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RESEARCH ARTICLE

Evidence from the Asian Economy in Gilan Province (Storage Pit in Shemam Village)

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Abstract

Rudbar, located in the south of Gilan, on both sides of the Sefid-rud River, is a mountainous and one of the ancient regions dating back to at least 200,000 years ago. The artifacts obtained from Darband- Rashi Cave, Marlik Hill, Caluraz, Halimehjan, etc. indicate the existence of ancient civilizations in this region, each of which has its own cultural characteristics. Shemam is one of the old villages with a rich cultural history in the highlands of South Rostamabad. The first archeological excavations in this village were carried out under the supervision of Shahidzadeh in 1970 and a big cemetery belonging to the Parthian period was discovered with slum graves. During the earthquake of 1989, this village was severely damaged and the people living there moved to the lower part and Rostamabad. In recent years, people have resumed building houses on their ancestral estates. During these constructions and the statue, which is accompanied by the supervision of cultural heritage experts of Gilan province, traces of a hand-made structure appeared. Therefore, the construction work was stopped and after issuing a permit from the Cultural Heritage Research Institute of the country, number 4002867, in summer 2021, speculation was made in this area under the supervision of Solmaz Raof. This structure is most likely a grain storage pit dug in the heart of the limestone bed. The wall inside the structure is covered with mud and the floor is covered with beaten mud. Other cultural data obtained from this excavation include pottery pieces. According to comparative study and comparison, most of these pieces are related to the Parthian period.

Keywords: Shemam Village; Rudbar; Storage Pit; Parthian; Asian Economy.

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Introduction

Storage pits are given different names in the literature, which makes uniform processing more difficult, as they often do not clearly express the type of pit it is about. Because underground storage facilities are usually one of the most common types of findings in an excavation alongside post pits, they are sometimes only referred to as "pits" or "settlement pits" (Schwarzländer, 2006: 132). Storage practice, as evidenced by archaeological traces of storage structures, is an important indicator of the past socio-political organization as manifest in the control of agricultural production and distribution (Jones et al., 1986; Hole, 1999). Grain storage can be done according to two different principles. One option is an open storage facility that ideally has dry, cool, and well-ventilated conditions. To prevent the climatic conditions from becoming stagnant, the stored goods are often turned over (Bartl, 2004: 102). On the other hand, there is the method of hermetically sealing the supply in a container such as a pit or a vessel and one of the insides to create a separate atmosphere from the environment. In modern agriculture, these containers, mostly large silos, are filled with gases such as bromomethane or hydrogen cyanide Preventing pest infestation and germination of the grain (Curried, 1989: 75). Of course, prehistoric farmers did not have these options. However, they could naturally do the same Create effect.

So far, there is no evidence of grain storage holes in Gilan, so the storage hole in Shemam village is the first example in Gilan province. The main purpose of this study is to compare this structure with other similar structures obtained from other regions and to prove its use as a place for storing food, most likely grain.

Research Questions

What are the structures in Shemam village and their use?

What is the age of these structures?

Research Hypotheses

This structure is a storage pit dug in the heart of the limestone bed. In the past, these pits were used to store grain for a long time. Before conducting laboratory studies, it is not possible to say for sure in what period this structure was built, but according to the discovery of pottery related to the Parthian period, the age of this area and possibly the storage pit can be considered to belong to the Parthian period and maybe earlier.

Research Methods

In this research, the structure obtained from the excavation for construction in the field method was studied. Pottery pieces were collected by field excavation around the storage pit. Comparative studies were used in the research from library resources and descriptive-analytical methods. Findings from documenting and excavation were analyzed in the form of comparative typology to provide relative chronology.

Research Background

For the first time, research studies on Shemam village were conducted by Abdolhossein Shahidzadeh in 1970. Shahidzadeh in the east of Shemam village excavated a large cemetery from the first millennium BC and the Parthian period in a piece of land that slopes from north to south and discovered artifacts from the Parthian period (Shahidzadeh, 1979: 61-73). In the summer of 2004, to compile the Archaeological Atlas of Gilan, the ancient sites of Rudbar city were studied and identified by Mohammad Reza Khalatbari and Behrouz Hamrang,

and the mentioned site was also examined (Khalatabri, 2014: 88). Another historical site in Shemam is Arofin, which has been registered in the list of national monuments of Iran under number 22513 in 2007.

So far, few studies have been conducted on grain storage pits. Benedikt Biederer's"master's degree in Prehistory and Historical Archeology" has compiled his senior thesis with the title "Speicherung in Boden. Wie organisierten spätbronzezeitliche Gesellschaften in Mitteleuropa ihre Vorratshaltung?(Storage in the ground. How did Late Bronze Age societies in Central Europe organize their stocks? 2017), in the university of the vine. This dissertation describes the history of construction and use of storage holes from prehistoric times to the present, its types, as well as its advantages and disadvantages.

Archaeologists have unearthed grain storage pits during excavations at several ancient sites, including the Cay Ono Site in Asia Minor (Pardo Mata, 1999: 4).

Excavations at the royal capital of Hattusha, situated in the modern village of Bogazkoy, and the important Hittite city of Ku§akh have uncovered crop storage structures capable of holding thousands of tons of grain (Seeher, 2000; 2002). The large earthen storage structures at Biiyiikkaya in Hattusha (Seeher 2000) fit exactly Hoffner's description of agricultural stores designated by the Sumerogram ESAG in his text-based exploration of Hittite food production (Hoffner, 1974: 34-37; note Hoffner uses ARAH, which was the correct reading at the time of publication).

Kalehoyiik lies within the bend of the Kizihrmak River (the ancient Halys River) in the western part of the Hittite homeland. This site was occupied, probably continuously, from at least the latter years of the Early Bronze Age (ca. 2000 BC) through the Hittite period to the Iron Age, with a final phase of occupation during the Ottoman period (Mikami, Omura, 1988; see also Omura 1992 and subsequent issues of Anatolian Archaeological Studies). A conspicuous feature of Kalehoyiik is the many small earthen pits found throughout the site's occupation horizons. Several thousand have been recorded. All of these pits were used to store grain. (Fairbairn, Omura, 2005: 17).

Geographical Location of Study Area

The storage pit is located in Shemam village, South Rostamabad district, the central part of Rudbar, about 50 meters from Taher Imamzadeh. Rudbar is one of the southern counties and a completely mountainous region and the highest city of Gilan province (Figs. 1-2).

Historical Background of Site

The oldest evidence of the human presence in Rudbar in Darband-e-Rashi cave has been obtained approximately 200,000 years ago (Biglari, 2007). When the Aryan tribes entered Iran in the middle of the second millennium BC, warlike tribes such as Cadusians, Derbices and Amards, Hyrcanian, Albanians, Kaspians, and Outians lived in the southern shores of the Caspian Sea (zareenkoub, 1986: 37; Strabo, 2003: 31). During the Islamic period, local governments appeared in different areas of Rudbar, and this area became a battleground for small rulers, each of whom was thinking of expanding their territory. During this period, families such as Jastanians, Kangarians (Salarians = Mosaferian), Kushijians ruled all or part of the current city of Rudbar. Before Abbas the Great of Safavid invasion of Gilan at the beginning of the eleventh century AH, Rudbar was considered part of the territory of the emirate of Kuh-

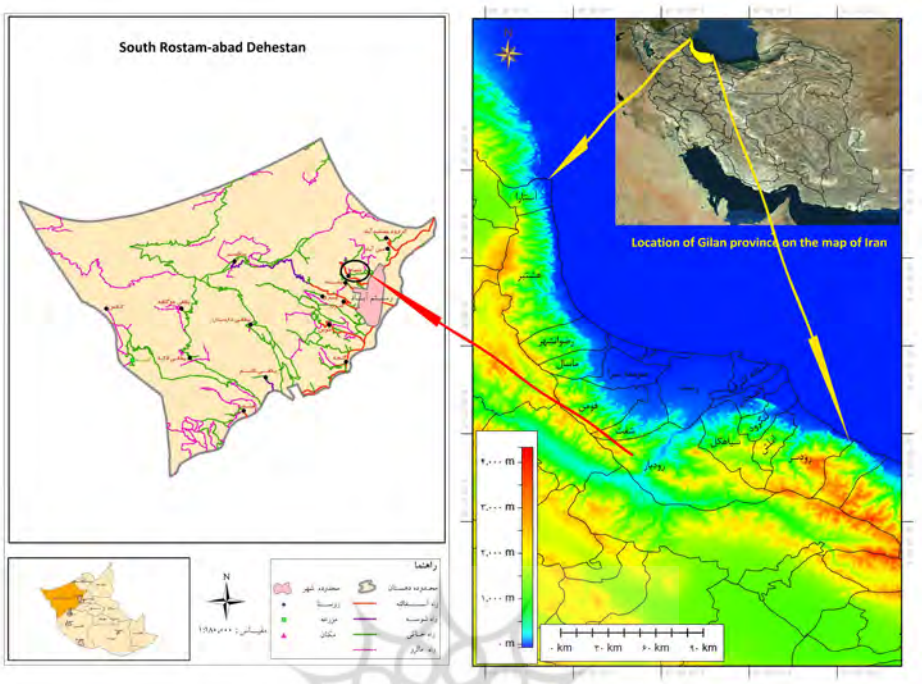

Fig. 1. Location of Shemam Village in the Map of Gilan

dam (Kohdam = Kodum = Kotam). This emirate, which consisted of two mountainous and plain areas, was located in the south of the emirate of Rasht and included the areas between Bijarpas and Fashtam in the south of Rasht to Manjil. The current Rudbar region formed the mountainous and southern part of the Kuhdam region, which was ruled by the Anuzvandian family and Fildeh was considered the seat of their throne (Fakhteh, 2007: 60). Rahmatabad and Jesijan were also important areas of the southern part of Kuhdam emirate. With the attack of Abbas the Great on Gilan, the remnants of the Anuzvandi dynasty fell like other local governments of Gilan, and the southern areas of Gilan, like other areas of Gilan, were invaded for seven years (1000-1007 AH) by the Safavid Ghezelbash (Ibid: 69). During the Safavid and Afshari dynasties, tribes of Kurds, Lors and Turks were forced to flee to revolt, control the province of Gilan and counter the possible uprising of the people of Gil and Deylam, as well as to prevent Russian invasion of Gilan, forcibly in parts of the county. They migrated to Rudbar and their survivors live in these areas today (Fakhteh, 2009: 173).

Remains of ancient cemeteries and historical sites can be seen in all parts of Rudbar which has been considered by archaeologists from the distant past until now and unfortunately unauthorized explorers. Alexander Khodzko, the Russian consul in Iran during the reign of Mohammad Shah Qajar, writes: "There is no place in Gilan where one cannot find ancient ruins. Many of these abandoned places have taken the name of the city ... Escape from the hot and humid days; I spent the summer under tents erected in the mountains of the Rudbar-e-Zaytun

Fig. 2. Location of Shemam Village in Google Earth

block. I saw on the hands and necks of many of the women of these block ornaments of Sassanid medals; I took charge of guiding several exhumations" (Khodzko, 1975: 38).

Shemam village also has a rich historical background. Abdolhossein Shahidzadeh excavated a huge cemetery in the east of the village with Shaft tombs containing valuable artifacts including gold necklaces, agate, glass paste, sculptures, glass cups, and gold and bronze rings from the first millennium BC to the Parthian period (Shahidzadeh, 1970: 61).

Excavation of Site; Data and Results

During the excavation operation to create the foundation of the residential building, was discovered a part of the storage pit, which was prevented from continuing with the presence of experts from the General Directorate of Cultural Heritage of Gilan Province. After clearing, it was determined that the handcrafted structure in this area belonged to a storage pit. The diameter of the entrance of this hole is 70 cm, its depth is 122 cm and the diameter of the pit in the lowest part and its bottom is 110 cm. The highest part is at a depth of -224 cm from the fixed point of measurement and the lowest part is at a depth of -346 cm. This pit was created in a limestone bed and its inner wall was lined with a thin layer of mud, and the bottom of the pit was paved with crushed mud to a thickness of ten centimeters. Part of the inner wall of this storage pit in its southern part has been destroyed due to the penetration of the thick roots of the walnut tree. It should be noted that the lime from this destruction was present in the bottom of the pit with a diameter of ten centimeters. The inside of the structure had been completely emptied in the past. In the layers where the pit was located, several pieces of pottery were found, among which the important pieces of Parthian period pottery are important (Fig. 3).

According to E. Haerinck, two Parthian pottery periods can be distinguished in Gilan region. The early period is from the third century to the first century BC. This period is known in Shemam, Shahpeer, and Joban. The late period from the first to the third century AD has been

obtained from areas such as Hassani-Mahalleh, Nowruz-Mahalleh, Khorram-Rud, Ghale Kooti. In these cemeteries, polished shiny pottery has been obtained in the color of dark red and very dark brown. Early Parthian pottery of northern Iran, especially in Gilan, is very significant. In terms of species and types, they are not comparable with other regions and also do not have similarities with the types of designs of the same region in the pre-and post-period.

The pottery in Shemam cemetery is completely polished. Due to the polishing, it is difficult to tell if the dishes are made by hand or with a wheel (Haerinck, 1997: 171). Characteristic shapes of these potteries in the early Parthian period include bowls and cups with a prominent ribbed edge turned outwards, as well as horizontal diagonal handles and vertical oblique handles. The decoration of the spiral screw patterns can be seen on the floor of the cup obtained from The Shemam excavation (Fig. 4).

Storage Pit

Excavation of a historic site in the village of Shemam revealed a structure that is most likely a storage pit. According to information obtained from indigenous peoples in other areas of Shemam, they also encountered such pits during excavation. Most people consider such pits to be ovens, but no traces of burns, smoke, and charcoal were found on the interior walls and floor of the pit (Figs. 5-8).

The first evidence of storage pit can already be found in the Epipalaeolithic in the Middle East. In the Natufi settlement of Ain-e-Mallaha, also known as Eynan in present-day Israel, they appeared for the first time. The storage method reached Central Europe with the linear ceramic tape. Storage pits have been archaeologically proven from the Neolithic, the Bronze Age through the Iron Age to the recent past (Perrot, 1957: 91–110). Storage pits from the early Neolithic period not only in the pre-Anatolian Neolithic centers but also in other Neolithic areas in the Middle East indicate a change in the livelihood system, so that man by cultivating some grains and animals to agriculture and animal husbandry. And due to the increase in food production, it creates facilities for storing its food surplus. The Cay Ono Site in Asia Minor has several storage facilities that may have been used to store grains and legumes. One such pit was found in the "Gritel" in the B stage of Neolithic pre-pottery. These pits were cylindrical and lined with clay and had a dome-shaped structure, possibly used to store a variety of products (Pardo Mata, 1999: 4). In the area, from which the earliest evidence of storage pits comes today, the people preserved underground storage as an astonishing tradition until almost today. Whereas this method of storage is better known in the Middle East; most historical accounts refer to it as the Asian economy. The technology could still be observed in Bedouins in the Negev desert in the 1980s (Curried-Navon, 1989: also with evidence of Iron Age storage pits). Countless reports and finds show that in "modern" Central Europe, too, the "Asian economy", i.e. underground storage, reappeared in turbulent times and that knowledge of its structure and function must therefore still have been present in the population (Kunz, 2004, 24) (Fig. 9).

Elsewhere in Turkey, similar pits were in use until the mid-20th century (Makal, 1954). Together the evidence suggests that they were a feature of Anatolian life for at least 4,000 years. Thus, ESAG was a Hittite term for a technology that existed before the Hittite Kingdom and persisted long after its decline. The

Fig. 3. The Location of the Storage Pit in Shemam Village (Google Earth, 2022)

technology described by ESAG existed in southwest Asia from the Neolithic period (for example, Akkermans, 1993), though it seems to have been present in central Anatolia only much later. Excavations at the Hittite capital at Bogazkoy have revealed large-scale crop storage structures that match the description of ESAG (Seeher, 2000; 2002: 120-21; see also summary by Bryce 2002: 77), and other similar structures have been noted elsewhere.

Kaman-Kalehoyiik is a multi-phase occupation mound approximately 280m in diameter, situated 100km southeast of Ankara in Kırşehir province, central Turkey. Excavation over 19 seasons showed that it was occupied, probably continuously, from at least the latter years of the Early Bronze Age (ca. 2000 BC) through the Hittite period to the Iron Age, with a final phase of occupation during the Ottoman period (Mikami, Omura, 1988; see also Omura, 1992 and subsequent issues of Anatolian Archaeological Studies). Archaeobotanical research established that agricultural production was a key part of the site's economy throughout the second and first millennia BC. (Fairbairn, Omura, 2005: 16). The Kalehoyuk finds provide another example of centralized storage from a Hittite site in the central Anatolian homeland, and extend the knowledge of storage structures into the domestic domain.

A conspicuous feature of Kalehoyiik is the many small earthen pits found throughout the site's occupation horizons. Several thousand have been recorded. Most are conical in shape, with a flattened circular base up to 2m in diameter, though size and shape vary widely. Rarely, whole pits were preserved, but in most cases their upper parts were lost as a result of rebuilding, making the exact shape and dimensions difficult to reconstruct. Pit density varied across the site, in some cases obliterating underlying archaeological strata (Fairbairn, Omura, 2005: 17). Many pits showed evidence of a lining, in many cases a thin white coating towards the pit base and in others a more substantial deposit of plaster. Chemical analysis and scanning electron microscopy (SEM) showed that mud and lime plaster were both used to line pits, often mixed with a straw temper (Kimura et al.,

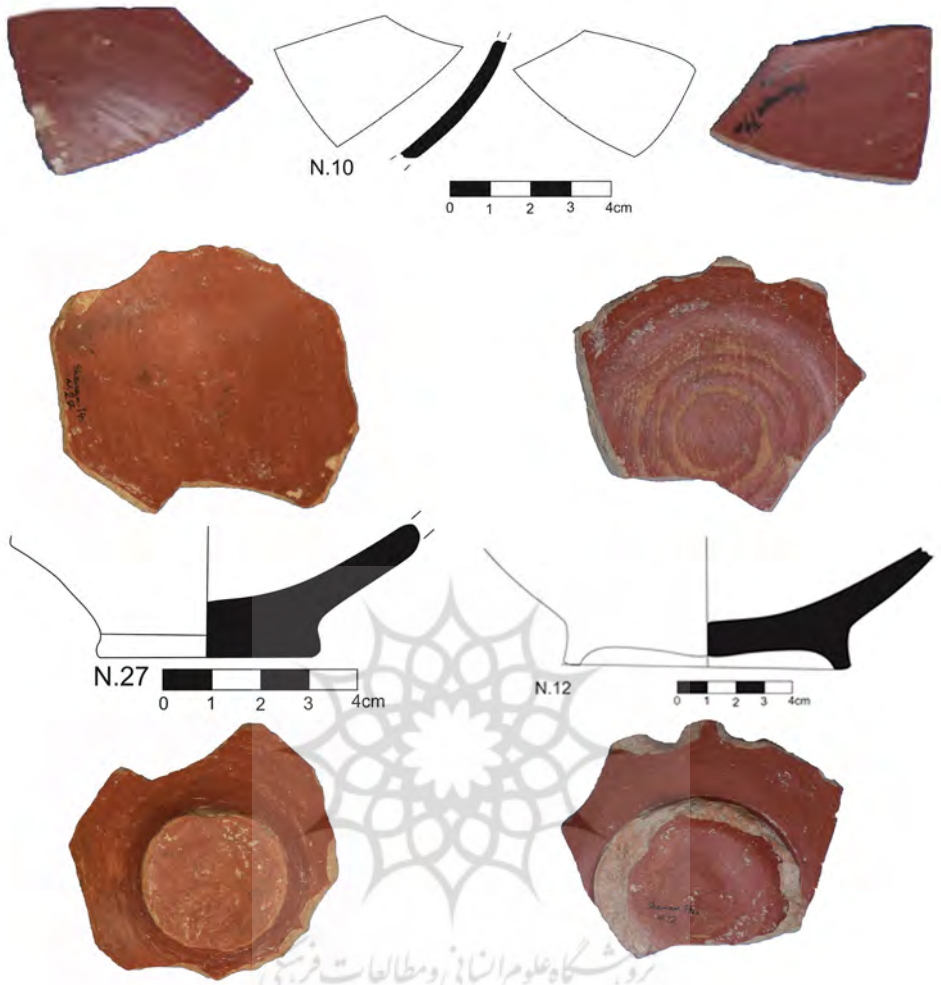

Fig. 4. Pottery Pieces Found in Shemam Village (Raof, 2021)

1998; Twilley, 2002). Experiments on crop storage using pits similar to the small pits at Kalehoyiik also found the design excellent for storing crop seed in this way (Reynolds, 1974). That study also showed that regular conical pits were often accidentally re-shaped and could become irregular when cleaned, perhaps explaining the origin of some irregularly shaped pits at Kalehoyiik. Similar pits have been found in archaeological sites across Eurasia and have commonly been given a crop storage function (for example, Akkermans, 1993; Cunliffe, 1993). The sheer number of small pits suggests that not only was Kalehoyuk a crop production center, but that crop production was one of, if not the most important, economic foci of life at the site. At Kalehoyuk evidence is provided for household-scale storage of crop products, probably seed corn or resources for trade, and centralized storage, perhaps to export to nearby urban centers. (Fairbairn, Omura, 2005: 22) (Figs. 10-11).

Fig. 5. Elementary Condition of the Storage Pit Surface before Starting the Excavation (View from the South) (Raof, 2021)

Advantages and Disadvantages of Storage Pits

There are several reasons to use a grain storage pit; if the grain is placed in a container and this is hermetically sealed so that neither air can get in nor out, the atmosphere soon reaches a point where the oxygen is used up and saturated with carbon dioxide. In such an anaerobic atmosphere, the stored grain comes into a state of rest. This stage is maintained with unchanged moisture content and a uniformly low temperature practically without a time limit, as long as the atmosphere remains sealed off from the surrounding air (Reynolds, 1974: 119). The anaerobic atmosphere has the further advantage that pests such as insects or microorganisms cannot live in it. The prerequisite for successful storage is the lowest possible moisture content in the pit. This fact is often emphasized in historical accounts. It is important to fill the storage pit "with dry fruit in dry weather" (Von Csaplovics, 1829: 13). The moisture content of the grain should be 14% or less. Although these would work just as well with a hermetic seal, if large quantities are stored there are storage pits but considerably.

An important factor in favor of underground storage is the protection factor. In doing so, the content is protected on the one hand against pests such as insects and microorganisms that are already inside and present through harvest or previous use. They die as a result of the anaerobic atmosphere. In addition, external predators such as mice and other rodents are warned of the toxic danger before they can damage the pit, as the surrounding substrate is usually saturated with carbon dioxide. The location also serves as protection against the theft of the stored goods by strangers. Simple thieves, as well as plundering warriors, can steal supplies from the dwelling house and storage buildings that are easy

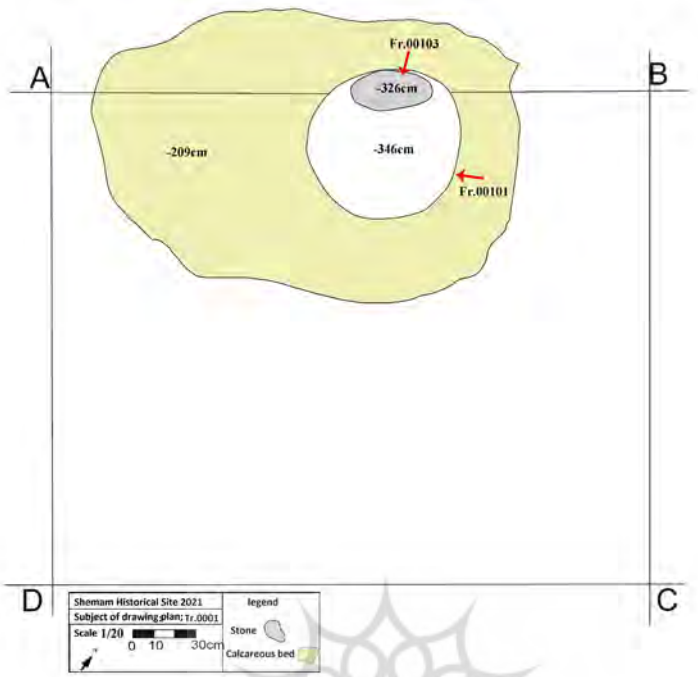

Fig. 6. Plan of the Storage Pit in Shemam Village (Raof, 2021)

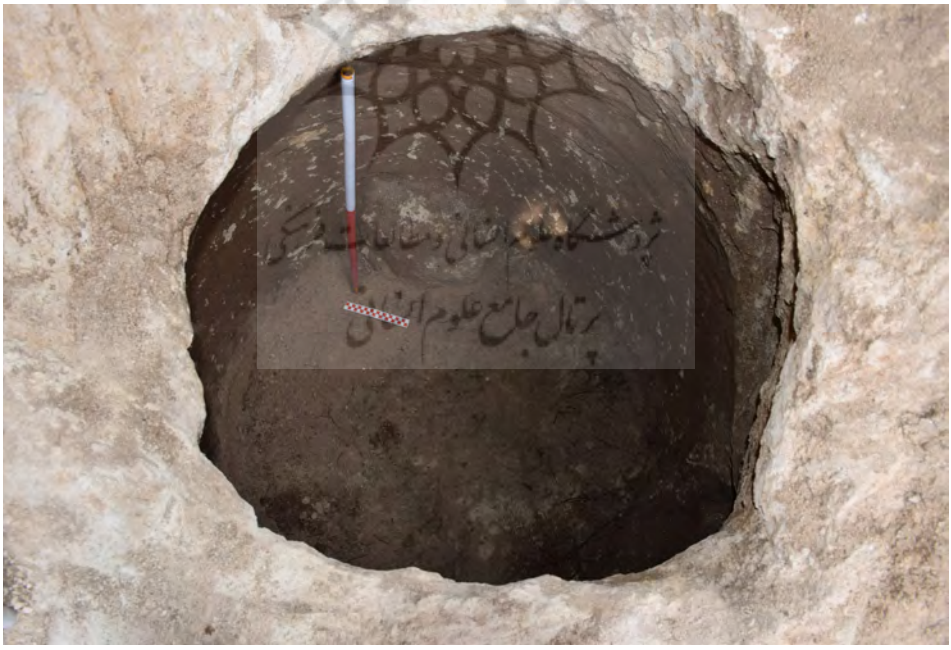

Fig. 7. Internal View of the Storage Pit in Shemam Village (Raof, 2021)

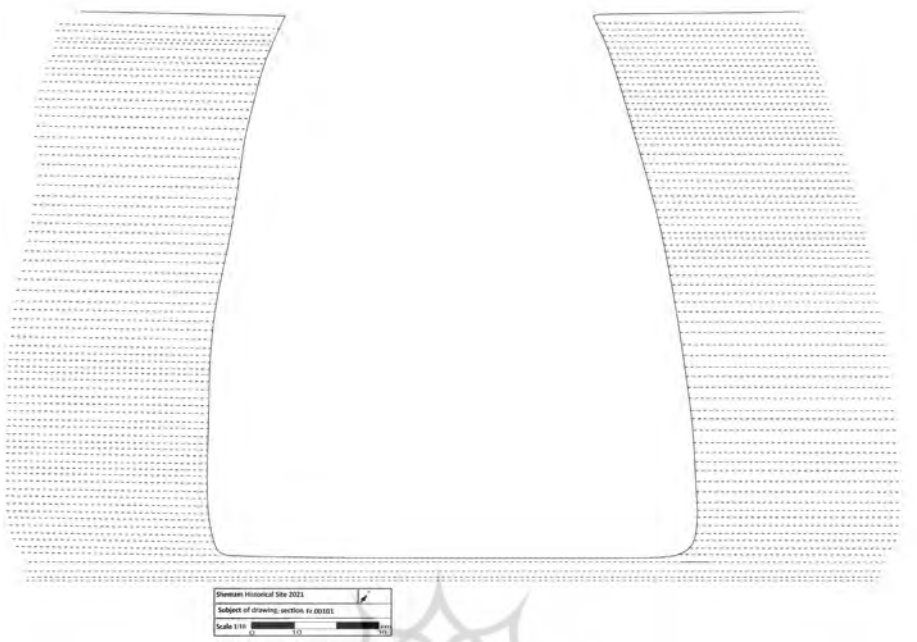

Fig .8 .The Section on Storage Pit in Shemam Village (Raof, 2021)

to hide above ground Storage pits, on the other hand, are difficult to discover for the uninformed. To camouflage the pits, for example, the field above was tilled or they were covered with piles of straw or even rubbish and dung. One of the most important advantages of underground storage is the possibility of long-term conservation they thus offer the opportunity to balance out different good harvest yields over long periods and thus contribute to the security of supply. Seasons with good conditions and excess production were able to counteract seasons with crop failures thanks to the storage pits that had been conserving for years (Figs. 12-13).

In addition to all the advantages, there are also disadvantages to consider. Above all, the uncertainty as to whether the seal is impermeable during the storage phase and whether the contents are not spoiled is a decisive weakness. The pit cannot simply be opened to check whether, for example, water has penetrated, as the conserving carbon dioxide would otherwise escape. Unsuccessful experiments show how much damage can only be discovered when it is planned to be opened. This also means that pits, if it was opened for the first time to remove grain, were completely emptied in one go and the contents either consumed immediately or otherwise stored had to. When emptying, there is also an invisible and odorless danger. Since carbon dioxide is heavier than the surrounding air, it collects on the bottom of the pit (Reynolds 1979, 75). When descending into the pit, the person can suffocate. Most of the builders of storage pits were aware of this threat, as historical reports show (Anonymous, 1772: 214) Reports from Tunisia and Palestine describe, for example, that whoever entered the pit was tied with a rope to be able to get back quickly in the

Fig. 9. A Modern Storage Pit Was Discovered in 1962 with a Preserved Pit Neck Near the Village of Kovalov (okr. Senica, Slovakia) (Kunz, 2004: 52)

event of an emergency due to the gas deposits (Kunz, 2004: 91, 123).

Discussion

Excavation of a historic site in the village of Shemam revealed a structure that is most likely a storage pit. In the past, to store grain, it was stored for a long time in a place called a storage pit.

The principle of grain storage in a pit is essentially quite simple. In a sealed container, the grain will continue its respiration cycle using up the oxygen in the intergranular atmosphere and giving out

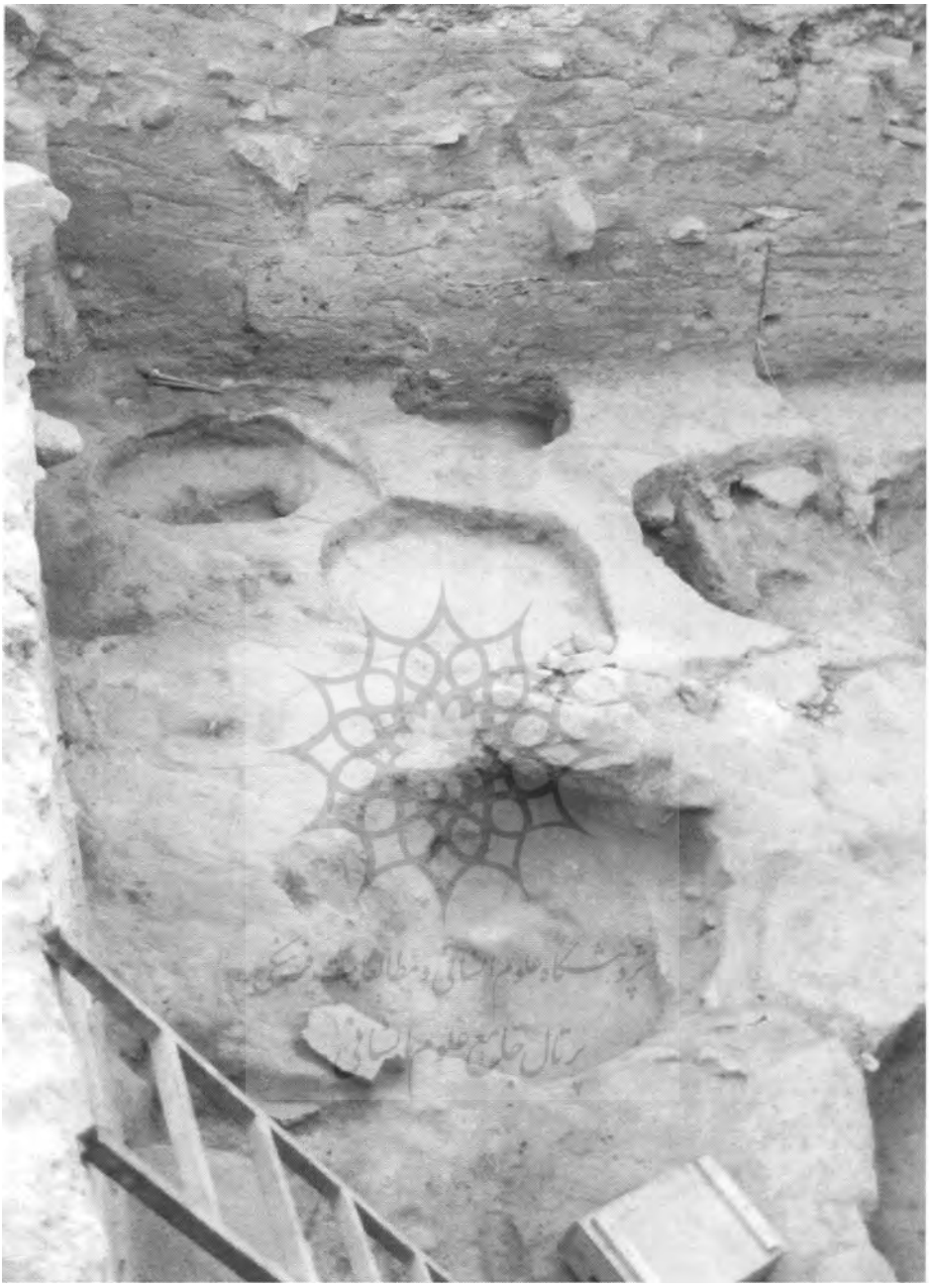

Fig. 10. Pits Intercutting Early Bronze Age Levels (Fairbairn, Omura, 2005: 17).

carbon dioxide. Once the atmosphere is sufficiently anaerobic the grain reaches a state of dormancy. Provided that the anaerobic atmosphere is maintained, the moisture content remains unaltered and a consistently low temperature that inhibits microflora activity prevails, the grain will store successfully for a con-

Fig. 11. Remains of a Pit Base with White Lining (Fairbairn, Omura, 2005: 17).

siderable period. The rise and fall of underground storage can be observed worldwide and across epochs. It can be said that the occurrence or the absence of several factors depends. The geographical location plays a role insofar as the subsoil should be suitable for storage pits. That is, should be in the area the groundwater level should not be too high and the soil substrate stable, easy to work with, and well-drained. Mostly these are Quaternary formations, especially loess, flysch, or soft limestone. But the unstable sandy soils of the North German lowlands were also used intensively for earth storage in the Young Bronze Age (Kunz 2004, 55). In addition to the aforementioned requirements inside the pit, the environmental conditions also play a role in successful storage. The groundwater level in this area should be as low as possible and the subsoil should drain well. To make the work easier, soil that is easy to dig and at the same time stable is an advantage. Loess combines these properties best, which is why it has been preferred overtime was chosen. If this was not available, as in the northern areas of Central Europe, sandy soils were used, and the pits there had to be stiffened and could probably only be used once. On the other hand, underground storage in loess soils could be refilled several times with regular maintenance. While the ancient authors mainly name dry Mediterranean countries as the distribution area of storage pits, archaeological evidence speaks of an occurrence in almost all of Europe. Indeed, they occur more frequently during particularly favorable, i.e. not too humid, periods. But even in rather unfavorable phases, they found a few uses. While storage pits occur in large numbers in the Late Bronze Age and the Iron Age, in more humid and cooler climates in some regions, a significantly reduced occurrence was found. The advantages of underground storage

Fig. 12. Drainage of a Storage Pit (Kunz, 2004: 53)

over other storage methods are clear: They are cheap, easy to maintain, and can be used for a long time under favorable conditions spacious, although they require little building space (Kunz 2004, 134). Although storage pits functioned on the same principle everywhere and at all times, they differed in shape and size. As Peter J. Reynolds found in Iron Age storage pits in Great Britain, they not only differ from one site to another but also from one another at one site (Reynolds 1974, 120).

A major motivation for storing sup-

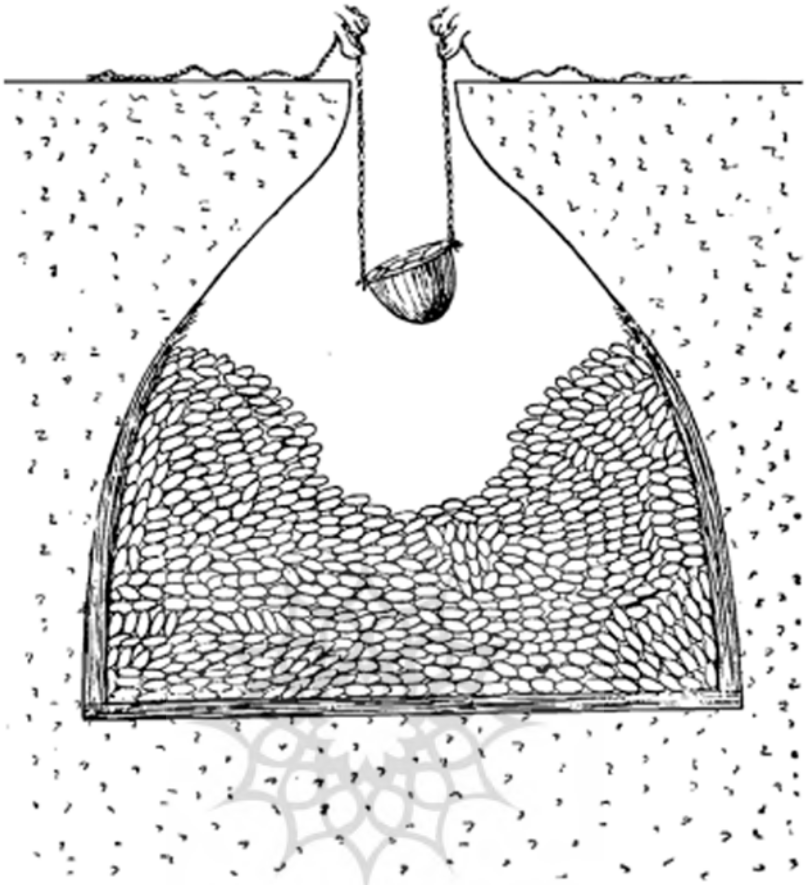

Fig. 13. Representation of Emptying of a Storage Pit in India in the 1920s. A Man Enters the Pit Called "Khattis" There and Fills the Grain into a Basket, Which is Pulled Out by Two Other Men (Bainbrigge Fletcher -Gosh 1921, Taf. 2, Abb. 2)

plies underground is the need for a safe place to store the valuable goods if one looks at the frequent mentions in historical sources of hidden storage pits. This can also be seen in the local names for "storage pit", which in addition to "storage" often express "protection". In the Arabic-speaking world, for example, "matamore", the name of storage pits, means "hiding place" or "protection". Variations of this name can still be found in Morocco, Tunisia, Syria, and Palestine (Dalman 1933, 195) In Central Europe; it is noticeable that storage pits increase in times of crisis is mentioned. The traveler Edward Browns wrote when he visited an area in what is now Slovakia in the middle of the 17th century. When the population had to flee, for example during the uprisings of the Hungarian Revolution of 1848-1849, they often dug pits or used existing pits to hide and store valuables and food in them. Even if the houses burned down, the food in the pits was spared (Kunz 2004, 85). During the two world wars, the tradition of storage pits was revived in

many places. Both inside and outside the houses, they trusted them as a safe place of storage more than in above-ground storerooms.

The advantages of underground storage lie in the fact that it can be built with only comparatively little effort and at a low cost. By doing without wooden construction elements and without requiring a lot of building space, large amounts of excess production can be stored in it for a long time. They are well protected from animal pests as well as enemy attacks and thieves, as all traces of their presence can be covered over the surface. The disadvantage is that a pit cannot be closed again once it has been opened. The conserving carbon dioxide is not formed again, which means that the contents of the storage tank are complete must be emptied and either consumed or otherwise stored. The danger posed by heavy carbon dioxide and only slowly escaping completely from the pit should not be underestimated either.

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