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# HOME IS WHERE WE KEEP OUR FOOD: THE ORIGINS OF AGRICULTURE AND LATE PRE-POTTERY NEOLITHIC FOOD STORAGE

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**Abstract:** *For many years archaeologists have understood that the development of storage systems is a major step in the social and economic process of Neolithisation, contributing to plant domestication, increasingly sedentary lifestyles, and new social organizations. At the same time our understanding of the material correlates of food storage remains underdeveloped, and in many cases archaeologists have struggled to meaningfully quantify the scale of food storage through time. Part of this challenge unquestionably is linked to the lack of visibility of some forms of plant food storage within Neolithic villages. This has probably resulted in an under recognition of Neolithic storage practices. Drawing on evidence from the Southern Levant, in this paper I discuss select evidence for food storage during the Late Pre-Pottery Neolithic B period. Adopting an alternative perspective on the Circular Buildings from 'Ain Ghazal, I explore the view that these features, often identified as evidence for ritual practices, may have actually been used for food preparation or storage.*

**Résumé:** *Les archéologues ont longtemps considéré que le développement du système de stockage constituait une étape majeure dans le processus socio-économique de néolithisation, contribuant à la domestication des plantes, à des modes de vie sédentaires allant en s'accroissant et à une nouvelle organisation sociale. Dans le même temps notre compréhension du matériel associé au stockage des aliments est restée peu développée et dans de nombreux cas les archéologues ont eu de grandes difficultés à quantifier de façon significative l'importance du stockage de nourriture à travers le temps. Cette difficulté est sans aucun doute liée en partie à l'absence de visibilité de certaines formes de stockage au sein des villages néolithiques, avec pour résultat probable une connaissance médiocre des pratiques de stockage au Néolithique. Dans cette étude, je commente une série de données relatives au stockage alimentaire, à partir surtout des découvertes du Sud levantin, à la fin du PPNB. Dans une perspective alternative, les bâtiments circulaires de 'Ain Ghazal, souvent interprétés comme des témoignages de pratiques rituelles, ont pu en réalité avoir servi à la préparation et au stockage des aliments.*

**Keywords:** *Food storage; Archaeological visibility; Social organization.*

**Mots-clés:** *Stockage de la nourriture; Visibilité archéologique; Organisation sociale.*

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## INTRODUCTION

As part of a multi-researcher discussion of *The Birth of the Gods and the Origins of Agriculture* Ofer Bar-Yosef stated, "In sum, it is an impossible task to discuss the whole range and richness and diversity of comments and interpretations offered by Jacques Cauvin".<sup>1</sup> While the publication of *The*

*Birth of the Gods and the Origins of Agriculture* represents the most high-profile, innovative and controversial of Cauvin's research, in many ways it has come to overshadow the contributions that Cauvin made as a long-time field archaeologist who both reflected upon the broader mechanism behind the Neolithic Revolution, the Neolithic material world, and the outcomes of Neolithisation. At his broadest, he wrote about the engines of change driving the social and economic processes of Neolithisation. Now ten years since his passing, I come back to Bar-Yosef's comments about the work of Cauvin, and find

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1. BAR-YOSEF, 2001: 117.

it very difficult to write about just one small dimension of his ideas, work and legacy, as his research transcended experiential replicated research, exhaustive descriptive treatments of a range of material culture, and of course, his broad overview of the Neolithic Revolution.

Recently I have become very interested in turning around some of Cauvin's ideas, and rather than focusing on the initial engines of change, the ideas and causes if you will, I have tried to explore some of the outcomes, both materialist and social, of the Neolithic Revolution. So, if I am to restrict myself to a single argument, a single theme that intersects with the research interests of Cauvin, then it will be the following: archaeologists are only now starting to understand the economic, social, and ritual impact of food storage as part of the Neolithic revolution. This is, of course, an easy argument to make, so let me narrow this down further: while we have long identified the importance of food storage, and at times its material correlates, archaeologists have struggled to meaningfully quantify the scale of food storage, and in the case of the Late Pre-Pottery Neolithic B, we may be underestimating the magnitude of food storage within these villages.

This paper is based upon the following assumption: the social and economic changes of the Pre-Pottery Neolithic were interconnected with shifting food storage practices. Elsewhere<sup>2</sup> I have explored some of the interconnections between Neolithic demography and food storage, and with Bill Finlayson<sup>3</sup> we looked at food storage within early pre-agricultural villages. My aim in this paper is not to revisit previous research exploring the significance of food storage among hunter-gatherers and foragers<sup>4</sup> or present a chronological overview of changing storage practices through the Neolithic.<sup>5</sup> Nor is this essay viewed as being a comprehensive treatment, either geographically or temporarily, of food storage. Rather, in this paper I want to think further about food storage in the later stages of the Neolithic narrative, not as a driver of domestication but as a byproduct of economic and social changes in the Late Pre-Pottery Neolithic B period (LPPNB). In the space available I want to think about the materiality and visibility of food storage and the current archaeological evidence for food storage in the LPPNB. As part of this I want to revisit the interpretation that LPPNB Circular Buildings at 'Ain Ghazal were used as ritual structure, and instead suggest that these structures may in fact have existed for food storage or perpetration.

2. KUIJT, 2008.

3. KUIJT and FINLAYSON, 2009.

4. TESTART, 1989.

5. See KUIJT, 2008.

## THINKING ABOUT NEOLITHIC FOOD STORAGE

To understand the Neolithic Revolution we need to envision food production as a long-term human process that centers on the control and management of cycles of plant reproduction, including the harvesting, storage and planting of seed stock. Drawing upon a growing body of literature illustrating multiple trajectories and pathways to agriculture, I see domestication as developing through co-evolution between human beings and the resources they exploited. To gain a more detailed understanding of the processes and pathways of the Neolithic Revolution requires us to disentangle a complex knot of different yet interrelated factors including technological developments, environmental background, new social practices and the development of food storage. Over the last few years several researchers<sup>6</sup> have directed renewed attention to understanding the social context of food systems, and the possible links between the control and storage of food and the scale and organization within communities. In brief, evidence from the Near East indicates that while the use of storage practices increased dramatically through the Neolithic sequence, it is equally important for us to consider who had access to stored foods, how such commodities were, or were not, viewed as forms of property, and foundational questions of the archaeological visibility of foods storage.

Articulating the interrelationships between food storage, economic decision-making, and community organization represents one of the greatest challenges that anthropologists face in understanding the global emergence of social differentiation and middle-range societies. Control of food represents one of, if not the, most important physical and observable foundation for increasing economic and political social differentiation. The ability to manipulate the availability of food, both wild and domestic, and to regularly overcome the seasonal schedule of availability, through good years and bad, is a critical foundation for the emergence of social differentiation in middle-range communities. In many geographical and temporal contexts, food storage precedes plant domestication as well as the appearance of status differences. Storage does not automatically result in a food surplus, but a food surplus is a central condition for social differentiation. From this perspective domestication and the development of a food surplus are foundational adaptations for later development of status

6. See BOGGARD *et al.*, 2009; FAIRBAIN *et al.*, 2007; FLANNERY, 2002; KUIJT, 2008; TWISS, 2008; WRIGHT, 2000.

inequalities. The invention of food storage technology and the renegotiation of social, economic and political arrangements around storage practices are the first step in the transition to more complex, segmented communities. While anthropologists recognize the evolutionary importance of the transition from more egalitarian to hierarchical social systems, we still lack a comprehensive understanding of the diverse pathways of how food storage and surplus lead to social differentiation in middle-range societies.

Over the last ten years researchers have made significant advances in our understanding of community organization and ritual within Neolithic communities. They have spent considerable time exploring the timing of morphological changes in seeds, and we are collectively developing a more refined understanding of the long-term evolutionary trajectory from foraging to cultivation to farming, and with lots of potential moments in between these idealized social and economic types. At the same time, we continue to have a poor understanding of food systems, as both a symbolic and practical dimension of Neolithic social change. While there are notable exceptions<sup>7</sup> we have only the most coarse-grained understanding of the location of food consumption within Neolithic settlements, feasting, food as property, food preparation (such as drying and smoking), and food storage of different types. It is not that one has been neglected for the other; rather I would argue that while our understanding of ritual and symbolism has been advanced as an agenda, our understanding of food systems beyond the morphological and temporal changes of different taxa has lagged behind. In this paper I want to try and fill in this gap, and to think about the visibility and evidence for food storage.

### CONSIDERING ARCHAEOLOGICAL VISIBILITY AND INVISIBILITY OF LATE PRE-POTTERY NEOLITHIC FOOD STORAGE

Before considering the available data on Neolithic food storage, it is necessary to briefly reflect upon the materiality of food storage, and to explore the methodological challenges in reconstructing food storage. The reconstruction of past food storage through archaeological data is a highly complex challenge, and given that it deals with materials that do not always preserve well in the archeological record, it is important to rec-

ognize that our understanding will always be incomplete. As researchers, we are limited by the data that are preserved. In some archaeological sites preservation of food storage is likely to be remarkably poor, and it is therefore necessary to pay greater attention to those case studies that are better preserved. The assumption that most sites shared similar storage technologies and practices is difficult to assess. Most likely, there were differences in practices through time, and as pointed out by researchers<sup>8</sup> these differ in terms of their ethnographic and archaeological visibility.

Needless to say, not all food storage can be identified in the archaeological record. Ethnographic accounts of hunter-gatherers and farmers illustrate a wide-range of storage practices. Many have no material manifestation in the long-term, and as such, are largely untraceable even with the most sensitive and sophisticated archaeological research. Some storage, as expressed through architectural rather than paleobotanical remains, may have been focused on general storage of goods rather than food. Thus, depending upon specific case studies, as researchers we are likely to be missing significant aspects of food storage practices.

There are a number of challenges that researchers face when reconstructing prehistoric food storage. First, researchers must determine which archaeological data, such as small rooms or features, are physical manifestations of storage rather than representing some other behavior. While it is possible to draw upon ethnographic or ethnoarchaeological data, at some level this requires a judgment by the researcher and a series of inbuilt assumptions, including that if we see x types of food storage in y type of feature then similar food storage might be occurring in other y features where no food remains were recovered. Second, it is necessary for researchers to determine if these spaces were used for some type of food storage, or more likely, a range of food and non-food storage practices. In some cases there is direct evidence available, such as burned grain or beans found in the rooms, that help us identify the presence of food storage. But in many, if not most, cases the determination of food storage is based on circumstantial evidence. This is particularly true with when addressing the possible interconnections between architecture, space and food storage. Third, and perhaps most complex, researchers need to determine if the scale of food storage actually reflects a food surplus beyond the yearly needs of a specific scale social group, such as the household or village. Such analysis takes researchers beyond the level of identifying individual features, and challenges them to reflect upon the number of features for

7. See BOGGARD *et al.*, 2009; FAIRBAIN *et al.*, 2007; FLANNERY, 2002; FULLER *et al.* 2010; KUIJT, 2008; TWISS, 2008; WRIGHT, 2000.

8. DAVID and KRAMER, 2001; KENT, 1999.



the entire village, how this helps us estimate population levels, and how much food was available at the household.

While recognizing the need for a detailed exploration of the materiality of Neolithic food storage, in this paper I am going to adopt a fairly flexible position as to what represents potential storage space. I am going to assume that if there is archaeological evidence for carbonized food resources from one site, in a particular type of feature or room, then features / rooms of the same type at the same or other sites, have the potential to also be used for food storage. For example, ethnographic studies have illustrated that roofs are often used for food processing, drying plants, and short-term (less than six months) storage. At the moment, however, the lack of archaeological evidence makes this impossible to confidently explore with archaeological data. In cases where there is no preserved paleobotanical remains and direct evidence, I develop circumstantial arguments by considering other possible alternative uses for space. This is most important when considering the possible use of specific rooms in the LPPNB that are very small (generally less than 1.5 by 1.5m) that have a half-door entrance, no windows, and are located in spatially controlled areas of the building. Again, I am focused on assessing the potential space for food storage, and then comparing this to the patterning seen with other archaeological data sets and the expectations of emerging social inequality with the development of domesticated plants and animals.

## THE BUILT ENVIRONMENT DURING THE LATE PRE-POTTERY NEOLITHIC B PERIOD

Food storage is a vital component in the economic and social package that comprises the Neolithic, contributing to plant domestication, increasingly sedentary lifestyles, and new social organizations. Research at several PPNA sites provides evidence for the appearance of large settlements, with buildings that required significant energy investment, and drastically expanded development of food storage compared to the Early and Late Natufian periods and increased manipulation of plant food sources. Excavations at Dhra', Gilgal I, Netiv Hagdud, and WF 16, illustrate that at the end of the Younger Dryas climatic period, for the first time people started to live in larger communities. This is echoed by additional architectural data from Çayönu and Nevalı Çori.

Archaeological data from Late Pre-Pottery Neolithic B period settlements allows researchers to develop a preliminary

understanding of, and how food storage fits within a broader developmental framework.<sup>9</sup> In brief, there are clear indications that through the LPPNB we see how:

- a) access to storage space becomes more restricted;
- b) that there was a general shift from extra to intra-mural storage;
- c) by the LPPNB storage technology eventually involved the creation of dedicated storage rooms;
- d) there is a significant increase in the scale of potential storage space through the Pre-Pottery Neolithic (Tables 1 and 2).

Several LPPNB settlements have been excavated in relatively broad horizontal areas, and as a result, archaeologists are quickly developing an understanding as to the nature of settlement organization at different sites in the Near East. At Beisamoun and Abu Gosh, for example, buildings are freestanding with the spacing of structures creating alleyways and distinct areas between buildings. In contrast, at the LPPNB settlements east of the Jordan River, such as Basta, 'Ain Ghazal, Es-Sifiya, 'Ain el-Jammam, El-Hemmeh, and Khirbet Hammam, buildings are usually built next to other structures, resulting in areas with remarkably high architectural density (fig. 1). It is not clear if this reflects a greater density of human occupation or if it is actually a by-product of more elaborate architecture.

To understand food storage in the LPPNB we need to briefly step back and think about residential architecture. As with the preceding MPPNB period, residential architecture in LPPNB settlements is generally characterized by rectangular or sub-rectangular buildings with plastered floors and walls.<sup>10</sup> In regions of the southern Levant where large stone material was not readily available, buildings were constructed of unfired mud-brick. At settlements where angular or flat stones were available, residential structures were quite elaborate, and in several cases included the development of true second story architecture. At Basta, Ba'Ja, and Es-Sifiya, for example, excavations have uncovered evidence of two story buildings with prepared stairways and stone platforms to support roof beams.<sup>11</sup> In some cases, external walls preserved to a height of 2-3 m illustrate remarkable stone working and two story buildings.

There are two other important aspects to LPPNB residential architecture: the existence of freestanding and/or abutting architecture at different sites, and the appearance of room systems that probably served as dedicated storage areas. Free-

9. See KUIJT, 2008.

10. PURSCHWITZ and KINZEL, 2007.

11. GEBEL *et al.*, 2006; KINZEL, 2004; PURSCHWITZ and KINZEL, 2007.

**Table 1** – General aspects of Levantine Natufian and Pre-Pottery Neolithic storage practices.

	Extra-mural	Inter-mural	Architecture	Interpretation	Sites
<b>Early Natufian</b> ca. 14,500-12,800 BP	• No evidence	• Possible rare storage installations	• Single-story oval architecture • Free-standing semi-subterranean buildings	• Low residential mobility and some storage • Unclear access	'Ain Mallaha, Hayonimn cave, Kebarah, Wadi Hameh 27
<b>Late Natufian</b> ca. 12,800-11,700 BP	• No evidence	• No evidence	• Single-story oval architecture • Free-standing semi-subterranean buildings	• Highly mobile groups with limited storage • Unclear access	'Iraq ed-Dubb, Fazael IV, Givat Hayil, Baaz Rockshelter
<b>Pre-Pottery Neolithic A period (PPNA)</b> ca. 11,700-10,500 BP	• Extra-mural storage silos	• Small storage installations in rooms?	• Single-story oval architecture • Free-standing Semi-subterranean buildings	• Low residential mobility and significant storage • Separation of residential and storage areas • Relatively open access	Netiv Hagdud, Jericho, Dhra' Gilgal I, Zahrat adh-Dhra' 2
<b>Middle Pre-Pottery Neolithic B period (MPPNB)</b> ca. 10,500-9,250 BP	• Clay storage installations in open areas	• Clay storage installations in corner/sides of room • Small compartments	• Single-story rectangular architecture • Free-standing buildings • Sub-basement?	• Low residential mobility and significant storage • Integration of storage facilities and residential areas • Restricted access	'Ain Ghazal, Yiftahel, Jericho, Kfar Hahorish
<b>Late Pre-Pottery Neolithic B period (LPPNB)</b> ca. 9,250-8,700 BP	• Unclear (Limited excavations)	• Transition to dedicated storage rooms	• Two-story rectangular architecture • Abutting buildings • Access by ladder/stairs from above?	• Low residential mobility and significant storage • Integration of residential and storage areas • Restricted access	Basta, 'Ain Ghazal, Es-Sifiya, 'Ain Jammam, Ghwair, Ba'ja
<b>Pre-Pottery Neolithic C period (PPNC)</b> ca. 8,700 - 7,800 BP	• No evidence	• Dedicated storage buildings?	• Abandonment of two-story architecture • Single-story buildings	• Low residential mobility and significant storage • Separation of residential and storage areas? • Unclear access	'Ain Ghazal, Khirbet Sheikh Ali, Atlit Yam

standing buildings were often constructed where there was no readily available flat or rectangular stone material (such as a Beisamoun, Abu Gosh, and Ramad). In larger settlements, buildings often abutted each other, using existing walls as a form of structural support. Beyond producing the conditions for second story residential architecture, these practices appear to have created, intentionally or unintentionally, ground floor room blocks composed of adjoining small 1.5-2 m rooms. In light of their size and the perceived absence of domestic artifacts, these areas possibly functioned as dedicated storage rooms.

## FOOD STORAGE PRACTICES DURING THE LATE PRE-POTTERY NEOLITHIC B PERIOD

With the onset of the LPPNB people shifted their food storage to intra-mural locations, in many cases with the use of separate dedicated rooms inside of buildings (fig 1). If avail-

able archaeological data accurately reflect the broader pattern during this point, then this reflects an increase in the scale of storage that was practiced, and perhaps just as importantly, the location of stored goods.

The transition from the MPPNB to LPPNB period illustrates a remarkable transition in how buildings were constructed, and how residential and non-residential space was defined and used by people.<sup>12</sup> Some of the interesting shifts are seen in how people generally shifted the location of food storage to internal areas of buildings, how storage potential increased significantly in scale, and how people created storage areas where access could be controlled. Archaeological evidence for storage systems is seen in the uncovering of dedicated storage rooms inside of buildings, in some cases with specially designed door ways. The other shift in architecture and food storage is that with the LPPNB we find our first evidence for two story-buildings, probably with people in select

12. See GORING MORRIS and BELFER-COHEN, 2008; KUIJT, 2000.

**Table 2** – Levantine Natufian through Pre-Pottery Neolithic food surplus and practical storage.

	Plant economy	Animal economy	Organization of practical storage (Dedication / Integration)	Scale of practical storage (Residential to Communal)	Access to stored materials (Restricted to open)
<b>Early Natufian</b> ca. 14,500-12,800 BP	Intensive collection and variable cultivation of local wild plant resources	Intensive hunting of wild animal resources: no evidence for subsistence husbandry	• Storage inside and outside of residential unit in public context	• Very small volume	• Relatively unrestricted spatial access
<b>Late Natufian</b> ca. 12,800-11,700 BP	Intensive collection and variable cultivation of local wild plant resources	Intensive hunting of wild animal resources: no evidence for subsistence husbandry	• Storage inside and outside of residential unit in public context	• Very small volume	• Relatively unrestricted spatial access
<b>Pre-Pottery Neolithic A period (PPNA)</b> ca. 11,700-10,500 BP	Intensive collection and variable cultivation of local wild plant resources: possible early domestication of some plants	Intensive hunting of wild animal resources: no evidence for subsistence husbandry	• Dedicated / storage outside of residential unit in public context	• Small volume	• Relatively unrestricted spatial access • Possible extramural storage facilities between residential structures
<b>Middle Pre-Pottery Neolithic B period (MPPNB)</b> ca. 10,500-9,250 BP	Collecting and cultivation of wild plant resources: variable use of a wide range of domesticates depending upon location	Hunting of wild animal resources: domestication of caprines (goat-sheep) for meat and secondary products	• Dedicated / storage inside of residence	• Medium volume	• Storage installations in corner/sides of room • Clearly identified storage locations
<b>Late Pre-Pottery Neolithic B period (LPPNB)</b> ca. 9,250-8,700 BP	Primarily focused on a restricted range of domesticates depending upon location	Hunting of wild animal resources: increased reliance upon narrow spectrum (caprines, pig, cattle)	• Dedicated / separate rooms for storage	• High volume	• Spatially restricted access from second floor to first floor • Dedicated storage rooms in lower floor of building
<b>Pre-Pottery Neolithic C period (PPNC)</b> ca. 8,700 - 7,800 BP	Primarily focused on a restricted range of domesticates depending upon location	Hunting of wild animal resources: increased reliance upon narrow spectrum (caprines, pig, cattle)	• Dedicated / separate rooms for storage	• Unclear	• Single-story buildings • Dedicated storage rooms in lower floor of building

villages spatially dividing up their use of space between the ground and upper floors.

Architectural practices in the LPPNB shifted to the construction of buildings that were composed of a series of rooms that abutted each other. By the later stages of the LPPNB, with aggregate villages, buildings were no longer freestanding. It was common for individual rooms to be added to earlier buildings, and in other cases older structures were later sub-divided into smaller rooms. In some cases buildings appear to have been pre-planned and purposefully designed. In contrast to the architecture of the MPPNB it was quite common for people to add rooms on to existing buildings or to sub-divide them.<sup>13</sup> At Es-Sifya people constructed multi-story buildings along a relatively steep slope area, with remarkably dense architecture.<sup>14</sup> Many of these buildings had small (*ca* 1.5 x 1.5 m) rooms, with

no windows to exterior areas, and half-door entrances connecting to what was probably a central room.<sup>15</sup> The resulting rooms were often irregular in shape, with many of them having plastered red floors, and internal subdivisions. As is seen in fig. 1, rooms at Ba'Ja, Basta and Es-Sifya, were accessed from central or adjacent rooms through small half-door entrances that are about 1 meter high.<sup>16</sup> These entrances have the appearance of windows, although they only connect rooms inside of structures.

At Basta, we see the same practice: the construction of two-story buildings with compartmentalized room blocks accessed through a series of small half-door entrances. Importantly, these are not found in every building.<sup>17</sup> Rather, it appears that they were built in spatial association with multiple interconnected half-door rooms. Unfortunately, our limited under-

13. GEBEL *et al.*, 2006; KINZEL, 2004; PURSCHWITZ and KINZEL, 2007.

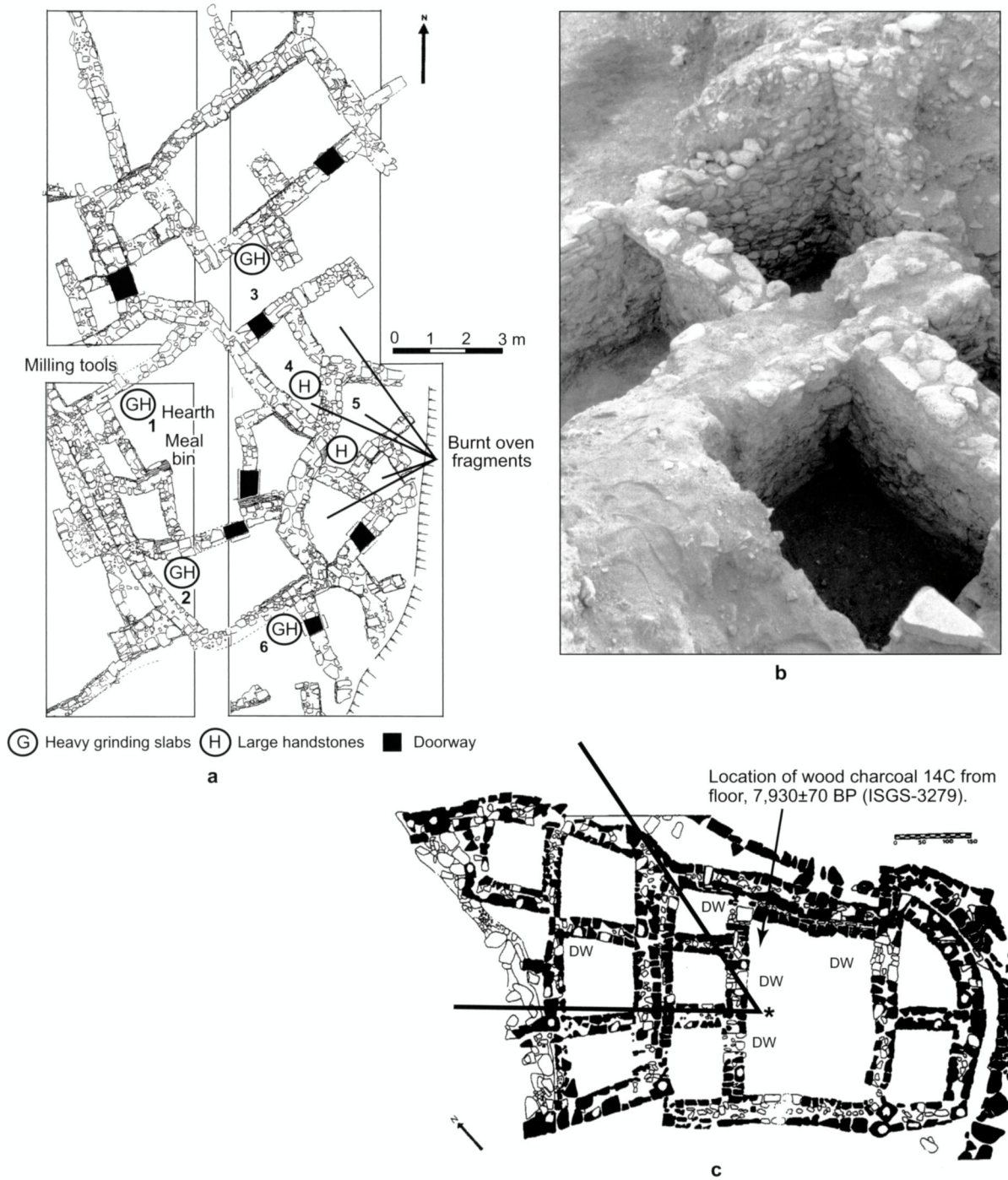
14. MAHASNEH and BIENERT, 2000.

15. GEBEL *et al.*, 2006; Fig. 4.

16. GEBEL *et al.*, 2006; KUIJT, 2000; PURSCHWITZ and KINZEL, 2007.

17. GEBEL *et al.*, 2006.





**Fig. 1** – Late Pre-Pottery Neolithic B period architecture from Es-Sifyia and Basta. *Plan view of Late Pre-Pottery Neolithic B period (ca. 9,500 to 8,700 cal BP).*

*a. area B, Basta Jordan (based on WRIGHT, 2000 and GEBEL et al., 1997).*

*b. cell structures and half-door system, Es-Sifyia, Jordan (photo by I. Kuijt).*

*c. area A architecture, Es-Sifyia, Jordan. \* is location of the viewer in photo 3 above right (based on MAHASNEH, 1997, fig.3).*



standing of the horizontal spatial organization of LPPNB sites makes it difficult to understand if the clustering of these half-door rooms was organized as part of household property, with one or more of these store rooms owned by household, or if they reflect some other system of ownership.

There are several possible explanations for why people constructed the half-door entranceways. It is possible that the half-door system with a plastered stone below and some form of wooden door up above were useful in creating a barrier against rodents and insects. This would have created a storage room where sacks or baskets of foods could have been securely stored. The other possibility is that these served as large bins for a range of commodities. People might have used them directly as grain bins that were of an increased scale compared to those of MPPNB. Regardless of what was being stored in these areas, it is clear that in the LPPNB people started to actively define space in new ways that were focused on limited access and protecting goods. Both the apparent spatial clustering of these within sites, the restricted access to these, as well as the significant scale, indicates that people were dealing with new technological systems of storing food as well as new means of controlling and owning resources.

### LATE PRE-POTTERY NEOLITHIC B PERIOD FOOD STORAGE, PREPARATION, AND CONSUMPTION

While still poorly understood, select research has provided us with an improved sense of the spatial location of food storage, preparation and consumption. Research at Çatalhöyük<sup>18</sup> and Aşikli Höyük,<sup>19</sup> illustrates that food storage, preparation and consumption were a major focus of life within Neolithic houses. These excavations have noted the close association of fire hearths and storage areas, and in some cases, refuse patterning that is consistent with feasting and eating. Excavations in the southern Levant have also provided new information on the spatial connection between LPPNB food storage and food preparation. As outlined by Gary Rollefson,<sup>20</sup> excavations at the North field of 'Ain Ghazal provide evidence for the spatial association of high-density food storage and food preparation. These excavations uncovered the incomplete remains of a rectangular structure, perhaps even a two story building, that

was divided into multiple compartments and with a clay oven, hearth and storage rooms with well-made plaster floors. Preserved on the floor of one of the rooms was a large quantity of carbonized grain. Both the density of carbonized macrobotanical remains, as well as their spatial association with the oven, indicate that people used these rooms for storage and food preparation. Similar practices have been noted at Es-Sifyia<sup>21</sup> and Basta.<sup>22</sup> Given the limited horizontal exposure around this structure, it remains unclear if this was a special building, perhaps serving as one of a series of buildings associated with an large household, or if this is representative of a broader pattern with most LPPNB structures.

Another example of the co-association of cooking and storage is seen at Basta.<sup>23</sup> Excavations of Basta Area B uncovered the remains of a two-story building that was probably accessed from above through the use of ladders. In the basement were multiple half-door storage rooms that were entered through a larger central room. In this case no hearths were identified on the ground level, probably indicating that food preparation occurred either outside of the building or the elevated first floor. Given that residential structures were built next to each other, it seems more likely that the cooking would have occurred on the first elevated floor. In area A, excavations identified a similar building system similar to that seen at Es-Sifyia. In many of the rooms, large grinding stones were left in place, illustrating the spatial connection between food processing and storage.<sup>24</sup> The food preparation rooms were located relatively evenly across the excavation area. This again, raises the question if these were associated with individual biological families or larger household units.

### ALTERNATIVE PERSPECTIVE OF THE 'AIN GHAZAL LATE PRE-POTTERY NEOLITHIC B PERIOD CIRCULAR BUILDINGS

While very difficult to quantify in a meaningful way, I now suspect that as a group of researchers we have been overlooking some Late Pre-Pottery Neolithic B manifestations of food preparation and storage within Neolithic villages. This is not linked to the skills and ability of the excavators, rather this is a byproduct of complex, and at times limited, material mani-

18. BOGGARD *et al.*, 2009; FAIRBAIN *et al.*, 2007.

19. ÖZBAŞARAN, 1998; DÜRING and MARCINIAK, 2006.

20. ROLLEFSON, 1997.

21. MAHASNEH and BIENERT, 2000.

22. GEBEL *et al.*, 2006.

23. GEBEL *et al.*, 2006; KUIJT, 2000; WRIGHT, 2000.

24. WRIGHT, 2000.

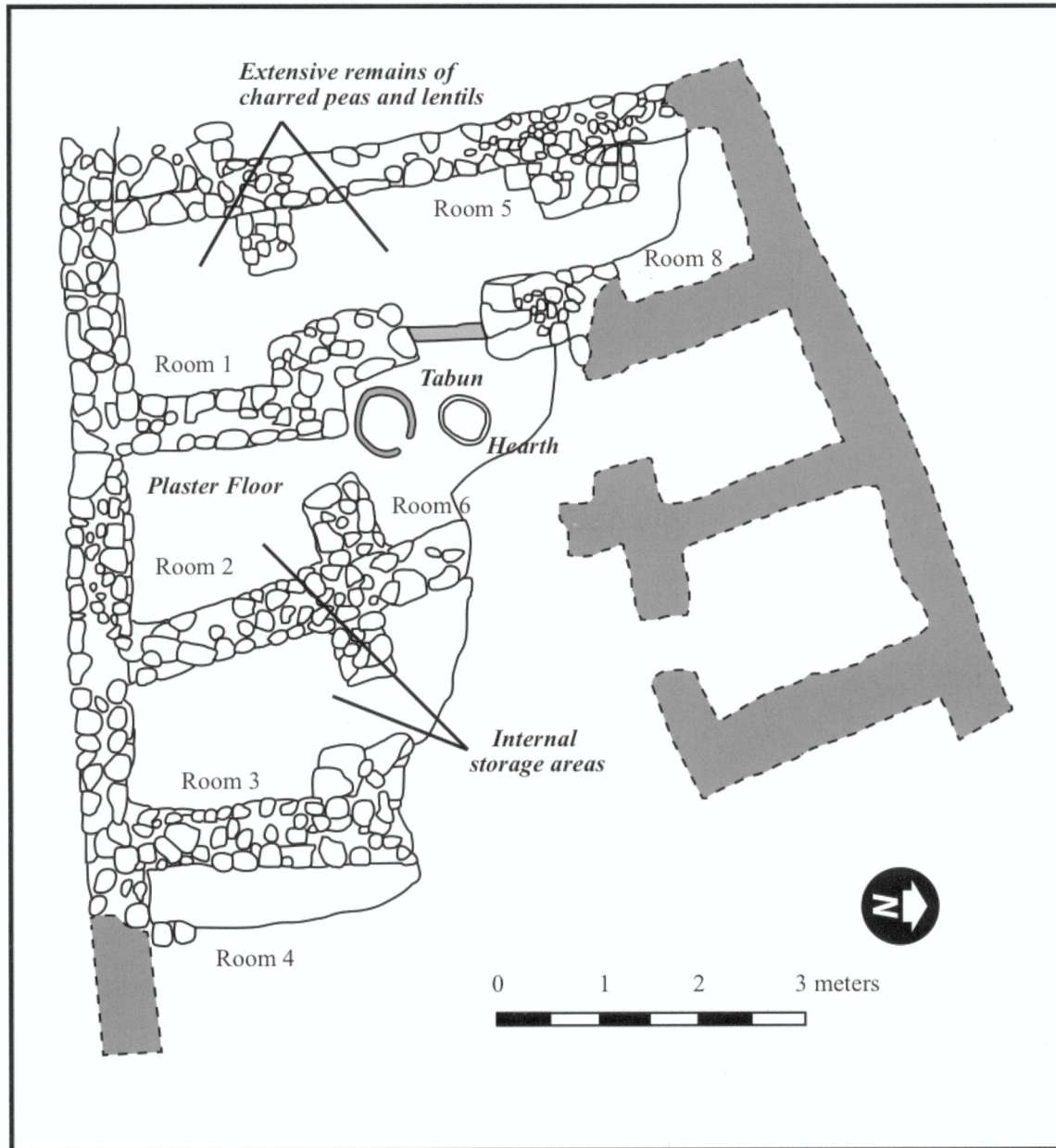


Fig. 2 – Partially preserved rectangular stone building, North Field, 'Ain Ghazal (adapted from ROLLEFSON, 1997).

festations of food preparation and storage, as well as that in many cases researchers are challenged by identifying physical remains and structures that no longer exist. While subject to further research, I suspect that 'Ain Ghazal is one example of this.

Broad horizontal excavations at several LPPNB settlements have provided important insights into the spatial organization of these villages, and by extension, uncovered evidence for

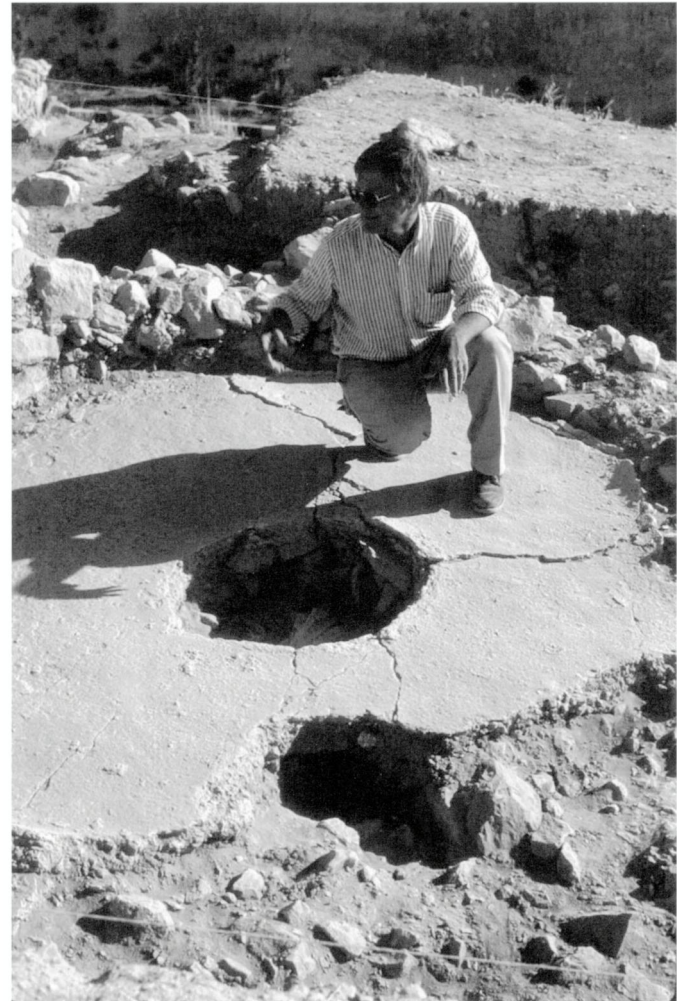
non-residential buildings. Excavations at Beidha,<sup>25</sup> for example, have revealed substantial buildings that are larger than residential buildings and are organized differently. As outlined earlier, excavations in the East Field of 'Ain Ghazal<sup>26</sup> have uncovered large structures that are internally organized differently from

25. BYRD, 1994.

26. ROLLEFSON, 1998 and 2000.

what are traditionally viewed as residential buildings. Structures at both of these sites have been interpreted as community buildings, a place that would have served as a physical place for community activities. Similar, and in some cases even larger, community buildings have been identified at Beidha, Çayönu, Nevalı Çori, and a host of other sites that have residential and non-residential buildings.<sup>27</sup> Excavations in 1993 at the North and the East Field at 'Ain Ghazal revealed evidence for buildings that are distinct from residential buildings.<sup>28</sup> Rectangular buildings in the LPPNB are commonly viewed as existing as residences, but also as a physical location for economic activities and household ritual within the community.<sup>29</sup>

As noted earlier, excavations in the North Field uncovered the remains of a partially preserved rectangular building where different rooms were used for storing grain, and for cooking (fig. 2).<sup>30</sup> Excavations five meters to the south uncovered two partially preserved round structures situated between or around (it is unclear at this point), rectangular buildings to the southwest and north and at least one courtyard to the west. Gary Rollefson (1998) identifies these as Circular Building I (the northern building) and Circular Building II. The Circular Buildings are small structures, less than 5 m<sup>2</sup>, with the outer walls constructed of cobbles and rubble fill (fig. 3-4). Circular Building I has the partial remains of an entrance way on the east side of the building. The walls and floors of Circular Building II are poorly preserved and it is not possible to determine if there was an entrance. The floors of Circular Building I were placed on a gravel foundation, just as the houses were. In contrast, the poor quality floors of Circular Building II were built directly on dirt. Rollefson<sup>31</sup> argues that this indicates that the structure was hastily constructed. Both of these structures have a central hole, with Circular Building I having subfloor channels radiating out from the center. Circular Building I was built with four sub-floor channels with one set oriented north-south and the other pair oriented northeast-southwest. It is not clear if these channels were designed to improve air circulation, water drainage, or if perhaps there was some ritual significance in their construction, such as a chamber for air to feed an elevated internal fire hearth for ritual.<sup>32</sup> While the



**Fig. 3** – Gary Rollefson in circular building I, North Field, 'Ain Ghazal, 1993. Note the central hole in the plaster floor, the small channel in the for ground, and the remains of the stone wall with plaster lipping up on the walls (photo by I. Kuijt).

building was void of contents, on the basis of material patterning and the unique nature of these structures, the excavators at 'Ain Ghazal argued that these served as cult buildings and have labeled them 'Shrines' to highlight the small size of these structures compared to what they argue are 'Temples' located in the eastern area of the settlement. Circular Building II, which is remarkably similar in construction and size to Circular Building I, was situated four meters to the south. Unlike with Circular Building II, according to Rollefson (1998), Circular Building I was refloored a minimum of eight times, each time painted red. Rollefson<sup>33</sup> suggests that since reflooring of

27. It should be noted that I am deliberately not discussing the site of Göbekli Tepe as it is not clear how, or even if, people lived in specific buildings at this settlement. For this reason I think it would be potentially misleading to draw comparisons between Göbekli Tepe and the dramatically different, and much later, settlements being discussed in this paper.

28. ROLLEFSON, 1998 and 2000.

29. ROLLEFSON, 2000.

30. ROLLEFSON, 1997.

31. Personal communication, 2011.

32. ROLLEFSON, 1998.

33. Personal communication, 2011.



some residential buildings seems to have been associated with a ritual of some sort (especially subfloor burials in houses), it is likely that the CBI refloorings were also related to some ceremonies. Interestingly, while Circular Building II also has a central hole, and was refloored once, it did not have the small sub-floor channels and the floors were not painted red. Both of these round buildings have been interpreted as being ritual buildings on the basis of the rare geometry of the buildings, the central hole and subfloor channels, and the multiple reflooring episodes.<sup>34</sup>

For many years I have also interpreted the Circular Buildings as being ritual in nature. In our publications, and with discussions with Rollefson, I have been struck by how different the Circular Buildings are from residential buildings at 'Ain Ghazal, as well as other contemporary sites in the southern Levant. Over the last few years, however, I have started to wonder if we have missed something and now increasingly wonder if the Circular Buildings were designed and used for food processing or storage. Specifically, as an alternative I want to suggest that the round structures at 'Ain Ghazal were buildings designed for grain storage, or perhaps for preparation and drying of grain before storage in other buildings. Archaeological field research at 'Ain Ghazal clearly illustrates that people in LPPNB settlements used internal areas of individual buildings for food storage,<sup>35</sup> but I now wonder if food storage was more extensive than previously recognized and occurred in a variety of different inter and extra mural locations. The argument for the 'Ain Ghazal round structures as food storage features grows out of my increased awareness of the pre-existence of oval grain storage structures in the PPNA at Dhra'<sup>36</sup> and WF 16,<sup>37</sup> and the realization that in many ways the size, morphology, and design of the round buildings at 'Ain Ghazal are consistent with other food storage systems.

To start this discussion let me note how several physical aspects to these Circular Buildings are inconsistent with the interpretation that these structures were used for ritual. First and most importantly, compared to other non-residential MPPNB and LPPNB buildings (*e.g.*, Beidha, Çayönu, Nevalı Çori), these are very small buildings. As is seen in fig. 3-4, floor space indicates that it would only be possible to squeeze in 3-4 kneeling archaeologists into Circular Building I, and this is not considering headroom. It is, of course, possible that the small size of the Circular Buildings relates to a different form

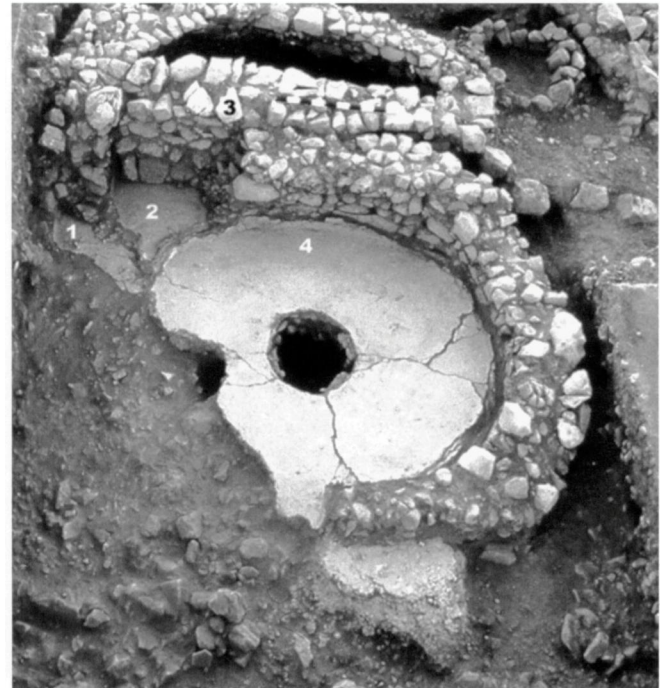


Fig. 4 – Circular building I, North Field, 'Ain Ghazal (photograph courtesy of G. Rollefson ; from ROLLEFSON, 2005).

of ritual, such as household based practices that were more restricted in access, perhaps focused on a sub-section of society. At the same time, the Circular Buildings are very different in size, and are much smaller than other, widely accepted, rectangular ritual buildings from different Neolithic settlements. Rollefson notes,<sup>38</sup> however, that that six 'Ain Ghazal apsidal buildings are similar in size to the Circular Buildings. He argues that the apsidal buildings were used by family / lineage groups for ancestral rituals.<sup>39</sup> While rituals are often conducted in private household spaces as well as at the scale of the community, some ritual performances have a public face, and this public face is linked to scale and participation. Our current narrative for the Circular Buildings does not address the limited size of the structures, nor the limited number of people who could have used these buildings. Second, it is interesting to note that there are no benches or seating areas in the 'Ain Ghazal Circular Buildings. Some, but by no means all, earlier non-residential buildings, such as Nevalı Çori<sup>40</sup> have benches around the perimeter of the room. At the same time

34. ROLLEFSON, 2000.

35. KUIJT, 2008; ROLLEFSON, 1997 and 1998.

36. KUIJT and FINLAYSON, 2009.

37. MITHEN *et al.*, 2011.

38. ROLLEFSON, 2005:7.

39. Rollefson, personal communication, 2011.

40. HAUPTMANN, 1999.

it is not clear that we should expect there to be benches in the 'Ain Ghazal Circular Buildings. Moreover, this is a potentially weak argument since seating in residential or non-residential contexts may have been constructed of wood, and therefore leaves no archaeological signature due to the limited preservation of the structures and material objects within them. The bottom line is that we have only a limited understanding of the nature of architectural variability within a single LPPNB community, and as such it is very difficult to confidently argue how neighborhood areas were laid out, how individual structures were used, or speculate on the possible links between these architectural practices and domestic/residential activities or ritual practices. As pointed out by Rollefson,<sup>41</sup> however, there is no question that the Circular Buildings are distinct from the rectangular structures excavated at 'Ain Ghazal. The question is how are we to interpret them.

To turn this around for a moment, it is important to note that there are several physical and design aspects to the 'Ain Ghazal Circular Buildings that are consistent with grain storage, or perhaps for preparation and drying of grain before storage in other buildings. First, from an engineering stand point it is clear that the people who designed and constructed these buildings, especially that of Circular Building I, were concerned with air circulation and / or control of water and humidity. These small buildings had a prepared plaster floor, plaster walls, and a hole in the center.<sup>42</sup> It was important to have the air circulation be focused on the ground level. With the exception of storage systems that are sub-floor and focused on oxygen depletion, most storage silos or drying systems are designed to maximize air circulation.<sup>43</sup> This can be done by either elevating the storage unit, or alternatively, lifting the commodity being stored such as grain in baskets, above the ground. Second, the plaster floor also helps us understand that cleanliness was important to the users of this building including, controlling dust and presumably insects. This is, of course, a critical element of grain storage, but is also likely to be an important aspect of ritual and living areas as well. Third, the small size of these structures, with a floor space of less than 2.5 by 2.5 m, is very similar to ethnographic storage and drying areas, and distinctly smaller than other widely accepted

Neolithic ritual structures. Finally, it is also interesting to note the spatial proximity of these round structures to the rectangular LPPNB structures where the excavation of multiple rooms revealed evidence for food storage and cooking. Collectively, all of these design elements can be interpreted as reflecting the need of Neolithic people to reduce and minimize water and moisture, and restrict access of insects and rodents. In sum, the design, organization, and size, of the round structures is consistent with argument for food storage or preparation.

What would such a structure look like and how might it have functioned? This is, of course, the critical question. It also, unfortunately, requires us to think in terms of what remains were uncovered and what was destroyed. As with Rollefson,<sup>44</sup> I suspect that Circular Building I was relatively small in size. Although impossible to demonstrate, my hunch is that it was no higher than 1.5 m and with a flat roof made of wood, reeds, and mud, probably looking similar to the exterior of storage structures identified at Dhra'.<sup>45</sup> There is evidence for a single entrance into this structure. It would have had a plaster floor, resurfaced at times, and walls made of stone, mud, and possibly with upright posts for support.

Although there are other possibilities, I can envision four possible ways this building was used for household food storage or preparation:

- 1) Grain stored directly on the plaster floor as in a silo (fig. 5),
- 2) In containers / baskets directly on the plaster floor,
- 3) Grain stored in containers / baskets elevated off the floor,
- 4) The structure was used for drying, smoking, or curing of grain or meat.

The first of these options is probably the least likely. Simply put the size of the structure and existence of a central hole makes this unlikely. In contrast, the second and third options fit well with the physical design of the structures. As noted by David and Kramer,<sup>46</sup> and seen in fig. 5, air circulation is a critical aspect to controlling moisture levels and water. This can be accomplished by either building a sealed container and then elevating it above the floor, or alternatively, constructing a dry room with sub-floor drainage in which containers, such as sacks and baskets can be stored as well as other foods was hung from the walls and ceiling. Finally, it is possible that the Circular Building were not used for long-term grain storage, but were used for drying, smoking and preparation of food,

41. ROLLEFSON, 2000.

42. ROLLEFSON, 1998 (p. 47-49), argues that Circular Building II was hastily constructed, perhaps even to the point of neglect. While Circular Building II appears to be complete, with damage likely being post-occupational, it is almost as if the builders of Circular Building II intentionally omitted several construction elements, and that there was less attention paid to the quality of construction. For these reasons I am going to focus this discussion upon circular structure I.

43. DAVID and KRAMER, 2001; SEEDEN, 1985.

44. ROLLEFSON, 2000.

45. See fig. 4 in KUIJT and FINLAYSON, 2009.

46. DAVID and KRAMER, 2001: Fig. 9.6.

and the finished prepared food was then moved to a secondary location for long-term storage. Certainly we know that the circular buildings at 'Ain Ghazal were located near to rectangular buildings with storage rooms. It is not clear, however, if these rectangular buildings were dedicated food storage buildings, or if the buildings are the basement remains of a residential house where people lived upstairs and stored food down stairs.<sup>47</sup>

Given the clear archaeological evidence for significant capacity for food storage inside of rectangular residential structures, how might we explain the presence of another system of food storage with the Circular Buildings? The answer to this question is partially linked to if we interpret the Circular Buildings as being related to food preparation or storage. If these were buildings designed for processing foods, such as drying grain, smoking foods, or some other yet to be considered alternative, then the Circular Buildings were not another food storage location, rather they would be physical manifestations of a different and earlier, technical stage in the processing of food for human consumption. As noted earlier, while researchers have a developing sense of morphological change in plant subsistence species, we have a remarkably poor understanding of the complicated pathways from plant growth, harvest, processing, and storage to later human consumption. One major gap in our understanding is how plant foods were processed.

If the Circular Buildings were used for food storage, however, then the simplest way to explain the co-existence of food storage in different contexts (rooms inside of rectangular buildings, and inside of the Circular Buildings) is that they represent different types of food storage, potentially focused on different types of food, or that these were locations controlled by different social or economic groups within the community. This maybe similar to later practices seen at Tell Sabi Abyad where round and rectangular buildings were used for food storage through time.<sup>48</sup> Elsewhere,<sup>49</sup> I have argued that food

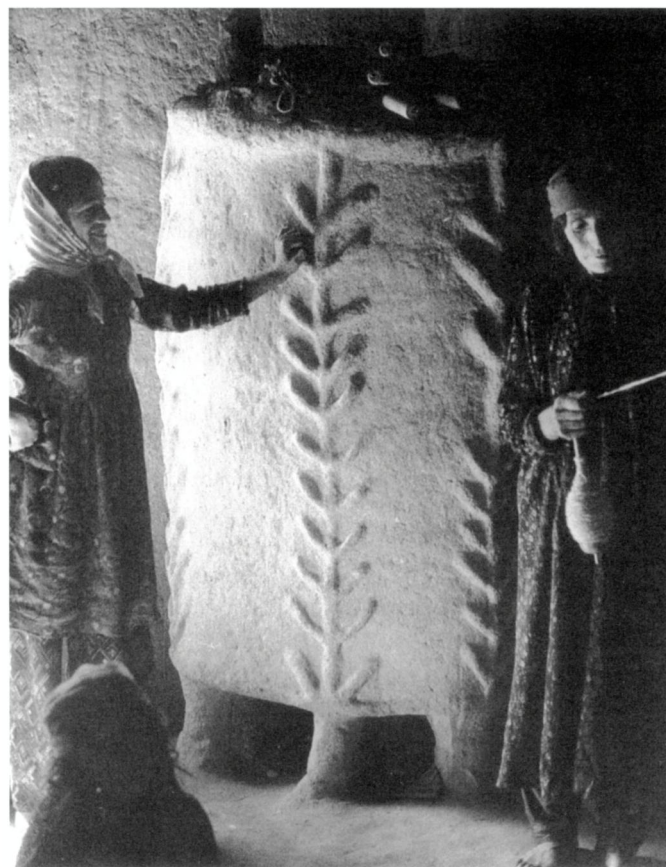


Fig. 5 – Aliabad women standing beside a grain bin, Iranian Kurdistan (from DAVID and KRAMER, 2001: Fig. 9.6).

storage in the LPPNB was characterized by increased control and reduced access to food, manifest in the appearance storage rooms inside of residential buildings. While it is difficult to estimate the total volume of such storage, especially in contrast to where there are clear storage bins, such as at Çatalhöyük,<sup>50</sup> the overall long-term picture is one of greater household control of stored foods. If Circular Buildings were used for food storage rather than preparation, then they might be best explained as facilities designed to hold excess grain, or other plants, from years when everything worked. Ethnographic research has demonstrated that there is remarkable variation between years, and Neolithic people would have wanted to take advantage of good years as a means of overcoming bad crop years. It is also possible that the Circular Buildings provide a material reflection of storage for different groups within a Neolithic community, with food storage inside of the rectangular buildings

47. In discussing this alternative view of the Circular Buildings, G. Rollefson (personal communication, 2011) points out that if there were family/lineage celebrations taking place in the apsidal buildings, common storage of food for celebratory feasts may have characterized part of the apsidal buildings as well as the antechamber of Circular Building I (there are the remains of a poorly preserved room of unknown size next to the east side of Circular Structure I). He also notes that in the large cult buildings ("Temples"), there was an extramural sub- or semi-subterranean feature ("FI") at the back of the structure about 5 x 1 x 1.2 m in size that may have stored food for feasting during rites practiced in this structure (see ROLLEFSON, 1998). Gary's idea highlights the need for future reflection upon the organization of potentially different storage practices for daily subsistence foods, those for feasting, and potentially select storage for ritual.

48. AKKERMANS, 2010; VERHOEVEN, 1999.

49. KUIJT, 2008.

50. BOGGARD *et al.*, 2009; FAIRBAIN *et al.*, 2007.



belonging to a single family / household in nature while food storage in the Circular Buildings being shared between multiple families and / or an extended household. All of these are entirely viable explanations, but given the lack of broad horizontal excavations to west of the Circular Buildings, and the downslope destruction to the east of the Circular Buildings, for the moment it seems unlikely that the exact use of these structures will be resolved anytime soon.

## DISCUSSION

With the publication of fieldwork, in some cases initiated by Jacques Cauvin and now brought to fruition by his former students, as well as the initiation of new field projects, archaeologists continue to shape our understanding of the economic and social engines that drive the early stages of the Neolithic Revolution. A number of recent studies have looked at the initial stages of the Neolithisation, and outlined how new food storage practices must have changed communities ability to overcome seasonal risk and food shortages.<sup>51</sup> Pre-domesticated food storage served as an economic and nutritional foundation for population growth several thousand years before domestication. By the PPNA, and possibly the Natufian, people had the ability to store any food surplus based of pre-domesticated plants, and this both reinforced the need for people to live in one place, as well as changed the potential for some households to control resources. By the MPPNB we see evidence for the development of a series of new complex systems for storing wild and domesticated plants. The existence of morphologically domesticated plants, as well as increased frequency of specific stone tools for harvesting and food processing, echo what we see with the development of MPPNB storage features from Jericho, 'Ain Ghazal and Yiftahel, and highlights the increased importance and reliance on food storage.

In this paper I have explored some of the material manifestations of food storage in the LPPNB, and tried to expand our discussion to consider one example of what may, or may not, be additional evidence for food processing / storage. Although limited by issues of archaeological visibility, this study clearly illustrates a significant ratcheting up of storage practices in the LPPNB, and quite possibly new systems and ideas about ownership. In light of the likely nutritional improvements from greater quantity of food and greater predictability that effective storage systems would have brought to Neolithic commu-

nities, it is clear that many of the elaborate ritual practices, significant population growth and appearance of aggregate villages in the LPPNB were related at least partially to new or improved systems of food storage. Collectively, this underlines that we need to think of food storage as something more than a binary category (it exists, it does not exist), and to develop the methodological means and interpretive framework, identify the variety of different food preparation and storage methods, that Neolithic villagers would have practiced.

Much of Cauvin's synthetic writing was focused on how the Neolithic Revolution represents a significant mental and social change in ideas and human cognition. I am sure, however, that if he were with us to day he would agree that it is important to both consider the genesis of ideas as well as their impact. In some ways archaeologists are now developing an understanding of the material outcomes of the Neolithic Revolution. Archaeologists are only now starting to understand the economic, social, and ritual impact of food storage as part of the Neolithic revolution. More to the point, while we have long identified the importance of food storage, and at times its material correlates, archaeologists are only at the earliest stages of meaningfully quantifying the scale of food storage, and in the case of the Late Pre-Pottery Neolithic B, the means to recognize food storage within large villages. The research of Cauvin, be it directly or indirectly, continues to frame some of the critical discussions as to the causes and social outcomes of food production within the long term process of Neolithisation.

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51. KUIJT, 2008 and 2009; KUIJT and FINLAYSON, 2009.

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