

# Architecture in the service of the Roman army: *Horrea* and the grain supply of Roman frontier forts

An analysis of Roman-period granaries during the conquest  
of the western Roman Empire

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*Schlagwörter:* Römische Republik / Römische Kaiserzeit / Eroberung / Getreidespeicher / Heeresversorgung / Ernährung

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## Introduction

Space limitations, the duration of the military campaigns and the objective of military expansion and power consolidation in the enemy territory included looting local resources (*frumentatio*). This resulted in the creation of various administrative mechanisms of product shipping and distribution, especially when it came to grain (*annona militaris*). Military supply in distant as well as neighbouring regions made it necessary to set up different supply networks together with people in charge of the product distribution and the construction of enormous *horrea* in strategic locations where grain could be stored and further distributed to other areas, mostly war-affected and conquered regions.

This paper examines the *horrea* from the Republican period, less known from an archaeological standpoint in terms of troop supply, all the way to the Flavian period, which is when different techniques for the construction of the *horrea* appeared as a result of the Empire's new borders. Varying geographic, military and strategic conditions made the construction of warehouses and granaries absolutely essential, along with specific building criteria and techniques for each of the periods of the Roman military conquest. We intend to analyse the different types of known structures according to the context and phases of the conquest.

### The Spanish experience: military granaries in the Republican period

The Republican period is one of the least known in the context of troop supply due to the absence of any state institutions dedicated to the subject<sup>1</sup>. The Republican army with generals who applied their own idiosyncrasy to their military campaigns and were at times more preoccupied with collecting trophies and war spoils as well as limited chronologically by their annual mandates logically generated a greater temporality in all of their acts<sup>2</sup>. Military supply thus depended on the logistical skills of the army leaders in charge.

<sup>1</sup> CARRERAS 2002, 70.

<sup>2</sup> MORILLO 2002; 2008, 74; MORILLO / SALIDO 2010, 138.

Republican *horrea* and the grain supply in Classical sources:  
problems in archaeological identification?

The first evidence of Republican military granaries were found in *Hispania*, dating back to the 2<sup>nd</sup> century BC, but written sources allow us to infer a presence of other *horrea* that likely have left no trace in the archaeological registry since the beginning of the conquest.

Classical sources that offer more information on the military grain supply network are useful in the analysis of the first stages of Roman military conquest in the western part of the Empire<sup>3</sup>. According to Livy (22, 22, 1–2), Rome had a grain supply system for their troops in *Hispania* as early as 3<sup>rd</sup> century BC<sup>4</sup>. Even though the supplies were unloaded in *Emporion* (Empúries, Girona, E), Livy's account leaves no doubt as to the fact that *Tarraco* (Tarragona, E) was the military operation hub from 217 BC onward. Transporting supplies and grain on huge vessels coming from Sicily and Sardinia was common practice in Rome at the beginning of their military conquest in distant regions as well as in later invasions of British and German provinces. In order to store their supplies in military bases, the army had to build enormous *horrea* where grain could be conserved and accumulated. Unfortunately, these warehouses could not be found in any archaeological records, probably because they were made out of perishable materials<sup>5</sup>.

In the initial stages of the Roman conquest, the politics in *Hispania* were dominated by the pragmatism and improvisation triggered by unstable conditions arising from the military operations. As a result, there is reason to think that private commercial agents or contractors often intervened during periods of scarcity to provide clothes or horses, but it is a bit more far-fetched to argue they supplied other products<sup>6</sup>. As the Romans stipulated different clauses and conditions of the treaties made with the indigenous communities, there were plans to supply the troops with grain from those communities, as proved by the following incident. In 205 BC, after a revolt was put down, the *ilergetas* in the *deditio* were required to give a 6-month supply of grain and clothes, all essential supplies that the troops needed for the upcoming winter (Livy, 29, 3, 5). These treaties made the Roman army less dependent on supplies coming from Italy, especially when it was about to start a new military campaign in a different region. A similar thing happened in 203 BC, when the Roman troops advanced into North Africa and grain had to be sent from *Hispania* (Livy, 30, 3, 2).

The transport of grain from Italy must have continued until the early 2<sup>nd</sup> century BC, its final destination being the coastal cities that served as military campaign hubs where huge, probably wooden, warehouses were built and used as distribution centres. During the preparation of sieges and attacks, the *horrea* were built in strategic areas a short distance, maybe 5–10 km from where the offensive would take place, and a supply line was

<sup>3</sup> LABISCH 1975. The great work by ERDKAMP (1998; 2002a) extensively deals with the question of grain supply during the Republican period and is based on the information from the classical texts. Regarding the supply system in *Hispania*, the region where most *horrea* from that period were found, there are studies done by MUÑIZ (1978), SCARDIGLI (2007) and ÑACO (2003), whose book deals with the so-called 'economy of war'. Recently, we have put forth some new theories on military supply from that period based on archaeological remains from

excavated warehouses in the Iberian Peninsula (MORILLO / SALIDO 2010; SALIDO 2011).

<sup>4</sup> ID. 2014.

<sup>5</sup> Even though ERDKAMP (1998, 115 f.) already pinpointed Livy's anachronisms and errors when the latter talks about *publicani* in relation to the troops' grain supply, there is no doubt as to the dependence of troops on supplies sent from Italy, which we know based on classical sources from the 3<sup>rd</sup> and 2<sup>nd</sup> century BC.

<sup>6</sup> ROTH 1999, 231.

established that ensured the grain got to the troops about to fight. This strategy was used in the provinces as well as the Italian territory throughout the 3<sup>rd</sup> and 2<sup>nd</sup> century BC.

Regarding the *indiketes* revolt put down by Cato, various silos were excavated in natural stone to the north of the Roman *forum* in Emporion. These silos, built somewhere between 175 and 150 BC, were linked to the *praesidium* established by Cato around 195 BC during the Greek colony period<sup>7</sup>. However, neither classical sources nor archaeological evidence testify to the use of these structures in other military settlements inside or outside of the Peninsula, which begs the questions if the *Emporion* silos were actually built by the Roman army<sup>8</sup>. It seems unlikely that the army used this type of warehouses since it is inefficient for short-term storage and daily consumption. Roman military archaeology only testifies to the use of raised granaries that were more practical for frequent and continuous consumption. In line with what Livy tells us, it seems that, during that period, the Roman army was using the supplies previously stored by the local communities. This use of force to take control of the enemy supplies stored in the silos was also common during Caesar's military campaigns in the north of Africa (Caes. *bell. afr.* 45).

In classical texts, there are continuous allusions to the problems with grain supply for the Roman troops during the conquest of the Iberian Peninsula<sup>9</sup>. Perhaps these references also indicate grain administration and transportation problems during the conquest of *Hispania's* central regions, especially in the central plateau (*Meseta Castellana*), far away from any sea or river communication lines. Scarce population in those regions would produce very limited agricultural supplies, insufficient for the Roman army<sup>10</sup>. Moreover, military campaigns were carried out in springtime when grain was not yet mature enough to be harvested, which meant the last year's harvest had to be brought in all the way from warehouses in other regions<sup>11</sup>.

In terms of the military tactic, the troops were continuously on the move to dominate and conquer tribes or *oppida* through sieges or assaults, setting up and abandoning different camps during the summer campaign to go back to their winter barracks for the *armilustrium* or the weapon purification ceremony every 19<sup>th</sup> of October<sup>12</sup>. There is little evidence of these camps, which makes it difficult to find any of their remains. The majority of the republican camps were built from perishable materials<sup>13</sup>. The presence of post or column holes and iron nails joined with carbonised grain might point to the existence of wooden storage structures that must have been common during the Republican period. However, the fact that the excavations of the Spanish military precincts from that period were done a long time ago makes it difficult to find those structures in any archaeological records. In this context, we need to apply methodical and systematic excavation criteria that would allow us to identify granary structures built from perishable structures such as wood. Undoubtedly, the use of this material must have been more frequent in large forested areas rich in wood, but their scarce documentation in southern Mediterranean regions could indicate more of an issue with the archaeological registry rather than an absence of these type of structures in the Roman period. In fact, the process of building the foundations and the support system of the storage rooms by using soil and wood is well documented in sources like Pliny's *Naturalis Historia* (18, 73). This issue in archaeology is directly linked to the construction based on perishable materials and the conservation issues that accompany this type of construction.

<sup>7</sup> AQUILUÉ et al. 1984; AQUILUÉ 2007.

<sup>8</sup> MORILLO / SALIDO 2010, 144.

<sup>9</sup> LABISCH 1975, *passim*; followed by CADIOU 2008, 545–609.

<sup>10</sup> MORILLO 2006.

<sup>11</sup> GROENMAN-VAN WAATERINGE 1997, 262.

<sup>12</sup> MORILLO 2003.

<sup>13</sup> *ibid.*, 72; 2008, 77 f.

Information about grain storage space and different army supplies is even scarcer in the 1<sup>st</sup> century BC. Sources do not mention warehouses or granaries *per se*, but they do refer to a long-distance supply system from Italy in the Pompeian period (Salust. hist. 2, 98; Plut. Pomp. 20, 1; Sert. 21). There are also references to a public warehouse during Caesar's campaigns in *Gallia* (Caes. civ., 1, 36; 2, 22). On the other hand, the dictator mentions that, in *Hispania*, the grain was stored in certain cities such as *Illerda*<sup>14</sup> and *Gades*<sup>15</sup>, before being sent to the camps<sup>16</sup>. He also talks about supply lines going from Italy and *Gallia*<sup>17</sup>. Undoubtedly, there were important granaries in those cities, but these were not military granaries *per se*, even though grain stored in those warehouses was sent to the army at times, perhaps as ordinary or special tax when needed.

### Archaeological evidence of granaries from the Republican period

Despite the continuous references of classical authors to the Roman military expansion in the west and the grain supply issues in the army during the Republican Period, the evidence of *horrea* is very scarce in the context of military campaigns. It is important to document these buildings in the archaeological registry, as they offer material remains that give us insight on the military supply and distribution centres as well as the overall demand-and-supply network. Up until now, the only region where remains of the military warehouses have been found is *Hispania*, with granaries dating back to the 2<sup>nd</sup> century BC.

The fact that those constructions were made of stone makes it difficult to determine the origin and development of those granaries with precision. However, the use of stone as the building material for the Republican military precincts fits perfectly in the general casuistry of camps during that period in the old *Hispania*. Thanks to Schulten's work in the Numantine cantonements<sup>18</sup>, it is generally accepted that the defence walls and the interior of the Republican camps were built from stone. However, the records of this German researcher are clearly biased since he excavated what were the sturdiest precincts of Roman military campaigns on the Peninsula during that period, such as the camps and forts in *Numantia*<sup>19</sup>. Still, we have to assume that the immense majority of the warehouses during the republican period was built from perishable materials such as wood and adobe, but up to date there is no archaeological evidence for these sites<sup>20</sup>.

<sup>14</sup> "The Afranians were exhausted because of food and water scarcity. The legionaries had some wheat because they took it from Ilerda and had enough supplies for 8 days, but other soldiers and auxiliary units had no access to this and were too weak to carry their weapons, so every day they went to Caesar's camp. The situation was grave and the most practical solution was to go back to Ilerda where they left some wheat" (Caes. civ. 1, 78).

<sup>15</sup> "The preparation included taking two legions to Gades (Cádiz) and storing all the wheat and vessels there since the entire province helped Caesar's troops" (Caes. civ. 2, 18).

<sup>16</sup> "In the meantime, the Oscenses and Calagurritanians sent their delegates to Caesar and promised him obedience. Tarraconians, Iacetanians, Ausetanians and the Ilurgavonians, who lived along the Ebro River, do the same shortly after. They were all

asked to help the Roman army with wheat supply. They promised to do so and started bringing the grain to the camp" (Caes. civ. 1, 40).

<sup>17</sup> "The villages near and far away that were on friendly terms with Caesar's weren't enough to supply the army with all the products it needed, and the enormous supplies from Italy and Gaul couldn't get to the camp because the river passage was cut off." (Caes. civ. 1, 48).

<sup>18</sup> SCHULTEN 1927; 1929.

<sup>19</sup> MORILLO 2003, 71 f.

<sup>20</sup> Insufficient information from older excavations, lack of modern archaeological research inside the camps from the Republican period, the camps' isolation from any urban nucleus (where the majority of modern archaeological research takes place) and the perishable nature of these establishments explain why so few granaries and warehouses from that period have been documented in *Hispania*.

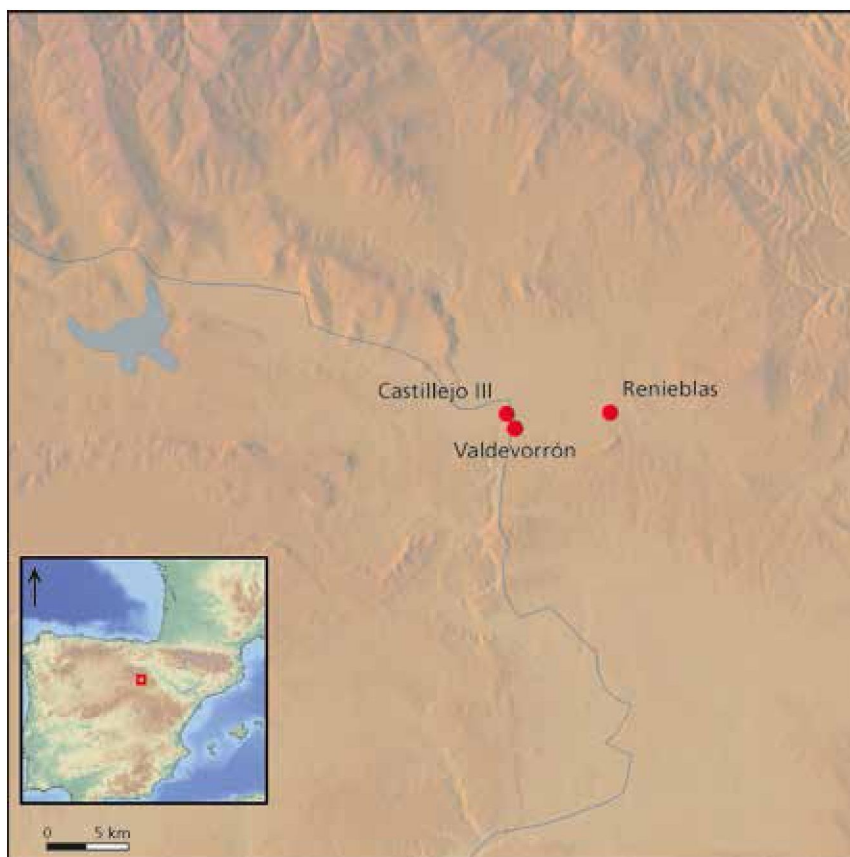


Fig. 1. Map of the Republican military *horrea* in *Hispania*.

Among different phases of military operations, the conquest of *Numantia* offers the most information from a literary and archaeological point of view. In terms of the written sources, there are well-known references to the tactics Scipio used to get to the Peninsula. Instead of attacking the city of *Numantia* directly, the Roman troops focused on taking over the necessary supplies in the Vaccean territory, northeast from the city, in order to control the area and cut off all supply lines to that city (Ap. *Iber*, 4, 90). The siege of *Numantia* relied on the *circumvallatio* formation, which allowed for different military camps to be in constant communication via the Duero River and, naturally, mark their victory by cutting off the city supply lines and thus causing widespread hunger in the entire city of *Numantia* (Ap. *Iber*, 4, 9).

From the archaeological point of view, the story of this siege reveals information about the type of warehouses built in the Republican period. The oldest excavated military *horrea* in the Roman Empire were built in two camps that were a part of the *Numantia circumvallatio*<sup>21</sup> (Fig. 1): the Valdevorrón fort (Soria, Castilla y León, E)<sup>22</sup> and what was the principal camp during the siege of *Numantia*, Castillejo III (Soria, Castilla y León, E), corresponding to Scipio's general cartel and his 134–133 BC campaign. Another one of

<sup>21</sup> SALIDO 2003-2004; 2009.

<sup>22</sup> SCHULTEN 1927, 216–221.



Fig. 2. Excavation of granaries at the Republican camp at Castillejo III (from SCHULTEN 1927, pl. 25.1).

the camps situated in central *Hispania* is Renieblas V (Soria, Castilla y León)<sup>23</sup>, which might have been a winter camp in 75–74 BC<sup>24</sup>, although the archaeological material found on site indicates the camp might be contemporary to the siege and fall of *Numantia*<sup>25</sup>.

The granary discovered in Castillejo III is situated in the camp's *praetentura*, next to *via praetoria*, not too far from where *porta praetoria* was probably located. Based on Schulten's excavations, the granary was described as a block made up of three storage naves<sup>26</sup> and an annex to the north (Fig. 2).

In the Valdevorrón fort, four buildings were discovered next to *porta praetoria*, which Schulten interpreted as where the catapults were stored<sup>27</sup> (Fig. 3). Schulten's hypothesis was based on the discovery of catapult projectiles at the battlefield<sup>28</sup>. However, Schulten himself pointed to the similarities between the military *horrea* in the Castillejo II and Renieblas V camps. Just like the other ones, these constructions had really thick walls, buttresses and, most importantly, a longitudinal interior wall that supported the raised floor (*tabulatum*). Consequently, those four buildings were undoubtedly used as granaries.

<sup>23</sup> ID. 1929; LUIK 2006.

<sup>24</sup> SCHULTEN 1927; GÓMEZ-PANTOJA / MORALES 2002.

<sup>25</sup> HILDEBRANDT 1979, 266–271; SANMARTÍ 1992, 427 f.; SALIDO 2014.

<sup>26</sup> SCHULTEN 1927.

<sup>27</sup> *ibid.*, 219.

<sup>28</sup> *ibid.*, 216–221.

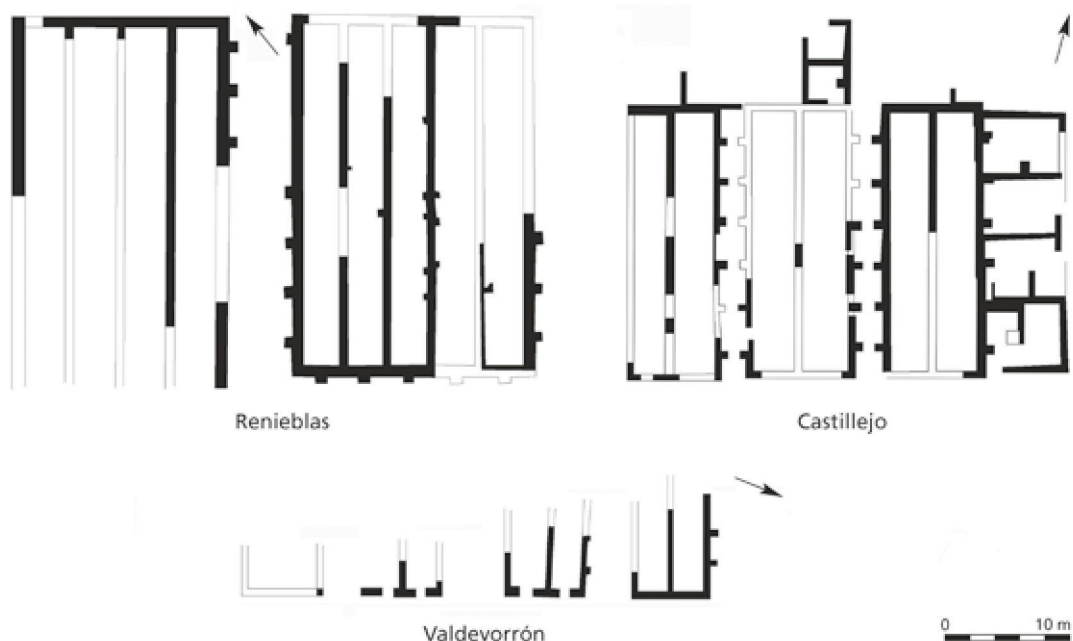


Fig. 3. Ground plans of Roman military granaries during the Republican period in *Hispania*.

Dating back to the mid-2<sup>nd</sup> century BC, those granaries had a wooden floor supported by stone walls that maintained optimal temperature and humidity for the conservation of grain and prevented parasites and rodents from ruining the grain. This type of stone wall was the most efficient prop for the *tabulatum* of the storage room because it allowed for equal distribution of the cargo weight and greater stability with various support points at the base. As one of the most widespread support systems when it comes to granaries, the stone wall is also one of the most documented ones, because the stone used in the construction of internal walls is not worked as easily as in the case of the pillars. The fact that it was easy to build these interior walls using the same technique as in the construction of outside walls and, above all, easy to place the floor on top of them to store some heavy cargo, explains why this support system had been used from the pre-Roman period<sup>29</sup>.

The peculiarity of granaries in *Hispania* is that their remains are key in understanding the techniques used in the construction of the first *horrea* outside of Rome during the Republican period. Even the ancient sources mention these structures as being characteristic of the *Hispania citerior* when the Romans came. This might lead us to conclude that the process of standardisation of the *tabulatum* technique in the Roman granaries during the 2<sup>nd</sup> and 1<sup>st</sup> century BC and the army's direct contact with the indigenous communities could have played a key role in the Roman military experience in *Hispania*. In fact, Roman agronomists had always seen this region as a symbol of development and application of the building techniques related to grain storage and conservation (Varro. rust. 1, 57, 3; Colum. 1, 6, 16)<sup>30</sup>.

<sup>29</sup> SALIDO 2011, 65; 87.

<sup>30</sup> ID. 2003–2004, 464–467.

Schulten's excavations in the Renieblas V camp (Soria, Castilla y León) revealed four granaries corresponding to one of the camps that were a part of the *Numantia circumvallatio*. Recent studies done on the storage capacity of the Republican *horrea* in camp V<sup>31</sup>, together with numismatic research and the analysis of the material found on site allowed us to date the camp somewhere between the end of the 2<sup>nd</sup> or the beginning of the 1<sup>st</sup> century BC<sup>32</sup>, and not to the period after 90 BC, during the siege and the fall of *Numantia* and the battle between Pompeius and Sertorio in the Iberian Peninsula, as Schulten argued<sup>33</sup>. Another thing to keep in mind is the standardised floor plans of these camp granaries, typical of the 1<sup>st</sup> century BC or at least of the period after the Numantine wars and whose paradigm is found in the camp at Cáceres el Viejo (Extremadura, E)<sup>34</sup>. The camps at Almazán and Navalcaballo (and possibly even the one at La Rasa [all three Castilla y León, E]) are worth mentioning as direct precursors of the imperial rectangular camps<sup>35</sup>.

### The expansion and the conquest: military granaries in the Augusto-Tiberian period

Intense military activity in *Hispania* during the Augusto-Tiberian period has not yet been backed up by hard archaeological evidence in terms of the location of the *horrea*. The only information about the military warehouses from that period is limited to the provinces of *Gallia* and *Germania*. The advance of Roman troops and the military operations undertaken in those regions were not a result of a planned strategy but rather an improvised process<sup>36</sup>. This continuous push into the enemy territory required the army to build *horrea* where supplies would be stored. The construction techniques in that case were undoubtedly subject to the vertiginous conquest of the aforementioned provinces (*Fig. 4*).

During that period, we start seeing enormous wooden warehouses and granaries built inside the military camps. Among these first camps where granaries were found, worth mentioning is the military precinct D at *Novaesium* (Neuss, North Rhine-Westphalia, D), which, thanks to its strategic location on the Erft, where it meets the Rhine, served as a protective outpost and an important communication hub for the principal grain supply centres.

On the inside, archaeologists found a granary measuring 24.80 m by 10.80 m, with 19 wooden dwarf walls that served as a support system for the raised floor. Even though its age is a subject of contention and the excavation itself does not allow us give us more details about the construction techniques used on this granary<sup>37</sup>, we can safely say this granary corresponds to the construction model typical of this period of military expansion. The construction techniques in this case also match those used in Numantine stone granaries with raised floors supported by walls. There was another legionary camp in the north at Nijmegen, the old *Noviomagus* (Guelders, NL), which also harboured three *horrea* inside<sup>38</sup>. Grain samples found in this camp confirm the import of this and other agricultural products typically found in the Mediterranean such as olives<sup>39</sup>.

<sup>31</sup> ID. 2014, 419.

<sup>32</sup> LUTK 1997, 463–479; DOBSON / MORALES 2008, 224.

<sup>33</sup> SCHULTEN 1929, 144; 182.

<sup>34</sup> MORILLO 1991; 2003, 70.

<sup>35</sup> ID. 1991, 179.

<sup>36</sup> TIMPE 1975; LEHMANN 1989.

<sup>37</sup> HEESCH / SEELING 1989; HANEL 2002; 2006.

<sup>38</sup> BOGAERS / RÜGER 1974.

<sup>39</sup> DE HINGH / KOOISTRA 1995; KOOISTRA 1996; CAVALLO et al. 2008, 73.





Fig. 4. Map of the Augusto-Tiberian military *horrea* in *Gallia / Germania*.

Various forts dating back all the way to the first military campaigns around 12 BC were documented along the Rhine River (Dio Cassius 44, 32), although the chronology is not always accurate. The presence of *terra sigillata italica* indicates that the army took positions in Nijmegen, Xanten, Moers-Asberg, Bonn, Mainz, Basel and Windisch. The importance of these military establishments tells us that Nijmegen, Xanten and Mainz were occupied by bigger troops before 9 BC, when, led by Drusus, they charged toward the North Sea coast towards Weser and Elbe. The only granaries from that period were discovered at camp 1 in Windisch 41 (Aargau, CH), featuring a storage room resting on top of wooden columns. Archaeobotanical analyses found traces of wine, oil, fish and *defrutum* inside the amphorae, along with grain that was also kept in these containers<sup>40</sup>. Moreover, a camp dating back to a campaign from the Augustan period was discovered in Holsterhausen (Dorsten, D), an advanced position considering the Rhine border<sup>41</sup>.

In the Roman camp in Kops Plateau in Nijmegen, Netherlands, which was probably built during that period, archaeologists excavated what is believed to have been an *horreum*, close to the *via principalis sinistra*, even though the data we have on this construc-

<sup>40</sup> HAGENDORN 2003, 48–81.

<sup>41</sup> EBEL-ZEPEZAUER et al. 2009, 15–29.

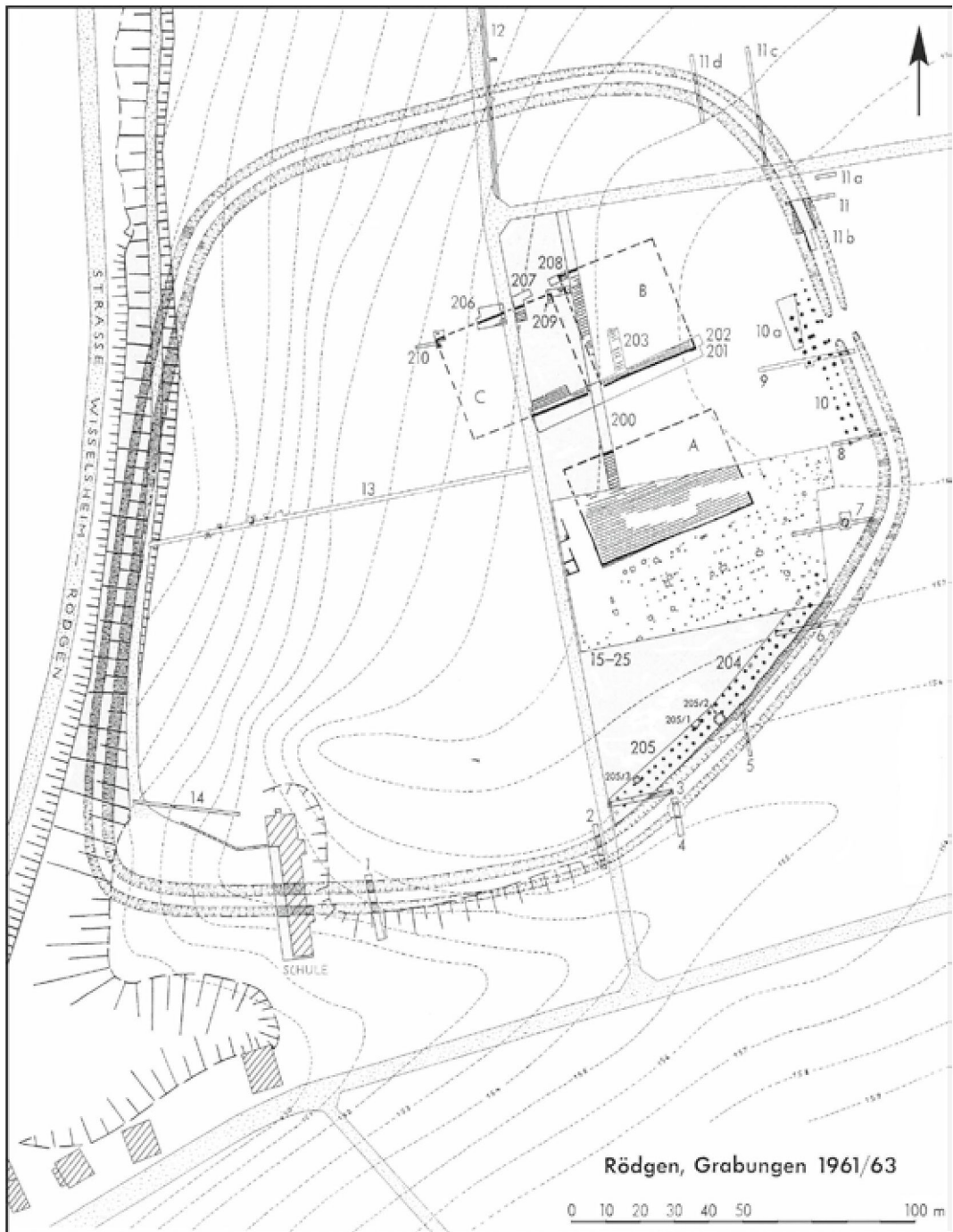


Fig. 5. Plan of the Rödgen camp (from SCHÖNBERGER 1963–1964, fig. 2).

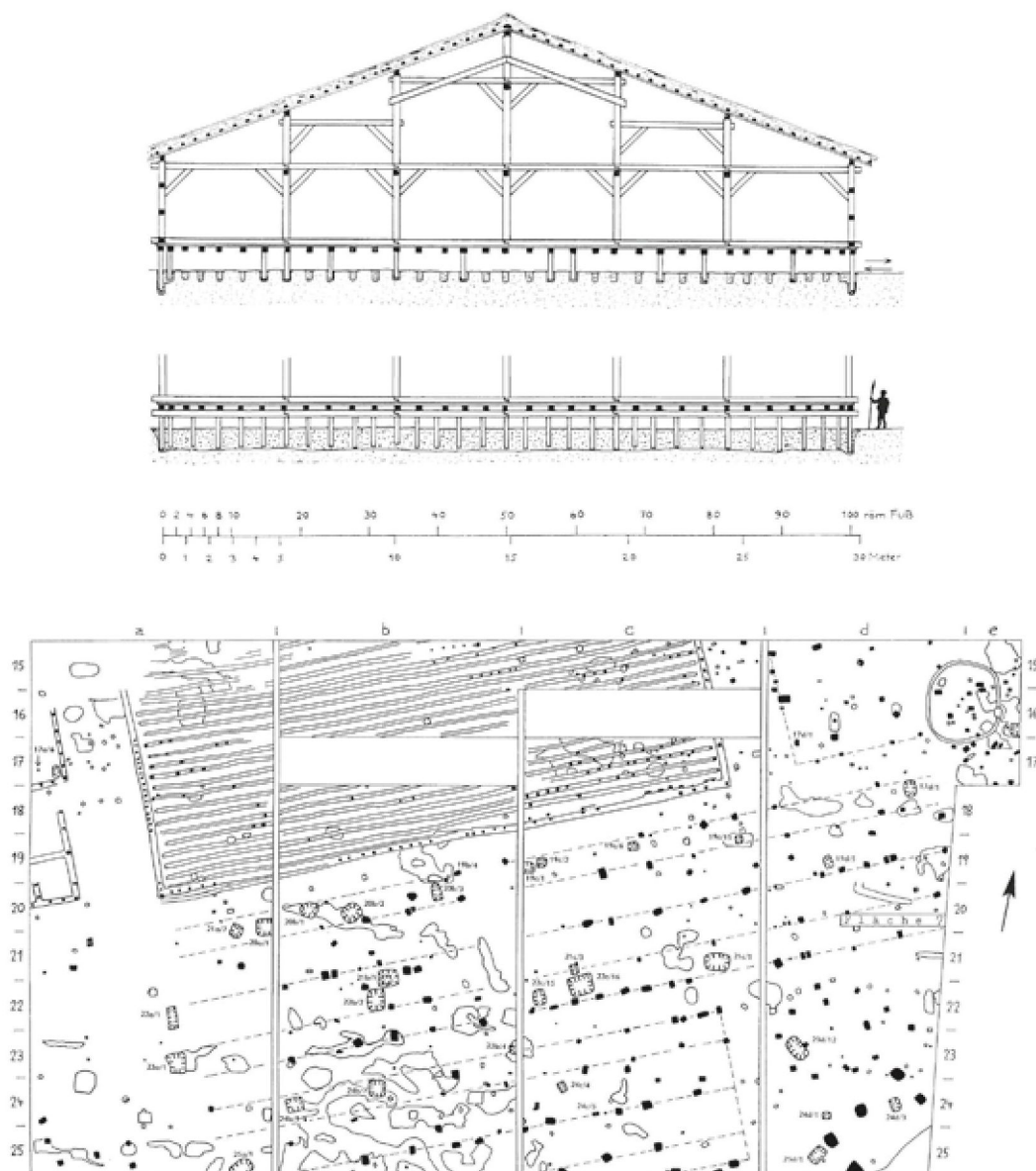


Fig. 6. Plan and reconstruction of *Horreum* A at the Rödgen camp  
(from SCHÖNBERGER 1963–1964, figs 5 and 6).

tion is very limited<sup>42</sup>. Under Drusus' leadership, military bases at Oberaden and Rödgen (Hesse, D) were established on the right bank of the Rhine; together with the one at Dangstetten (Baden-Württemberg, D), these are among the most important military sites. These bases were abandoned a little after Drusus' death in 9 BC. Rödgen was a base for

<sup>42</sup> BRUNSTING 1961; VAN ENCKEVORT / ZEE 1996;  
WILLEMS 1991; HAALBOS 2006, 358.

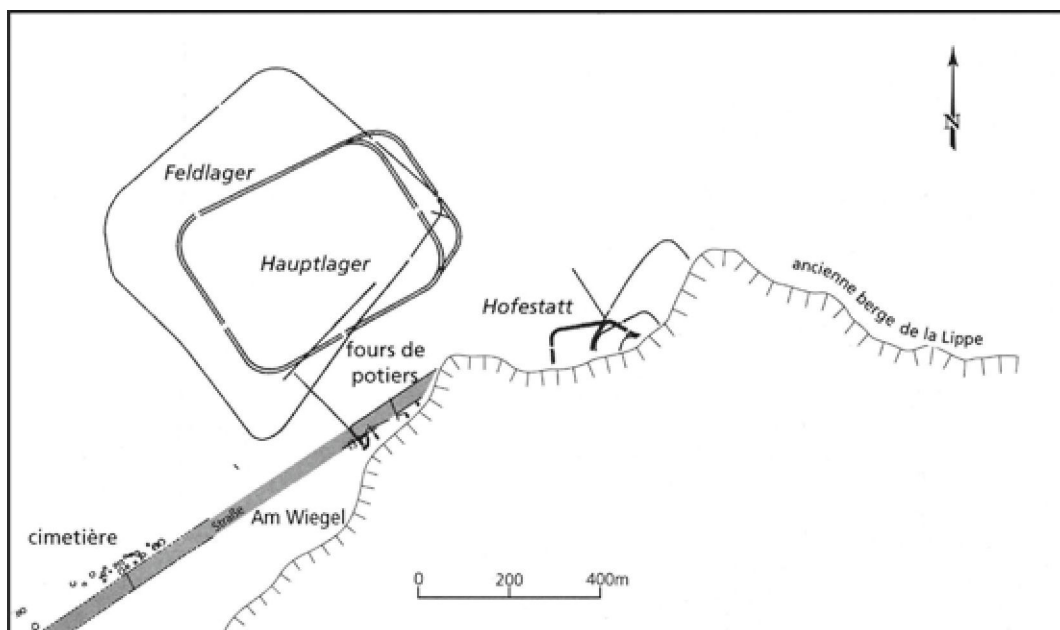


Fig. 7. Plan of the Haltern camp (from KÜHLBORN 2006, fig. 307).

grain storage and supply<sup>43</sup>, the product being transported via land or fluvial routes such as the Lahn and Nidda rivers<sup>44</sup>. Inside this base, the archaeologists excavated three *horrea* whose location (east and northeast from the camp) and dimensions indicate the importance that these buildings had in the precinct (Fig. 5). The three granaries were discovered based on aligned traces of posts placed in rows on top of which the storage rooms were built (Fig. 6). The traces on these wooden walls confirm that the constructions with elevated floors could have been used as *horrea*. In terms of explaining why the biggest part of the camp's surface was occupied by granaries, it may suffice to say that this was the most common logistical strategy in the Roman period. Grain storage in a strategic military supply centre is a system that has been repeated in later periods of history<sup>45</sup>, as we will analyse later on, namely during the conquest of *Britannia* during Claudius' reign, when various *horrea* were built inside the camps along the southern and southeastern British coast, or during the Severian period when the army got their supplies from strategic centres such as South Shields (South Tyneside, GB)<sup>46</sup>.

In this early Augustan period, the military base in Haltern (Hauptlager) was established in North Rhine-Westphalia (D) together with the corresponding granary some 30 m away<sup>47</sup>. Inside, the archaeologists excavated small trenches that ran parallel to the columns on top of which a wooden floor rested that was ventilated from below. There were four such trenches found in the central part of the building tracing the interior wooden walls that ran along the building, and another located 2 m from the western wall (Fig. 7).

<sup>43</sup> SCHÖNBERGER 1963–1964; 1975; SCHÖNBERGER / SIMON 1976, 24–27 plate 2.

<sup>44</sup> KEHNE 2007, 333.

<sup>45</sup> SALIDO 2011, 153.

<sup>46</sup> BIDWELL / SPEAK 1994; HODGSON 2001.

<sup>47</sup> V. SCHNURBEIN 1974, 31–33; 1981, fig. 14.

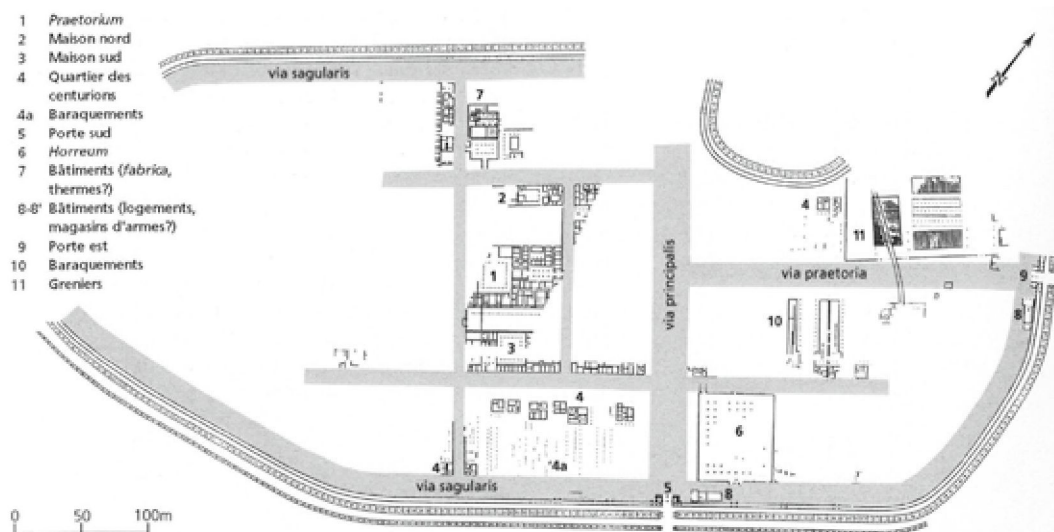


Fig. 8. Plan of the Delbrück / Anreppen camp (from KÜHLBORN 2006, fig. 267).

In the same period, another military establishment is set up in Delbrück / Anreppen (North Rhine-Westphalia, D), probably built by Tiberius during his stay in the region between A. D. 4 and 5 (Fig. 8)<sup>48</sup>. Dimensions and the storage capacity of the granaries indicate that Anreppen was the principal logistical base in the offensive lines towards the interior of *Germania*<sup>49</sup>. In the *praetentura*, archaeologists found five granaries, north of the *via praetoria*, along with trenches and wooden walls as well as columns (Fig. 9). The biggest *horreum*, located on the west end, measured 37.25 m by 20.5 m and faced north-east-southwest, different from the other granaries that had a southeast-northwest orientation and measured approximately 36.5 m in length and 13.5 m / 6.5 m in width. Apart from these, another building with exceptional dimensions was excavated along the *via principalis*, east of the precinct's southern gate. As of now, we know this construction measures approximately 68 x 56 m, which is significantly larger than military granaries found up until now in the Western Mediterranean<sup>50</sup>.

Along the western bank of the Rhine River, archaeologists recovered remains of the 'Halter horizon', corresponding to a campaign from A. D. 8 to 9 or 9 to 10, in different military establishments such as Bunnik-Vechten, Nijmegen, Xanten, Moers-Asberg, Neuss, Cologne, Bonn, Andernach, Mainz, Worms, Speyer, Strasbourg, Basel and Augst. Among those, the only place where remains of a granary were found was in Bunnik-Vechten, the old *Fectio* (Utrecht, NL)<sup>51</sup>.

There were many military camps built along the Rhine River during Tiberius' rule, even though *horrea* were only found inside the forts at Biesheim-Oedenburg (Haut-Rhin, F)<sup>52</sup>,

<sup>48</sup> Dendrochronological analyses done on wood found in a well and a sewer unequivocally date the camp to A. D. 5. The final year of the camp is estimated to be A. D. 9.

<sup>49</sup> BECK 1970; DOMS 1971; 1983; GLÜSING 2000; KÜHLBORN 1991; 1995; 2006; 2007.

<sup>50</sup> SALIDO 2011, 75–85.

<sup>51</sup> VAN GIFFEN 1949, fig. 10.

<sup>52</sup> REDDÉ et al. 2005, fig. 13; REDDÉ 2009, 1335.

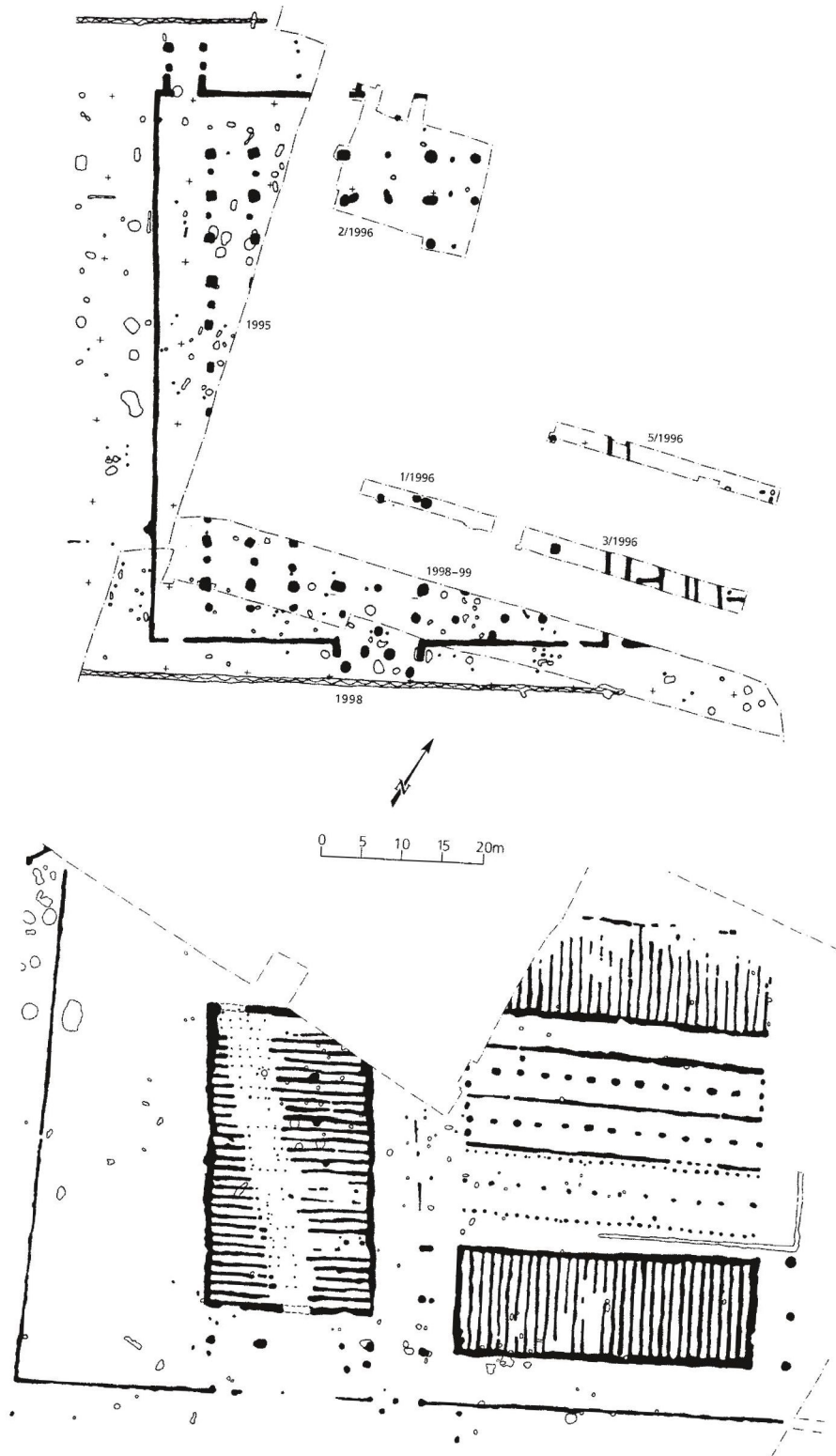


Fig. 9. Plan of the granaries north of the *via praetoria* at the Delbrück / Anreppen camp (from KÜHLBORN 2006, fig. 269).

Hofheim im Taunus I (Hesse, D)<sup>53</sup> and the camp at Windisch-Vindonissa<sup>54</sup>. A camp also exists at Aulnay de Saintonge, or the old *Aunedonnacum* (Poitou-Charentes, F), close to Saintes, in *Gallia*. Coins and pottery found there date the construction somewhere between A. D. 20 and 30, linking this precinct to Sacrovir's revolt in A. D. 21<sup>55</sup>. At the centre of the camp, some *principa* and a *horreum* (18.15 x 8.15 m) were excavated.

Based on this information, we can conclude that the typology of these *horrea* corresponds to the store buildings with raised floors supported by parallel walls, perpendicular to the building's major front walls. These granaries were built using wooden planks attached to wide columns or posts placed at an equal distance from each other. Archaeological records only mention wall foundation trenches and holes on the inside where the columns were placed. Generally, the front walls were wider than the interior walls. Frequently we find a wall or a support beam parallel to the internal walls, which possibly informs us about the existence of loading and unloading platforms. The entrance halls prevented brusque temperature and humidity changes inside the warehouse, which was imperative for grain conservation. Finally, worth mentioning is that the only thing we know about the actual construction of the *horrea* in this case is the foundation, so it is difficult to estimate their maximum capacity. Even though we can generally calculate the building's height based on the depth of its foundation trenches, we should still be careful when forming hypotheses reconstructing the warehouses and estimating their maximum capacity.

The construction of the *horrea* with raised floors supported by walls does not correspond to any particular period, but to the building's purpose. The *horrea* were built in this way during periods of military expansion and conquest because the construction material used in those cases was the most abundant in the occupied areas and allowed for the storing of a huge amount of grain. We can assume that those periods required the supply camps to be built quickly, which explains the use of wood as the principal construction material, as it is more easily worked than stone. It was easy to use wooden beams and planks, entrench them and quickly make the granaries' foundations. The fact that wood was the principal construction material during the period of military expansion confirms that this building technique was probably common in the initial stages of the military expansion in *Hispania* during the Republican period; however, no column marks or traces of wall trenches have yet been found in the southern province.

In terms of their purpose, there is no doubt that the *horrea* served as warehouses for various types of products, including grain. Archaeological research done on different sites found traces of grain, which confirms the buildings' function as granaries, as is the case with the *horrea* at Bunnik-Vechten. In the wooden warehouse at Hofheim I, we can see two different storage rooms, where traces of different products that were once stored there were discovered. In the south wing, the excavators found traces of wheat and in the northern wing traces of legumes, namely peas. The other part of the warehouse may have been used for the storing and drying of meat, as indicated by animal bones found in the proximity<sup>56</sup>.

Dating back to the first quarter of the 1<sup>st</sup> century A. D., traces of wheat (*Triticum spelta* and *Triticum monococum*) and even rice were found at the Neuss camp<sup>57</sup>. Grains of rice were also recovered from a building identified as a military hospital (*valetudinarium*), suggesting that rice was valued for its medicinal properties. The rice appeared to correspond to the *Oryza sativa* type of Asian origin, different to the African rice produced in Western

<sup>53</sup> RITTERLING 1913, 52–59 fig. 3.

<sup>54</sup> LAUR-BELART 1935.

<sup>55</sup> V. SCHNURBEIN 2006, 31.

<sup>56</sup> RITTERLING 1913, 52–59 fig. 3.

<sup>57</sup> KNÖRZER 1966, 433–443; 1970.

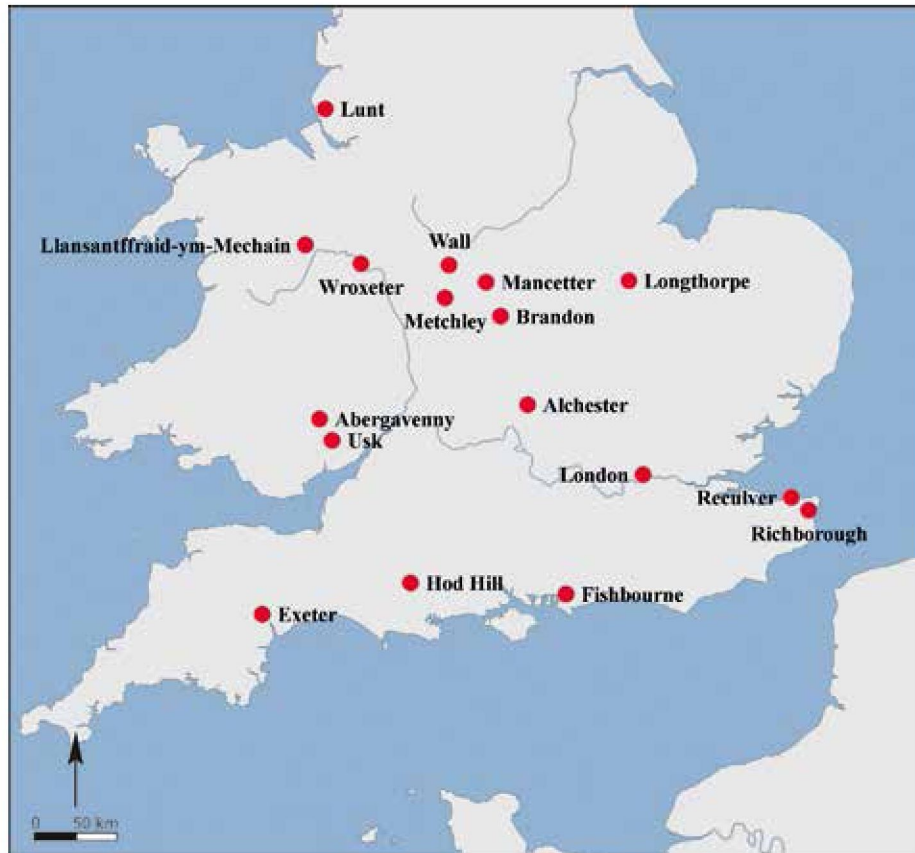


Fig. 10. Map of the Claudio-Neronian military *horrea* in *Britannia*.

Africa (*Oryza glaberrima*). This rice could have been produced, therefore, in the regions of the South and Southeast Asian continent, including India. The classical sources inform us about rice cultivation in Syria and Mesopotamia (Str. 15, 1, 18)<sup>58</sup> and trade rice from Sri Lanka (India) (Ptol. 7, 4, 1)<sup>59</sup>. For now we do not know if imported rice came to the western regions of the Empire from the Middle East or Arabia, by trade through the port of Berenike<sup>60</sup>, but it is impossible not to think of trade by sea<sup>61</sup>.

#### *Britannia* in focus: military granaries in the Claudio-Neronian period

Claudius' military campaigns were focused on the conquest of *Britannia*, an objective that was dismissed by Augustus, as it was considered too expansive and not lucrative enough for the Roman State (Strab. 3, 4, 5). In addition, military grain supply issues played an important role in the economy of such an undertaking from a strategic point of view.

<sup>58</sup> ZOHARY / HOPF 2000, 91.

<sup>59</sup> CAPPERS 2006, 104 f.

<sup>60</sup> *ibid.* 105.

<sup>61</sup> SALIDO 2013, 168.



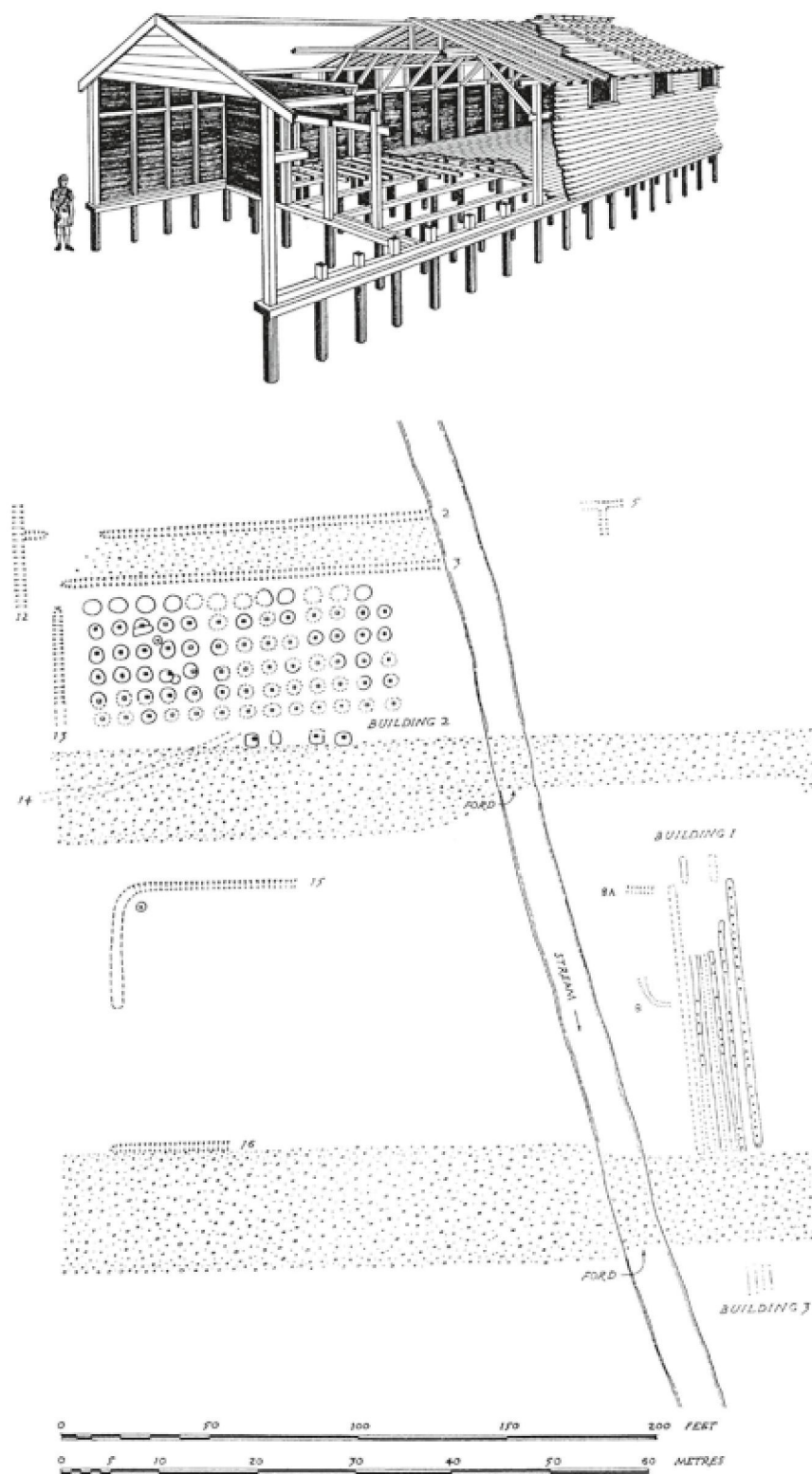


Fig. 11. Map and reconstruction of the Fishbourne granaries (from CUNLIFFE 1971a, fig. 11; 1998, fig. 5).

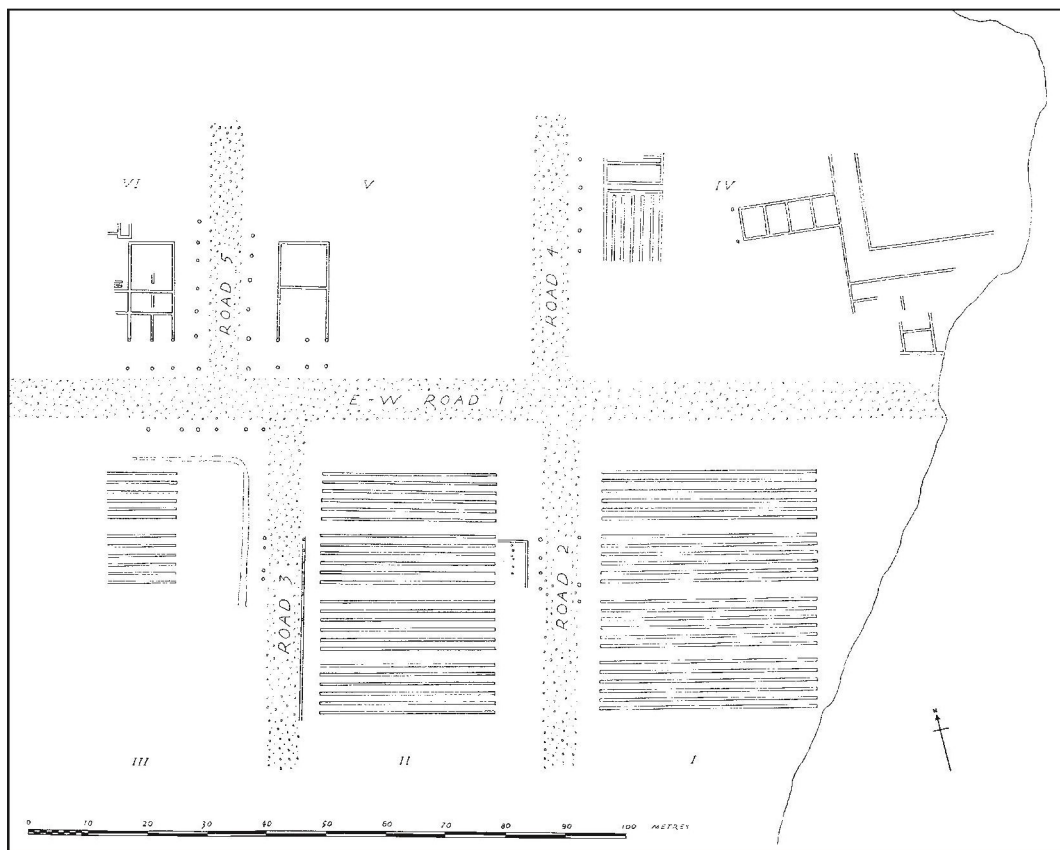


Fig. 12. Plan of the Richborough camp (from CUNLIFFE 1968, fig. 27).

During Claudius' reign, various timber camps were built, both temporary and permanent, that included *horrea* on the inside, which we know based on the discovery of various wooden poles or posts on top of which the granaries were constructed (Fig. 10). The use of those materials is again explained by the practicality and immediacy of construction required during the period of military expansion and conquest.

The oldest *horrea* were found in military establishments along and around the southern and southeastern coast of *Britannia*, dating back to the period right after the conquest of A. D. 43. This is the case with Fishbourne (West Sussex, GB), which served as a military grain supply base for the Chichester camp between A. D. 43 and 44, as indicated by the two granaries excavated on the inside<sup>62</sup> (Fig. 11). Just like the granaries from the period of *Britannia's* conquest, these were built from wood and were supported by columns. Another granary was found in the Roman fort at Hod Hill (Dorset, GB), which was occupied between A. D. 43 and 51<sup>63</sup>, and one from the Claudian period (A. D. 43) in the oldest military camp in Richborough (Kent, GB). This camp served as a grain supply base for the Roman military, which explains the discovery of eleven huge *horrea* on the inside

<sup>62</sup> CUNLIFFE 1971a, fig. 11; 1971b.

<sup>63</sup> RICHMOND 1968.

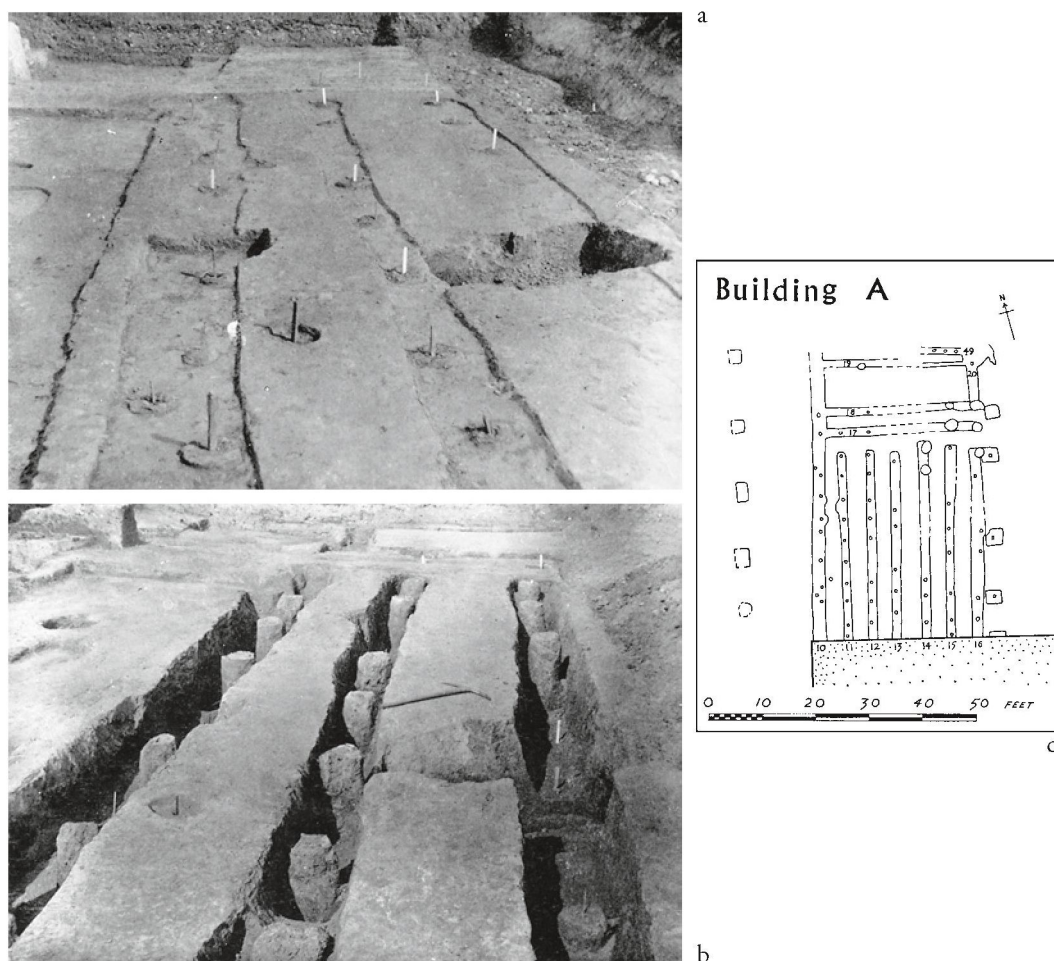


Fig. 13. Traces of columns and beams at the Richborough *horrea*: foundation trenches of building A (from CUNLIFFE 1968, fig. 6 and pl. III).

(Fig. 12)<sup>64</sup>. In this camp, dating back to A. D. 44–85, the excavators uncovered granaries at 3.05 m from each other. They also found columns and wall traces of four of these granaries at the southeast part of the camp, measuring approximately 37.49 m in length and 7.92 m in width. Similar to these were the other four granaries excavated in the southern part of the camp measuring 28.34 m in length and the same width as the other ones. In the western part of the camp, archaeologists excavated an eastern part of another couple of granaries that may have been a part of a block that consisted of four granaries. In the north, they found another *horreum*, called building A, 9.14 m wide (Fig. 13)<sup>65</sup>.

Recently, the camp at Richborough was linked to *Portus Trucculensis*, mentioned by Tacitus (*Agr.* 38, 4), a port used as a base for the Roman fleet since Claudius' invasion in A. D. 43<sup>66</sup>. Also in the camp Reculver (Kent, GB), close to the coast, a granary built dur-

<sup>64</sup> CUNLIFFE 1971a, fig. 11; ID. 1971b; BUSHE-FOX 1928; ID. 1949.

<sup>65</sup> CUNLIFFE 1968.

<sup>66</sup> GRANT 2007, 111.

ing that same period was excavated<sup>67</sup>. These two camps, Reculver and Richborough, were natural anchorage points for the fleet's disembarkation. However, no evidence of *horrea* in establishments along the southeastern coast of *Britannia* such as Dover and Lympne, which make for great maritime ports, have been found as of yet.

Roman camps dating back to this initial stage of the military expansion, during the period after the arrival of the Roman fleet to *Britannia*, have been found in the country's interior. The presence of military establishments in an inland region such as the West Midlands is explained by the penetration of the Roman troops in the territory of the *Cornovii* under Scapula's leadership. Archaeologists also found granaries in that region, namely in camps at Metchley<sup>68</sup> and Wall<sup>69</sup>.

Archaeological remains bear witness to the Roman army's notable advance westward during that period, possibly along the Thames valley<sup>70</sup>. A military establishment was built in Alchester (Oxfordshire, GB) between A. D. 44 and 45. The fort is situated in a strategic location, at a road junction going to the Severn Valley via Cuna-Wolds all the way to Watling Street in the north, crossing the Midland plains toward Wales<sup>71</sup>. The location of this camp explains why two granaries were constructed on the inside<sup>72</sup>. In the mid-1<sup>st</sup> century A. D. (between A. D. 50 and 70), a wooden *horreum* was built in Mancetter (Warwickshire, West Midlands, GB), where the necessary troop supplies were stored<sup>73</sup>. In addition, a camp of some 4.4 ha or *castra hiberna* with two big *horrea* from the Claudio-Neronian period was found in Longthorpe I<sup>74</sup>.

The revolt against the Romans on part of the indigenous people was quickly crushed after the Romans crossed the Thames River, even though Caratacus did offer quite a bit of resistance to the Roman invaders. In the first years of the invasion, he was able to maintain a front extending from the River Wye all the way to the River Severn. In fact, another camp and fort were discovered at Llansantffraid-ym-Mechain (Powys, Wales, GB), including a wooden granary supported by columns and posts<sup>75</sup>. Even though we cannot tell with precision when exactly the camp was built, we can assume it was somewhere during the pre-Flavian period, around A. D. 50, at the time of the Roman offensive against Caratacus in the hillfort at Llanymynech. In the following year, in A. D. 51, Caratacus' defeat marked an end to the indigenous resistance<sup>76</sup>.

During Nero's reign, enormous *horrea* were built in military camps in London<sup>77</sup>, Exeter (Devon, GB), Usk (Monmouthshire, Gwent, Wales, GB), Wroxeter (Shropshire, West Midlands, GB), Abergavenny (Monmouthshire, Gwent, Wales) and Brandon (Herefordshire, West Midlands, GB). In the north, various wooden granaries were found in a camp at Lunt (Warwickshire, West Midlands, GB) (Fig. 14).

With the exception of *legio XX*, which resided at the *Camulodunum* fort in Colchester, none of the three legions seem to have built a camp sufficiently big to accommodate the entire legion before the mid-50s A. D. Instead, there is a series of mid-sized forts (approximately 8 ha). At some point in the mid-50s A. D., this strategy changed, and the military started building bigger camps, a tactic that might have been concocted by Didius Gallus. During that period, the conquest of *Britannia* was swift, as confirmed by the fact that

<sup>67</sup> PHILP 2005.

<sup>68</sup> JONES 2002.

<sup>69</sup> GOULD 1964a; ID. 1964b.

<sup>70</sup> TODD 2003, 42–59.

<sup>71</sup> SAUER 2000.

<sup>72</sup> ID. 2004; 2006.

<sup>73</sup> SCOTT et al. 2000.

<sup>74</sup> FRERE et al. 1974.

<sup>75</sup> FRERE et al. 1987.

<sup>76</sup> WEBSTER 1982.

<sup>77</sup> WILSON 2006.

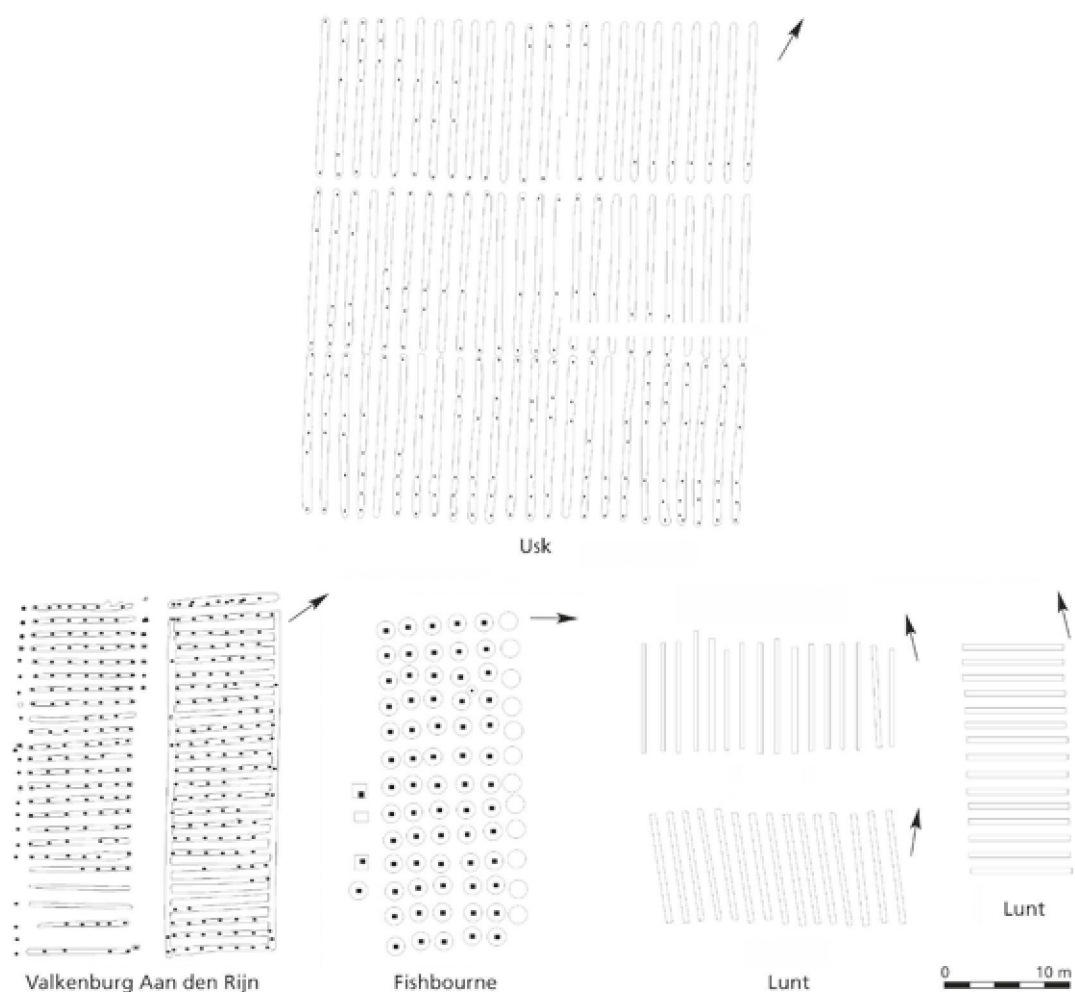


Fig. 14. Ground plans of the Claudio-Neronian military *horrea* in *Britannia* and *Gallia / Germania*.

camps in western England and Wales were built at that time. After a short while, the Roman army gained control over gold and lead mining in the mineral deposits at Mendip, a few kilometres from the Bristol Canal<sup>78</sup>, indicating that the southwestern part of the island was already conquered at the time. It was also during this period that the Exeter fort was built and occupied by the Second Augustan Legion. A *praetorium*, a *valetudinarium*, a *fabrica* and the *horrea* were excavated there as well<sup>79</sup>.

In Wales, there were two camps built that served as military defence bases for the occupied territory as well as expansion precincts. Didius Gallus was probably in charge of this reorganisation. These new camps were *Burrium*, modern Usk, on the River Usk, and *Viroconium* or Wroxeter, east of Shrewsbury, on the River Severn. Granaries were discovered inside

<sup>78</sup> RIB II, 2404, 1; 2. The fact that the Second Augustan Legion's stamp appears in the second ingot indicates that this legion was in charge of con-

trolling the mines (TODD 2003, 42–59).

<sup>79</sup> BIDWELL 1980.

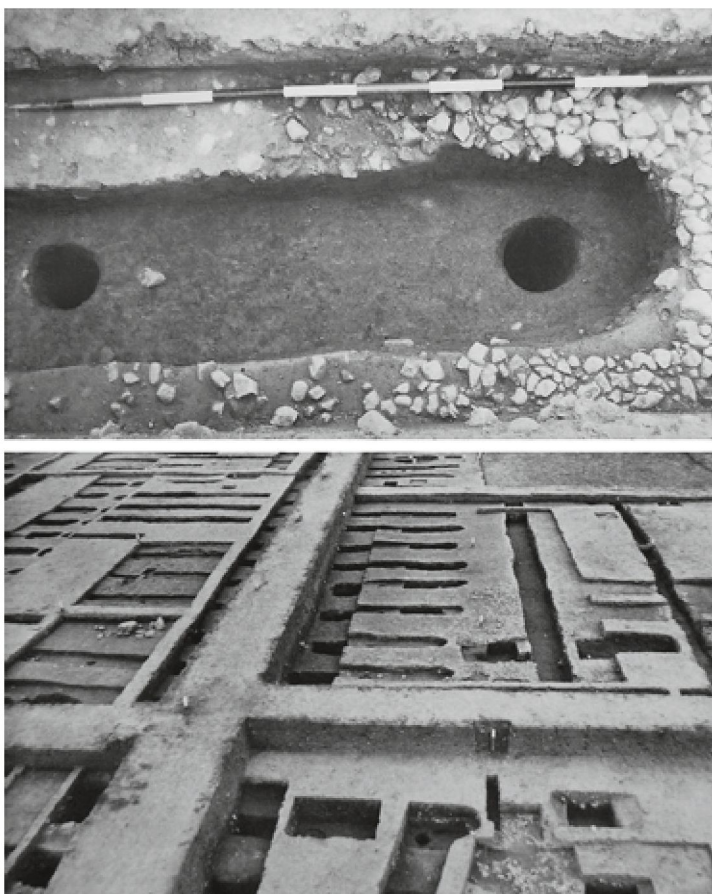


Fig. 15. Traces of columns and beams at the Usk *horreum* (from MANNING 1981, pl. XXX-XXXI).

both precincts. Between A. D. 55 and 60, a real grain supply hub was constructed in the Roman camp at Usk, with eight wooden *horrea*<sup>80</sup> (Fig. 15). In the Usk valley, the Roman army had two options: go south to the coastal plains or follow the river to the northwest where they would build another fort in Abergavenny, north of Breconshire, contemporary to the one at Usk. Archaeological excavations done on site at this fort situated midway between the legionary camp at Usk (*Burrium*) and the fort at Pen-y-Gaer revealed remains of a camp dating back between A. D. 55 and 60 and a granary on the inside of the camp<sup>81</sup>.

North Wales was conquered shortly after, with the army following the same strategy as it did in the south. The legionary camp at Wroxeter (*Viroconium*), east of Shrewsbury, accommodated *legio XIV*. This fort was built during the same time as the camp at Usk, around A. D. 60. A *horreum* was built inside this 19-hectar walled precinct (462 x 402 m)<sup>82</sup>. The location of this camp allowed *legio XIV* to control the passage across the River Severn, an important access point to the Central Marshes region. The first camp that was built

<sup>80</sup> MANNING 1981; 1993.

<sup>82</sup> WEBSTER / CHADDERTON 2002.

<sup>81</sup> ASHMORE / ASHMORE 1973; BLOCKLEY / ASHMORE 1993.

south of Wroxeter was probably Brandon camp, south of Leintwardine, where the army occupied an Iron Age fort that was later on substituted by the Jay Lane Leintwardine fort<sup>83</sup>. Brandon Camp could have been the central base for military campaigns in Wales (*castra aestiva*), perhaps linked to Quintus Veranius' military operations in A. D. 57 and Suetonius Paulinus' in A. D. 58 and 59<sup>84</sup>. The necessary grain for troop supply was stored in a wooden *horreum* built on the inside of the camp.

Four *horrea* were excavated at the military camp at Lunt in the northern region (Warwickshire, West Midlands, GB), dating back between A. D. 60 and 64<sup>85</sup> (Fig. 14). Also from that period was a military camp in London where two phases of construction with wood were recognised and which might have been destroyed during Boudicca's revolt around A. D. 60 and 61. There is little evidence that would allow us to determine how long the camp was occupied, but it is likely that this was no later than A. D. 70.

After Corbulo's military actions of appeasement (Tac. ann. 11, 19) and engineering works that connected the mouths of the rivers Meuse and Rhine in the Holland delta area (*fossa Corbulonis*) (Tac. ann. 11, 20), Claudius decided to retreat with the troops from the Rhine provinces back to the western bank of the Rhine. This way, the river became a new border of the Empire<sup>86</sup>. It is possible that this retreat was one of the consequences of Claudius' decision to conquer *Britannia* during that time. The camp at Cologne was abandoned for the ones at Bonn and Neuss, and in its place the emperor established the *Colonia Claudia Ara Agrippinensium* in A. D. 50 (Tac. ann. 12, 27).

The Claudio-Neronian period marked the beginning of Roman control over territories that were further away from the Rhine. Tiberius ordered the troops to retreat all the way back to the Rhine River (Tac. ann. 2, 26); however, the last years of his reign and those of his successors saw the conquest of the eastern bank of the Rhine, an area that had always been considered under the Roman influence. Construction of forts along the Danube was not completed until A. D. 50, indicating that the soldiers of *legio XIII*, staying in a camp at *Vindonissa* (and also perhaps in Augsburg), must have been responsible not only for the construction of camps in that area, but also for the military campaigns such as the one led by Caligula from A. D. 39 to 41<sup>87</sup>. The camp at Windisch, or the old *Vindonissa*, indicates the military advanced westward in the third decade of the 1<sup>st</sup> century A. D., possibly as a result of the arrival of other troops<sup>88</sup>. In that military precinct, the archaeologists found a wooden granary supported by 360 wooden posts or columns. Traces of ashes on site indicate that the building caught on fire.

Along the River Rhine, there were numerous military border posts, but during that period only a few *horrea* were built inside the camps, namely in the one located next to the Rhine estuary in Valkenburg (Zuid-Holland, NL) (Fig. 14)<sup>89</sup>.

As in *Germania* or *Gallia*, wood was used for the construction of the granaries in military settlements, especially in the supply bases of troops during the phases of conquest. Again this constructive technique does not correspond to a particular period, but to the purpose of the buildings. They choose the wood, because this was the most abundant material in the occupied zone, resulting in building large granaries for storage of enormous volumes of grain.

<sup>83</sup> NASH-WILLIAMS 1969, 93.

<sup>84</sup> FRERE et al. 1987.

<sup>85</sup> HOBLEY 1973.

<sup>86</sup> SCHÖNBERGER 1985, 246.

<sup>87</sup> KEMKES 1998.

<sup>88</sup> HERZIG 1945–1946; FELLMANN 2006; LAUR-BELART 1935; MEYER-FREULER 1989; ID. 1996; PAULI-GABI 2004.

<sup>89</sup> GLASBERGEN 1972.



Fig. 16. Map of the Flavian military *horrea* in *Britannia*.

### The origin of border creation: military granaries in the Flavian period

There were various military granaries from the Flavian period found in all of the western provinces of the Roman Empire. In *Britannia*, 22 Flavian forts with *horrea* on the inside were excavated (Fig. 16). Generally, these were wooden *horrea*, perhaps due to the immediacy of the military expansion and conquest (Fig. 17). Although the archaeological materials found on site do not allow us to date these military establishments with precision, we can estimate – based on literary references and some remains – that most of these precincts were built under Bolanus (A. D. 69–71), Cerialis (A. D. 71–74), Frontinus (A. D. 74–77) and Agricola (A. D. 77–83) as well as during the period of consolidation and reconstruction of the forts from A. D. 84 to 96. In *Gallia* and *Germania*, various *horrea* were also built inside the Flavian camps. In the other two provinces where only a few archaeological remains of *horrea* from the Late Empire were found, that is, in *Hispania* and *Mauritania Tingitana*, archaeologists excavated grain warehouses from that period.

Under Bolanus, who was sent to *Britannia* by Emperor Vitellius in A. D. 69, the army had to build temporary and permanent camps, but we have no data that would link the remains of Roman forts to the campaigns initiated in the Brigantes' territory. It is possible



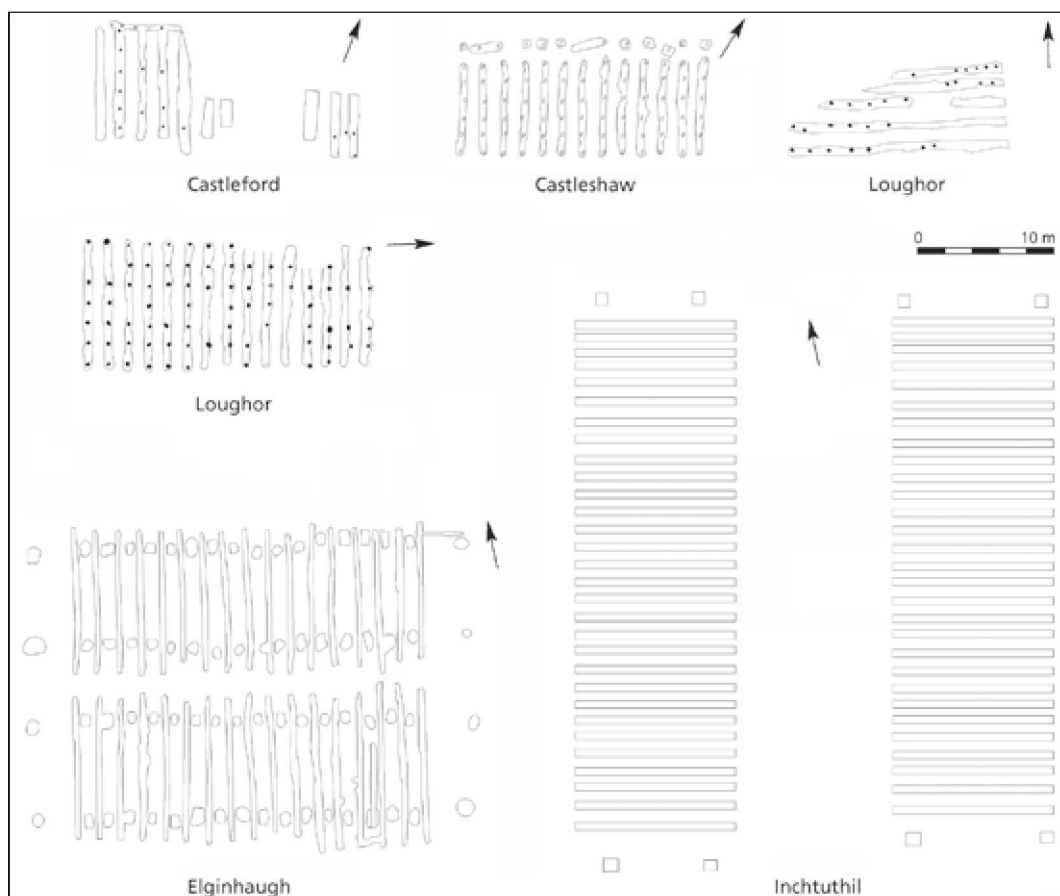


Fig. 17. Ground plans of the Flavian military *horrea* in *Britannia*.

that a lot of the camps traditionally considered to have been established under Cerialis (A. D. 71–74) could have already been set up under Bolanus. This might be the case with camps at Doncaster, Castleford and York<sup>90</sup>.

Under Cerialis, *legio IX Hispana* was sent to York and *legio II adjutrix* was sent to the camp at Lincoln, previously occupied by *legio IX*<sup>91</sup>. A legionary camp was established in York (Yorkshire and the Humber, GB) around A. D. 71. Archaeological excavations led by Richard Hall in Coney Street revealed a wooden *horreum* in a civilian settlement next to the military camp, that is, in *cannabae*, at the northeast bank of the River Ouse<sup>92</sup>. However, we do not know anything about the *horrea* inside the camp or about the granaries in forts close to York founded during the same period such as Malton, Stamford Bridge, Hayton or Brough. On the other hand, there were grain warehouses excavated in two important military establishments from the same period that served as a base for the conquest of the north-east *Britannia*, which was the Brigantes' territory. The first was the camp at Crawford (South Lanarkshire, Lanarkshire, Scotland, GB), where three construction phases were identified.

<sup>90</sup> GRANT 2007, 72.

<sup>92</sup> HALL / KENWARD 1990.

<sup>91</sup> JONES 2002, 37.

This camp from the Flavian period measured 117.34 m x 91.44 m, with the *principia* and a wooden granary discovered inside<sup>93</sup>. The second one is the camp at Brough-by-Bainbridge, the old *Virosidum* (Yorkshire and the Humber, England, GB), which may have been designed to accommodate a *cohors quingenaria*. Archaeological excavations revealed various constructions inside the camp, such as the headquarters (*principia*), commander's house (*praetorium*) and a stone *horreum* where carbonised wheat and barley grain was found<sup>94</sup>.

Under Frontinus (A. D. 74–77), the military campaigns were aimed at conquering Wales, inhabited by the Silures and the Ordovices<sup>95</sup>. It is possible that a lot of the camps from the early Flavian period located north of the River Severn were built during Frontinus' campaigns against the Ordovices<sup>96</sup>, like the fort and granary at Llanfor (Gwynedd, Wales, GB). Research done on site revealed there had been two temporary camps, a polygonal precinct and a wooden *vicus*. The surface of first wooden camp measured 3.8 ha and a wooden granary was found inside the camp.

Military campaign against the Silures caused *legio II Augusta* to change its permanent establishment to the legionary camp at *Isca* (Caerleon, GB), where three stone *horrea* were found<sup>97</sup>, as well as a network of small auxiliary forts some 15–20 km away. The army was able to control ample territory out of Caerleon and its auxiliary camps. In the west, they built various military forts with their own granaries: Pumpsaint (Dyfed, Wales, GB), which basically served to exploit gold deposits at Dolaucothys<sup>98</sup>. In the center of this 1.9 ha camp, a *horreum* that was 17 m long and 12 m wide was found. The archaeologists excavated a northwest corner of this building with three buttresses reinforcing the west-side wall and four inside walls supporting the floor. According to Jones and Little, the *tabulatum* of the granary was supported by posts along the granaries' east- and west-side walls<sup>99</sup>.

To the south of this camp, different auxiliary units with granaries were established in camps such as Loughor, the old *Leucarum* (West Glamorgan, Wales, GB), *Moridunum* (Carmarthen, Dyfed, Wales, GB) and Cullompton (Devon, South West England, GB)<sup>100</sup>.

Agricola managed to conquer Wales, finishing the task started by Frontinus, as well as Northern England before invading *Caledonia*. He organised and led seven military campaigns aimed at a progressive conquest of the western as well as the northern part of the island until he took control over these territories and consolidated Rome's power across the entire island, including Wales and Scotland. Tacitus tells us that these military campaigns were financed with grain taxes paid by *Britannia's* tribes – a burdensome policy that probably ended with the conquest of the island<sup>101</sup>. In fact, it was probably this tax that triggered Boudicca's revolt.

<sup>93</sup> MAXWELL 1972.

<sup>94</sup> BIDWELL / HODGSON 2009.

<sup>95</sup> Even though Tacitus says Frontinus only fought against the Silures, there is no doubt that the governor also undertook military actions against the Ordovices (GRANT 2007, 68). In fact, Tacitus himself tells us that one cavalry unit had already been defeated before Agricola's arrival to the province (Tac. agr. 18, 1–2). Archaeological remains also bear witness to the construction of various Roman forts during that period.

<sup>96</sup> DAVIES 1980, 261.

<sup>97</sup> GUEST / YOUNG 2006.

<sup>98</sup> BURNHAM 2004.

<sup>99</sup> JONES / LITTLE 1973, 11 f.

<sup>100</sup> Pottery found on site allows us to assume the camp had been inhabited as early as A. D. 75 (MAXWELL / WILSON 1987).

<sup>101</sup> "Agricola knew by the experience of past events, that conquest, while it loads the vanquished with injury and oppression, can never be secure and permanent. He determined, therefore, to suppress the seeds of future hostility. (...) When grain was scarce, the locals had to buy it at an arbitrary price from imperial granaries in order to pay their taxes; where grain was abundant but delivery sites were far away, the onerous transport was paid in cash" (Tac. agr. 19, 4).

The first campaign started in the summer of A. D. 77 via land routes surprised the Ordovices, as they were expecting a sea attack (Tac. agr. 18, 4). In this campaign, Agricola managed to conquer the Island of Mona (Anglesey, GB) and Northern Wales, the territory of the Ordovices. Three camps where *horrea* have been excavated correspond to this period: Caersws (Powys, GB)<sup>102</sup>, Pen Llystyn (Gwyned, GB)<sup>103</sup> and Loughor (West Glamorgan, GB)<sup>104</sup>. Archaeological analysis of evidence found in granaries of the second camp in this establishment (phase 3), dating back before A. D. 85, allowed us to determine the type of grain stored in the granaries when the fire broke out. The majority of carbonised grain was barley (*Hordeum sp.*) and spelt wheat (*Triticum spelta*), which were probably stored separately. Archaeologists also found small traces of *Triticum aestivum* and *Triticum dicoccum*; there were barely any traces of weed and hay, indicating that the grain had been cleaned before being stored<sup>105</sup>. These data tell us about an organisation and a particular interest in keeping troops provisioned and store grain in good condition for long-term preservation.

During Agricola's second campaign, the army occupied strategic locations in order to ensure control in North *Britannia* (North England and South Scotland). Agricola might have used the same tactic as Cerialis before him in conquering the Brigantes' territory: he not only reoccupied the military establishments from the previous campaigns, but also set up new camps that allowed him to control the newly conquered territories<sup>106</sup>.

The third military campaign led by Agricola around A. D. 80 was aimed at conquering the territory south of the River Tay or Tatha. Corresponding to this stage of conquest are two camps, Elginhaugh (Midlothian, Scotland, GB) (Fig. 17) and Strageath (County of Perth, Scotland, GB), whose *horrea* were analysed in important monographs<sup>107</sup>. The enormous capacity of the excavated *horrea* in these military precincts coincides with Tacitus mentioning that the annual troop supplies were stored in those forts<sup>108</sup>.

<sup>102</sup> JONES 1961; ID. 1993; NASH-WILLIAMS 1969.

<sup>103</sup> HOGG 1968, 101–192.

<sup>104</sup> FRERE et al. 1989, 261 fig 3.

<sup>105</sup> MARVELL / OWEN-JOHN 1997.

<sup>106</sup> Five forts where *horrea* have been excavated inside correspond to this period: Castleshaw (Greater Manchester, North West, GB) (START et al. 1985), *Camulodunum* (Slack, Yorkshire and the Humber, GB) (RICHMOND 1925) and *Navio* (Brough-on-Noe, Derbyshire, GB) (DEARNE 1993). In the north of this region, we have the camp at *Corstopitum* (Corbridge, North East, GB) (GILLAM / TAIT 1971). The camp at Lease Rigg (North Yorkshire, Yorkshire and the Humber, GB) might also be from that period (GOODBURN et al. 1979).

<sup>107</sup> The camp at Elginhaugh (Dalkeith, Midlothian, Scotland) is located on the border between the Brigantes and the Votadini and south of the camps at Forth-Clyde, past Antonine's Wall. The use of its horreum is not only confirmed by the construction techniques, but also by traces of carbonised grain, namely *Triticum spelta*, *Triticum*

*aestivum* and barley (HANSON 1990, 379–387; HANSON et al. 2007, 54–63). The camp at Strageath (Perth and Kinross, Tayside, Scotland, GB) forms part of a line of forts built after Roman victories in the River Earn Valley (Strath-earn), together with Stirling, Ardoch, Bertha and Doune (FRERE / WILKES 1989). It is possible that this camp was a military base for territorial control and grain supply during the Flavian occupation (GRANT 2007, 91).

<sup>108</sup> “The country, as far as the Romans advanced, was secured by forts and garrisons. No officer knew better than Agricola, how to seize the most advantageous situation; and, accordingly, not one of the stations, fortified by his direction, was taken by storm; not one was reduced to capitulate; not one was surrendered or abandoned to the enemy. The enemy who had been accustomed to retrieve in the winter what they lost in the antecedent summer, now saw no difference of seasons; they were defeated everywhere, and reduced to the last despair.” (Tac. agr. 22, 2).

In the area where fort Strageath is found, there is a network of forts known as the Gask Ridge Frontier. Even though some argue this line of forts was built to protect the Venicones in Fife from attacks from the west, this does not seem to be enough reason to explain the construction of these forts. Another research concluded that this line of forts was consolidated as a frontier after the troops left the camp at Inchtuthil (Scotland, GB)<sup>109</sup>. This way, the Roman army was able to control a fertile land south of this line of forts that provided them with ample grain supplies. It is likely that local communities in the area played an important role in land exploitation through grain taxation enforced by the Roman army. Hard proof of this is the famous *modius* dating back to the Domitian period found in the camp at Carvoran, in the southern part of this fertile region<sup>110</sup>.

Ptolemy mentions there was a camp known as *Orrea* in the Venicones' region (*Geographia* 2, 3, 9)<sup>111</sup>. This camp would have been located next to the River Tay, just where it connects to the sea, and, as the name itself indicates, must have included numerous *horrea* from where grain was supplied to other forts. An anonymous writer from Ravenna refers to this place as *Poreo Classis* (V, 31), whose name means 'fleet granaries'. Traditionally, this precinct was linked to a Roman camp at Carpow, some 30 km east from Strageath. This fort is situated on the south bank of the River Tay, east of its confluence with the River Earn. Archaeological excavations done on site between 1964 and 1979 revealed a floor that measured more than 11 ha. Archaeologists found a wall, three of the four gates and various constructions inside the camp such as the *principia*, captain's house and a granary. However, the excavated materials do not date the camp to the Flavian period but to the 2<sup>nd</sup> century A. D. or to the beginning of the 3<sup>rd</sup> century A. D.<sup>112</sup>. Even though it is true that Carpow's location is privileged in terms of the proximity of the confluence of River Tay and River Earn, there is no information about it being occupied during the Flavian period, which is when Ptolemy mentions the *Orrea* settlement. Other camps such as Ardoch were located in areas connected with the River Tay. Still, based on archaeological data, it is difficult to locate *Orrea* or *Poreo Classis* with precision. Until now, the only excavated camp with huge *horrea* inside from that period is the fort at Strageath. This camp was built strategically to control the River Earn passage, close to one of the river's crossable meanders. Even though the camp was linked to what Ptolemy called *Victoria* and the anonymous writer from Ravenna *Victorie* as a symbol of Roman triumph in the Stratearn area, there is no reliable data to confirm this theory<sup>113</sup>.

There is little information on the construction of granaries inside the camps built during Agricola's fourth military campaign, aimed at strengthening the hold of the conquered territory and advancing northward to Firth of Clyde (*Clota*) and Forth (*Bodotria*)<sup>114</sup>, and fifth campaign, whose objective was to consolidate Rome's power in western Scotland.

During Agricola's sixth military campaign, the army fought to control the area north of the River Tay. Consequently, the army built a series of forts known today as the Highland Line Fort or Glenblocker Fort in Scotland. Among those camps, there are various *castella*

<sup>109</sup> JONES / WOOLLISCROFT 2001.

<sup>110</sup> HAVERFIELD 1916.

<sup>111</sup> RICKMAN 1971, 316 f.

<sup>112</sup> DORÉ / WILKES 1999.

<sup>113</sup> Recently, GRANT (2007, 102) has argued that the settlement known as *Victoria* could have been Strageath rather than Delginross in the past, as it was traditionally thought.

<sup>114</sup> There is no archaeological evidence of *horrea* from the Flavian period in camps that would later form part of the Antonine Wall, such as Murrills, Camelon, Castlecary, Cadder, Balmuildy and Old Kilpatrick. The granaries in all those camps date back to the Antonine period.

<sup>115</sup> WOOLLISCROFT / HOFFMANN 2006.

where *horrea* have been excavated: Dalginross<sup>115</sup>, Fendoch<sup>116</sup>, Cargill<sup>117</sup>, Inchtuthil<sup>118</sup> and another one located further north at Cardean<sup>119</sup>.

In the later stages of Agricola's conquest, between A. D. 84 and 96, the army adopted the politics of maintaining their frontiers. The second phase of the construction of the camp at Castleford-Wakefield (West Yorkshire, Yorkshire and the Humber, England, GB) might correspond to this period. The army probably occupied the camp between A. D. 85 and 90 and from 95 to 100. A wooden granary, later substituted for a stone *horreum*, was discovered inside the camp<sup>120</sup>.

### Military *horrea* and grain supply in *Germania* during the Flavian period

In the northern provinces of Roman Empire during the civil war that broke out after Nero's assassination in June of A. D. 68, the most experienced units of the Rhine army were sent to Italy led by Vitellius. When Vespasian was proclaimed emperor in July of A. D. 69, the civil war was at its peak, and the troops left in the Rhine area were unable to suppress the uprising of the Batavians, the Lingones and the Trevirians. During that period, the legionary camp at *Vetera* was surrounded and destroyed by the Batavians in the spring of A. D. 70. In Neuss, the soldiers of *legio XVI Gallica* surrendered to the Gauls (Tac. hist. 5, 59, 2). These events forced Vespasian to quickly send his troops to *Gallia* under the leadership of Q. Petillius Cerialis, who defeated the Trevirians and the Batavians, and Annius Gallus, who conquered the Lingones. Once the situation was under control, the army proceeded to restore the damaged buildings and build new forts.

The camp at Neuss, or the old *Novaesium*, played an important part during the Batavian uprising between A. D. 69 and 70 – this is where *Legatus Augusti pro praetor* of the *Germania superior* army, Hordeonius Flaccus, and the delegate of *legio XXII Primigenia*, C. Dillius Vocula, were assassinated by the rebel troops. In fact, Tacitus (hist. 4, 26) specifically mentions a lack of supplies due to draught and talks about the enormous dependence on grain supply that came on ships via the Rhine River. *Novaesium* was then destroyed and the first ever documented stone camp was built the following year in the same location (Tac. hist. 5, 22, 1).

In *Germania superior*, the legionary camp at Mainz, or the old *Mogontiacum* (Rhine-land-Palatinate, D), accommodated two legions that rebuilt a part of the precinct: *legio I Adiutrix* and *legio XIII Gemina Martia victrix*<sup>121</sup>. To the southwest, near Dijon, a military camp was built out of stone in Mirebeau (Bourgogne, F), measuring 22.33 ha in size (583 x 383 m). The material found on site was determined to date back between A. D. 70 and 90<sup>122</sup>. Aerial photographs allowed the archaeologists to identify various buildings inside the precinct, including the warehouses<sup>123</sup>. However, since those warehouses have not been excavated, it is impossible to determine whether these were in fact *horrea*.

In the south of *Germania superior*, there was a legionary camp of *Vindonissa*, at Windisch, built during the Tiberian period. From A. D. 70 onward, *legio XI Claudia Pia Fidelis* destroyed and partially rebuilt the camp once occupied by *legio XXI Rapax*<sup>124</sup>. Among the

<sup>116</sup> RICHMOND / MCINTYRE 1939.

<sup>117</sup> GREW et al. 1981, 319; RANKOV et al. 1982, 335 f.

<sup>118</sup> PITTS et al. 1985, 116–122.

<sup>119</sup> ROBERTSON 1977.

<sup>120</sup> ABRAMSON et al. 1999.

<sup>121</sup> BAATZ 1962; BÜSING 1982.

<sup>122</sup> GOGUEY / REDDÉ 1995.

<sup>123</sup> GOGUEY 2008, fig. 2. 3.

<sup>124</sup> HARTMANN 1983; ID. 1986; FELLMANN 2006.

discovered buildings, there is a warehouse located east of the northern gate. This is a rectangular building measuring 33.8 x 10.8 m in size. On the interior surface of the walls, there are small pilasters, 30 cm wide and 1 m high, that were a part of the support system for the storage room floor<sup>125</sup>.

During Vespasian's reign, the Roman army stationed in *Germania superior*, crossed the Rhine and took control of the eastern half of the fertile region of Wetterau (Midwestern Germany). In order to strengthen its hold over that territory, the army built wooden camps for auxiliary units in locations such as Frankfurt am Main / Heddernheim, Okarben and Friedberg. In Frankfurt am Main / Heddernheim (Hesse, D), or the old *Nida*, remains of at least ten military establishments were found<sup>126</sup>. The best known camps are the permanent establishment A, dating back to the late Vespasian period, and an annex from the Domitian period. This annex (camp B) is a 292 x 80 m precinct that had a huge wooden double door. Inside the camp, there was a building with various column rows indicating this was probably a granary with an elevated floor supported by wooden posts<sup>127</sup>.

The camp at Sulz am Neckar (Baden-Württemberg, D) was also set up during the Vespasian period. It was built south of the Neckar River, probably during the same time as the one at Rottweil, and later on abandoned under Trajan's rule, although the *vicus* continued to be occupied. Archaeologists have found remains of the *principia* on the west side of the camp and what might have been a *horreum* at the southern corner<sup>128</sup>.

Under Domitian, there were new camps built such as the military precinct at Koblenz-Niederberg (Rhineland-Palatinate, D). This military establishment measured 177.4 x 157.8 m (2.8 ha) and played an important role behind the *limes*<sup>129</sup>. Inside the camp, there was a stone granary (20 x 10.8 m) separated from the *praetorium* by a 4 m wide road. The storage floor is similar to the granaries excavated in other camps such as Feldberg<sup>130</sup>, Glashütten<sup>131</sup>, Oberscheidenthal<sup>132</sup>, Kapersburg<sup>133</sup> and Welzheim<sup>134</sup>. Traces of carbonised grain found in the warehouse at Welzheim (Baden-Württemberg, D) and an inscription on the warehouse in the camp at Kapersburg (Hesse, D) indicate that these were in fact used as general supply and grain warehouses.

Based on the information about the building techniques in the case of *horrea* from the Flavian period in the northern regions, we can conclude that the construction of big stone legionary camps like the ones at *Novaesium* (Neuss)<sup>135</sup>, *Noviomagus* (Nijmegen)<sup>136</sup>, *Bonna* (Bonn)<sup>137</sup> (Figs 18, 19), and *Vindonissa* (Windisch)<sup>138</sup> included erecting huge stone *horrea* with stone pillars as a support system for the storage room floors. This use of stone in the construction of granaries and other buildings indicates that the storage and redistribution

<sup>125</sup> HERZIG 1945–1946, 42.

<sup>126</sup> Lack of information about buildings inside the camp and the scarcity of material found in the camps C–L suggest that these were marching camps from the Flavian period. Forts C, D, F and G (?) are probably older than *castellum* A, built at the end of the Vespasian period. Camps H, I and K probably date back to Domitian's rule. The L precinct includes a most recent installation and was probably built at the end of the 1<sup>st</sup> century A. D. One of those camps might have been linked to the Augusto-Tiberian campaigns.

<sup>127</sup> WOLFF 1915.

<sup>128</sup> HERZOG 1897; SOMMER 2006.

<sup>129</sup> DHAM 1900.

<sup>130</sup> JACOBI 1905.

<sup>131</sup> BAATZ 1987.

<sup>132</sup> SCHUMACHER 1897.

<sup>133</sup> JACOBI 1906.

<sup>134</sup> METTLER / SCHULTZ 1904.

<sup>135</sup> HEESCH / SEELING 1989.

<sup>136</sup> VAN ENCKEVORT et al. 2000.

<sup>137</sup> GECHTER 1986; ID. 1987; ID. 1995.

<sup>138</sup> MEYER-FREULER 1996; HERZIG 1945–1946.



Fig. 18. Excavation of the granary at the Bonn camp (from GECHTER 1987, fig. 317).

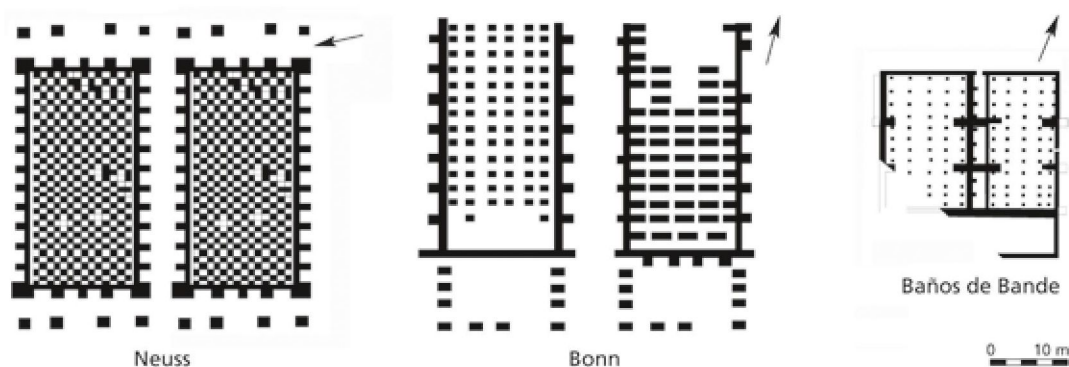


Fig. 19. Ground plans of the Flavian military *horrea* in *Germania / Gallia* and *Hispania*.

centres for the agricultural surplus had been previously selected and that the supply networks had already been firmly consolidated by that time.

The use of pillars in the floor support system required a minor adjustment in form of simple petrification of wooden planks that had been used before. This support system was not very efficient, as it required pillars of same length to be placed in different rows, making it difficult to lay the floor on top in a perfectly flat and balanced way. This instability and difficulty placing the *tabulatum* or the floor on top of the pillars probably made this support system the least popular during the Roman era since it also required stone walls, double walls, benches etc. On the other hand, stone walls provide more stability and rigidity to the floor. In the archaeological records, only stone pillars appear *in situ* with

equal distance between them, so we can determine the area where most of those pillars were. In addition, we know that in case the building included ventilation openings, the pillars were placed in a way that the air passage would not be blocked. The records we have on the *in situ* pillars tell us approximately how deep these were in the ground, which, in turn, allows us to estimate the height at which the warehouse floor or *tabulatum* was placed. These pillars were often reused in the construction of new buildings, which makes it difficult to confirm their use in other warehouses. Archaeologists mention usually the construction of internal buttresses, which proved to be inefficient support tools in the case of granaries. From what I have been able to see and analyse, these buttresses probably were not used as wall reinforcements, but as pilasters supporting the storage floor.

A lot of inscriptions that mention different *beneficarii* (*consularis, procuratoris*) in *Germania* give us information on grain supply among different provinces, as the principal role of these officials was to keep the administrative control of the products sent to the soldiers in the field via road networks. In terms of the merchandise transport, various *horrea* were excavated in secondary agglomerations connected to the main road networks. These establishments date back to the 2<sup>nd</sup> and 3<sup>rd</sup> century A. D. and were clustered in the northern part of provinces in *Gallia* and *Germania*, possibly along the principal roads that connected the most important military camps such as the legionary camps mentioned earlier. It is exactly in these camps that most inscriptions about the *beneficarii* have been documented<sup>139</sup>. This connection between the redistribution centres and supply networks ensured the army got the basic products. Supplying the soldiers with products they were used to in a consistent and reliable manner allowed the generals to maintain the army's morale and made the soldiers feel they were protected and taken care of by the State. The *annona* thus became one of the factors that motivated the troops in battle and kept them loyal during peace periods.

Regarding the transport of supplies to the troops, worth noting is that there was probably free commerce alongside the regular supply system. This free commerce was organised by *negotiatores* who sold certain products to and even set up long-term sales contracts with the army<sup>140</sup>. Grain was one of the products supplied to the army<sup>141</sup> as well as some of the more exotic ones, documented in camps of central Europe, which probably came from this free commerce<sup>142</sup>. However, it is hard to imagine the State was not entirely in charge of administering and supplying basic products to the army, even though the actual transport of merchandise was set up with private contractors (*negotiatorii, mercatores frumentarii* and *navicularii*) or with soldiers themselves<sup>143</sup>. The importance of grain in the army's diet points to the fact that the State was probably in charge of supplying this product to the troops. The emperors and governors in the provinces were conscious of the importance grain had in maintaining the soldiers' strength as well as of the fact that the stability and security of the Empire relied on the troops' morale (and that the soldiers would probably

<sup>139</sup> In some provinces of Belgica and Germania inferior, there is a cluster of some of the most important camps built along the Rhine, such as the ones at Köln, Bonn, Remagen, Xanten and Neuss. See SCHALLMAYER et al. 1990 and NELIS-CLEMENT 2000 for more on this subject.

<sup>140</sup> WIERSCHOWSKI 1984; ERDKAMP 2002b, 65. Tacitus gives us a good example of this (an. 15, 72)

when he talks about army grain sales during the Neronian period.

<sup>141</sup> KEHNE 2007, 329.

<sup>142</sup> BAKELS / JACOMET 2003, 547–550; SALIDO 2013, 167 f.

<sup>143</sup> cf. KISSEL 1995, 45–50; BREEZE 2000, 60; LO CASCIO 2007.



start a revolt in case they did not have basic supplies). On the other hand, if the transport and distribution of grain and other products had not been centralised, it would not be necessary to build enormous warehouses and granaries inside the camps. In other words, the scenario where grain supply is a matter of individual negotiation with each soldier who then stores his supply separately from the other soldiers is far-fetched and entirely implausible, especially considering the fact that archaeological records point to the presence of communal granaries. Hence, it is likely that the grain trade, mentioned in epigraphic archives, is a proof of a smaller free commerce system, where private *negotiatores* sold different products to the soldiers. This process was similar to the one used in the production and supply of weapons, where, despite the State's control over the iron production, there was decentralisation of the weapon supply and free gun trade.

This strategy of consistently maintaining the army through safe and reliable supply lines and networks from grain production zones was also applied in the southern provinces of *Hispania* and *Mauritania Tingitana*, which explains the construction of huge stone forts and *horrea* that follow the same building model as the ones along the Rhine frontier. The construction of *horrea* in those provinces included placing the *tabulata* or wooden floors on stone pillars placed perfectly in organised rows. This confluence of criteria might be the result of establishing certain construction patterns that were perfectly adapted to the consolidation of new supply networks. Thus, the *horrea* had their *tabulata* supported by stone pillars, a technique which required more time and skill in order to be properly built.

Scarce information on granaries from the Late Empire period documented in *Hispania* is limited to a double granary made of stone excavated in the auxiliary camp (*castellum*) at Baños de Bande-Porto Quintela (Orense, E) (Figs 19, 20), known in the written sources as *Aquis Querquennis*<sup>144</sup>. In *Mauritania Tingitana*, the excavators discovered *horrea* in a camp at *Thamusida* dating back to the early A. D. 69 that follow the same construction pattern<sup>145</sup>.

### Final remarks

In the initial stages of the conquest, logistical problems stemming from the troops' continuous mobility made it necessary for the army to acquire supplies and resources directly in the field (*frumentatio*). This practice was very common when the troops would advance in recently conquered territories. However, the absence of grain during certain military initiatives led to the establishment of regular lines of supply from other regions such as Italy during the conquest of *Hispania*. In turn, this grain supply made it necessary to build huge *horrea* in strategic locations from where it would be distributed to the troops. Selecting and setting up the supply centres also had its challenges, as it required the army to establish communication lines and supply networks ensuring that the right supplies got to the troops. On the other hand, the troops' mobility depended and was in a way limited by this supply system since military attacks and sieges far away from the supply hubs posed a real challenge.

The oldest *horrea* from the Roman Empire were documented in *Hispania* in forts belonging to the *Numantia circumvallatio*: Valdevorrón and Castillejo (3<sup>rd</sup> construction stage), corresponding to the siege and the conquest of the Arevacan city led by Scipio between 134 and 133 BC, and the nearby camp at Renieblas V, which seems to date back to the first half of the 1<sup>st</sup> century BC. Overall, the granaries from the Republican period,

<sup>144</sup> RODRÍGUEZ / FERRER 2006.

<sup>145</sup> PAPI / MARTORELLA 2007.



Fig. 20. Excavation of the granary at Baños de Bande (from RODRÍGUEZ / FERRER 2006, figs 52 and 53).

dating back to mid-2<sup>nd</sup> century BC, had floors supported by stone walls, which made for ideal temperature and humidity conditions for grain conservation and prevented parasites and rodents from ruining the grain. These construction techniques had been known from the pre-Roman period and may have stemmed from the army's previous experiences in the field and its contact with the indigenous communities.

The use of wooden walls in the case of those granaries was also documented in many later military establishments used as supply bases for troops trying to conquer the provinces in *Britannia*, *Gallia* and *Germania*. The fact that wood was the principal material used during the period of military expansion and conquest confirms that this construction technique was probably very common in *Hispania* in the initial stage of conquest; however, archaeologists have not yet discovered any column marks or interior wall trenches in those provinces. The construction of *horrea* with floors supported by wooden walls does not correspond to any particular period but rather has to do with the warehouses' function and the moment in which they were built. The *horrea* built during periods of military expansion and conquest followed certain construction patterns, as the materials used in their construction were the ones that were most abundant in the occupied area (i. e. wood). This construction system was efficient for storing huge amounts of grain, as the floors or *tabulata* in those granaries were very stable. It is safe to assume that the important thing during those times was to build military camps and granaries as quickly as possible, which explains the use of wood as the principal construction material, more easily worked than stone, along with beams and planks fixed or entrenched into the ground. All this made for fast and practical construction.

This building technique was used in different periods but was always accompanied by the construction of big military hubs that served as supply bases for the troops who were participating in different campaigns. In the provinces of *Gallia* and *Germania*, archaeologists documented stone walls in granaries belonging to camps from the Augusto-Tiberian period. These granaries were found in camps built along the Rhine River around A. D. 12 under Drusus' leadership and in precincts from Tiberius' rule on the river's right bank. In *Britannia*, there were big military grain supply centres found close to the southern and southeastern coast of *Britannia* dating back to the period right after the Roman troops' arrival on the island in A. D. 43. In *Hispania*, the archaeologists have not yet found any *horrea* in military camps from the Cantabrian Wars or in military bases from the Augustan and Julio-Claudian periods.

In *Gallia* and *Germania*, after Corbulo's campaigns that pacified the area occupied by the Frisians and after connecting the Rhine River with the Meuse River by the *fossa Corbulonis*, Claudius decided to pull his troops from the Rhine's right riverbank in A. D. 47 and make this river a definite border of the Roman Empire in *Germania Inferior*. This retreat was a result of Rome's focusing on the conquest *Britannia* and brought about a novelty in terms of grain transport to the border areas. The troops stationed in the permanent military precincts relied on secured supply centres and consolidated communication and transport lines whose principal function was to get the first-necessity products to those troops. The grain was stored in huge wooden *horrea* in camps along the right bank of the Rhine.

During the Flavian period, more permanent camps were built, as the northern borders became more stable. The use of wood in the construction of military *horrea* continued in *Britannia* during Agricola's campaigns to conquer Wales (an initiative started by Frontinus) and also in the north of England before the invasion of *Caledonia*, which explains the need for quick and practical construction of the *horrea*. Locally harvested grain was stored in granaries, and the volume must have been sufficient to supply all the units deployed in *Britannia*. It is likely that the army continued using wood to build the *horrea*, as this was the most practical and easily worked material, ensuring quick supply of the troops in Wales and Scotland. However, immediately after Agricola's conquests and consolidation of power in newly occupied territories between A. D. 84 and 96, Romans started using stone to build their *horrea*. Military expansion in a way depended on where the supply hubs and fertile lands would be located. In fact, some military initiatives were strongly influenced by these factors. This was the case with one of Agricola's campaigns that started in A. D. 80 south of the River Tay and included the construction of a series of forts known as the Gask Ridge Frontier, which strengthened the army's hold over the fertile territory south of this defence line. This geostrategic policy indicates that, at least in this case, the army opted for a micro-regional grain supply system.

In the Rhine provinces during the Flavian period, the Romans tried to stabilise the borders by building huge legionary stone camps such as *Bonna* (Bonn), *Noviomagus* (Nijmegen), *Novaesium* (Neuss) and *Vindonissa* (Windisch). These were camps where the army started building huge stone *horrea* where stone pillars or columns supported the warehouse floor. The use of stone indicates these precincts had been selected as supply and distribution hubs before the actual construction began and that the supply networks had already been well established by that time.

Along with border consolidation, this period also witnessed the process of military stabilisation, with supply lines being secured from the grain production areas in the southern regions, where big stone forts and *horrea* were built following same construction model as the ones along the Rhine border (in the case of *horrea*, *tabulata* or wooden floors were placed on stone posts). Some of the biggest *horrea* built in those regions during the Flavian period were *Aquis Querquennis* in *Hispania* and *Thamusida* in *Mauritania Tingitana*. However, lack of archaeobotanical analyses in those regions makes it impossible to confirm whether there was interprovincial supply trade, even though we know there was intense grain production at a regional level. This economic stimulus might explain the origin of numerous rural establishments in those regions that would make use of the newly cultivated fields.

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### Zusammenfassung: Architektur im Dienst der römischen Armee: *Horrea* und die Getreideversorgung römischer Grenzkastelle

Alle militärischen Entscheidungen, von grundlegenden strategischen Konzepten bis zu kleinsten taktischen Bewegungen, wurden beeinflusst und bestimmt durch die Notwendigkeit, die Versorgung der Armee zu sichern. Räumliche Beschränkungen, die Dauer der militärischen Kampagnen, die Ziele militärischer Expansion und die Festigung der Macht im feindlichen Gebiet umfassten auch das Plündern lokaler Ressourcen (*frumentatio*) und einen administrativen Verteilungsmechanismus der Produkte (*annona militaris*). Die umfangreiche Lagerung von Getreide und anderen Nahrungsmitteln in großen Getreidespeichern und Lagerhäusern (*horrea*) war essenziell während der römischen Eroberung. Dieser Beitrag untersucht genauer die *horrea* von republikanischer bis in flavische Zeit, deren Bauweisen von den Bedürfnissen der römischen Armee abhingen.

### Abstract: Architecture in the service of the Roman army: *Horrea* and the grain supply of Roman frontier forts

All military decisions, from the basic strategic concept to the smallest tactical movements, were affected and determined by the need to provide the supplies to the army. Space limitations, the duration of the military campaigns, the objective of military expansion and power consolidation in the enemy territory included looting local resources (*frumentatio*) and an administrative mechanism of product distribution (*annona militaris*). The large-scale storage of grain, as well as other foodstuffs, in large granaries and store buildings (*horrea*) was absolutely essential during the Roman military conquest. This paper examines precisely the *horrea*, from the Republican to the Flavian period, whose building techniques depend on the needs of the Roman army.

### Résumé: L'architecture au service de l'armée romaine : les greniers et l'approvisionnement en céréales des camps frontaliers romains

Toute décision militaire, du plan stratégique général jusqu'aux plus petits mouvements tactiques, était influencée et déterminée par la nécessité d'assurer l'approvisionnement de l'armée. L'espace limité, la durée des campagnes militaires, les objectifs de l'expansion militaire et la consolidation du pouvoir en territoire ennemi impliquaient aussi le pillage des ressources locales (*frumentatio*) et un mécanisme administratif pour répartir les produits (*annona militaris*). Le stockage à grande échelle de céréales et autres aliments dans de vastes greniers (*horrea*) fut absolument essentiel lors de la conquête romaine. Les *horrea*, dont les techniques de construction dépendent des besoins de l'armée romaine, sont examinés en détail dans cet article de la République à l'époque flavienne.

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*Figs 1, 3–4, 10, 14, 16–17, 19:* J. Salido Domínguez. – *Fig. 2:* SCHULTEN 1927, Taf. 25.1. – *Fig. 5:* SCHÖNBERGER 1963–1964, fig. 2. – *Fig. 6:* SCHÖNBERGER 1963–1964, figs 5 and 6. – *Figs 7–9:* KÜHLBORN 2007, figs 267, 269, 307. – *Fig. 11:* CUNLIFFE 1971a, fig. 11; 1998, fig. 5. – *Fig. 12:* CUNLIFFE 1968, fig. 27. – *Fig. 13:* CUNLIFFE 1968, fig. 6, pl. III. – *Fig. 15:* MANNING 1981, plates XXX–XXXI. – *Fig. 18:* GECHTER 1987, fig. 317. – *Fig. 20:* RODRÍGUEZ / FERRER 2006, figs 52, 53.