

Storage in the Eastern and Southeastern Carpathians,  
1st–6th Centuries AD





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# **Storage in the Eastern and Southeastern Carpathians, 1st–6th Centuries AD**

***Pits, Dolia, and Horrea***

Bianca-Elena Grigoraş

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# Contents

<b>Acknowledgments</b> .....	<b>iii</b>
<b>Chapter 1: Introduction</b> .....	<b>1</b>
Historiographic context.....	3
Geographical and methodological framework.....	7
<b>Chapter 2: Storage pits</b> .....	<b>15</b>
Introduction .....	15
Sources .....	16
Literary sources .....	16
Storage pits in eastern and southeastern Carpathian regions .....	17
The eastern Carpathian region.....	18
The southeastern Carpathian region .....	25
Conclusions .....	26
<b>Chapter 3: Storage vessels</b> .....	<b>28</b>
Introduction .....	28
Sources .....	32
Literary sources .....	32
Epigraphical sources .....	37
Iconographical sources.....	42
Manufacturing techniques.....	49
<b>Chapter 4: Typology of storage vessels</b> .....	<b>54</b>
Introduction .....	54
<i>Dolia</i> .....	56
<i>Dolia</i> from the southeastern Carpathian area .....	56
Bases and lids .....	72
Petrographic analyses .....	77
Medium-sized storage vessels.....	78
Typology of medium-sized storage vessels from the east Carpathian area.....	78
Typology of medium-sized storage vessels from the southeastern Carpathian area.....	97
Small-sized storage vessels .....	106
Small-sized storage vessels from the eastern and southeastern Carpathian areas .....	106
Small-sized storage vessels from the southeast Carpathian area: provincial storage pots .....	112
Conclusions .....	114
<b>Chapter 5: Food storage in warehouses</b> .....	<b>116</b>
Introduction .....	116
Typology of warehouses .....	121
Typology based on architecture.....	122
Typology based on economic function .....	127

Sources .....	136
Literary sources .....	136
Epigraphic sources .....	138
Representations of <i>horrea</i> in mosaics .....	142
Storage structures between the Danube and the Black Sea.....	143
Port <i>horrea</i> .....	144
Late Roman urban <i>horrea</i> .....	150
Early Roman military <i>horrea</i> .....	150
Late Roman military <i>horrea</i> .....	153
Early Roman rural <i>horrea</i> .....	155
Communal storerooms .....	157
Storerooms from rural areas.....	158
Storerooms from urban areas.....	160
<i>Dolia</i> storage inside dwellings.....	165
Storage warehouses in extra-muros areas of fortresses.....	169
Storage inside towers.....	170
Conclusions.....	173
<b>Chapter 6: Conclusions.....</b>	<b>176</b>
Considerations on economic history in the eastern Carpathian area.....	176
Considerations on economic history in the southeastern Carpathian area.....	177
<b>Abbreviations .....</b>	<b>187</b>
<b>Bibliography .....</b>	<b>188</b>

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# Chapter 1

## Introduction

Preserving agricultural products, in the short, medium, or long term, represents an essential activity beginning with prehistory and continues today, as part of daily life. Throughout time, innovation and the improvement of storage systems have been the main concerns of all societies. Nevertheless, it is a recent trend in the studies of ancient economies to pay closer attention to these storage systems.<sup>1</sup>

They represent an essential component in a long operational chain: production, processing, storage, distribution, and consumption.<sup>2</sup> They serve three main purposes: 1) products could be stored for household consumption; 2) surpluses could be kept for sale or exchange-in-kind (barter), as well as for the payment of taxes; and 3) holding seeds for future use. Theophrastus informs us that the best seeds are usually those that are a year old. After one year of storage, their quality is reduced; after three years they become even less fertile.<sup>3</sup> Regarding the archaeological data on storage systems, two significant lines of research have emerged: one related to technological innovation and the other to the economic role. All these steps are interconnected and depend on external issues such as climate and economic strategies.

Various products were consumed at different times of the year. In certain years the harvests would be good, while in other there would be drought and famine. In addition, political and social factors, including wars, would diminish food supply. Strategies such as stockpiling, mixed cultivation, and foraging for substitute foods allowed humans to survive in these diverse situations.<sup>4</sup>

Another issue we have to consider when studying the storage of products involves the risks that can arise in this process, in particular those deriving from seasonal availability or the perishability of products. As examples, cereals follow an annual cycle, usually marked by a successive price increase until the next harvest; with olive oil the quality decreases once stored for over a year, so the farmer must sell it periodically to ensure the crop is not spoiled.<sup>5</sup> On the other hand, the longer wine is stored in good condition, the better it becomes. We see that warehouses play an essential role, as the prices of goods in city markets are fixed according to local stocks and those from other regions. Thus storage periods of products are related to their particular features.

This diversity of storage forms fulfils several functions, one such being large-scale units supplying civilians and the military. They also served to support Rome's monopoly through the ability of the authorities to involve themselves in the storage process. Thus, public authorities could invest in warehouses, while those private individuals who conserved products for the long term either assumed very high risks or created their own storage facilities. There are also the warehouses of the large *emporion*,<sup>6</sup> which collected the products of smaller centres from their territory to redistribute them, based on orders, to other more distant cities.<sup>7</sup>

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<sup>1</sup> Some of the references will be mentioned in the Historiographic Context subchapter.

<sup>2</sup> Cheung 2018: 3; Curtis 2016: 587.

<sup>3</sup> Theophrastus, *Historia Plantarum*, 8.11.4. The Loeb Classical Library editions have been used for the ancient literary sources; Garnsey 1988: 54-55.

<sup>4</sup> Frank 2018: 4.

<sup>5</sup> Forbes and Foxhall 1995: 76; Piscope and Poiana 2012: 207. It is also pointed out that the proper storage temperature for olive oil is between 14-15°C; Opař 2021: 356.

<sup>6</sup> According to Virlovet 2020: 155: 1, and Cosentino 2023, an *emporion* is defined as a commercial establishment in which commerce was practised within a legal framework.

<sup>7</sup> An instructive example is the Cabrera wreck, discovered south of the island of Mallorca, which carried Spanish and North African amphorae. These were loaded onto the ship at an *emporium* for redistribution to consumption centres (Dominguez 2012b). One of the best-known consumption centres was Constantinople. Multiple *horrea olearia* and warehouses were mentioned in the written sources, i.e. Notitia (Mango 2004: 40).



Figure 1: Map of Romania, the delimited territories discussed in red.

Both household and large-scale storage, which involves different economic actors, must be taken into account. The choice to store inside the household is not accidental. Many storage vessels and provision pits indicate their importance to household life. Additionally, ‘large-scale food storage also affected household food storage and interacted with it.’<sup>8</sup> The duration of storage represents a particular problem. Some products were kept in the houses for immediate consumption in a few days or weeks, while other parts were intended for storage for several years. In other cases, products were moved from long-term to short-term storage.<sup>9</sup>

The inhabitants of the urban environment stored products at home, in storage rooms or pantries, as evidenced, for example, by the archaeological finds from Tropaeum Traiani,<sup>10</sup> Dinogetia, and Histria.<sup>11</sup> Those doing the storing had to consider the quantities required, the duration of storage, the environmental conditions, and the technology available for processing and storage.<sup>12</sup>

Under the influence of the institutions, Roman law, and the legal and economic organisation of the property, and also to ensure optimum quality, the Greco-Roman world developed particularly advanced storage systems. The study of these sheds light on the economic level reached by local societies and contributes to the knowledge of the development of local, provincial, and intra-regional trade.

<sup>8</sup> Frank 2018: 1.

<sup>9</sup> Frank 2018: 2.

<sup>10</sup> Barnea 1979a: 19.

<sup>11</sup> Florescu 1954: 308, 309, fig. 135. For multiple discoveries, see the specific chapter.

<sup>12</sup> Curtis 2016: 587.

Combining storage with mobility, diversification, and economic exchange is required to protect seasonal, inter-annual, and longer-term supplies of food.<sup>13</sup> This continuous process can vary from days or months to over a year.<sup>14</sup> Also, according to Kostandinos Christakis, stockpile strategies can differ depending on the time elapsing between storage and distribution/consumption and how the surplus is collected, controlled, and managed.<sup>15</sup>

In any historical period, storage becomes part of a mechanism that validates larger quantities of products, thus extending the period during which consumption is possible.<sup>16</sup> Better organisation of storage spaces in ancient settlements resulted from the intensification and specialisation of production. At the same time, it also contributes to developing social and political structures. Such intensification and specialisation can be identified in the intended space. Thus, with the Greek influence,<sup>17</sup> and then with the arrival of the Roman administration, better resource management took place in the territories between the Danube and the Black Sea. New storage techniques were used, leading to the preservation of supplies for extended periods.

At the same time, in addition to a thorough study of storage systems, we seek in this work to reach an understanding of the ancient economy by answering the question: How do specific storage systems highlight social and economic differences existing in particular geographical and political areas? To try and find an answer, we look, in particular, at the northern and southern Danube areas.

### Historiographic context

The economic situation of a city/village, or a specific space, can be studied from several research directions. In this work, we choose to study the area's economy from the east and south of the Carpathians to the Black Sea via its storage systems. For a comprehensive analysis, we must also consider developments in other regions where storage spaces have been extensively researched and studied, and numerous references will be included throughout.

The importance of studying storage systems of the Mediterranean basins attracted the attention of various researchers at the beginning of this century. A group of scholars, mostly Spanish, French, and Italian, studied the politics of storage in ancient societies within a European network under the acronym RAMSES, funded by the 'Programme Cadre de Recherche et Développement (PCRD 6)'.<sup>18</sup> This research focused on Mediterranean urban societies, having as its object of study an extended period from Antiquity until the end of the modern era. The results, as yet, have not yet been fully published – two volumes appeared in 2008 within the series 'Mélanges de l'École française de Rome'.

In terms of the territory east and southeast of the Carpathians, information about the existence of storage pits, storage vessels, and *horrea* can be found in various excavation reports published in different periodicals, i.e. *Materiale și Cercetări Arheologice*, *Pontica*, *Studii și cercetări de istorie veche*, *Peuce*, *Carpica*, etc., as well as in monographs, e.g. those dedicated to Capidava,<sup>19</sup> Zargidava,<sup>20</sup> and Piroboridava.<sup>21</sup>

<sup>13</sup> Christakis 1999: 3.

<sup>14</sup> Christakis 1999: 3.

<sup>15</sup> Christakis 1999: 3.

<sup>16</sup> Van Oyen 2020: 6.

<sup>17</sup> See the storage rooms from the north Danubian territory with large pithoi discovered at Popești (Vulpe 1959: 310, fig. 5), Radovanu (Morintz *et al.* 2015: 120), Dămăroaia (Ignat *et al.* 2015: 110-111), and Bucureștii Noi (Turcu 1978: 8-9, 11, fig. 9. 1-2).

<sup>18</sup> Marin and Virlouvet 2016.

<sup>19</sup> Oprea 2003.

<sup>20</sup> Ursachi 1995.

<sup>21</sup> Vulpe and Teodor 2003.

In the period we are dealing with, storage pits were used both in eastern Carpathian territories and the area between the Danube and the Black Sea. Their numbers are significant, as they could only be used for one year, or a maximum of two, before being replaced. (We know that the old ones were turned into waste pits.) A particular interest is the location of these pits, i.e. within the house, outside it, or specially arranged areas within settlements, representing either pits for grain storage or simple pits for keeping food cool. The literature we have on Getic settlements looks at the existence of these pits and their various forms.<sup>22</sup>

As for storage vessels, these are analysed in archaeological and ethnographic studies, looking at their uses and production over a long period, from the end of the Neolithic until the 20th century,<sup>23</sup> and also at the many purposes for which they were made, i.e. to store products, as funereal urns,<sup>24</sup> wells,<sup>25</sup> building materials,<sup>26</sup> ovens,<sup>27</sup> latrines,<sup>28</sup> in water supply systems, etc.<sup>29</sup> Among the essential works addressing the aspects, we can mention, for example, the work of Kostis S. Christakis,<sup>30</sup> dealing with the politics of storage in Neopalatial Crete; Tracey Cullen and Donald R. Keller,<sup>31</sup> who discusses pithoi in Greece and the multiple uses of provision vessels; Mimika Giannopoulou's<sup>32</sup> study of Messenian storage; and Tim Frank's<sup>33</sup> work on storage in ancient Israel and Judah. For *dolia* specifically, Charlotte Carrato<sup>34</sup> discusses finds from Gallia Narbonensis; Caroline Man Ting Cheung<sup>35</sup> from Italy, with aspects to do with repairs; and Branko Kirigin has dealt with Dalmatian examples in several articles.<sup>36</sup> In addition, a volume edited by Henri Amouric, Véronique François, and Lucy Vallauri<sup>37</sup> was devoted to medieval and modern storage vessels.

Anna O. Shepard<sup>38</sup> and Prudence M. Rice<sup>39</sup> have explored the techniques of making storage vessels. Clive Orton, Paul Tyers, and Alan Vince<sup>40</sup> have also been writing from an ethnographic perspective. Ioannis Ionas<sup>41</sup> and Gloria London have contributed important work on the topic.<sup>42</sup> Highlighting one of the essential ethnographic studies, Roland Hampe and Adam Winter have focused on Crete, illustrating the techniques and all the manufacturing stages of storage vessels.<sup>43</sup>

Storage vessels, of course, also feature prominently in the literature on underwater archaeology, given their role in long-distance transportation and trade. Among the many contributions, we may single out

<sup>22</sup> See, e.g., Baumann 1995; Irimia and Conovici 1989: 115-154; Vulpe 1966.

<sup>23</sup> One resident in Babadag still uses a *dolium* today (pers. comm. Dorel Paraschiv); another, from Slava Rusă, every autumn kept wine in one (pers. comm. Andrei Opaïţ).

<sup>24</sup> Ebbinghaus 2005: 55; or as a grave cover (Carrato 2017a: 211).

<sup>25</sup> Carrato 2017a: 210-211.

<sup>26</sup> Carrato 2017a: 210-211; Nuţu *et al.* 2023: 424.

<sup>27</sup> Opaïţ 2004: 3; Taxel 2018: 92; Tomber 2013: 124.

<sup>28</sup> Tremoleda 2020: 243.

<sup>29</sup> See, e.g., the discoveries from Odessos (Kuzov and Hristov 2016: 424, fig. 2) and Pompeiopolis (Larguinat Turbatte 2011: 122, pl. 1. 2).

<sup>30</sup> Christakis 1996.

<sup>31</sup> Cullen and Keller 1990: 183-209.

<sup>32</sup> Giannopoulou 2010.

<sup>33</sup> Frank 2018.

<sup>34</sup> Carrato 2017a.

<sup>35</sup> Cheung and Tibbott 2015: 175-185; Cheung 2018; 2024a; 2024b.

<sup>36</sup> Kirigin 2012; 2016.

<sup>37</sup> Amouric *et al.* 2016.

<sup>38</sup> Shepard 1956.

<sup>39</sup> Rice 1987.

<sup>40</sup> Orton *et al.* 1993.

<sup>41</sup> Ionas 2000.

<sup>42</sup> London 2016; 2020.

<sup>43</sup> Hampe and Winter 1962; 1965.

the work of Marie-Brigitte Carre and Robert Roman.<sup>44</sup> More recently, one volume was dedicated to the production and function of *dolium* in terrestrial and underwater contexts.<sup>45</sup>

Monographs dedicated to storage vessels from the east, or southeastern Carpathian areas have yet to appear. There have been some articles, however, on pottery typologies from these regions that include the storage vessels, i.e. those by Emil Moscalu,<sup>46</sup> Gheorghe Bichir,<sup>47</sup> and Ion Horațiu Crișan.<sup>48</sup> The Getic storage pots form part of the ceramic material discovered from the Getic *davae* and can be found in studies dedicated to specific sites, e.g. Vasile Ursachi<sup>49</sup> and Constantin Preda.<sup>50</sup>

One of the most important studies on *horrea* deposits is *Horrea d'Hispanie et de la Méditerranée romaine*,<sup>51</sup> which includes several articles brought together by Javier Arce and Bertrand Goffaux referring to warehouse typology in the territories examined, with examples, and an analysis of their role within the broader context of the distribution and redistribution of products. The military *horrea* from Hispania have been discussed by Javier Salido Dominguez,<sup>52</sup> while Anne P. Gentry's study<sup>53</sup> is dedicated to warehouses from Britannia. A description of the warehouses and their role in the *annona* is also made by Geoffrey Rickman,<sup>54</sup> while Efthymios Rizos<sup>55</sup> discusses the Late Roman military centres connected with the supply network in the Balkans. Great attention has also been paid to the direct connection between the great warehouses and their role in the supply network of products to the citizens of Rome<sup>56</sup> and the Roman army. Of many, we need only mention the work of Peter Garnsey and Richard Saller,<sup>57</sup> in which the *annona* system is described, as well as the study by Lluís Pons Pujol<sup>58</sup> that focuses on the provision of products to the military and also describes the entire *annona militaris* system. Another important work on this subject is that by Jonathan P. Roth.<sup>59</sup> Likewise, information regarding the *annona* of the 6th-7th centuries AD can be found in an article by Salvatore Cosentino,<sup>60</sup> while the storage system of the 7th-12th centuries AD, its fiscality and the new institution in charge of taxation, is examined in Vivien Prigent's article.<sup>61</sup>

An important contribution relating to Romanian territory is made by Liviu Petculescu,<sup>62</sup> who has collected all the available information on *horrea* in Dacia, describing and analysing them, as well as establishing analogies with those from the rest of the empire. Regarding the territory between the Carpathians and the Black Sea, some warehouses have been researched and published in different studies, although only in some cases is mention made of their economic role within the cities. Warehouses were

<sup>44</sup> Carre and Roman 2018: 175-192.

<sup>45</sup> Carrato and Cibecchini 2020.

<sup>46</sup> Moscalu 1983.

<sup>47</sup> Bichir 1973.

<sup>48</sup> Crișan 1969.

<sup>49</sup> Ursachi 1995.

<sup>50</sup> Preda 1986a.

<sup>51</sup> Arce and Goffaux 2011.

<sup>52</sup> Dominguez 2011.

<sup>53</sup> Gentry 1976.

<sup>54</sup> Rickman 1971.

<sup>55</sup> Rizos 2013; 2015.

<sup>56</sup> An analysis of *annona* allocations to citizens is provided by Zuckerman (2000: 86-87).

<sup>57</sup> Garnsey and Saller 1987.

<sup>58</sup> Pujol 2008: 145-153.

<sup>59</sup> Roth 1999: 287-299.

<sup>60</sup> Cosentino 2024: 259-289.

<sup>61</sup> Prigent 2008: 7-37.

<sup>62</sup> Petculescu 1987: 66-76.

discovered at Callatis,<sup>63</sup> Histria,<sup>64</sup> Noviodunum,<sup>65</sup> Tropaeum Traiani,<sup>66</sup> Rasova,<sup>67</sup> Capidava,<sup>68</sup> Topraichioi,<sup>69</sup> and Teliţa-Amza.<sup>70</sup> Tomis probably had the most important storage system, an *emporium*,<sup>71</sup> as it was the gate through which both annony and free trade products arrived. The latter had to pay both the port tax and the provincial tax.<sup>72</sup> These taxes were critical financial resources for the province and the city, a good example suggested by the two inscriptions in Antioch set up by the emperors Anastasius and Justinian detailing the levels of these fees and thus preventing extortion by officials.<sup>73</sup> We believe that every town had a *horreum* for the collection of taxes in kind, and a closer look at the structures researched to date can help us understand not only the role played by cities in the supply of citizens and the Roman army but also the economic status it acquired through the construction of such large edifices: emperors, city administrations, and private individuals alike could build them.

Studies into the economic history of the province of Moesia Inferior, later Scythia, have been undertaken by Alexandru Suceveanu, both alone<sup>74</sup> and in collaboration with Alexandru Barnea.<sup>75</sup> More recent studies were published by Maria Bărbulescu<sup>76</sup> and Adela Băltăc.<sup>77</sup> They were primarily based on written, literary, and epigraphic documents, giving us a history seen only through this prism.

In terms of storage, more work has also been done. We can cite the work of Astrid Van Oyen,<sup>78</sup> in which the author considers two aspects of storage within the Empire, i.e. namely centralised, explained by the presence of large warehouses, and the permanent need to transport grain from one region to the other; and household storage, the needs of farmers being also presented, i.e. the obligation to store products for extended periods and surplus concerns when harvests fail.

This present volume is a first attempt at in-depth analysis and discussion of the storage system in the territory between the Carpathians and the Black Sea. Discussions of storage systems and vessels have appeared in specialised Romanian literature over the last 50 years or so, i.e. the studies of Gheorghe Popilian,<sup>79</sup> Ioan Glodariu,<sup>80</sup> and Andrei Opaîţ,<sup>81</sup> but these were made within a broad context not intended as detailed analyses of this aspect of the ancient economy. We now offer a work that gathers all storage systems and highlights their essential role within the Roman economic and social system.

<sup>63</sup> Ionescu 2010.

<sup>64</sup> Angelescu 2019: 39-81; Rizos 2013: 674.

<sup>65</sup> Aparaschivei and Bilavschi 2016: 249-270.

<sup>66</sup> Gamureac 2010.

<sup>67</sup> Opriş 2021: 47-64; Zahariade 1996: 225.

<sup>68</sup> Opriş 2003.

<sup>69</sup> Opaîţ 2004.

<sup>70</sup> Baumann 1995.

<sup>71</sup> For the definition of *emporium*, see note 6.

<sup>72</sup> Cosentino 2023: 2.

<sup>73</sup> Mitchell 2015: 348; Another interesting example is the Abydos tariff, which mentions the tariffs and gratuities applied to some categories (Cosentino 2022: 123-131). At the same time, the author proposes a new date for this Abydos tariff in AD 498 or AD 500.

<sup>74</sup> Suceveanu 1977; 1998.

<sup>75</sup> Suceveanu and Barnea 1991.

<sup>76</sup> Bărbulescu 2001.

<sup>77</sup> Băltăc 2011.

<sup>78</sup> Van Oyen 2020.

<sup>79</sup> Popilian 1976.

<sup>80</sup> Glodariu 1974.

<sup>81</sup> Opaîţ 2004.

## Geographical and methodological framework

This book aims to study only those storage systems discovered between the Carpathian Mountains, the Prut River, and the Black Sea (Figure 1). We have divided the research region into two areas.<sup>82</sup> The East-Carpathian area is bounded to the south by the Danube, west by the Carpathian Mountains, east by the Prut River, and north by the current Romanian border – today’s Moldavia. This territory was constantly inhabited during the 1st-6th centuries AD, mainly by the so-called conventional Geto-Dacian population,<sup>83</sup> followed by the Carpi in the 2nd-3rd centuries AD,<sup>84</sup> and the inhabitants of Sântana de Mureş-Chernyakhov culture, dated to the 4th-5th centuries AD. For the 5th-7th centuries AD, regional aspects of the indigenous civilisation have been identified as part of the Costişa-Botoşana-Hasca culture.<sup>85</sup> Our study will also discuss the present southeastern Carpathian territory, bounded by the Danube and the Black Sea – Dobruja, also referred as South Danubian territory. Before the conquest of this territory by the Romans, it was also populated by a predominantly Getic population. In the Early Roman period it was part of the province of Moesia Inferior, and in Late Roman times it lay within the province of Scythia. Taken together, therefore, our research will trace the evolution of storage systems in the regions of eastern and southeastern Carpathian.

We have chosen these two territories because conventionally named Geto-Dacic groups mainly inhabited them. However, they had a different historical path, i.e. the local southern Danubian population was assimilated into the Roman empire, leading to a new socio-economic organisation. Our aim, therefore, is to highlight both the similarities and differences relating to economic activities and the storage of provisions over a reasonably extended period, specifically the 1st-6th centuries AD. As we will see, there were uninterrupted economic contacts between the two territories, unhindered by the Danube. The river and its tributaries connected these regions economically, even if the Romans carefully controlled it all.<sup>86</sup>

Hence, the fords of the Danube<sup>87</sup> and the rivers in the eastern Carpathian lands made goods much more accessible, as the multiple southern Pontic imports from the eastern Carpathian area prove.<sup>88</sup>

Through this present research, we also seek to highlight and compare the economic differences between these two areas. One of these areas, the southeastern Carpathian, was part of the Roman Empire, and there were interactions with the inhabitants of the eastern Carpathian space, both via exchanges and incursions. In this regard, the storage systems used, their capacity, and frequency are the criteria we can use for comparing living standards and availability of resources.

Throughout antiquity, wide ranges of goods were stored – predominantly agricultural products, i.e. cereals and wine. Various methods and strategies for storing were discovered in these areas, some used in parallel. Pits and storage vessels were used simultaneously in the eastern Carpathian region and also in rural areas between the Danube and the Black Sea in the Early Roman period. However, in the

<sup>82</sup> This work did not include the south Carpathian area, but some references will be given.

<sup>83</sup> The term Geto-Dacian designates the non-Greek inhabitants of the territory analysed.

<sup>84</sup> For more information on the Carpi and their ethnic and cultural background, see Bichir 1973: 147-162; Spânu 2019: 26-28.

<sup>85</sup> Mitrea 2005: 131-142; 2011: 130-135; Teodor 2001: 652.

<sup>86</sup> More information on the active surveillance and patrolling role of the Roman fleet, as well as on the fortifications and port facilities south of the Danube, can be found, e.g., in Matei 1991: 143-158; Bounegru and Zahariade 1996: 10-16; Munteanu 2015: 135.

<sup>87</sup> E.g. from Noviodunum (cf. Aparaschivei 2010: 113); Barboşi, that represented the end of the commercial road in the Siret valley (Bounegru and Zahariade 1996: 11; Munteanu 2015: 142); Capidava (Opriş 2003: 17); as well as at the two fortresses of Troesmis that controlled a Danube crossing point (Munteanu 2015: 142). For a detailed description of the existence of customs offices in Moesia Inferior and a *collegium of nautae universi Danuvii* at Axiopolis, see Opriş and Raţiu 2016: 89-109. Also, from Moesia Inferior comes an altar dedicated by a *servus* of three *conductores publici portorii Illyrici et ripae Thraciae* and dedicated to *numen Augustorum* and to *Genius publici portorii* (Antolini and Marengo 2016); *CIL III 751 = 7434 = 12345*.

<sup>88</sup> For the roles played by the Siret, Prut, and other tributary rivers, see Croitoru 2011; 2021: 185-191.

latter area, *horrea*-type structures were mainly intended for military settings. By the 3rd century AD, the method of storing supplies in pits disappeared, and warehouses and storage vessels are found in all environments, whether rural, urban, or military.

Grain reserves are a vital element for survival, and in ancient times certain foodstuffs could be locally produced, close to the household,<sup>89</sup> and their seasonality made growers stockpile these goods. This, of course, was necessary to make food available throughout the year, and for this to be sustainable a portion of the harvest had to be kept for cultivation.<sup>90</sup>

Ranges of imports fulfilled other needs, and exotic goods (perfumes, spices, and items unavailable locally) arrived into city markets. Although, exotic imports attracted local elites especially, deliveries of foreign wine, olive oil, etc., played a role in elevating social status. Of course, communities could also request supplies of products normally grown locally if harvests failed for one reason or another, threatening the population's well-being.<sup>91</sup> In some cities, the supply of wheat was one of the main responsibilities of the authorities. Much evidence of grain transportation to Rome and other great cities will be mentioned during the course of our research.

Although numerous sources exist, a new approach that unites them is necessary. This topic, of storing goods, needs to be debated more in the two analysed territories, due to the lack of literary, epigraphic, ethnographic, and iconographic sources regarding it. However, general information, and sources from other regions will help with our analysis of the economic history, as well as processes involving the integration of the financial situation of the region under consideration within the economy of the Roman Empire as a whole. These storage systems we propose for study have been researched individually and schematically, at least in Romania, and it is thus necessary to study them also from an economic perspective as part of an organised system of production, storage, and distribution of products essential for economic survival and social prosperity.

A farmer, for example, had to keep wheat for domestic consumption, with any excess held for next year's sowing and trade.<sup>92</sup> In addition, he/she had to consider poor or late harvests in following years in anticipation of a better market price.<sup>93</sup> Thus, one of the standard practices was the storage of grain for at least a year, with examples coming, e.g., from Xenophon, explaining that Greek farmers had to gather enough produce for twelve months,<sup>94</sup> and Tacitus, who mentions that Roman military forts had to maintain grain for the same length of time.<sup>95</sup> Nero, we learn, threw old wheat into the Tiber to show an anxious population that enough new wheat was coming from Egypt,<sup>96</sup> thereby proving himself, according to Astrid Van Oyen, a capable strategist in terms of the 'psychology of storage'.<sup>97</sup>

Many ancient texts explain dietary needs as both basic grains, *sitos* (plants), and *opsa* (animal proteins).<sup>98</sup> The agricultural economy in eastern and southeastern Carpathian areas is also based on animal breeding and cereal production, as documented through archaeozoology and archaeobotany. Of these

<sup>89</sup> Wilkins and Hill 2006: 1.

<sup>90</sup> Frank 2018: 5-8; e.g. the type of wheat discovered at Topraichioi, *Triticum compactum*, not cultivated in the Greco-Roman world, was most likely kept for sowing (after Barnea 1991: 226).

<sup>91</sup> Wilkins and Hill 2006: 114.

<sup>92</sup> Galen records that some farmers could add water to grains to make them heavier, which may pass immediate inspection, even if this could spoil the entire warehouse content (Elliott 2024: 44). For this reason, a rate of c. 25% - 33% has been indicated by Geraci as loss due to the Mediterranean climate in the ancient world. The same author also provides information from ancient sources on spoilage (2018: 224).

<sup>93</sup> Curtis 2016: 587; Forbes and Foxhall 1995: 72.

<sup>94</sup> Xenophon, *Oeconomicus*, 7.36; Curtis 2016: 587.

<sup>95</sup> Tacitus, *Agricola*, 22; Curtis 2016: 587; Davies 1971: 123.

<sup>96</sup> Tacitus, *Annales*, 15.18; Geraci and Marin 2016: 106; Van Oyen 2020: 3.

<sup>97</sup> Van Oyen 2020: 3.

<sup>98</sup> Wilkins and Hill 2006: 112.

staples, millet and chickpeas are more resistant to drought and heat than wheat, barley, and rye.<sup>99</sup> In the southern Danube area, seeds have been discovered in contexts from the 2nd-3rd centuries AD, e.g. at Moşneni (Constanța), with finds of 845 wheat and barley seeds (*Triticum aestivum* ssp. *Vulgare* (82.9%), *Hordeum vulgare* (17%), *Vicia cf. faba* (0.1%);<sup>100</sup> and Murighiol – lentils (*Lens esculenta* var. *microsperma* (99.5%)) and peas (*Vicia ervilia* (0.5%)).<sup>101</sup> For the Late Roman period, seeds were found at Histria from amphorae and other categories of ceramics, with subsequent analysis determining two species (*Triticum vulgare* and *Secale*).<sup>102</sup> From Aegyssus, 130 kg of wheat was recovered from a *dolium*.<sup>103</sup> *Hordeum vulgare*<sup>104</sup> was identified at Capidava, linen from (L)Ibida,<sup>105</sup> and at Noviodunum several cereal types were found in the ‘Great tower’.<sup>106</sup> Recent phytolith analysis from Halmyris<sup>107</sup> and (L)Ibida<sup>108</sup> clearly attests to the wide reliance on agricultural and cereal processing.

For the eastern Carpathian territory, we know that from the 1st century BC to the 3rd century AD, *Vitis vinifera*<sup>109</sup> existed at Brad (Bacău),<sup>110</sup> and cereals have been recovered from storage pits at Poiana (Galați),<sup>111</sup> Barboși (Galați),<sup>112</sup> and Răcătău (Bacău).<sup>113</sup> At the same time, north of the Danube there are also some other indicators of wine production, e.g. the grapevine leaf incised on the inner part of a hearth from Popești (Ilfov); grape seeds and pruning knives<sup>114</sup> from the same settlement; and the grape seeds from the *dava* of Piscul Crăsani (Ialomița).<sup>115</sup> All these discoveries and the well-documented presence of pithoi and locally made amphorae in all Geto-Dacian settlements demonstrate widespread wine production. At the same time, the storage pits and storage vessels are good indicators of the agricultural output reaching beyond the domestic scale.

Several storage structures were discovered within the geographical and chronological scope of our research. We will analyse them – and their time and space distribution will help us reach conclusions about the economic history of the regions of concern to us.

The following chapters will approach both general and specific goals. The general objectives are those of an economic nature. By systematically analysing the socio-economic potential of storage at the regional/zonal level, we want to identify the peculiarities and integrate our regions within the economic system of the Roman Empire.

Up to now, in our region, have storage pits, storage vessels, and warehouses been studied schematically, often in isolation, with no correlation made between all these systems and the economic potential of the area. We will be able to see via our research if there are any particularities in manufacture and use

<sup>99</sup> Erdkamp 2015b: 184; Sanja Pilipović (2015: 41-59) has discussed the deities influencing farming activities, (agrarian gods).

<sup>100</sup> Honcu 2017: 164-165.

<sup>101</sup> Honcu 2017: 164-165.

<sup>102</sup> Cârciumaru and Ionescu 1977: 267-270.

<sup>103</sup> Opaît 2004: 2.

<sup>104</sup> Monah 2007: 209.

<sup>105</sup> Monah 2007: 206.

<sup>106</sup> For the various cereals discovered at Noviodunum, see Monah 2007: 209-210.

<sup>107</sup> Stanc *et al.* 2023: 20.

<sup>108</sup> Stanc *et al.* 2020: 6-7.

<sup>109</sup> Even though studies on seeds from this territory are scarce to date, important information has come from other parts of the Empire, e.g. details comparing wild and cultivated grapes from southern France (Gasquino, i.e. Béziers, Hérault) used in local wine-making (Bouby *et al.* 2009: 129-139; Figueiral *et al.* 2010: 139-149).

<sup>110</sup> Cârciumaru 1983: 130.

<sup>111</sup> Teodor 2011: 196.

<sup>112</sup> Sanie and Sanie 2011a: 64.

<sup>113</sup> Căpitanu 1992: 141.

<sup>114</sup> Pruning knives have been recovered from almost all Geto-Dacian settlements from the 1st century BC to the 1st century AD (Sîrbu 2003: 87).

<sup>115</sup> Palincaș and Avram 2022: 498.

based on the areas where they were discovered. Comparisons are necessary, as we are dealing with two regions with different histories.

Another problem that needs to be clarified is the purpose of storing particular products, e.g. were storage pits used to keep grain for animals, humans, or both, and to what extent? Were our *dolia* (storage vessels) used for storing liquids (e.g. wine) only, solid foodstuffs (e.g. cereals), or both?

Each chapter starts with an introduction. As storage represents a stage that succeeds production and precedes consumption, we will explain these stages, giving some general data to create an overview of the agricultural activity as a whole, and the methods of food processing (e.g. grains) before they are consumed.

In general, three types of the economy are identified, looking at how surpluses are acquired, preserved, and distributed: central, regional, and domestic. The storage systems discussed in the following chapters fall within this general scheme.

A key chapter deals with storage pits, i.e. enclosed spaces with controlled atmospheres, the first storage method used in the eastern and southeastern Carpathian areas. Pre-Roman populations from different regions of Europe used this method to preserve goods, in particular areas with temperate climates, e.g. Hispania. In these territories, storage pits were gradually replaced by storage vessels, which reached their greatest popularity in the Roman period. However, pits were not universally abandoned in the regions under discussion and continued into medieval times. Although ancient sources provide us with some information about these pits, most of our knowledge comes from the sphere of archaeology.

The subsequent chapter is devoted to container types, which are discussed using literary, epigraphic, ethnographic, iconographic, and archaeological sources. A typology is produced of those ceramic vessels used to preserve food, identifying particularities in certain territories. In addition, this typology is also correlated with observations on whether there are increases in storage capacity during periods of prosperity or dearth.

The storage vessels assessed are ceramic forms, with dimensions ranging from 40 cm to 180 cm in height, designed to store food supplies (cereals and liquids) for short, medium, or long periods. Air sealed inside the containers will determine the 'shelf life' of different products. Oxygen should be prevented from reaching inside the vessel after covering, and the product is kept away from potential spoilage (e.g. rodents, fungi, moisture, etc.). Smaller vessels are often found in the household next to larger *dolia*, representing intermediate phases between daily food preparation (cooking) and bulk storage. It is not our intention to look at amphorae in detail, nor other categories reused for storage,<sup>116</sup> keeping our focus on those vessels whose primary function was linked to the storage of provisions.<sup>117</sup> The reuse of amphorae for the preservation of other categories of goods in the Roman era was mainly addressed by J. Theodore Peña,<sup>118</sup> who specifies three types of reuse: primary, intensive, and 'standard practice'.<sup>119</sup>

<sup>116</sup> For example, at Tomis amphorae were reused to store resin (Rădulescu 1973: 193-207). At Samos and Iatrus, LRA 2 amphorae were located near wheat mills, and these are considered as having been reused for storing grain (Polla *et al.* 2021: 151). At Histria, seeds were recovered from an amphora of undetermined typology (Cârciumaru and Ionescu 1977: 267-270; Opaïţ 2004: 107). An LRA 3 amphora with unhusk wheat, specifically *triticum compactum*, was discovered at Topraichioi (Barnea 1991: 226). For other examples, see also, e.g., Peña 2021: 77-91.

<sup>117</sup> For a short period, *dolia* were used to transport commodities (Carrato and Cibecchini 2020: 16-17); they are occasionally found in shipwrecks, i.e. containing the crew's daily rations, i.e. the Knidos J shipwreck (Opaïţ *et al.* 2021: 78, fig. 3C) and Yassi Ada (Bass 1982: 186, 188, fig. 8-21).

<sup>118</sup> Peña 2007: 61-192; 2021: 77-91.

<sup>119</sup> Peña 2021: 77-78.

This range of activity can also be found in various economic contexts, including the sale of specific new contents, both locally and regionally.<sup>120</sup>

This chapter also includes a catalogue of storage vessels from different settlements, as well as an analysis and characterisation of the type of associated economy, according to shape, dimensions, and capacity of vessel. Capacity calculations provide useful clues. The ancient sources we have mainly focus on vessels involved with the storage of large quantities of goods rather than small-scale storage arrangements, the latter requiring medium- and small-sized vessels (archaeological and ethnographic sources are suggestive here). Irrespective, we may consider vessel size as an indicator of production capacity, and for this reason deal with the vessels both chronologically and according to size. The frequency and size of these vessels are factors directly related to several parameters associated with a group's social organisation and economy.<sup>121</sup>

Over the extended periods of use of these ceramic vessels we also find that, in general, they kept their functions unchanged. Where there were changes in use over time, these seem to involve elements of decoration, symbolic reasons, and socio-economic significances.<sup>122</sup> As ethnographic studies have shown, more than any other ceramic category, storage and kitchen vessels changed the least over time.<sup>123</sup>

Another aspect we will consider in analysing storage vessels is their location within domestic settings. The spatial distribution of vessels suggests that they formed a significant part of the household and were located in multi-purpose rooms rather than isolated storage areas.<sup>124</sup> When they are found within fortifications, they provide insights into the economic changes observed in the Lower Danube area, i.e. the agglomeration of urban space and the necessity of the local population to store their harvests within city walls.

As mentioned, domestic storage is mainly represented by pits and storage vessels. These provide the necessary supplies during disruptions, thus ensuring economic independence. However, they are also sufficiently capacious to store the supplies needed to pay taxes.<sup>125</sup>

Storage vessels are able to fit into this economic scheme on account of their size. *Dolia*-type vessels often exceed capacities of 1000 l, and those inside large storage rooms<sup>126</sup> can be associated with regional storage. On the other hand, medium- and small-sized vessels are frequently found in places of food preparation, processing, and consumption. At the same time, they can store enough to provide for a family. From an economic point of view, the presence of these vessels in almost all settlements, in varying quantities and capacities, would indicate the importance of food management for the community.<sup>127</sup> Thus, the production of storage vessels was adapted to financial requirements.<sup>128</sup>

The next chapter analyses the large *horrea* structures that formed part of the Roman administration's regional and centralised economy. Under the central system, surpluses are collected and stored in large complexes under the control of the central administration.

<sup>120</sup> Peña 2021: 77-78.

<sup>121</sup> Giannopoulou 2010: 33.

<sup>122</sup> Giannopoulou 2010: 34.

<sup>123</sup> Giannopoulou 2010: 34.

<sup>124</sup> Katsonopoulou *et al.* 2016: 15.

<sup>125</sup> Christakis 1999: 3.

<sup>126</sup> Large, well-studied, storage rooms were also discovered at Ostia (Rickman 1971: 76; Brenni 1985: 50), Marseille (Brenni 1985: 52), Lyon (Brenni 1985: 52), and Burguera (Macias 2011: 189).

<sup>127</sup> Katsonopoulou *et al.* 2016: 15.

<sup>128</sup> Carrato *et al.* 2019: 70.

We have included in the category of *horrea*, as attested by ancient sources, structures made of stone fixed with mortar. These had a role in storing large quantities of goods and had, therefore, both a provincial and inter-provincial role.

Ancient authors commended such warehouses for the better preservation of food and for more extended periods. Thus, wheat could also be stored for those times when environmental factors were unfavourable for agriculture. Every city should have had at least one *horreum* or storehouse to keep supplies, although present researches have not identified them for all known ancient settlements – but such repositories must have existed. The Roman authorities' zeal in constructing road networks to move goods from rural to urban environments, and vice versa, provides additional proof for such storage buildings. In addition, after the middle of the 4th century AD, the state built fortified *horrea* at the main intersections of roads, i.e. at Topraichioi.<sup>129</sup>

Such warehouses are in large cities, where most of the taxes collected from the territory end up. For example, the warehouses provide an instructive example of this central storage at Patara and Andriake, centres that collected agricultural products from the hinterland and then redistributed them.<sup>130</sup> Similar cases also exist in North Africa, where the large coastal cities (e.g. Leptiminus, Hadrumetum,<sup>131</sup> Carthage<sup>132</sup>) collected olive oil from the hinterland, 'bottled' it in amphorae, and sent it off to consumption hubs. Of course, we must also remember that they played an essential role as centres receiving merchandise and then redistributing it throughout the city, or territory of the province.

In the territories we are concerned with, Tomis might have been the most important economic centre, acting as the administrative seat for both civil and religious authorities. The provisions collected from the urban environments could be transferred abroad through this main port. Its primary duty was to receive merchandise, nevertheless the administrative control must have also been complex and on a regional scale. *Horrea* are found in rural settlements up until the beginning of the 5th century AD, both in large urban centres and fortified settlements<sup>133</sup> (the last latter specific to the Late Roman period).

A well-known example is the fortified *horreum* at Topraichioi, in the province of Scythia; it was essential in supplying the army, being on a significant provincial road. It was a place where loads could be broken up, as demonstrated by the quantities and varieties of amphorae, glassware, and the more than 2000 coins discovered. From this point, goods could quickly be shipped to (L)Ibida and Troesmis, following the Taiţa Valley. We see a similar example at Palazu Mare, Constanţa.<sup>134</sup>

In the southeastern Carpathian area, some alternative structures have been uncovered, made of stone bound with earth and finished off with adobe. They could feature wooden posts standing on round pedestals (c. 50 cm high and 50 cm – 60 cm in diameter) to support the roof. Those known from Mihai Bravu,<sup>135</sup> Teliţa,<sup>136</sup> (L)Ibida,<sup>137</sup> Aegyssus,<sup>138</sup> etc., have been classified as storehouses, and, most often, they

<sup>129</sup> Ammianus Marcellinus, *Res gestae*, 29.5.10: 'But among many other excellent measures he made himself immensely more beloved by this – that he did not allow the provincials to furnish supplies for the army, declaring with splendid confidence that the harvests and stores of the enemy were the granaries of our valorous troops.'

<sup>130</sup> Lemaître and Yener-Marksteiner 2018: 267.

<sup>131</sup> Costa 2007: 311–312.

<sup>132</sup> Hurst 2010: 55. Several ostraka have been discovered at this site. An oil *ensor* is mentioned on one of these. The fragment is dated AD 372–373 and proves the presence and involvement of the imperial authority in the gathering and redistribution of goods (in this case oil) to areas of consumption (Peña 1998: 117–238).

<sup>133</sup> Analysis of the minor fortifications in the territories of the dioceses of Dacia and Thracia in the 4th–6th centuries AD has been undertaken by Băjenaru (2010).

<sup>134</sup> Băjenaru 2010: 135.

<sup>135</sup> Pers. comm. A. Opaiţ.

<sup>136</sup> Baumann 1995: 40.

<sup>137</sup> Aparaschivei et al. 2019: 190; Aparaschivei et al. 2020: 342–343; Nuţu et al. 2008: 285.

<sup>138</sup> Mocanu and Stănescu 2019: 231.

had large storage vessels inside them – *dolia*. Similar structures were discovered at Ostia and Marseille<sup>139</sup> and are referred to as ‘magazzini’.

With the chapter dedicated to *horrea*, we reach the final stage of the evolution of storage systems, and the most complex, since these warehouses were built strategically and responded to a hierarchical supply network. To understand these deposits as fully as possible, we have turned to several sources: literary, epigraphic, archaeological, and iconographic.

Another phenomenon, mainly after the middle of the 5th century AD, in the Late Roman period, was the tendency to keep supplies in storage vessels inside the domestic setting. This is attributed to the increase of ‘barbarian’ invasions, administrative changes, and the withdrawal of rural populations to the big cities, increasing the crowding of urban spaces.

This complex situation, i.e. with different types of *horrea* and large storage vessels used to store products, only applies to the south of the Danube area, which was integrated into the Roman Empire. The northern region remains one based on household economy, as demonstrated by the continued use of storage pits and small- and medium-sized portable storage vessels. The mobility of these containers reflects a lifestyle dependent on food security and the constant search for better land (the settlements moved as the fields became overworked or dried out: at least one-year fallow was needed to restore it). It would appear that continuous interactions between the two populations either side of the Danube did not significantly improve the economy and the agriculture of the population north of this great river.

The final chapter attempts to provide conclusions in terms of the economic story that emerged from our analyses of the three storage systems mentioned above. Storage systems are approached from the perspective of the local economy, trying to find answers to all the questions we proposed initially. For the 1st-3rd centuries AD, we can talk about some balance, with the use of pits and small- and medium-sized storage vessels, both north and south of the Danube; however, starting at the end of the 3rd, and in the 4th century AD, a more thorough organisation of storage spaces can be observed in the southern Danube area: the new storehouses, a *horrea-type* storage facility, and the ubiquity of large *dolia* all demonstrate this.

The primary method used in this work will be the interpretation of archaeological, literary, epigraphic, and artistic sources. The archaeological evidence is analysed through both a ‘qualitative’ approach of interpreting individual discoveries, as well as ‘quantitative’ methods, e.g. large amounts of ceramic fragments from a specific time interval or territory can be linked to the need to increase storage volumes for both household consumption and to meet tax payments. However, it should be noted that the realisation of this analysis is deeply influenced, in particular, by the archaeologists who carried out the excavations and their methods of collecting materials and making statistics. We rely, of course, on the evidence to hand and cannot claim to have exhaustive collections of storage vessels – thus making our efforts challenging.

As mentioned above, we have turned to literary, epigraphic, archaeological, and iconographic sources for contemporary data. Happily, ancient authors have written about all of three storage systems of interest to us. Columella, Varro, and Pliny the Elder all refer to storage pits (*siri*) in certain regions with temperate climates, including Cappadocia, Thracia, and Hispania. The Carpathians and the Black Sea regions share these climates. As for references to storage vessels, the terminology differs according to region. Within the ‘Greek’ sphere they appear as *pithos/pithoi*, and in Roman lands *dolium/dolia*. The

<sup>139</sup>Rickman 1971: 76; For more information, see also note 126.

larger storage warehouses have the generic name *horreum/horra*, but they can also be found with specific appellations depending on construction techniques, shape, location, and purpose.<sup>140</sup>

As well as storage systems themselves, ancient authors also refer to the centralised food distribution system (*annona*). This institution was established in the time of Augustus and was concerned with supplies of olive oil and grain (obtained via tax payments in kind) to Rome (and later Constantinople).<sup>141</sup> From the 3rd century AD, the literary sources speak of the existence of an institution to deal with the exclusive supply of the military apparatus (*annona militaris*). Even if scholars have yet to reach a consensus on the date of the establishment of this system,<sup>142</sup> clearly soldiers' needs had to be met within the context of where they found themselves, i.e. responsible for the defence of the frontiers of the empire.<sup>143</sup> As for warehouses along the lower Danube, they had to be linked to the supply needs of the men stationed there, logically involving private warehouses as well as private commerce and local production also needing to be taken into account in our analysis; clearly, volumes of wine and oil came via the *annona*, while other quantities came through private commerce. Concerning cereals, local production can be considered the army's primary supplier. During Late Roman times, the warehouses holding these provisions were connected to the road network within a larger nexus, thus suggesting that food could be 'imported' from the empire's eastern provinces via the Black Sea. However, *horrea* were needed regardless of the method of procuring food, via *publicani* (procurators) or 'free trade'. To better understand this process, certain legal sources, i.e. the *Codex Theodosianus* and *Justinianus*, are referred to, enabling this process to be better understood.

As for epigraphic sources, although we have none mentioning storage pits (being limited to more temperate climates), storage vessels are mentioned in the context of production centres specialising in making them. Additionally, the surfaces of these types of vessels often provide valuable information (e.g. capacity, potter's name, customer, etc.). For *horrea* the data are more generous, and we even have a *lex horreorum* (end of the 1st century AD) stipulating regulations. Certain inscriptions also detail the creation of warehouses, their dates, and the reasons for building them (most often linked to potential harvest surpluses).

Iconographic sources are also well represented, e.g. there are many villa mosaics in the Roman empire depicting life around warehouses – rural, urban, port. Storage vessels are also represented on mosaics within the broader context of making wine or oil.

One of the methods applied, a comparative one, is employed to discover the potential similarities and differences between the lands of Moesia Inferior, as part of the Roman Empire, and the extra-Carpathian territory. Two regions with different political, social, and economic statuses use similar storage systems within the domestic environment.

Another method turns to typology – making various typological series of the storage systems discovered in the territories of interest to us. We will also use a chronological approach by drawing up maps that illustrate the geographical and chronological distribution of warehouses. Plans are also used to show the disposition of *dolia* in certain rooms and warehouses at specific sites, e.g. Dinogetia, Tropaeum Traiani, Topraichioi, Halmyris, and Histria.

<sup>140</sup> E.g. *Horrea Piperataria*, *Horrea Olearia*, *Horrea Chartaria*, *Horrea Candelaria*. The number of *horrea* in Rome is unknown, but 290 are mentioned in the city in a 4th-century Rome list (Holleran 2012: 72).

<sup>141</sup> During the Late Roman empire, the service was transformed into a support for the proletariat of large cities. Consequently, *annona* systems existed not only in Rome and Constantinople, but also Alexandria and Antioch (Mitchell 2015: 342).

<sup>142</sup> The most common hypothesis is the establishment of the *annona militaris* during the Severian period. Yet, e.g., Strobel (2007: 280) believes that the term *annona* in the context of the supply of troops began to be used as early as the beginning of the 3rd century AD, i.e. starting with Diocletian there was also a land tax used to pay or supply the army.

<sup>143</sup> Carreras 2002: 81; Glad 2009: 186; Le Roux 1995: 405; Lo Cascio 2007: 197; Strobel 2007: 280.