La revue d'études archéologiques ISSN:1111-7699
Vol:23 /Num: 01/ 2025 / pp 765-787 EISSN:2600-6499

Storage Architecture in Cuicul: The Public Granaries as a Case Study

L'architecture du stockage à Cuicul : les greniers publics comme étude de cas

Boubaker Benkacir [1♦], Nacer Benmessaoud[2]
[1] University of Algiers 2 - benkacir.boubaker@univ-alger2.dz
The Laboratory of Civilizational Construction of the Central Maghreb (Algeria)
[2] University of Algiers 2 - nacer.benmessaoud@univ-alger2.dz

Received 06/09/2025 **Accepted 01/12/2025** **Published 31/12/2025**

Abstract:

The subject of grain storage in the city of Cuicul during the Roman period is among the important yet insufficiently explored topics in archaeological and historical studies of Roman cities in the province of Numidia. Despite its remarkable economic and cultural value, this aspect of the city has not received the scholarly focus it deserves. Archaeological excavations have revealed the clear presence of these granaries within the urban fabric, Cuicul's granaries was primarily regional and military within Numidia, rather than that of a major supplier to the Roman state, which relied mainly on Africa Proconsularis and Egypt.

The significance of these facilities is further underscored by a Latin inscription discovered in the city, which provides evidence for the existence of such Granaries in Numidia in general, and in Cuicul in particular. This evidence enables scholars to trace the evolution of storage practices and to establish Cuicul's role as a crucial provisioning center for both the Roman army and local population. At the same time, Cuicul contributed to regional trade, with surplus produce circulating towards nearby Numidian ports such as Rusicade and Stora, which were integrated into the larger North African economy.

Studying these structures sheds light on essential aspects, including their economic and fiscal role, storage techniques, and dual function, serving both military needs and local consumption while ensuring exports. This emphasizes the city's economic and administrative importance within the extensive Roman storage network in Numidia.

Keywords : Granaries, Storage, Cuicul, grain.

♦ *Corresponding author*

Résumé :

Le sujet du stockage des céréales dans la ville de Cuicul à l'époque romaine compte parmi les thèmes importants, mais encore insuffisamment explorés, dans les études archéologiques et historiques des villes romaines de la province de Numidie. Malgré sa remarquable valeur économique et culturelle, cet aspect de la ville n'a pas reçu l'attention académique qu'il mérite. Les fouilles archéologiques ont révélé la présence manifeste de ces greniers au sein du tissu urbain. Le rôle des greniers de Cuicul était principalement régional et militaire au sein de la Numidie, plutôt que celui d'un grand fournisseur pour l'État romain, qui dépendait principalement de l'Afrique Proconsulaire et de l'Égypte.

L'importance de ces installations est en outre soulignée par une inscription latine découverte dans la ville, qui atteste de l'existence de tels greniers en Numidie en général, et à Cuicul en particulier. Ces preuves permettent aux chercheurs de retracer l'évolution des activités de stockage et d'identifier le rôle de la ville comme un centre clé dans l'approvisionnement de l'armée romaine et des habitants locaux. Parallèlement, Cuicul contribuait au commerce régional, les excédents de production étant acheminés vers les ports numides voisins tels que Rusicade et Stora, qui étaient intégrés à l'économie nord-africaine au sens large.

L'étude de ces structures éclaire des aspects essentiels, notamment leur rôle économique et fiscal, les techniques de stockage et leur double fonction : répondre aux besoins militaires et à la consommation locale tout en assurant des exportations. Cela met en lumière l'importance économique et administrative de la ville au sein du vaste réseau de stockage romain en Numidie.

Mots-clés : greniers, stockage, Cuicul, céréales

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1.INTRODUCTION:

The study of grain storage in the Roman city of Cuicul (modern-day Djemila, Algeria) opens an important window onto the economic and administrative organization of the province of Numidia. Granaries (*horrea*) represented not only architectural structures for the preservation of grain but also instruments of control, taxation, and distribution that shaped the city's role within the broader Roman system. Archaeological evidence from Cuicul reveals the integration of these granaries into the urban fabric, underlining their centrality in supporting , both the local population, and the Roman army.

Despite this significance, the topic has received limited scholarly attention compared to other aspects of Cuicul's urban development. A Latin inscription discovered in the city further confirms the importance of such facilities, highlighting Cuicul as a key center for provisioning and trade.

This prompts a key research question: to what degree did Cuicul's granaries embody Roman economic strategies in North Africa, and how did they balance local supply needs with imperial export demands? Addressing this question allows us to better understand the economic and administrative dimensions that characterized Roman Numidia.

2. Definition of Storage Architecture:

Roman grain warehouses are defined as public facilities that formed an integral part of the urban infrastructure. As official structures, they performed dual economic and administrative functions in major urban centers, operating under the authority of either local councils or imperial administration. These structures were distinguished by their advanced architectural techniques and strategic urban location. Their function extended beyond mere storage encompassing the organization of distribution and even the exercise of symbolic authority.[1]

In Latin they are referred to as *Horrea* and are commonly known as warehouses or depots. These were buildings used for the preservation and storage of foodstuffs, especially grain and liquids, though they were also employed for storing other materials such as marble and textiles.[2]

They represent a particular form of storage in the Roman period, whether for grain or for other commodities. A *horreum* could be a freestanding structure or part of the urban environment, consisting either of a single unit or of several rooms and spaces. Storage could be short- or long-term, with materials kept in heaps, wooden chests, sacks, jars, or amphorae. One of their key features was the ability to provide optimal protection for stored goods, safeguarding them against insects and dampness.[3]

Horrea appeared in different forms across the Roman Empire, with some in Italy and Ostia reaching two stories. However, in North Africa, including Cuicul, the preserved examples are single-storied, designed with thick walls, raised floors, and ventilation systems to protect stored grain from humidity and spoilage, they could be public or private, civilian or military. By nature, they were often isolated from other buildings and located in markets, harbors, or rural estates, reflecting both commercial and agricultural activities as well as the importance of storage. These warehouses played a significant economic role in the Roman Empire. Many scholars have studied them, most notably the English researcher Geoffrey Rickman, who conducted extensive research on Roman warehouses, including Latin inscriptions and examples across various Roman provinces.[4]

In terms of urban planning, *horrea* were typically placed apart from other structures, often adjacent to the city wall, and usually opened onto streets or gates to allow for protection and easy access for the movement of goods. They appeared in diverse forms, which sometimes complicates the determination of their specific functions or identities, making construction techniques and inscriptions the main tools

[1] Rene Ginouves, et autre, Dictionnaire méthodique de l'architecture grecque et romaine, Tomb11, école française de Rome, p 122.
[2] Gros, Pierre. L'Architecture romaine : du début du IIIe siècle av. J.-C. à la fin du Haut-Empire. Tome I: Les monuments publics. 2e éd., Paris, Picard, coll. Les manuels d'art et d'archéologie antiques, 1996, p 465.
[3] Alfonso Vigil-Escalera Guirado, Giovanna Bianchi, Juan Antonio Quirós, horrea barns and silos Storage and incomes in Earl médiéval Europe, DOCUMENTOS DE ARQUEOLOGÍA MEDIEVAL Universidad de León), Iñaki Martín Viso (Universidad de Salamanca), p11
[4] Geoffrey Rickman,' "Roman Granaries and Store Buildings,Cambridge at the Universitypres 1971, p 201.

for interpretation. Their layout typically featured rectangular rooms with elevated floors to prevent water infiltration and moisture damage, while walls employed specialized construction techniques for enhanced durability. They often included a courtyard to facilitate circulation and the transfer of goods in and out of storage rooms.[5]

3. Grain Storage Methods in the Roman World:

Various grain storage techniques were employed throughout the Roman world, spreading across the provinces under Roman rule. These methods differed between rural and urban environments, adapting to the specific needs and conditions of each setting.

1.3. Large Storage Jars (*Dolium*):

One of the most common storage methods was the use of large ceramic containers known as *dolium*. These were sizeable earthenware vessels with flat bases, specific thicknesses, and large storage jars (*dolia*) were massive ceramic containers, often exceeding 1-2 meters in height, with thick walls, partly sunk into the ground to ensure stability and preserve contents. They were made from carefully selected clay mixed with stabilizing filler to ensure proper firing quality[6] (*figure01*).

According to researchers, the origins of the *dolium* can be traced back to the Greeks, emerging as early as the sixth century BCE. As agricultural production expanded, their use became more widespread in the ancient world, particularly due to their effectiveness in preserving goods over long periods. These vessels varied in form depending on the regions where they were produced. Initially used for maritime transport, *dolia* became extensively utilized by the Romans for both transportation and storage, especially for liquid commodities such as oil and win e transported from the provinces.[7] Their controlled capacity made them particularly practical for storage and transport. Archaeological evidence has revealed their presence in numerous sites, both in Rome and across the Roman provinces, particularly in domestic settings, oil and wine presses, farms, and ports.

In rural agricultural estates known as *oppida*, where production was relatively modest, *dolia* vessels were commonly used to store grains or liquids for individual households. Excavations in the Mediterranean basin have uncovered storage facilities containing remnants of these ceramic jars. Over time, *dolia* was succeeded by *amphorae* which served similar functions in transport and storage but differed in shape, size, and manufacturing techniques.[8]

[55] Vivian pigment, "le stockage du grain dans monde antique", Ecole française de Rome, tomb 120, 2008, p 34.
[6] Dominique Garcia, "observation sur la production et le commerce, des céréales en langue do méditerranéen durent l'Age du fer, les frones, de stockage des grains", revue archéologique, de narbonnaise, Tomb 20, 1997, p 98.
[7] Michel P.N, Doluims, lattara6, 1993, p 402.
[8] Dominique Garcia, op cit, p 100.

In the African provinces, *dolium* vessels were particularly abundant, especially in regions with high agricultural productivity. They have been found in both rural estates and urban centers. In urban areas, they were often placed in front of houses, assigned dedicated storage rooms, or buried partially in the ground, leaving only the opening visible. They were also commonly stored in granaries. One of the main advantages of these vessels was their ease of storage and accessibility, allowing for convenient retrieval of stored goods.[9]



figure No. 01: Jars found in the storage facilities of the city of Ostia, Italy.
Source: Stephan Fichti, p. 12.

2.3. Silos:

Silos were one of the oldest methods used for grain storage, with evidence of their use found across several Roman provinces as well as in the Italian peninsula (*figures 02,03*).

A silo consists of a pit with a narrow opening, excavated into the ground. This method was particularly suitable for storing grains in a sealed environment. Once filled, the pit was tightly sealed with soil or clay, effectively isolating its contents from air and moisture to ensure long-term preservation. Some researchers suggest that silos emerged alongside the advent of agriculture itself. One of their key advantages was their ability to preserve grain effectively. These storage pits appeared in various forms, and in some cases, grains were not stored directly in the silo but placed inside ceramic jars before being stored within the pit.[10]

Not all regions were suitable for the construction of silos, as they required careful site selection. Factors such as firm soil composition, proximity to farmlands, and accessibility from harvesting areas were crucial in determining the viability of this storage method

[9] Stephan fichti, "silos et stockage a la période gauloise (VI-I siècle av. j.-c)", université François Rabelais de tours, p 15.
[10] Mounir Fantar, "Silos et entrepôts en Afrique préromaineDes témoignages historiographiques et archéologiques", A. AF, 43,2007. Afrique du Nord de la protohistoire à la conquête arabe. p. 231.

Silo openings were typically circular or semi-circular and were securely sealed after grain was deposited inside. The walls had to be carefully prepared to prevent moisture infiltration, ensuring proper preservation of the stored grain. The shape of the storage pit varied and could be circular, cylindrical, or concave, with depths ranging from 1 to 3 meters.[11]

There were two main types of silos: those carved into rock and those dug into soil. The primary advantages of this storage method included long-term preservation, large storage capacity, and ease of preparation. However, silos also had drawbacks, such as the risk of collapse during unloading and the limited accessibility, which made frequent retrieval of stored grain impractical.[12]

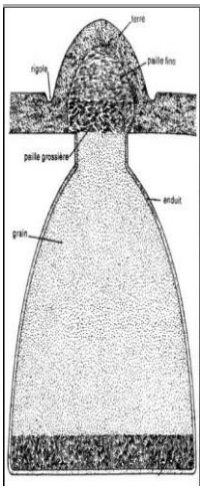
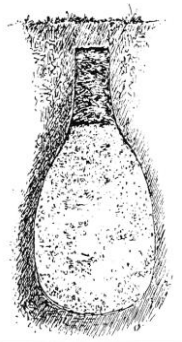


Figure No. 02: Model of silos (*silos*) and their components.
Source: Stephan Fichti, p. 11.



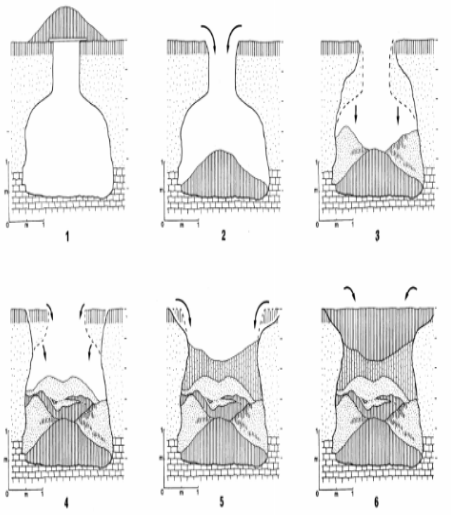


Figure No. 03: Stages of preparing silos (*silos les*) and placing materials inside them.
Source: Stephan Fichti, p. 11.

3.3. Built Granaries (*Horrea*):

The Latin term *Horrea* refers to storage buildings or warehouses used primarily for the preservation and storage of foodstuffs, particularly grains and liquids. However, these structures were also utilized for storing other materials such as marble and textiles.[13]

As a form of storage infrastructure in the Roman period, *horrea* were used for storing both grain and other goods. They could exist as standalone buildings or be integrated within an urban setting. Their layout varied; some were single-unit structures, while others consisted of multiple rooms and spaces. Storage within these

[11] Alfonso Vigil-Escalera Guirado, Giovanna Bianchi, op cit, 38.
[12] Stephan fichti, op cit, p 9.
[13] Rene ginouves, op cit, p 122.

facilities could be either short-term or long-term, with goods stored in heaps, wooden crates, sacks, or ceramic jars and amphorae. A key feature of *horrea* was their ability to provide optimal protection against pests and humidity, ensuring the preservation of stored commodities.[14]

Architecturally, *horrea* appeared in various designs, including single-story and multi-story buildings, the latter being used to optimize space and protect stored materials from deterioration[15]. These storage facilities could be either public or private, serving civilian or military purposes. They were typically isolated from other structures and strategically positioned in markets, ports, and rural enclosures, highlighting their role in commercial and agricultural activities, as well as in large-scale storage. The economic significance of these granaries in the Roman Empire was considerable, attracting scholarly attention. One of the most notable studies on these structures was conducted by the English researcher Geoffrey Rickman, who examined Latin inscriptions and analyzed the presence of *horrea* across various Roman provinces[16].

In terms of urban planning, *horrea* were usually located in isolated areas near the city's protective walls. They typically faced streets and gates, facilitating both security and the movement of goods. Identifying their specific functions and distinguishing their types was often challenging due to variations in architectural forms. Researchers have relied on construction techniques and inscriptions to determine their purposes. Structurally, these granaries generally consisted of rectangular rooms with slightly elevated floors to prevent water infiltration and moisture damage. They frequently included a central courtyard to facilitate circulation and a corridor providing access to the western streets through only two entrances, enabling efficient loading and unloading of goods[17].

Two primary types of *horrea* have been identified: public and private. Public granaries could serve either military garrisons or civilian populations, while private granaries were commonly found in both urban and rural homes.

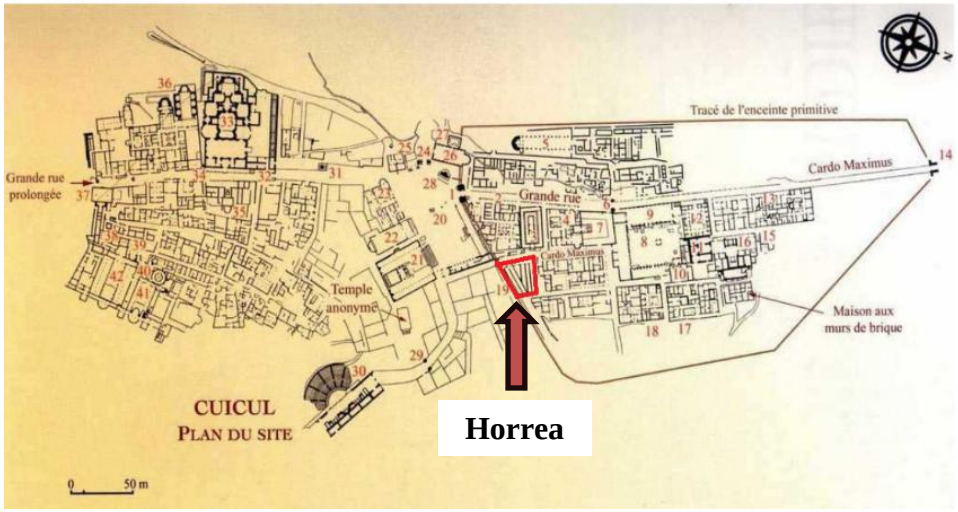
4. The Public Granaries of Cuicul:

The public granaries of Cuicul are an important utilitarian complex, shedding light on the city's provisioning system, although architecturally they do not rival the monumental character of Cuicul's forum, basilica, or theater. They are situated on the eastern side of the archaeological site of Cuicul, covering an area of approximately 500 square meters. The complex lies to the east of the *House of Castirius*, bordered to the south by the *Cardo Maximus* (the main street), to the north by a small street, and to

[14] Vivian pigment, "op cit, p 37.
[14] Dominique Garcia,op cit, p 221.
[15]Rickman, Geoffrey E. "The Grain Trade under the Roman Empire." Memoirs of the American Academy in Rome, vol. 36, 1980, p 261.
[16] Rickman, Geoffrey. The Corn Supply of Ancient Rome. Oxford University Press, 1980, P 191.
[17] Ibid, p 199.

the west by another minor street, while the eastern boundary is defined by the city wall of ancient Cuicul.

The granaries occupy an elevated position overlooking the eastern baths and are directly connected to several roads, ensuring both ease of surveillance and the efficient transportation and circulation of stored goods and commodities[18]. (Plan No. 01).



Plan No.01 : Plan of Cuicul Showing the Location of the Public Granaries

Source: Blas (J-M) de Robelès et Sintes . p88

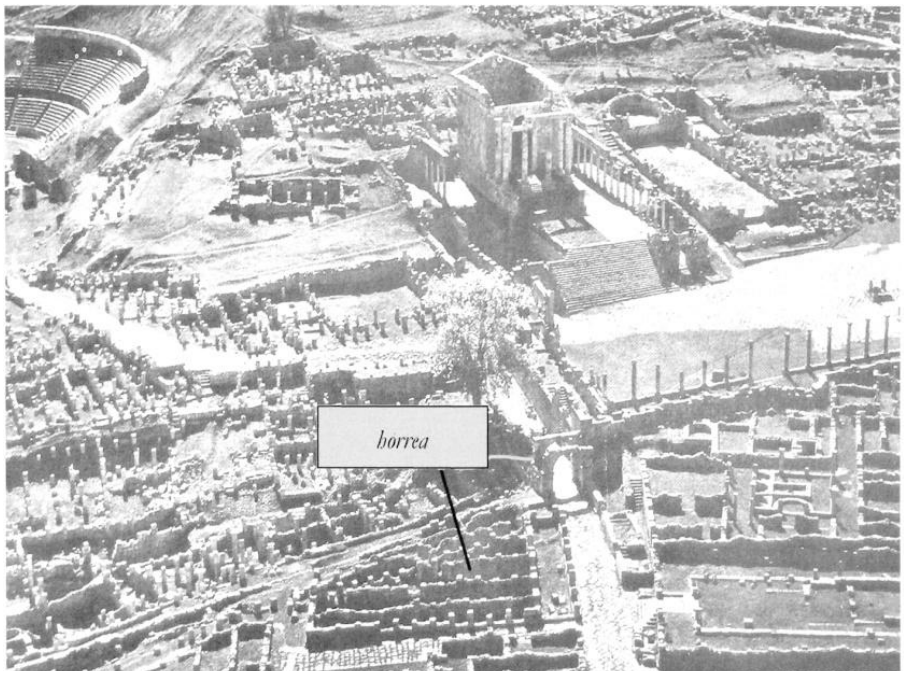


Figure No. 04: Location of the Public Granaries.

Source: Papi Emanuele, Martorella Francesco. I granai della Numidia, p 179.

[18] Zidane Miloud, "Djemila et Sétif l'urbanisme compare de deux villes romaines d'Afrique du nord", thèse de doctorat, université de paris, panthéon sorbonne, UFR d'histoire, 1998, p221.

1.4. History of Research on the Granaries and Their Construction

In 1910, an inscription was discovered in the city, near the southern Great Baths, recording a dedication for the construction of granaries in the *municipium* of Cuicul. At that time, however, the precise location of these granaries remained unknown.[19]

In 1926, an excavation was carried out on the eastern side of the road, during which a fragment of the same inscription found earlier near the Great Southern Baths was uncovered. This excavation, conducted by the researcher Yvonne Allais, led to the identification of the monument as the public *horrea*. The complex consists of several longitudinal spaces or rooms arranged in a rectangular layout, bounded on three sides by roads intersecting at right angles.[20]

2.4. Dating of the Public Granaries

Based on the information provided by the inscription discovered at the archaeological site, the granaries were built as an initiative of the Roman imperial administration in the region. They were inaugurated in 199 CE during the reign of Emperor Septimius Severus, as attested by the inscription, which provides an annual date based on tribunician powers but does not mention exact calendar days under the supervision of the local governing body of Cuicul.[21]

These granaries were integrated into the urban fabric of the city and served to store the *Annona* tax levied on agricultural produce, which was managed by the *procurator* Flavius Nepos Marcianus.[22]

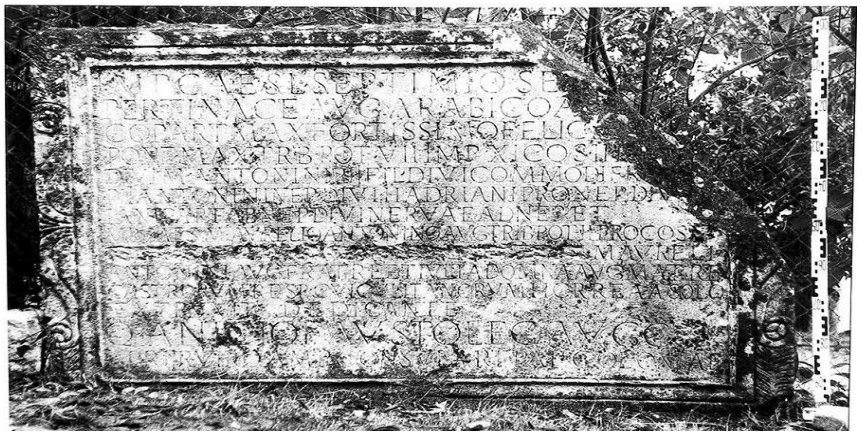


Figure No. 05: The inscription found near the Great South Baths.

Source: AE 1911, 0106.

[19] Virlouvet, Catherine. "Entrepôts de stockage, entrepôts et marchés : Pour une typologie des horrea dans l'Afrique du Nord antique." Antiquités Africaines, vol. 43, 2007, p. 168.
[20] Allais, Y. "Les greniers publics de Djemila." Revue Africaine, vol. 74, 1933, p. 260
[21] Allais, Y. op cit, p. 261.
[22] Eugene Albertini, "une inscription de Djemila", comprends des séances de l'académie des inscriptions et belle lettres 68 année n,4, 1924, p 254.

The Inscription

Latin text:

Imp(eratore) Caes(are) L(ucio) Septimio Se[vero Pio] Pertinace Aug(usto) Arabico A[diabeni]co Part(hico) max(imo) fortissimo feliciss[imo] pont(ifice) max(imo) tr(i)b(unicia) pot(estate) VII imp(eratore) XI co(n)s(ule) II p[roco(n)s(ule)] divi M(arci) Antonini Pii fil(io) divi Commodi fr[atre divi] Pii Antonini nep(ote) divi Hadriani pronep(ote) div[i Tra]iani Part(hici) abnep(ote) divi Nervae adnep(ote) et Imp(eratore) Caes(are) M(arco) Aurelio Antonino Aug(usto) trib(unicia) pot(estate) II proco(n)s(ule) ⟦P(ublio) Septimio Geta Caes(are) [Augusti nostri]⟧ M(arci) Aureli Antonini Aug(usti) fratre et Iulia Domna Aug(usta) matre castrorum res p(ublica) Cuiculitanorum horrea a solo extruxit dedicante Q(uinto) Anicio Fausto leg(ato) Augg⟦g(ustorum)⟧ pr(o) pr(aetore) viro (!) amp(lissimo) consular(i) pat(rono) coloniae.[23]

Translation

"To the Emperor Caesar Lucius Septimius Severus Pius Pertinax Augustus, conqueror of the Arabs, the Adiabeni and the Parthians, greatest, most valiant, most fortunate, pontifex maximus, holder of tribunician power for the seventh time, acclaimed imperator for the eleventh time, consul for the second time, proconsul, son of the deified Marcus Antoninus Pius, brother of the deified Commodus, grandson of Antoninus Pius, great-grandson of the deified Hadrian, great-great-grandson of the deified Trajan Parthicus, and descendant of the deified Nerva; and to the Emperor Caesar Marcus Aurelius Antoninus Augustus (Caracalla), holder of tribunician power for the second time, proconsul; and to Publius Septimius Geta Caesar [our Augustus], brother of Marcus Aurelius Antoninus Augustus, and to Julia Domna Augusta, Mother of the Camps:

The *res publica* of the Cuiculitani constructed from the ground and dedicated these granaries (*horrea*), under the auspices of Quintus Anicius Faustus, legate of the Augusti, *pro praetore*, a man of consular rank, most illustrious patron of the colony."[24]

3.4. The Architectural Layout of the Public Granaries

The building is trapezoidal in shape, with variations in the measurements of its walls: the southern wall measures 21 meters, the northern wall 28 meters, the eastern wall 11.8 meters, and the western wall 23 meters. Access to the granaries is provided through the eastern gate, which consists of a double arch, itself opening onto the secondary *cardo*, measuring 3.13 meters in width and 26.35 meters in length from the gate to the end of the granaries' wall.[25]

[23] AE 1911, 0106. / Année Épigraphique.
[24] ILAlg-02-03, 7806. / Inscriptions Latines d'Algérie.
[25] Allais, Y.op cit, p. 261.

To the east lies the Severan square, while to the south runs the road that separates the public granaries from the ancient city wall, measuring 21.50 meters in length and 3 meters in width. On the northern side, there is the secondary *decumanus*, with a width of 3.10 meters and a length of 28 meters. On the eastern side, a small street separates the granaries from unidentified structures.

The maximum dimension of the granaries is 28 meters, while the minimum length is 11.28 meters. Internally, the building is divided into several compartments or spaces.[26]

1.3.4. The Portico Connecting the Storage Rooms

This portico takes a rectangular form, measuring 20.60 meters in length and 2.80 meters in width. It connects the storage rooms along a longitudinal axis, adjoining both the House of Castirius and the so-called "Unknown Temple." To the north, it opens onto the secondary street, while to the south it leads to the small annex.

2.3.4. The Storage Rooms

The public granaries of Cuicul comprise six storage rooms, which vary in size and form, though most are rectangular in shape.

Room 1. Rectangular in plan, measuring 26 meters in length and 3.15 meters in width. It opens directly onto the main portico through a doorway. Built using the African technique, its walls are about 60 cm thick. The floor is water-resistant, paved with hydraulic mortar to ensure insulation**. (Figure No.06)**

Room 2. Also rectangular, measuring 26 meters by 3.26 meters. It opens onto the portico directly from the west through a doorway about 1.55 meters wide, with a threshold raised 90 cm above the ground. The walls, 60 cm thick, are built in the African technique and currently preserved to a height of approximately 1.90 meters. **(Figure No.07)**

Room 3. Trapezoidal in shape, with its larger portion rectangular and the remainder triangular. The northern wall measures 21.50 meters, the southern up to the beginning of the triangular part 13.10 meters, with a width of 3.08 meters. It opens onto the portico through a doorway similar to those of the previous rooms. It is bounded to the east by the secondary *cardo*, to the west by the portico, to the south by Rooms 4 and 5, and to the north by Room 2. Built in the African technique with stone buttresses, its walls are 60 cm thick, with large unbonded stones forming the corners. It communicates with Rooms 4 and 5, the former through its rectangular section, the latter through its triangular part. **(Figure No.08)**

Room 4. Triangular in plan, nearly right-angled, with the northern side 11.08 meters long, the southern about 11 meters, and the western 5.34 meters. It opens onto the portico by a doorway like the previous ones and connects southward to Room 5 and

[26] Papi, Emanuele, and Francesco Martorella. "I granai della Numidia." Antiquités Africaines, vol. 43, 2007, p179.

northward to Room 3. Its walls, built in the African technique, are about 60 cm thick. This room is distinguished from the others by its triangular shape**. (Figure No.09)**

Room 5. A quasi-rectangular room, measuring 23.23 meters in length and between 3.13 and 3.20 meters in width, making it one of the largest storage spaces. It is accessed from the portico through a doorway like the others. It is bounded to the north by Rooms 3 and 4, to the east by a small secondary street, to the west by the portico, and to the south by Room 6. Constructed in the African technique with 60 cm thick walls, it preserves remains of pottery, bricks, and large discarded stones. Its foundations and stone buttresses show evidence of repair work. At its corners, large stones are placed without mortar. It is the last room directly connected to the portico. **(Figure No.10)**

Room 6. A quasi-rectangular room, measuring 21.20 meters in length and between 2.19 and 2.12 meters in width. Unlike the previous rooms, it opens westward onto the annex leading to the main gateway, while to the east it is bounded by the secondary *cardo*, where only the foundations and a few large stones of the wall survive. To the south lies the passage separating the granaries from the city wall, and to the north Room 5. A distinctive feature of this room is that its western and southern walls were built in brick and stone—unlike the other rooms, though today only remains survive. This peculiarity raises questions about the reason behind the use of a different building technique. Inside, there are heaps of small stones, brick fragments, and discarded roof tiles. The room lacks both a doorway and threshold, unlike the others. Its northern wall, however, was built in the African technique, with a thickness of 60 cm. **(Figure No.11)**

ISSN:1111-7699
EISSN:2600-6499



Figure No.06: ***Room 1.***



Figure No.07: ***Room02.***



Figure No.08: ***Room03.***



Figure No.09: ***Room04.***



Figure No.10: ***Room05.***



Figure No.11: ***Room06.***

The granary rooms of Cuicul

by the researcher

1. 3.3.4. The Annex :

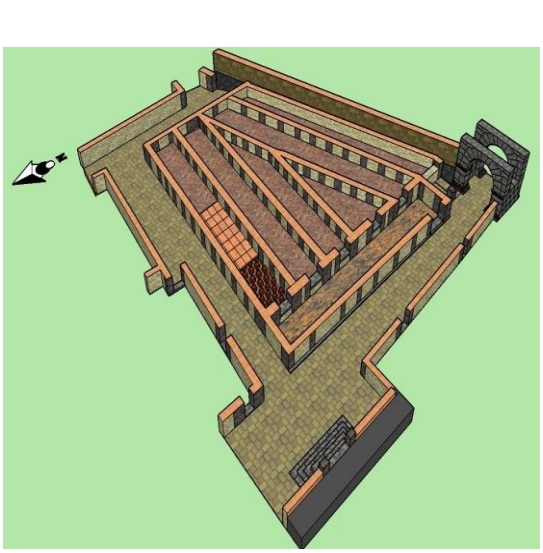
Located next to the main gate and the large arch, the annex has a nearly square shape, measuring 3.20 m in length and 2.22 m in width. It opens to the north through a doorway 3.12 m wide. On the western side, there is a stone slab with perforations forming a threshold near the main gate. To the south, another slab leads to space separating the granaries from the city wall, while to the east lies the entrance leading to Room VI. The annex was built using large, well-cut stones. (Figure No.12)

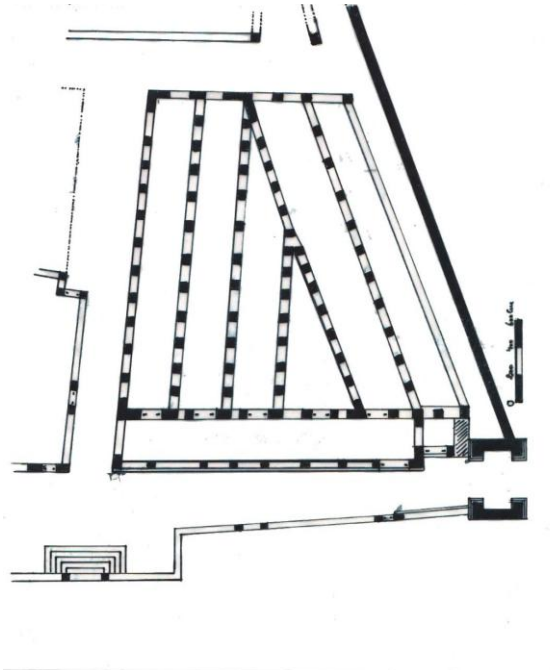
The presence and specific placement of this annex have raised numerous questions regarding its actual function and intended purpose within the complex.



Figure No.12: **The granary Annex of Cuicul**

by the researcher





Plan No. 02 Architectural Plan of the Public Granaries of Cuicul.

by the researcher

5.The Storage of Grain in the Granaries – Archaeological Analysis

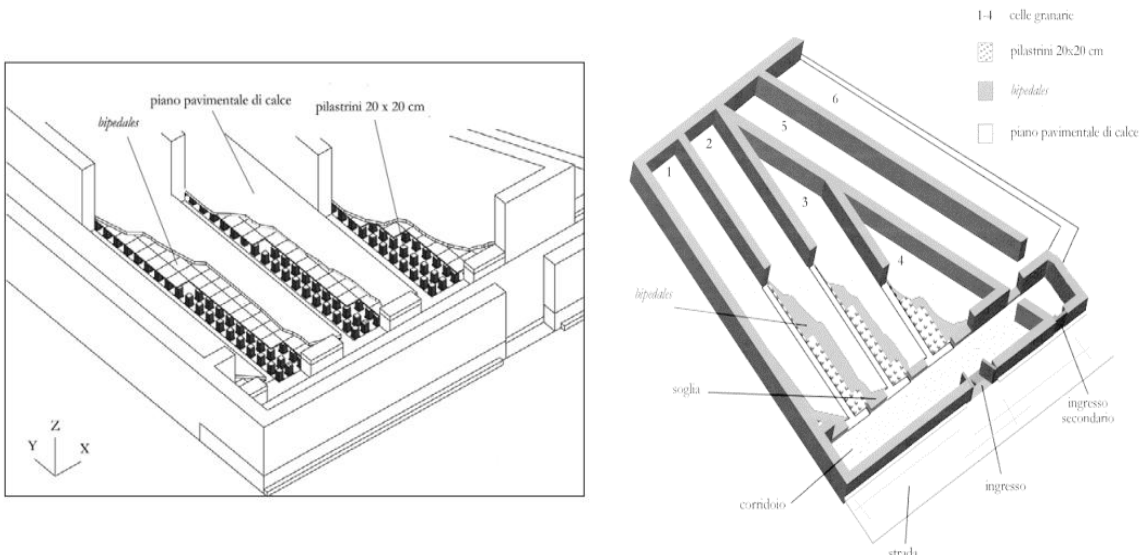
1.5. The Location of the Granaries within the City

The public granaries of Cuicul are situated in the southeastern sector of the city, and their placement was carefully chosen, as they are surrounded by roads and streets on all sides. This choice was not arbitrary but rather a recurring architectural principle observed across Roman cities in Africa, Italy, and Asia. For instance, the granaries of Ostia and Rome were built alongside major thoroughfares, while those in the Asian provinces were often constructed in isolated positions along major roads. At Timgad, the granaries aligned with the main street (the *decumanus*) near the western gate, whereas at the military camp of Lambaesis, the military granaries occupied the northern corner of the *principia*, oriented towards the eastern gate. In Tiddis, the granaries were constructed in the southern part of the city, adjacent to the main road.

All these examples share the fundamental characteristic of isolation, achieved through their strategic positioning amid surrounding roads and open spaces. This isolation was not merely an architectural characteristic but served several practical purposes, the most important of which were ensuring proper ventilation, protecting against fires that could spread from adjacent buildings, and facilitating security and surveillance, given that granaries were among the most vital institutions of Roman cities.

In the case of the Cuicul granaries, their isolation is evident from the network of roads surrounding them: to the west runs a secondary *cardo*, to the south a road separating them from the ancient city wall to the east another street, and to the north the secondary *decumanus*. The western road played a particularly significant role, as two doors opened onto it from the corridor linking the first five storage rooms. This arrangement proved highly practical, as it allowed goods to be brought in and taken out with ease.

Moreover, the deliberate separation of the granaries from other buildings had a considerable impact on improving ventilation, which was essential for the preservation of stored goods. Ventilation contributed to regulate internal temperatures and prevent the accumulation of humidity. Openings in the external walls of the granaries permitted the constant circulation of air and light, which discouraged the proliferation of insects and microorganisms that could damage agricultural produce. This demonstrates that Roman planners addressed not only immediate storage needs but also long-term preservation through carefully engineered architectural solutions that optimized environmental conditions.



Plan No. 03: The Granaries of the city of Cuicul.

Source: Geoffrey Rickman, P 141

2.5. General Layout and Spaces of the Granaries:

The Roman granaries of Djemila (Cuicul) represent one of the most significant public economic structures in the province of Numidia during the Imperial period. They were built in 199 CE, under the Severan dynasty, over the remains of an earlier building whose materials were reused in the construction, indicating a functional continuity of the site across different phases.

These granaries were characterized by an irregular layout, taking a trapezoidal form imposed by the topography of the site, situated on a promontory overlooking the eastern baths. This distinguished them from the classical Roman models with their regular rectangular layouts, such as those at Ostia or in Proconsular Africa. The complex comprised six main rooms of varying shapes (rectangular, semi-rectangular, and triangular), in addition to a square annex and a central transverse corridor, which served as the backbone of transport and unloading activities.[27]

The architectural organization shows the absence of the usual central courtyard found in many Roman granaries, replaced instead by the corridor, which facilitated the entry, weighing, and distribution of goods. This corridor was connected to the western streets by only two entrances, reflecting a deliberate concern for security and control. Some of the storage rooms were directly linked to secondary streets (cardines) or to the city walls, which enabled a functional regulation of the spaces.

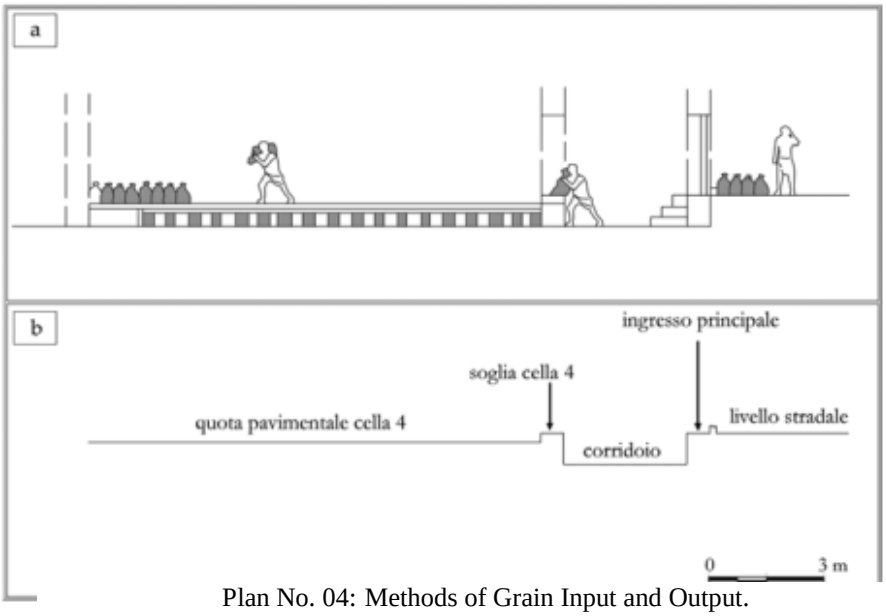
[27] De Romanis, Federico. "In tempi di guerra e di peste: Horrea e mobilità del grano pubblico tra gli Antonini e i Severi." Antiquités Africaines, vol. 43, 2007, p223.

From a technical perspective, the builders employed a combination of construction methods: some walls were erected using the traditional African technique (*opus africanum*), while others were reinforced with brick and stone. The floors were raised on brick piers and covered with layers of hydraulic and lime mortar; a sophisticated system designed to insulate against dampness and protect the stored grain and foodstuffs from spoilage. Small wall openings played an essential role in natural ventilation and the regulation of the internal climate, reducing moisture condensation and ensuring the preservation of perishable goods. Elevated thresholds (up to 90 cm) at the doorways provided a practical solution for facilitating loading and unloading while preventing water infiltration.

As for the roofing, it was flat and covered with tiles, with a slight slope toward the east to allow rainwater drainage away from the corridor, distinguishing it from the traditional gabled roof. Remains of tiles and bricks also reveal a particular concern with thermal protection and ventilation.

In terms of function, the larger rooms (such as the fifth and sixth) may have been designed to accommodate bulk storage, (In large jars and amphorae, while the other rooms were used for grain and dry goods. The square annex adjacent to the corridor likely served an administrative or supervisory role, where guards or officials would monitor entries and exits and manage accounts.

These architectural and functional features make the Cuicul granaries a highly developed model of storage technology in Roman North Africa, combining adaptation to the topography of the site with strict economic and security functions. Moreover, the ventilation and moisture-control solutions highlight the Romans' awareness of the impact of climatic conditions on the preservation of foodstuffs, ensuring that these facilities fulfilled their purpose with remarkable efficiency.



Plan No. 04: Methods of Grain Input and Output.

Source: Geoffrey Rickman, P 141



Figure No.12: Thresholds and Entrances of the Granary Rooms in the City of Cuicul.

by the researcher

3.5. The Organizational Aspect (Management of the Granaries)

The city of Cuicul (Djemila) occupied a strategically important location, functioning as a customs hub due to its position at the crossroads linking the cities of *Mauretania Caesariensis*, Igilgili, Milev, and Cirta. This made it an ideal point for the establishment of facilities with both administrative and economic purposes. The city was founded by Emperor Nerva as a military colony for retired Roman veterans to reinforce control over a region frequently troubled by conflicts and uprisings.[28]

Initially, storage was associated with military supplies (*Annona*) destined for the army, since sieges and wars required the presence of military granaries to preserve taxes in kind and foodstuffs. Epigraphic evidence indicates the existence of early tax-storage facilities prior to the construction of the public horrea, though their exact location within the city has not yet been determined. These early granaries were used to store provisions collected from the local population as tax in kind, either to be shipped elsewhere or consumed by the army.

Later, during the Severan dynasty, public granaries were built because of agricultural and fiscal prosperity. They received vast quantities of agricultural produce

[28] Cagnat, René. L'armée romaine d'Afrique et l'occupation militaire de l'Afrique sous les empereurs (Parts 1 & 2). Paris: Imprimerie Nationale, E. Leroux, 1913, p 272.

(especially grain) from Cuicul and its surroundings, in addition to supplies coming from Mauretania Caesariensis and the southern regions. These stocks were either intended for local consumption or exported to major ports such as Stora, Rusicade, and Igilgili, from where they were shipped to the Roman ports of Ostia and Puteoli. This demonstrates that the horrea of Cuicul had a dual function: annual local storage on the one hand, and commercial storage for export on the other.[29]

From an administrative perspective, the granaries were managed according to the well-established Roman model. Supervision was entrusted to the *aediles plebis cereales*, who appointed a *praepositus* as the head of the horrea, responsible for security, maintenance, and the preservation of stored goods. The administration also included a specialized staff:

- *Mensores*: in charge of weighing goods.
- *Saccerii*: responsible for loading and unloading.
- *Catabolenses*: for the reception of goods inside the storage rooms.
- *Numerarii*: acting as accountants.[30]
- *Tabularii*: serving as treasurers.
- *Custodes*: for security and guarding.

In addition, inscriptions from Cuicul attest to a specific position, the *horreorius* (supervisor of a section of the granaries), a role equivalent to titles known in Italy such as *lecator*.[31]

Storage techniques varied according to the nature of the goods:

- **Grain**: stored either in bulk, poured from sacks into the rooms and supported against the thick masonry walls (60cm).
- or kept inside sacks placed on wooden platforms. Elevated thresholds prevented spillage and facilitated movement, while raised floors helped protect the grain from water infiltration.
- **Liquids (oil, wine, fermented beverages)**: preserved in jars and amphorae within rooms V and VI, which were characterized by thinner walls and lower thresholds than

[29] Bali, N. "L'activité commerciale des ports d'Hippone et de Russicada et leur rôle dans le soutien de l'économie romaine." Revue Qabas des Études Humaines et Sociales, vol. 6, no. 2, 2022, p 1748.
[30] Chankowski, Véronique, Xavier Lafon, and Catherine Virlouvet, editors. Entrepôts et circuits de distribution en Méditerranée antique. École Française d'Athènes, 2012, p 50.
[31] France, Jérôme. "Les personnels et la gestion des entrepôts impériaux dans le monde romain." Revue des Études Anciennes, vol. 110, no. 2, 2008, p. 483.

the other rooms. The use of ceramic containers provided additional protection against humidity and water damage.[32]

In conclusion, the horrea of Cuicul were not merely small municipal facilities, but rather a fully integrated economic institution that contributed to:

- sustaining military supplies.
- meeting the needs of the local population.
- and supporting commercial activity through the export of surplus goods to Rome.

Their particularity lies in their meticulous administrative organization and advanced architectural techniques, which carefully addressed the essential requirements of storage, including ventilation, moisture control, and the protection of provisions from spoilage.

The *horrea* of Djemila (Cuicul) in Numidia constituted a vital node in the administrative and logistical network of the Roman Annona. As municipal granaries, these facilities served as primary collection points for grain levied as tax-in-kind (stipendium) from the fertile surrounding highlands. The grain was temporarily stored in these granaries before being transferred to larger, state-administered fiscal granaries (*horrea fiscalia*) located along key transportation routes. From these intermediate hubs, the grain was ultimately channeled to coastal ports, such as Rusicade and Stora, for shipment to Rome and other major cities, exemplifying the integration of inland urban centers into the imperial supply system.

Cuicul's granaries were more than local silos; they were a vital nexus connecting Numidian agriculture to the heart of the Roman Empire. The scale of the facility, with its massive, ventilated halls, implies the capacity to store substantial quantities of grain, sufficient to supply the city, its garrison, and the imperial Annona. While it is difficult to quantify precisely the volumes stored, the size and design of the halls suggest they hold considerable amounts of grain. This surplus was essential not only for the stability of the city of Cuicul (*Annona civica*) but also for provisioning Roman military garrisons (*Annona militaris*).[33]

Thus, the horrea of Cuicul illustrates how a provincial city was economically embedded within the imperial system, its local agricultural productivity directly supporting the logistical machinery and stability of the Roman state. Their study highlights the strategic and economic importance of such granaries as integral components of a wider infrastructural network connecting local production to imperial governance and supply.

[32] Martorella, Francesco. I dell'Africa romana: Architetture e sistemi di conservazione delle derrate. Mediterranean Archaeology Studies, edited by Emanuele Papi, Edizioni Quasar di Severino Tognon, 2022.p 140.

[33] Cagnat, René. *L'Annone d'Afrique*. In: *Mémoires de l'Institut national de France*, tome 40, 1916, p263.



Plan No. 05: Reconstruction of the Shape of the Granaries and Their Roofing Technique Using SketchUp

6. Conclusion:

The public granaries of Cuicul represent a remarkable example of Roman engineering and administrative organization in Numidia. Their sophisticated architectural design characterized by elevated floors, robust masonry, and carefully planned ventilation reflects a deliberate concern for the long-term preservation of grain and the strategic management of food resources. Functionally, these granaries supported local urban populations, provincial garrisons, and the broader imperial provisioning system, highlighting their dual role in maintaining local stability and fulfilling imperial needs.

Despite the wealth of archaeological and epigraphic evidence, several limitations continue to constrain a full understanding of these structures. Regional variations in granary architecture across North Africa, as seen in Timgad, Lambaesis, Tiddis, and rural estates, remain insufficiently compared with Cuicul. It is still unclear whether Cuicul's irregular trapezoidal plan reflects a local adaptation or a wider Severan-era trend. Dating uncertainties also persist while the Severan inscription of 199 CE provides a secure reference for the reconstruction, earlier phases indicated by reused materials and possible pre-Severan tax-storage facilities remain undated. Furthermore, the state of preservation of certain architectural elements walls, thresholds, and ventilation opening limits precise interpretation of circulation patterns and the function of annex spaces.

These limitations give rise to important research questions: To what extent were Cuicul's granaries integrated into Numidia's wider provisioning network? Can archaeological evidence distinguish between storage for local consumption and military supply? How did environmental and climatic factors shape the architectural

choices of these structures? And what was the relationship between Annona taxation, local markets, and regional trade routes connecting Cuicul to ports such as Rusicade and Stora?

Addressing these questions will not only refine our understanding of Cuicul's granaries but also provide broader insights into the economic, administrative, and social mechanisms of Roman North Africa. In this sense, Cuicul's grain storage facilities should be seen not merely as functional warehouses, but as integral nodes within a sophisticated infrastructural network linking local production to imperial logistics and governance. Their study thus contributes significantly to our knowledge of how Roman cities in Numidia were organized within regional and imperial systems of resource management.

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