary tradition that dates back to the 2nd millennium BC⁽⁸⁹⁾. These previous experiences and additional agricultural innovations included and was not limited to:

1-Extracting sub-surface water from artesian wells to the surface and then transporting it to small plots of land. This started in third millennium BC and Umm an-Nar period ⁽⁹⁰⁾. For example, the second millennium BC discovered wells and irrigation canals around the site of Hili 8 in the al-Ain oasis ⁽⁹¹⁾;

2-Inventing *saruj* which is strong hydrological plaster for the spring water channels. This plaster holds out the pressure of the spring and without it the channels would collapse. This plaster maintained the water access to Mountain settlement e.g. at Balad Sit in wadi Bani Awf and on the Sayq plateau of the Jabal al Akhdar.

3-Transformation of soil to the terraced fields was also a technique used in Balad Sit where the land is difficult to obtain ⁽⁹²⁾;

4-Cultivation using the hoe ⁽⁹³⁾.

These examples of additional innovations related to the irrigation system maintain the argument that the *Falaj* technology is a result of a long period of accumulated experiences ⁽⁹⁴⁾ ⁽⁹⁵⁾.

Evidence of the political and economic control related to managing the *Falaj* technology appears in the administration structure such as Hili 15, Magee⁽⁹⁶⁾ suggests that the emergence of an elite class was a direct result of the introduction of the *Falaj* technology which created a surplus⁽⁹⁷⁾.

⁽⁸⁹⁾ Mouton & Schiettecatte. 2014, p.36

⁽⁹⁰⁾ Mouton & Schiettecatte. 2014, p.36

⁽⁹¹⁾ Cleuziou in Potts. 2001, p.39

⁽⁹²⁾ Haser in Avanzini. 2010, p.177

⁽⁹³⁾ Potts. 2001, p.49

⁽⁹⁴⁾ Magee. 2014, p.219

⁽⁹⁵⁾ Al-Tikriti. 2010, p.240

⁽⁹⁶⁾ Magee. 2007, p.90

⁽⁹⁷⁾ Al-Tikriti. 2010, p.246

Elites might be the main motivation for domesticating the camel, because firstly the inhabitants of south eastern Arabia were familiar with the transport capacity of Bactrian camels from the middle of the third millennium BC⁽⁹⁸⁾. Secondly, they were also familiar with methods of husbandry and domestication during Bronze Age⁽⁹⁹⁾.

Thirdly, using the camel for transportation rather than using it as a source of protein, was the reason behind camel domestication.

Finally, domestication chronologically came after the introduction of the *Falaj* technology and probably after the presence of elite class.

Elites played an important role in the production cycle and internal expansion.

⁽⁹⁸⁾ Magee. 2014, p.210

⁽⁹⁹⁾ Uerpmann. 2001, p.230

Conclusion:

The *Falaj* technology and the emergence of elite class played a key role in expansion, diversity and distribution of Iron Age II settlement patterns. The diversity of settlement patterns was a result of specialization of labor (Saruq al-Hadid) and manipulating the rest of the community by a belief system in order to guarantee the social cohesion between different groups combining farmers, craftsmen and traders. Camel was the needed tool for achieving their ambitious in opening up the way for trans-regional trade (such as, to south Arabian kingdoms) and opening new environmental zones for regional trade (such as Muweilah). Elites successful management of the agriculture surplus brought by *Falaj* and their desire of wealth continuity was key role in cyclic production in different economic activities which consequent flourishing in the economy, expansion and diversity of settlements.

Bibliography

1. AVANZINI, A. (ed.), Eastern Arabia in the First Millennium BC. Italy: 'L'Erma' di Bretschneider, 2010.
2. BENOIST, A., An iron age II snake cult in the Oman peninsula: Evidence from Bithnah (Emirate of Fujairah) *Arabian Archaeology and Epigraphy* 18. Wiley-Blackwell: 34–54, 2007.
3. BENOIST, A. & S. MÉRY, Initial results from the programme of petrographic analysis of Iron Age pottery from the United Arab Emirates *Arabian Archaeology and Epigraphy* 23. Wiley-Blackwell: 70–91, 2012.
4. CARTER, R., The Wadi Suq period in south-east Arabia: a reappraisal in the light of excavations at Kalba, UAE *Proceedings of the Seminar for Arabian Studies* 27. Archaeopress: 87–98. <http://www.jstor.org/stable/41223590>, 1997.
5. CHAPMAN, R. & C. ROBERT, *Archaeologies of complexity*. New York: Taylor & Francis, 2003.
6. CHARBONNIER, J., Groundwater management in Southeast Arabia from the Bronze Age to the Iron Age: a critical reassessment *Water History* 7. Springer Science + Business Media: 39–71, 2015.
7. DELCERRO, C., Accessed November 11. <http://www.anthropology.uw.edu.pl/07/bne-07-02.pdf>, 2015.
8. HERRMANN, J.T., J. CASANA. & H.S. QANDIL, A sequence of inland desert settlement in the Oman peninsula: 2008-2009 excavations at Saruq al-hadid, Dubai, UAE *Arabian Archaeology and Epigraphy* 23. Wiley-Blackwell: 50–69, 2012.
9. Köhler-Rollefson, Camels and Camel Pastoralism in Arabia the *Biblical Archaeologist* 56. *American Schools of Oriental Research*: 180–88. <http://www.jstor.org/stable/3210371>, 1993.
10. LEES, S., Irrigation and society, *Journal of Archaeological Research* 2. Springer Science + Business Media: 361-78, 1994.
11. MAGEE, P., New Evidence of the Initial Appearance of Iron in Southeastern Arabia *Arabian Archaeology and Epigraphy* 9. Wiley-Blackwell: 112–17, 1998a.
12. MAGEE, P., Settlement patterns, polities and regional complexity in the southeast Arabian Iron Age *Paléorient* 24. PERSEE Program: 49–60, 1998b.
13. MAGEE, P., Writing in the Iron Age: The earliest south Arabian inscription from southeastern Arabia *Arabian Archaeology and Epigraphy* 10. Wiley-Blackwell: 43–50, 1999.
14. MAGEE, P. & E. THOMPSON. Excavations at Muweilah 1997-2000 *Proceedings of the Seminar for Arabian Studies* 31. Archaeopress: 115–30. <http://www.jstor.org/stable/41223675>, 2001.
15. MAGEE, P., The impact of southeast Arabian intra-regional trade on settlement location and organization during the Iron Age II period *Arabian Archaeology and Epigraphy* 15. Wiley-Blackwell: 24–42, 2004.
16. MAGEE, P., The production, distribution and function of Iron Age bridge-spouted vessels in Iran and Arabia: Results from recent excavations and geochemical analysis *Iran* 43. JSTOR: 93, 2005.

17. MAGEE, P., Beyond the Desert and the Sown: Settlement Intensification in Late Prehistoric South-eastern Arabia. *Bulletin of the Late Prehistoric Southeastern Arabia*. 347:83-105, 2007.
18. MAGEE, P., The archaeology of prehistoric Arabia: Adaptation and social formation from the Neolithic to the Iron Age. Cambridge: Cambridge University Press, 2014.
19. MUTON, M., A. BENOIST. & J.M. CORDOBA, The Snake Figuration in Iron Age Society. *Journal of National center of Documentation and Research*. <http://www.na.ae/en/Images/LIWA05.pdf> , 2001.
20. MOUTON, M. & J. SCHIETTECATTE, In the Desert Margins: The Settlement Process in an Ancient South and East Arabia. Italy: 'L'Erma' di Bretschneider, 2014.
21. POTTS, D.T., The Arabian Gulf in Antiquity: Volume I: From Prehistory to the fall of the Achaemenid Empire (Arabian Gulf in Antiquity). New York: Oxford University Press, USA, 1990.
22. POTTS, D.T., Before the Emirates: an Archaeological and Historical Account of Developments in the Region c. 5000 BC to 676 AD, in P. Vine, P. Hellyer, I. Al-Abed, & I.A. Abed (ed.) *The United Arab Emirates: A New Perspective*. United Kingdom: Trident Press, 2001.
23. AL-TIKRITI, W, The south-east Arabian origin of the falaj system *Proceedings of the Seminar for Arabian Studies* 32. Archaeopress Publishing:117–38. <http://www.jstor.org/stable/41223728>. , 2002.
24. AL-TIKRITI, W. in A. Avanzini (ed.), *Eastern Arabia in the First Millennium BC*. Italy: 'L'Erma' di Bretschneider, 2010.
25. AL-TIKRITI, W., *Archaeology of the Falaj: a field study of the ancient irrigation systems of the United Arab Emirates*. 1st ed. Abu Dhabi: Department of Historic Environment, Abu Dhabi Culture & Heritage, 2011.
26. UERPMANN, M., Remarks on the animal economy of tell Abraq (Emirates of Sharjah and Umm al-qaywayn, UAE) *Proceedings of the Seminar for Arabian Studies* 31. Archaeopress: 227–33. <http://www.jstor.org/stable/41223685> , 2001.
27. UERPMANN, M., The appearance of the domestic camel in south-east Arabia. https://www.academia.edu/15648682/The_Appearance_of_the_Domestic_Camel_in_South-east_Arabia. , 2015.

العصر الحديدي وأنماط الاستيطان في شبه جزيرة عمان والجزيرة العربية *نهى كامل موسى

الملخص :-

يعد العصر الحديدي الثاني الفترة الكلاسيكية للعصر الحديدي. تلك الفترة شهدت زيادة ملحوظة في توزيع و تنوع نمط المستعمرات في جنوب شرق الجزيرة العربية. امتدت مستعمرات تلك الفترة لتحتوي على مواقع داخلية، جبلية و ساحلية. كما تنوعت المستعمرات لتشتمل على مواقع عمرانية غير سكنية. تزامن ظهور تقنية الري التي تعرف بالفلاج إلى جانب إستئناس الجمل مع هذه الزيادة. كما صاحبت زيادة المستعمرات إتصال إقليمي بين مختلف أنواع المستعمرات و إتصال عبر الأقاليم مع جنوب الجزيرة العربية و تبادل البضائع. إن النسق، البناء و المواد الثقافية المكتشفة من هذه الحقبة تعكس وجود مجتمع معقد. و قد تبين ذلك من ظهور نظام عقائدي يرتبط بكل من الزراعة و إنتاج البرونز (عقيدة الثعبان)، وجود عمالة متخصصة لإنتاج الفخار، إنتاج المعادن، نظم الإدارة، أبنية تحصينية مرتبطة بالنشاط الزراعي، بضائع رمزية (رأس فأس على أختام) و بضائع قيمة للنخب. هذا البحث يناقش أن تقنية الري كانت مسؤولة عن خلق طبقة النخبة و هذه الطبقة بدورها كانت مسؤولة عن تدوير عجلة الإنتاج، توسع و تنوع المستعمرات عن طريق إستئناس الجمل.

الكلمات الدالة : العصر الحديدي الثاني ؛ نمط المستوطنات ؛ تقنية الري ؛ الفلاج ؛ أستئناس الجمل ؛ اقتصاد العصر الحديدي.

DEPOSIT NO.
INTERNATIONAL & DOMESTIC

January Edition

2019/ 12894

ISSN 2537-026X