

DOI: 10.5281/zenodo.7459990

PAMPHYLIAN COUNTRYSIDE: AN OVERVIEW AND A GIS-BASED SPATIAL INVESTIGATION OF REGIONAL SETTLEMENT PATTERNS

Alper Aşınmaz¹ and Ertan Özcan²

¹*Koç University Research Center for Anatolian Civilizations, İstiklal Caddesi No: 181 Merkez Han 34433
Beyoğlu İstanbul, Türkiye*

²*Digital Archaeologist at City of Cologne Department for Art and Culture, Stadt Köln - Die Oberbürger-
meisterin Dezernat für Kunst und Kultur VII/3 Archäologische Zone Heumarkt 64-66 50667 Köln, Germany*

Received: 22/11/2022

Accepted: 20/12/2022

*Corresponding author: Alper Aşınmaz (alperasinmaz@gmail.com)

ABSTRACT

Although famed for its well-known ancient cities, Pamphylia, located in southern Asia Minor and roughly corresponds to the present-day Antalya plain, also harbours numerous minor sites that can be defined as rural settlements. Despite some of the rural settlements in the region have been researched mainly through surface surveys, the majority of rural sites and the rural settlement patterns in the region have not been investigated or discussed at a regional scale so far. Therefore, this study aims to summarise and evaluate the current state of archaeological evidence in Pamphylian countryside and investigate the regional rural settlement patterns in Pamphylian cultural sphere and agricultural aspects of these patterns, using geographic information systems (GIS) based spatial analysis techniques and statistical analyses.

The GIS-based applications used in this study include raster terrain analysis, nearest neighbour analysis, and cost surface analysis. These applications are used to process and analyse the spatial relationship between the rural sites and the following datasets: elevation, slope percentage, proximity to hydrologic units, ancient road network and major towns in the study area. Following the processing of the datasets in GIS, these datasets are examined through descriptive statistics and tested with the Kolmogorov Smirnov Goodness-of-fit test (KS-test).

As a result of conventional investigations, spatial and statistical analyses of the datasets, this study has enabled us to determine that the rural site distribution in Pamphylia reflects certain locational patterns at a regional scale, the region mainly consists of agriculturally oriented settlements, and the rural site distribution in the region seems to have been shaped in harmony with various environmental and anthropogenic factors in order to obtain maximum benefit from arable land.

KEYWORDS: Ancient Countryside, Geographic Information Systems, Pamphylia, Settlement Patterns, Spatial Analysis, Agriculture, Land, Cultural, Environmental, Masonry, Rural.

1. INTRODUCTION

Located in southwestern Türkiye, Pamphylia (present-day Antalya) harbours numerous ancient cities that are well known by both the archaeological community and the public. It can be claimed that many of these cities have been relatively well researched. In particular, what we know about Perge, Side and Sillyon is richer compared to what we know about the other towns in the region thanks to the continuous fieldwork that have been carried out at these sites. Although cities are important and famed elements of Pamphylia, the region also harbours numerous rural sites. Despite this fact, a study, which holistically focuses on Pamphylian countryside and deals with minor settlements in the region, has not yet been carried out. Additionally, except for a few examples (Spratt and Forbes, 1847; Heberdey and Wilhelm, 1896; Rott, 1908; Ormerod and Robinson, 1911; Paribeni and Romanelli, 1914) the majority of 18th, 19th and 20nd century travellers who visited the region (Lucas, 1712; Le Bruyn, 1732; Beaufort, 1818; Leake, 1824; d'Anville, 1834; Lanckoronski, 1890) prioritised the known large ancient towns, neglecting the lesser-known sites of southwestern Anatolia. Although Pamphylia is rich in rural sites, only a small number of rural settlements have been surveyed and excavated so far. As a matter of fact, although several short-term surface surveys and excavations have been carried out at the rural sites in Pamphylian cultural sphere, the rural charac-

teristics and settlement models of Pamphylia at regional scale have not yet been holistically investigated or discussed.

Although previous fieldworks have revealed and focused on several rural sites, the number of documented rural settlements and find spots in the region is, in fact, significantly high. Based on the detailed examinations of the registered archaeological sites and the previous research, 99 rural settlements have been identified in the Pamphylian cultural sphere so far. Also, a small number of find spots, which have not yielded any settlement related finds, as well as small number of singular structures - including baths (Yener, 2011) and towers - have also been documented in the region. It should be pointed out here that the overwhelming majority of rural sites in Pamphylia have been documented through surface evidence due to lack of systematic excavation. Most of these sites have been documented through archaeological site registration campaigns carried out by The Committee on Conservation of Cultural Assets in Antalya (KVKK). These campaigns are carried out by teams that consist of archaeologists, art historians and cartographers. Although the main goal of site registration campaigns is to document and register archaeological sites (Fig. 1) to protect them from destruction and other illicit activities legally, the methodology does not differ significantly from academic surface surveys for documenting and classifying the surface finds, since surface finds currently provide the main source of evidence in Pamphylian countryside.

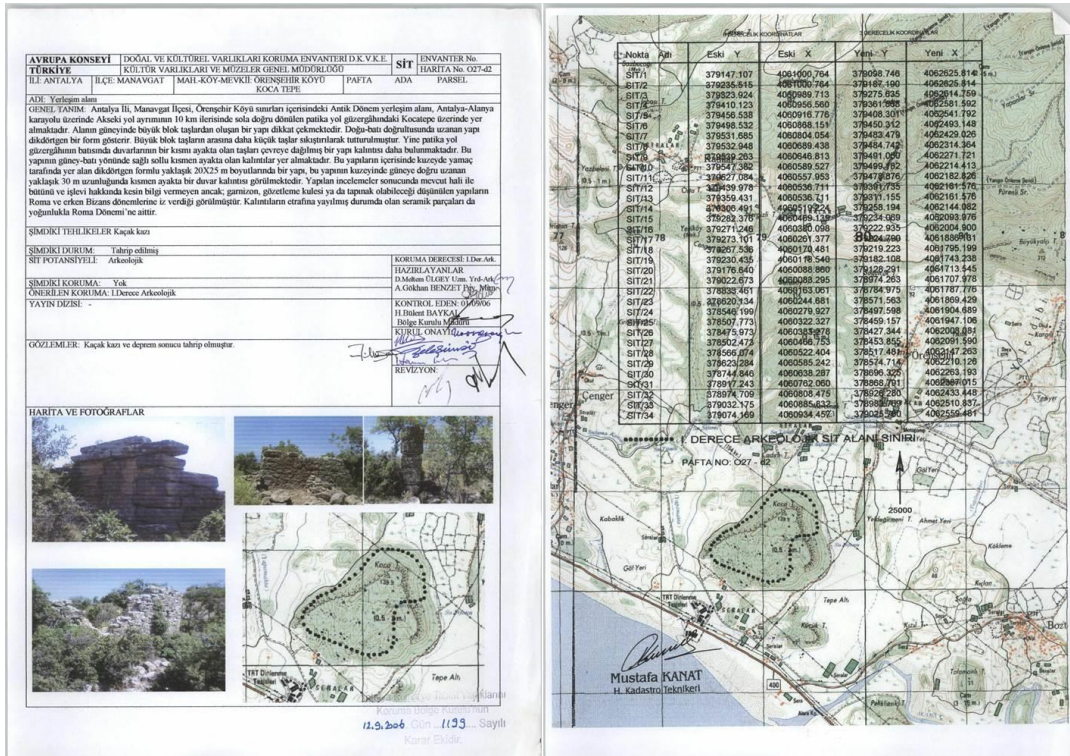


Figure 1. An example of site card used during the site registration activities (KVKK).

The available archaeological evidence leads us to claim that the vast majority of rural settlements identified in Pamphylia are modest, self-sufficient and agriculturally oriented. In this context, the evidence pointing to large-scale settlement at village level has been observed at only a very few sites. Therefore, the majority of rural settlements in the region seem to have been farmstead and/or villa settlements. However, since more intensive fieldwork is required to precisely reveal the functions and sizes of these settlements, the term “settlement” and “site” are used to refer to rural sites in this study (Akalin-Gül, 2005).

Considering the abundance of sites in the region and the potential of the archaeological evidence, the Pamphylian countryside is mapped, holistically discussed, and the rural settlement patterns in the region are investigated for the first time with this study. Firstly, one of the main goals of this work is to draw attention to the archaeological potential of the region’s countryside by providing an overview of the current state of the rural sites by summarising previous research and literature. Secondly, it is aimed to form a preliminary work for future studies by inquiring and gaining insights into the regional rural settlement patterns in the region by using GIS-based spatial applications and statistical analysis. One of the main stimulants to this approach is embarking on studying Pamphylia’s neglected countryside that is in danger of modern destruction. Additionally, investigating the spatial aspects of agricultural production in Pamphylia with the help of the results of spatial and statistical analyses and a selection of ancient sources on agriculture is also aimed in this work since agricultural activity is the core of rural inhabitation and practices.

The GIS and GIS-based spatial applications have been adopted by archaeologists for the last decades in order to make sense of locational properties behind archaeological site and findspot distributions, and the site-environment relationship (Gaffney and Stancic, 1991; Wheatley and Gillings, 2002; Conolly and Lake, 2006; Oğuz-Kırca, 2014; Oğuz-Kırca, 2015; Gümüş et al., 2017; Hill, 2019; Selvi et al., 2020; Li et al., 2021; Panagiotidis and Zacharias, 2022). In this context, this study adopts and relies on various widely used GIS-based spatial applications for geospatial data production/retrieval and analysis for both initial visualisation purposes, as well as for further statistical analyses. The GIS-based spatial analyses and statistical analyses performed in this study focus on exploring possible and significant associations between the rural site distribution in Pamphylian countryside and various environmental and anthropogenic parameters that include major topographic features including elevation, slope and soil properties, as well as the

geographical proximity to hydrologic units, ancient road network and major Pamphylian towns.

As a result, this study represents the first endeavour to map, analyse and gain spatial insights into the rural site distribution in Pamphylian cultural sphere at a regional level.

2. PREVIOUS RESEARCH

Except for a few examples, 18th, 19th and 20nd century travellers did not pay sufficient attention to the territories of the major Pamphylian cities. In this regard, Spratt and Forbes, who visited the region in 1842 and conducted investigations in Pamphylia, documented several broken *sarcophagi* in the vicinity of Hurma Village located in the westernmost part of Pamphylia. They referred to this area as “Goormah Köyü” (Spratt and Forbes, 1847). Recent research has revealed that this site can be best identified as a farmstead (Çevik, 1995; Çevik, 1996). Rott, who visited Pamphylia in the early 1900s, reported that the number of towers and defensive structures, which could be identified as rural settlements, increases towards eastern Pamphylia (Rott, 1908). Italian researchers Paribeni and Romanelli, who visited the southern Anatolia with the mission of discovering and documenting archaeological sites and monuments in the early 1900s, reported ceramic finds dating to the Roman - Late Roman period at a hill, which is known as Kargılı Tepe today and located within the borders of today's Kadriye neighbourhood, just east of Çalkaya in Aksu. They also documented an inscription near a rural hill settlement, which yields architectural finds (Paribeni and Romanelli, 1914). The research done by Ormerod and Robinson in Pamphylia in 1911 is one of the most productive studies on the lesser-known small settlements in the region. The researchers carried out important documentation activities in neglected spots such as Lyrboton Kome, rather than the well-known cities of the region (Ormerod and Robinson, 1911).

Archaeological excavations carried out in the cities of Pamphylia have not yet produced a significant amount of data relating to the rural parts of the region. The majority of current evidence on the regional countryside mainly comes from modern surface surveys. These surveys include the surveys carried out by Çevik in the vicinity of Hurma in western Pamphylia in the early 1990s (Çevik, 1995; Çevik, 1996), in Varsak in northwestern Pamphylia (Çevik, 1997; Çevik and Gülşen, 1998; Çevik, 2017), the surveys carried out in Alanya by Doğan in the early 2000s (Doğan, 2005; Doğan, 2006; Doğan, 2007), those carried out in the territory of Sillyon in central Pamphylia by Küpper in the mid-1990s (Küpper, 1996; Küpper, 1998), the more recent surveys carried out in the territory of Sillyon led by Özer (Özer and Taşkıran, 2010; Özer, 2011), and the ones carried out

by Köse in the close vicinity of Aspendos (Köse, 2011). Among these surveys, the surveys carried out in Hurma, Varsak, near Sillyon and Alanya yielded productive results in terms of rural settlement characteristics of Pamphylia.

Intensity of site registration activities carried out by KVKK has gradually increased since the early 2000s.

As a result of these activities, the number of documented sites which yield rural characteristics has also increased over time (Fig. 2). The reports produced by KVKK provide fundamental but crucial data for the neglected rural sites in the region. Therefore, the data obtained from KVKK constitutes the backbone of this research, in particular for the sites that have not yet been thoroughly investigated.

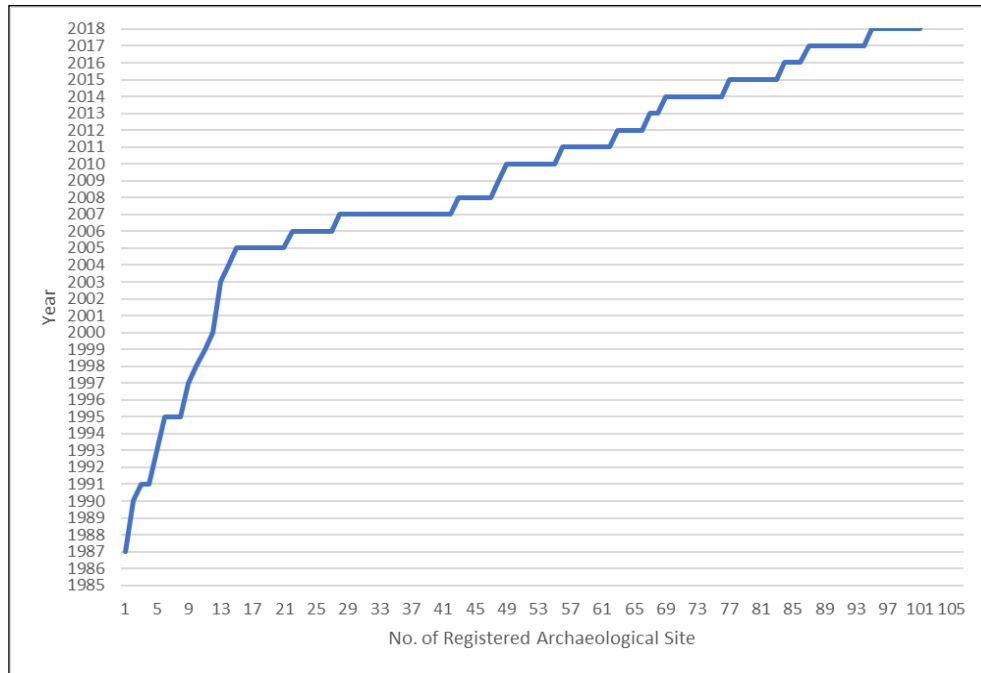


Figure 2. Graph showing the number of new recorded registered archaeological sites in Pamphylian cultural sphere by years.

3. STUDY AREA

As for other regions in Asia Minor, it is difficult to determine the boundaries and geographical extent of Pamphylia precisely, mainly due to the insufficiency of written sources, textual evidence, and hence the uncertainty of urban territories. Additionally, ancient written sources do not provide sufficient information on the ancient countryside. As a matter of fact, ancient writers specify the borders of regions mostly through place names and do not provide satisfactory information on regional topography and cultural geography. In addition, the material culture documented at archaeological sites referring to regional identity is quite limited. In this regard, opinions and inferences on the borders of Pamphylia rely mainly on the narratives of ancient writers. In this context, our knowledge on the western border of Pamphylia with Lycia is relatively richer compared to what is known about the northern border of the region with Pisidia and the eastern border with Cilicia.

The major cities of Pamphylia, from west to east, are: Attaleia, Perge, Sillyon, Aspendos and Side. These cities are spread over the Pamphylia plain, an alluvial area of roughly 150,000 hectares, which is fed by several large

and middle-scale rivers. Therefore, Pamphylian cities may be expected to have had relatively large inhabitable territories. However, although the present archaeological and epigraphic evidence regarding the cities in the region are partially satisfactory, written evidence on the chorai of the cities, consisting of villages and farms, is quite limited. Only a few rural settlements can be epigraphically associated with cities in Pamphylia. While Lyrboton Kome is a village settlement of Perge (Şahin, 1996) in western Pamphylia, the Hurma Farmstead has been evidenced to be a settlement that can be associated with Attaleia (Kaleiçi) by means of a tomb inscription dating to the third century AD (İplikçioğlu, 2001). In addition, an inscription bearing Aspendian names and found at a settlement located eight km south of Aspendos on the Mediterranean coast, shows that this area was a part of the Aspendos cultural sphere (Brixhe, 1976). Finally, according to Stephanus Byzantinus (512; 648), Olbia – possibly located in the westernmost part of Pamphylia as mentioned by Strabo (XIV.4) – had a colony named Cadrema in Lycia (Şahin, 2002). Apart from these examples, there is no compelling written source that provides evidence on any sort of urban belonging.

Although it is not possible to determine the geographical extent of Pamphylia precisely, it is still possible to make rough determinations based on the narratives of ancient authors. The town generally accepted to be located on the Pamphylia–Lycia border is Phaselis, which is located 54 km southwest of the centre of Antalya. According to Suidas, which is an encyclopaedia dating to the tenth century AD, the article "Cimon", which gives information from the fifth century BC, is a Pamphylian city (Suda, kappa 2299). As may be inferred from Diodorus Siculus (XI.2.1), Phaselis was a city located on the Lycia-Pamphylia border in the first century BC. Ptolemy (V.3) refers to Phaselis as a Lycian city. Strabo (XIV.4) reports that there was a fortified settlement called Olbia at the beginning of western Pamphylia, implying that Phaselis was a Lycian town. Despite there being no definite consensus, Olbia is widely associated with Çalışdağ Hill in Antalya's Kemer District, due to its suitability for Strabo's narrative and topographic inferences (Şahin, 2001; Şahin, 2002). In the early Byzantine sources, such as Hierocles (638) Phaselis is mentioned as a Lycian city.

Pamphylia is bordered by Pisidia in the west and northwest. Here, the two regions are bordered by Neapolis, Trebenna and Eudokias, which are mainly located within the cultural sphere of the Pisidian city Termessos (İplikçioğlu et al., 1998; İplikçioğlu, 2002; Çevik et al. 2004; Çelgin, 2008, Onur, 2005). According to Pliny (V.93) and Ptolemy (V.5), the region is bordered on the

east by Side and the Meles River (Manavgat River). Strabo (XIV. 5), on the other hand, reports that Cilicia begins with Coracesium in Alanya (Ruge, 1949).

As a result, it can be claimed that the western and north-western borders of Pamphylia are bordered by the hinterlands of Phaselis and Termessos, and the region begins where the Beydağları mountain range ends and the Antalya Plain begins. As a matter of fact, the farmstead in Hurma, which has been epigraphically documented to be connected to Attaleia (İplikçioğlu, 2001), may reveal that the Pamphylian cultural sphere starts from the foothills of Beydağları approaching the Mediterranean Sea. Thus, it can be thought that the region stretches along the Antalya Plain. According to the results of the current surveys conducted in the territory of Phaselis, it is estimated that the territory of the city extends along the Çandır Valley and reaches the Gökdere Valley in the north (Arslan and Önen, 2013) and the Kocaköy-Gedeller area, where Tenedos is believed to be located (Arslan and Önen, 2016).

Based on the ancient authors' narratives, information relied on surface survey reports and the current state of archaeological evidence, the study area of this research has been determined as the Antalya Plain corresponding to the widely accepted Pamphylian cultural sphere and partially north of this plain. In other words, the area that covers the central Antalya province and its immediate surroundings has been determined as the study area (Fig. 3).

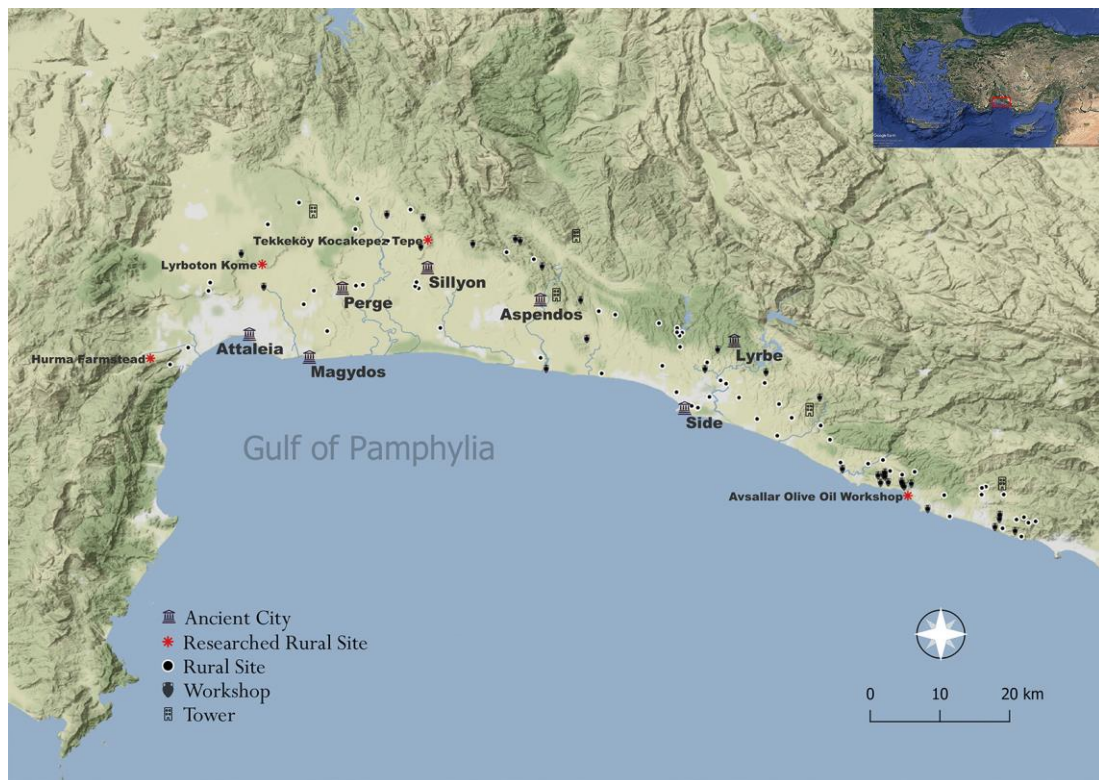


Figure 3. Map showing the location of Pamphylia and its settlements (Map by Author)

4. AN OVERVIEW OF THE CURRENT STATE OF ARCHAEOLOGICAL EVIDENCE FROM THE PAMPHYLIAN COUNTRYSIDE

Although several rural sites were known by the early 2000s, the number of registered archaeological sites in Pamphylia, most of which can be classified as rural settlements, has recently increased drastically (as shown in Fig. 2), showing that rural Pamphylia was densely populated in antiquity. As a result, the amount of data on rural sites in the region has immensely proliferated.

Relying on the results of systematic surface surveys and site registration campaigns, it is convenient to claim that the majority of rural sites identified in Pamphylia are heavily damaged and/or are covered with vegetation. For this reason, the intra-site architectural structure of these settlements has not been intensively documented so far. In addition, very few rural settlements in Pamphylia have yielded epigraphic evidence. In this context, only sites that have yielded epigraphic evidence are Lyrboton Kome (Ormerod and Robinson, 1911; Keil, 1926; Şahin, 1996; Çevik, 1997; Çevik, 2017; Erdoğan, 2018) in north-western Pamphylia, the farmstead in Hurma in western Pamphylia (Çevik, 1995; Çevik, 1996), and Pissarissos (Esen Tepe) in eastern Pamphylia (Tomaschitz, 1998). Among these, Lyrboton Kome and Pissarissos are the only rural sites that have yielded epigraphic evidence that allows us to determine the settlement type; these two sites are the only *komai* currently known in Pamphylia.

Archaeological evidence documented at the rural sites in the region is mainly represented by ceramic scatters and architectural remains. The largest portion of this data consists of wall remains, bricks and tiles, as well as ceramics, and production equipment that can be associated with workshops. Based on the review of site registration and surface survey reports, the majority of architectural remains in the study area seem to have mainly been parts of civic structures that reflect residential features. Cisterns and the other forms of water-related structures which could be water reservoirs were also frequently detected at the rural settlements.

The majority of the documented ceramics found at the settlements are coarse ware, most possibly manufactured for daily use. The majority of diagnostic ceramic finds in Pamphylian countryside come from the researched rural settlements Lyrboton Kome (Çevik, 2017) and Kocakepez Tepe (Bilgin, 2021). In particular, recent detailed analysis on the *sigillata* documented at Kocakepez Tepe deserves attention (Bilgin, 2021). Ceramic finds documented at this settlement

are dated between the first century BC and the sixth century AD. Red slip wares found at this site, which are well documented, are dated to the Late Roman Period and Late Antiquity. Examples of Sagalassos red slip ware, among the late Roman red slip ware detected in the site, is also noteworthy. A small portion of the ceramics in Kocakepez Tepe, which are generally associated with daily use, is Eastern Sigillata D dated between the early first century BC and the second century AD (Bilgin, 2021).

In terms of evidence on agricultural activity and the associated architecture related to agricultural production, Lyrboton Kome (Çevik, 2017; Erdoğan, 2018) and the Avsallar olive oil workshop (Türkmen, 2015) provide the most significant data. Numerous workshops and related production equipments have been identified at Lyrboton Kome. The presence of workshops in the settlement is represented by a large number of *fulcra*, *litus*, press beds, liquid containers, *mortarium*, *trapetum*, and *orbis*. Some of the workshops in the settlement are located next to houses, while some are inside the residential structures. Some singular spaces identified as workshops have also been identified. Workshops connected to domestic structures have been determined to be attached to a separate part of the building complexes. It is argued by Erdoğan (2018) that the spaces identified next to some workshops in the settlement were probably used for storage purposes.

The short-term salvage excavation carried out at the Avsallar olive oil workshop in eastern Pamphylia revealed four connected spaces that form a central production facility. Formally identifiable ceramics and 11 bronze coins- which rarely excavated in Pamphylia - dating between the third century AD and sixth century AD, were identified in this workshop (Türkmen, 2015).

Functions of the majority of documented spaces and structures at rural sites in the study area are unclear due to destruction, the lack of excavation, and systematic documentation. Therefore, in terms of architectural evidence, the masonry construction technique represents the primary archaeological source at hand in Pamphylian countryside. In this context, in the region two masonry techniques, which are mainly associated with residential and civic structures, predominate: Walls built with large blocks that are often rectangular and shaped either elaborately or imprecisely and can be considered polygonal technique or *opus quadratum*; the other technique can be considered less qualified and can mainly be classified as *opus incertum* and *opus caementum* that is made of irregular stones, which may also contain rubble, mortar and bricks (Fig. 4).



Figure 4. Three examples that show the widely documented masonry techniques in Pamphylia countryside. Left corner: a wall built with large blocks in Lyrboton Kome in western Pamphylia dating between the first and second century AD (After Erdoğan, 2018); right corner: a wall built with irregular stones from Gebedelen in eastern Pamphylia dating c. fourth to seventh century AD (After Doğan, 2008); bottom: rock-cut construction technique from Lyrboton Kome possibly dating first century to seventh century AD (After Erdoğan, 2018).

Civic structures that are built with large blocks and irregular stones have frequently been documented together in most settlements. In this context, while the large blocks are considered indicative of earlier periods (i.e., Hellenistic to Roman), the masonry technique represented by irregular stones, which may be determined as less qualified, is mainly associated with later periods, Late Antiquity to Byzantine era. The masonry technique consisting of irregular cut and rubble stones as well as mortar and brick

is observed at 36 settlements. At 34 settlements, the technique, made of regular cut stones and large blocks, is observed together with the aforementioned less qualified technique, mainly characterised by irregular stones. At some of the settlements, it has been reported that walls made of cut stone blocks were rebuilt or reinforced with rubble masonry in later periods. Small number of sites also yields bossage walls that can be attested to the Hellenistic Period (Fig. 6).

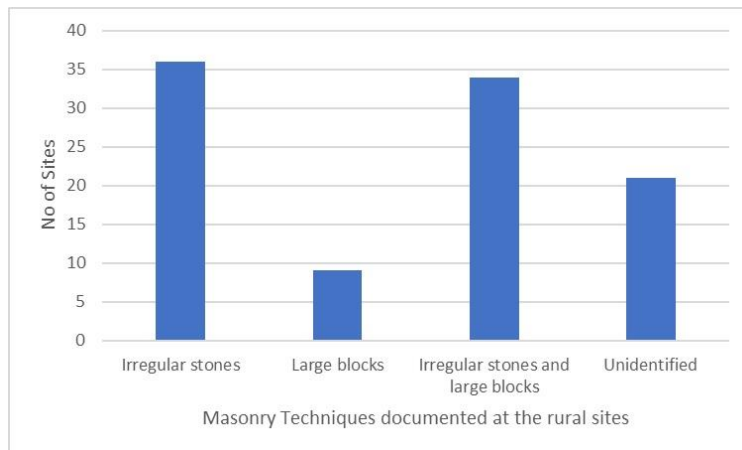


Figure 5. Graph Showing the Frequency Distribution of Masonry techniques documented at the rural sites in the study area.

As a result, the statistics and reinforcements on the walls prove that many settlements identified in Pamphylian countryside have multi-phase stratigraphy. For 21 settlements in the study area, no data providing information on the masonry technique could be clearly determined due to intense destruction, even though architectural remains are present at some of these sites. Additionally, at 28 settlements qualified and diagnostic architectural remains such as profiled architectural blocks, column fragments, door lintels, door sills, and profiled architectural blocks with motives have also been reported. It may be claimed that these architectural finds may belong to dwelling structures, possibly landowner houses, since they differ from the dominant architectural texture of rural sites.

Rock cutting technique is observed at 18 settlements in the study area. In this technique, spaces or building sections are formed by carving the bedrock. Additionally, this technique has been observed to have been used for tomb construction. In this context, *chamosorion* type *sarcophagi* produced by the technique of carving into bedrock is also well documented at the Pamphylia's researched rural sites Lyrboton Kome (Şahin, 1999a; Çevik, 1997), Hurma Farmstead (Çevik, 1995; Çevik, 1996) and Kocakepez Tepe (Özer, 2011; Bilgin, 2021). The main reason why this technique is frequently observed in rural settlements might be the fact that it is less costly and only requires labour force rather than possibly expensive construction material(s). As a matter of fact, it does not seem to be a coincidence that the rock cutting technique is frequently encountered at rural settlements, which generally have modest architectural texture, and for this reason, many settlements were built on or near rocky areas.

4.1. Dating of the Sites

In Pamphylia the earliest evidence, documented in the territories of cities, comes from tombs and individual find spots. This evidence consists of pottery dating to the fifth century to third century BC (Akarca, 1950; Tosun, 2008; Akman and Tosun, 2011), and a terra cotta figurine dated to the late seventh/early sixth century BC (Metzger, 1952). Apart from these rare examples, dating of the Pamphylian countryside is mainly possible by means of surface finds since the region has not witnessed intensive systematic surface surveys or long-term archaeological excavations conducted within cities' hinterlands so far. However, systematic surface surveys conducted in the territories of Perge, Sillyon and Aspendos have yielded significant information for dating the surface findings of rural sites. Additionally, short-term excavations carried out in Lyrboton Kome (Çevik, 2017) and the olive oil workshop in Avsallar (Türkmen, 2015) in Alanya

(eastern Pamphylia) has yielded supplementary evidence for the rest of the region's rural areas. In this context, the site registration reports provided by KVKK show parallels with the results of the mentioned surface surveys.

The most comprehensive and consistent datable evidence in Pamphylia's countryside come from the researched rural sites Lyrboton Kome in Perge's territory, Hurma Farmstead in Attaleia's territory and Kocakepez Tepe in Sillyon's territory. Among these settlements, Lybroton Kome, in particular, provides a reliable information in terms of dating of surface evidence. According to Çevik (1997), the earliest finds in Lyrboton Kome - including potsherds and a few tomb inscriptions - dated back to the Late Hellenistic Period, possibly the second century BC. Apart from the early finds, the site has mainly yielded surface finds dating between the second century AD and the seventh century AD (Erdoğan, 2018).

Kocakepez Tepe, located in Sillyon's territory in central Pamphylia, is an important site since it yields diagnostic ceramic finds classified as terra sigillata, which is dated from the first to sixth/seventh centuries AD. On the other hand, a small number of ceramic finds found at the settlement date back to first century BC (Bilgin, 2021).

Recent research in eastern Pamphylia has shown that the significant portion of daily-use wares documented in rural settlements are dated between the fourth century AD and eight century AD. However, the latest ceramics detected at these settlements are dated to the 12th century AD (Doğan, 2008).

Except for the researched settlements, the majority of rural sites in Pamphylia have been dated by the specialists of KVKK. Based on the reports provided by the KVKK teams, the archaeological finds documented in the majority of rural sites in the region show chronological parallel with the above-mentioned researched settlements and the other counterparts in neighbouring regions including Rough Cilicia (Aydınoglu, 2010) and Eastern Lycia (Bulut, 2018). In conclusion, the rural settlements identified in these regions are generally dated between the second century AD and seventh century AD. In this context, the majority of sites in Pamphylia yield Roman, Late Roman, Late Antique and Early Byzantine materials.

Since the material that helps dating is mostly surface data, the exact chronology of the sites cannot be precisely determined due to a lack of excavation. Also, as has been noted, the rural sites in Pamphylia can be dated within a broad time frame, and the sites are transitive in terms of dating of the surface material. According to the results of site registration activities and archaeological fieldworks (see chapter 2), 76% of the settlements are roughly dated to the Roman Period; architectural finds that can be dated to the Late

Roman Period were found in 13% of the sites. At 36% of the sites, the presence of material dated to the Late Antique-Early Byzantine/Byzantine periods has been reported (Figure 6). Additionally, the olive oil workshop in eastern Pamphylia, identified and excavated in 2014, has yielded 11 bronze coins, which are rare examples for Pamphylian countryside. Five of these coins are dated between the third century AD and the sixth century AD (Türkmen, 2015).

As a result, relying on the current evidence – unlike, for example, Greece (Bintliff and Snodgrass, 1985; Bintliff, 1991, Alcock, 1996) – Pamphylia does not

seem to have witnessed a drastic drop in the number of rural sites following the Roman conquest. However, as in Greece (Bintliff and Snodgrass, 1985; Bintliff, 1991), the rural site density seems to have increased during the Late Antique period.

In conclusion, according to the available evidence – that is based predominantly on surface data – the broad timespan for the ancient Pamphylian countryside can be determined as the second to sixth/seventh centuries AD. This time parallels with the countryside of the neighbouring regions Rough Cilicia (Aydmoglu, 2010) and Eastern Lycia (Bulut, 2018).

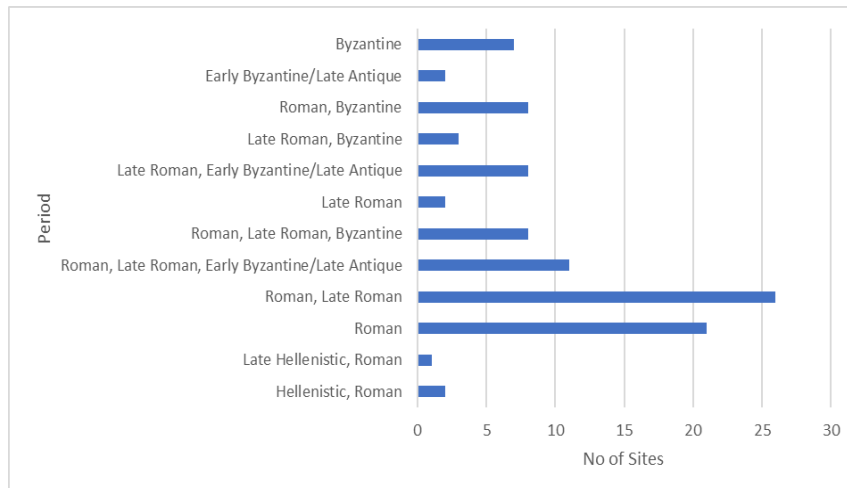


Figure 6. Chart showing the number of rural sites in Pamphylian cultural sphere by periods. The data is produced and classified based on the results of site registration campaigns, surface surveys and archaeological excavations carried out in the region.

5. SETTLEMENT PATTERNS: A GIS-BASED APPROACH

5.1. Methodology

The GIS-based spatial and statistical analyses in this study are intended to gain understanding of the locational associations between the rural sites and various major environmental and anthropogenic factors in the study area, including elevation, slope percentage, proximity to hydrologic units, proximity to major towns, proximity to ancient road network, and soil properties (Table 1). In other words, the main goal here is to quantify the associations between the rural sites distribution and the mentioned factors, and to examine the underlying spatial factors that might have shaped the site distribution and rural settlement patterns in the region. Through the methodology adopted by this study, the regional rural settlement patterns in Pamphylia are investigated for the first time by employing a novel approach that exploits and supplements traditionally produced archaeological data.

As a first and essential step, all the registered archaeological sites in the study area were investigated

through satellite images as well as by on-site observations of the landscape and locational characteristics. Prior to performing the further analyses, the rural sites in the study area were classified based on their types and possible functions as determined by surface finds and findings. Also, the rural site data obtained was structured and converted into tabular data format to store the data in a sustainable manner to allow reuse and enable further queries and analyses. Following this step, the rural sites were imported into and mapped with their precise coordinates in the open-source GIS software Quantum GIS 3.24.0 (QGIS) for visualisation purposes and spatial data analysis.

The digital elevation model (DEM), which has 30 metres spatial resolution and provided by the Shuttle Radar Topography Mission (SRTM) was downloaded and clipped to the extent of the study area. The environmental datasets including elevation, slope percentage and hydrologic units were generated in the GIS software using the DEM. All the data (i.e., all the GIS layers included in the analyses) were transformed into the same reference system, WGS84 UTM zone 36N (EPSG: 32636). Following this step, the environmental and anthropogenic datasets were generated and quantified using spatial analyses functionalities

provided by QGIS, and then the obtained data were extracted from the software for further spatial and statistical analyses. The environmental and anthropogenic datasets have been sampled for each of the rural sites, extracted from the GIS software, and stored in tabular format for the further statistical analyses.

Following the GIS operations, all the variables have been quantified to perform primary statistical analyses. Thus, descriptive statistics have been produced for each variable for initial observations of the datasets. This step, which consists of generating all the necessary descriptive statistics, has yielded important understanding of the rural site distribution in the study area. As a final step of the statistical analysis, hypothesis tests were performed to detect possible statistical associations between the settlements and the compared environmental and anthropogenic datasets.

Before embarking on further statistical analysis, the site distribution was tested using nearest neighbour analysis (Hodder and Orton, 1976; Conolly and Lake, 2006) to observe the overall locational tendency of the sites between each other. Following this step, the relationship between the site data, and environmental and anthropogenic datasets, including elevation, slope percentage, soil properties, distance to hydrologic units, distance to major cities and distance to road network were tested using one sample KS-test, which has been employed by archaeologists for both intra-site analyses (Hacıgüzeller, 2007) and regional scale analyses (Kvamme, 1990; Wheatley and Gillings, 2002). The statistical tests were employed to infer statistical associations between the site data and the aforementioned factors, which represent the background data in our case. In the analyses, the null hypotheses (H_0) were constructed for the absence of pos-

sible relationships between settlements and background data; H_1 hypotheses, on the other hand, were constructed based on the assumption that there is a significant association between the site data and background variables. Therefore, the hypotheses were established to reject the null hypothesis H_0 .

Numerous tests are used in archaeology (Fletcher and Lock, 2005; Vanpool and Leonard, 2010); however, three major factors that affected the selection of the KS test include the type of datasets, the geographical extent of the study area, and the effort to gain insights into regional settlement patterns. In this regard, the KS test has been widely used in archaeological research and accepted to be effective in regional scale analysis for continuous data (Kvamme, 1990). In addition, since the KS test is a nonparametric test, the data at hand do not need to be normally distributed (Kartal, 2014).

In the KS test, the cumulative frequencies of the settlement data and the background variables are compared. The difference between the two cumulative distributions is expressed as "D". In case the maximum value of the difference between two cumulative distributions $|D_{\max}|$ is greater than the critical value – which is expressed as "d" – it can be deduced that the difference is significant (Fig. 7). Thus, in our case, it can be claimed that there is a significant association between the compared variables. The critical value d at 0.05 significance level is calculated with the following formula: $d = 1.36/\sqrt{n}$, where d is the critical value and n is the sample size.

Following the obtainment of the KS test results, further spatial investigations have been performed in order to make more sense of the statistical and spatial results and gain more understanding of the derived results.

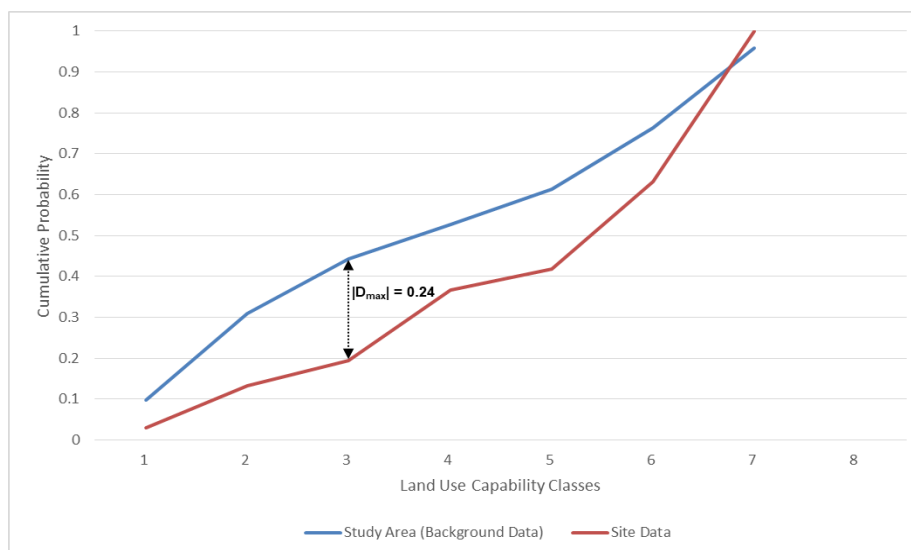


Figure 7. A representative Kolmogorov Smirnov graph showing the statistical comparison of the site data and background data (study area) for the land use capability classes, and the $|D_{\max}|$ value between the two compared data

A further set of supplementary spatial analyses, which consists of generating and evaluating the site catchment areas (Finzi and Higgs, 1970; Roper, 1979) calculated using cost surface analysis based on Tobler's Hiking Function¹ (Tobler, 1993), and the GIS-based mapping of the shortest planar distances between rural sites, hydrologic units and major towns, have been performed in an attempt to provide more insight into these geographical proximity relationships. In this context, the cost surface analysis (Finzi and Higgs, 1970) has been performed to visualize the geographical proximity relationship between rural sites and major towns in a more realistic way, in order to supplement the statistical results. The cost surface analysis calculates the set of areas one can reach from a point or polygon within a specific time that is calculated based on slope value of a given area. Thus, the slope percentage value in a given raster data represents the cost. In this study, the cost surface raster generated consists of nine different layers that correspond to nine zones, which one can reach between 0.5 and 5 hours.

5.2. Data

The datasets used in the analyses include the rural sites, the DEM of the study area and its derivative slope percentage, hydrologic units, soil properties, ancient road network and major Pamphylian towns in the study area (Fig. 8).

The rural site data consists of 99 settlement points documented through surface surveys and site registration campaigns. Only civic settlements have been included in the study area. In other words, the sites reflecting defensive occupation, which are represented by towers or possible garrisons, were excluded from the analyses since the main purpose of this research is to understand the civil rural inhabitation in the study area. In addition to this, findspots that do not yield compelling evidence of residential occupation are also not included in the analyses since they may skew the analysis results, leading to misleading inferences.

Environmental datasets analysed in the study include elevation, slope percentage, hydrologic units, and soil properties (land use capability). Elevation

and slope data are generated from the SRTM DEM, which provides 30-meter spatial resolution. This DEM source was preferred by mainly considering the large extent of the study area. Elevation and slope data were extracted for each site using GIS. Following this step, the hydrological model of the study area was generated in GIS using the raster layers including the elevation and slope data. Thus, large, middle, and small-scale water courses in the study area were produced. In this context, while large and middle scale hydrologic units are mainly major rivers; the small-scale hydrologic units are mainly represented by streams –either seasonal or four-season. It should be pointed out that the only known lake in the Pamphylia plain in antiquity is Capria, which was possibly located between Cestrus (Aksu) and Eurymedon (Köprüçay) rivers (Strabo, XIV.4). Therefore, rivers and streams constituted the main hydrologic resources in the region, which are considered significant locational factors in Pamphylian countryside.

The soil dataset was obtained from the Republic of Türkiye Ministry of Agriculture and Forestry. Although the soil dataset consists of several attributes, Land Use Capability (LUC) classes were chosen for the spatial analysis, since it is considered representative, and offers the most meaningful and descriptive evidence for examining the settlement trends and practical habitation characteristics at regional scale, based also on initial observations. In fact, the result of the analysis has justified this hypothesis by showing promising results for identifying the spatial associations between the site distribution and the LUC classes in the study area. The LUC classes consist of 7 different GIS layers. While LUC 1, LUC 2 and LUC 3 classes represent the fertile areas, which have less surface roughness and are close to water resources, LUC 4, LUC 5, LUC 6 and LUC 7 classes represent the least fertile areas, which are characterised by inclined or rough areas, and located farther from vital sources, mainly, water. In conclusion, LUC 1, LUC 2 and LUC 3 classed soils can be considered fertile and much more favourable for agriculture. However, the soil groups LUC 5, LUC 6 and LUC 7, are suitable for a more limited agricultural activity in terms of product variety (Lynn et al., 2009).

¹ The equation of this function is as follows: $W = 6e^{-3.5 | dh/dx + 0.05 | dh/dx} = S = \tan\theta$. In the formula, W is

walking velocity (km/h), dh is the elevation difference, dx is the distance, S is the slope value, and θ is slope angle.

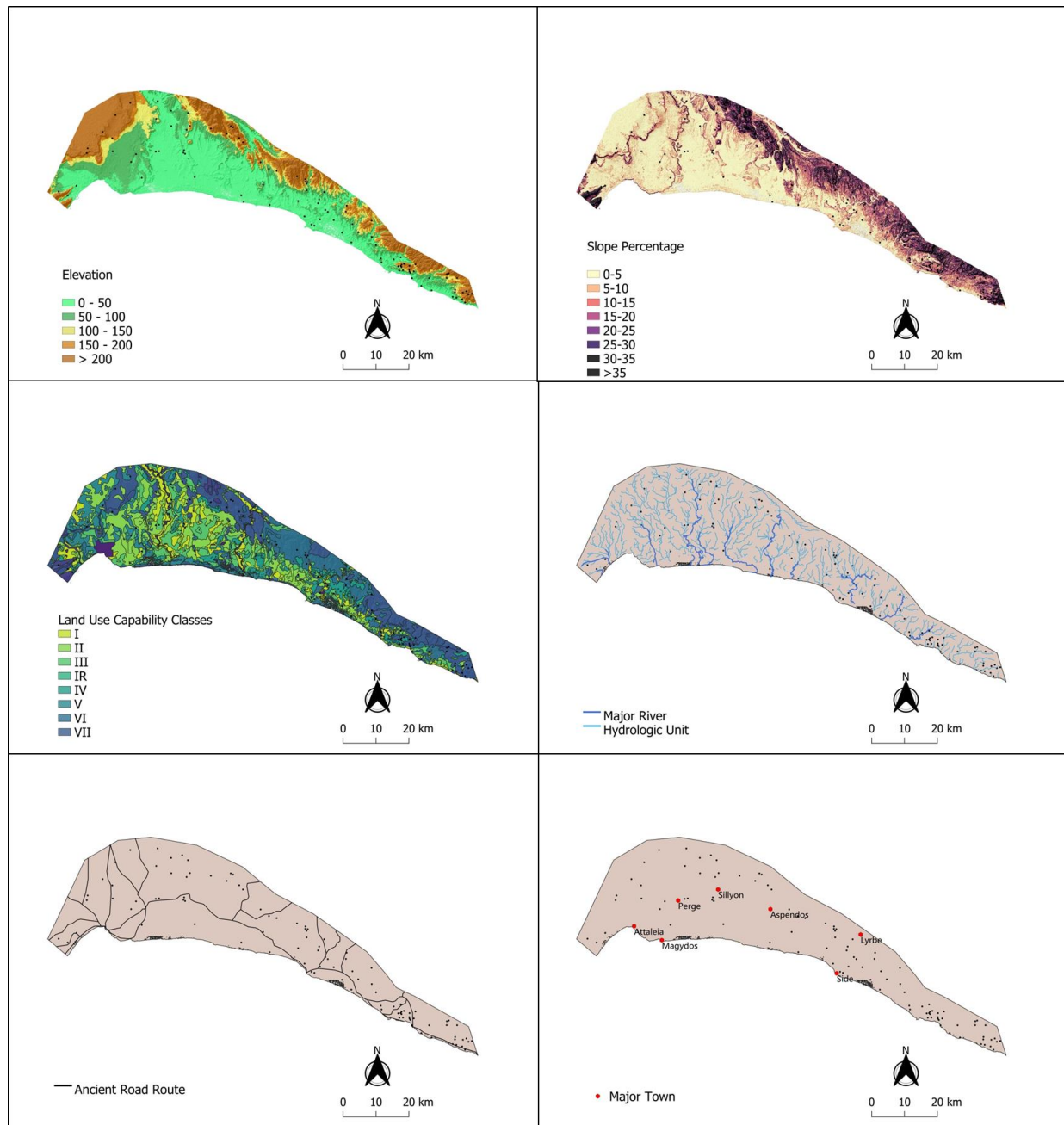


Figure 8. Data used in the spatial and statistical analyses shown as GIS layers (Maps by Author).

Anthropogenic data consists of the major towns in Pamphylia, including Attaleia, Perge, Silyon, Apendos, Side and Lyrbē, and the ancient road network in the region. These datasets were included in order to analyse and understand the proximity relationship between the rural sites and the major Pamphylian towns, and the proximity relationship between the rural sites and the ancient road network in the study area. It should be noted that the evidence of the ancient road network in Pamphylia is fragmentary due to a lack of archaeological and textual evidence, as well as destruction due to modern anthropogenic activity in the region. In this study, therefore, the reconstructed road network has been digitised based on the

routes that were identified by previous research (French, 1991; Ercenk, 1992; French, 1992; French, 1994; French, 2016; Talbert, 2000; Talbert, 2010).

Table 1. Data and data sources used in the spatial and statistical analyses.

Data	Source
Rural Sites	KVKK
Major Towns	Google Earth Pro 7.3.4.8642
Elevation	SRTM (30-meter spatial resolution)
Slope	SRTM (30-meter spatial resolution)
Road Routes	French, 1991; French, 1994; French, 2016; Ercenk, 1992; Talbert, 2000
LUC Classes	Republic of Türkiye Ministry of Agriculture and Forestry

5.3. Results and Archaeological Inferences

As a first step, the result of the nearest neighbour analysis has shown that the current rural site distribution tends to be clustered (Table 2). This generic result may lead us to claim that the rural sites are clustered in certain zones in the study area, since the result does not indicate a dispersed distribution pattern, as can also be perceived by viewing the map of the study area (Fig. 3).

Initial descriptive statistics have revealed a relatively significant tendency between the rural sites,

and elevation, slope percentage, LUC classes, road network and hydrologic units. In other words, it can be inferred from the frequency graphs that there are spatial associations between the rural sites and these environmental and anthropogenic variables (Fig. 9).

Table 2. Nearest Neighbour Analysis results.

Observed Mean Distance	2.15 km
Expected Mean Distance	3.3 km
NNA Value	0.65
z value	-6.81
p value	0

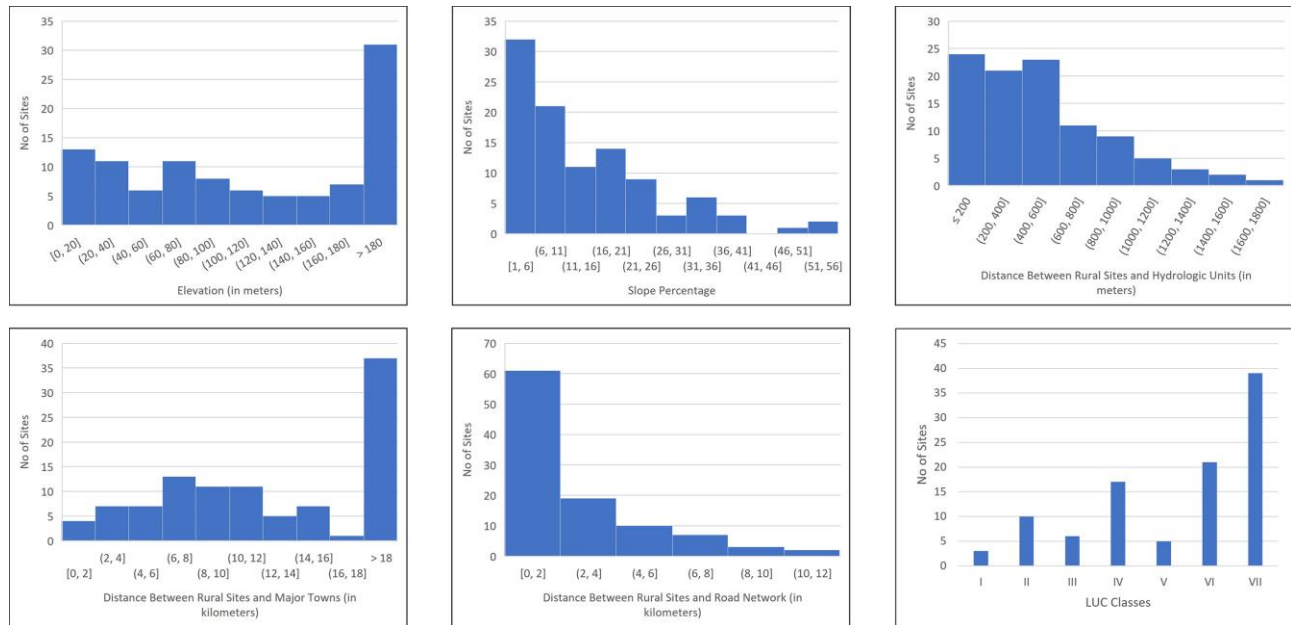


Figure 9. Frequency Tables of Data Used in the Analyses

The mean value of the DEM of the study area is 108 metres. The GIS-based results have shown that the rural sites are mainly concentrated below 180 metres altitude, while 31 sites, which can be mainly defined as hilltop and hillside settlements such as Lyrboton Kome and Kocakepez Tepe, are located above this level of altitude. On the other hand, relying on the sampled elevation values of sites and the graphs produced, it can be highlighted that the rural sites are spread relatively equally in the study area, between roughly 1 to 180 metres above sea level. (Fig. 9).

The average slope percentage of the study area has been calculated as 11.05%. The average slope value of the sites, on the other hand, is 14.26%. It has also been observed that the settlements are concentrated in the areas with an average slope of 1% to 10%, reflecting a spatial tendency. In this context, the primary statistical evaluation shows that the study area and the sites differ in terms of slope percentage values (Fig. 9).

A spatial association between proximity to water resources and site density has also been revealed

through the descriptive statistics. The proximity analyses have shown that most rural sites (68 sites) are located not farther than 600 metres from hydrologic units. Also, the number of sites decreases with distance from hydrologic units, which can be mainly classified as middle and small scale (either seasonal or four-season) water resources. The further spatial analysis performed to visualise the proximity relationship between the sites and water resources, on the other hand, has revealed a noteworthy pattern that there are zonal differences in terms of proximity to water as a locational factor. In more detail, while the rural sites in western Pamphylia seem to more tend to situate near hydrologic units, the sites in eastern Pamphylia display weaker tendency in terms of geographical proximity to hydrologic units (as shown in Fig. 10).

The proximity analysis performed for the association between the majority rural sites (60 sites) and the digitised road network has revealed that the sites tend to situate less than 2 km from the ancient road routes.

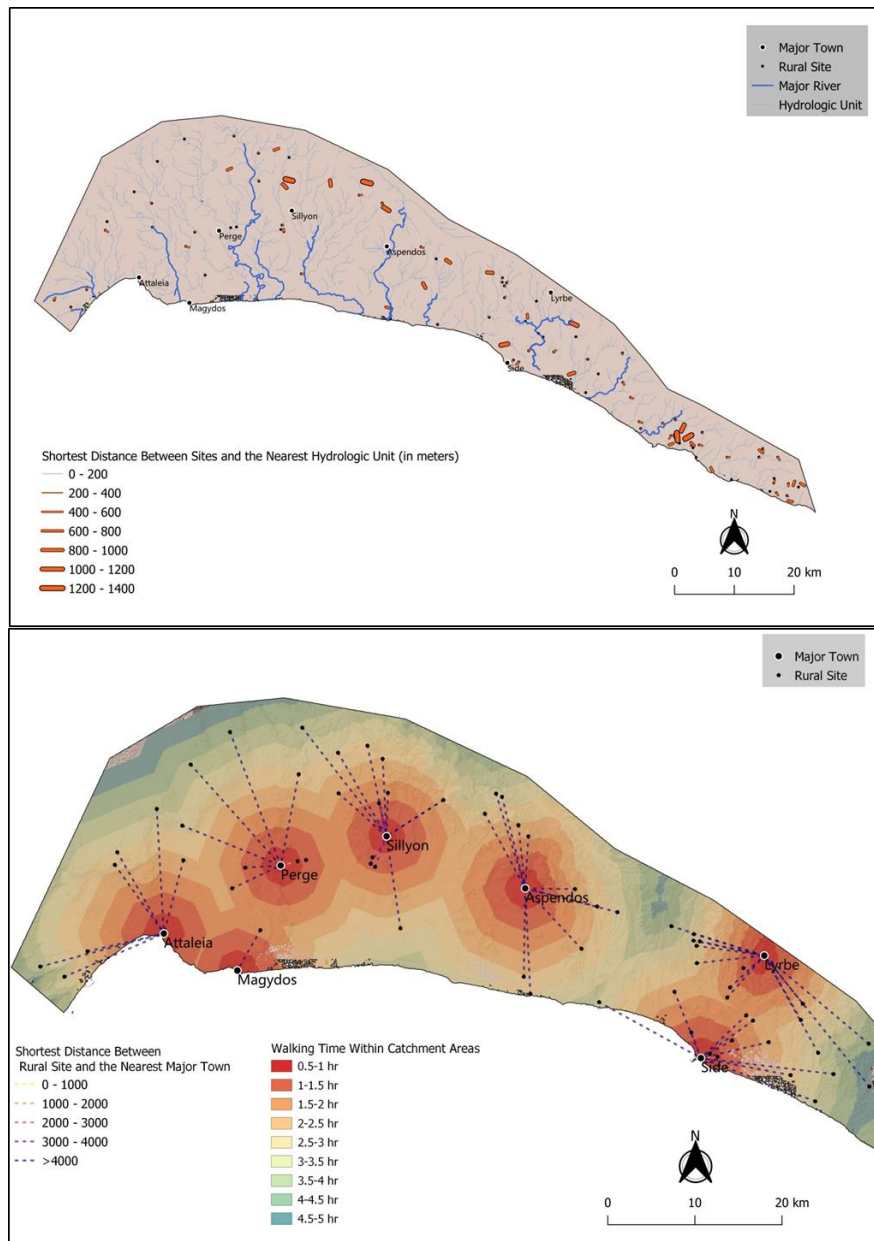


Figure 10. Map showing the shortest distance between rural sites and the nearest hydrologic units (top). Map showing the cost surface areas of major Pamphylian towns and the shortest distances between the rural sites and major towns in the study area (bottom) (Maps by Author).

The descriptive statistics have not revealed a locational tendency between the rural sites and major towns in the region in terms of geographical proximity. Only a small minority of sites are located in the close vicinity of major towns. Conversely, many sites (58 sites) are located farther than 10 km from the major towns. In this sense, even the cities that are surrounded by large fertile areas such as Perge, Aspendos and Sillyon, do not have large number of rural sites in their close vicinities. As can be inferred from the further analysis and the mapping of the distance relationship between the rural sites and the cities, it can be perceived that the urban centres in Pamphylia are not surrounded by a significant number of rural

sites. In this context, it can be highlighted that the rural site density is considerably low in the nearest catchment areas of the urban centres (Fig. 10). Statistically, the number of sites increases with distance from the major towns, peaks in the areas that can be reached between two and three hours and starts decreasing in the areas that can be reached in 3.5 hours.

The descriptive statistics of the relationship between the LUC classes and rural sites show that 3.96% of the sites in the study area are located in the LUC 1 classed areas, 10.89% are in the LUC 2 classed areas, 5.94% are in the LUC 3 classed areas, 16.83% are in the LUC 4 classed areas, 4.95% are in the LUC 5 classed areas, 20.79% of sites are in LUC 6 classed areas, and

36.63% of them are in areas classified as LUC 7. According to the first determinations, the large numbers of settlements are located in LUC 6 and LUC 7 classed areas.

The KS test results indicate significant relationships between the site locations, elevation, slope percentage, LUC classes, proximity to hydrologic units and proximity to the reconstructed road network. $|D_{\max}|$ values for the cumulative comparison between the site data and elevation data is 0.21, while $|D_{\max}|$ is 0.26 for the slope data, 0.25 for the LUC data, 0.29 for the hydrology data, and 0.31 for the road network data (Table 3). These values are greater than the critical value d , which is equal to 0.136. Therefore, relying on these results it is possible to claim that the locational properties of rural sites in the study area show statistical association between these environmental and anthropogenic factors at regional scale. On the other hand, as can also be inferred the descriptive statistical information, no significant relationship could be detected between the site locations and the cities in terms of geographical proximity between these variables. $|D_{\max}|$ value of the comparison of the rural sites and major towns is 0.099, which is less than the critical value d . (Table 3).

As a result, the statistical evaluation shows that the site distribution does not follow a stable pattern in the

study area, and it can be claimed that the site distribution differs from the background data based on certain factors. In this regard, an interesting fact about the data distribution deserves attention: the sites do not tend to cumulate in the alluvial plain of Pamphylia, which is fed by major rivers and is represented by 37.39% of the study area. That is, only 22% of the sites are located within this fertile area. Interestingly, on the other hand, 28.28% of the sites are located above 180 metres. Additionally, when the relationship between the settlement distribution and the slope percentage is examined, a concrete tendency is not observed in the region in terms of locational preferences. In this regard, while 49% of the study area is flat with 0% to 5% slope, only 23% of the sites are in this area. In connection with this, relying on the association between the LUC data and the site distribution – contrary to what one would expect – rural sites in Pamphylia do not show a strong tendency to be in agriculturally favourable areas at regional scale. However, the spatial analysis has revealed that the number of rural settlements in the region decreases significantly as the number of rural sites decreases as the distance between the sites and the LUC 1 and LUC 2 classed areas increases. Accordingly, it may be suggested that the settlements in the region are in infertile spots by still being in an effort of locating close to fertile areas (Fig. 11).

Table 3. Frequency distribution between rural sites and environmental/anthropogenic factors, and KS test results.

Variable	Interval	Background Area Percentage	No. of Sites	D value
Elevation	0-20	25.07558403	13	0.119442709
	20-40	13.57057083	9	0.164239326
	40-60	12.32038689	7	0.216736124
	60-80	7.942853717	11	0.185053551
	80-100	6.333543466	8	0.167580904
	100-120	4.607346393	6	0.153048308
	120-140	3.708585931	4	0.149730127
	140-160	3.1495857	6	0.120619923
	160-180	2.79045939	7	0.077817446
	>180	20.50108366	28	0
Slope	0-5	49.67911342	23	0.264467902
	5-10	18.6098357	23	0.218243027
	10-15	8.689531818	15	0.153623193
	15-20	6.262801719	10	0.115241109
	20-25	4.717965739	14	0.021006625
	25-30	3.60590806	2	0.036863686
	>30	8.43484354	12	0
LUC	1	9.820700896	4	0.067594764
	2	21.14914425	10	0.17704539
	3	13.32518337	6	0.249072734
	4	8.516707416	17	0.160770421
	5	8.47595762	5	0.194509589
	6	14.99592502	21	0.130183125
	7	19.68215159	36	0.040342298

Distance to Hydrologic Unit	0-200	14.705452	24	0.09054548
	200-400	11.461431	20	0.17393117
	400-600	11.43217	22	0.27740947
	600-800	10.178987	12	0.2944196
	800-1000	10.175032	9	0.28176928
	1000-1200	7.789665	5	0.25337263
	1200-1400	7.959596	4	0.21337667
	1400-1600	6.281139	3	
	1600-1800	9.613932		
	>1800	10.402497		
Distance to Cities	0-2	3.377176672	7	0.036935304
	2-4	8.825526686	11	0.059791148
	4-6	13.48970881	7	0.004398869
	6-8	15.68174101	13	0.029903148
	8-10	14.42990186	15	0.022687015
	10-12	13.08549855	11	0.042430889
	12-14	11.80496047	8	0.079672413
	14-16	6.772947016	6	0.086795823
	16-18	4.263609759	3	0.099128890
	>18	8.268929166	18	0
Distance to Road Network (in kilometres)	0-2	28.059143	60	0.31340857
	2-4	20.503758	18	0.28657099
	4-6	14.568218	9	0.22998881
	6-8	10.344463	7	0.19584418
	8-10	7.086979	3	0.15467439
	10-12	5.461104	2	0.11986335
	≥12	13.976335	0	0.0199

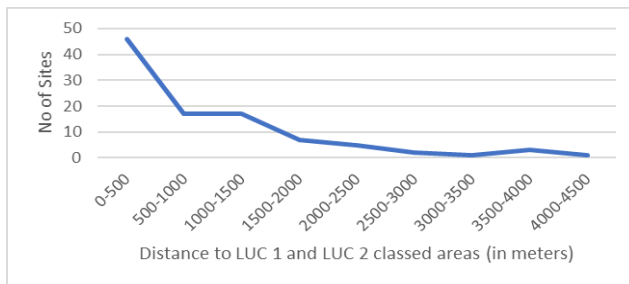


Figure 11. Graph showing the proximity relationship between the rural sites and the fertile areas classified as land use capacities LUC 1 and LUC 2.

In conclusion, it can be claimed that the rural site distribution in Pamphylia must have relied on certain patterns. Also, the field observations conducted in the study area and the examination of satellite images have yielded promising results for understanding the background environmental factors that might have shaped the rural site distribution in Pamphylia. On the other hand, it is appropriate to highlight the fact that only more data, which could mainly be obtained through fieldwork, will allow us to make more solid inferences in the future.

5.4. An Enquiry into the Relationship Between Agricultural Land Division and Locational Modelling in Pamphylian Countryside

The results of the spatial and statistical analyses have revealed that the settlements in the region are

concentrated in the areas that are classified as LUC 6 and LUC 7, which are the least suitable land classes for agriculture. On the other hand, fewer settlements were found in the fertile areas, which are classified as LUC 1, LUC 2, and LUC 3. Moreover, the results of spatial analysis have also revealed that the number of rural sites in the study area decreases as the distance increases from the fertile areas classified as LUC 1 and LUC 2 (Fig. 11). As a result, it can be observed that, numerous rural sites in the study area show a tendency to be in infertile areas, that are, on the other hand, close to fertile areas. Therefore, the following rural settlement model formulated for Pamphylia can be argued: a residential spot located in an infertile area that can control its surroundings, which are mainly fertile.

Based on the statistical analysis, another fact draws attention: rural sites in the region do not show a strong tendency to be located near major cities. In this sense, for example, we know that Lyrboton Kome, which is a large production centre of Perge, is not located in the vicinity of this city, although the city is surrounded by a rather fertile and flat area that is suitable for an agricultural-oriented settlement. Although the reason for the low density of rural settlements in the alluvial zones of Pamphylia may be due to the destruction caused by the modern urbanisation, this situation may also reflect an intentional division of the alluvial areas for agricultural use. Due to the arability of the Pamphylia plain, which is fed by major rivers

and streams, it may be claimed that agricultural products such as vegetables and fruits – which are less durable for transportation but occupy the essential part of human diet – might have been produced in this area. In this context, Von Thünen's ring model (Thünen, 1826), which has been implemented to the ancient countryside in Mainland Greece by Rizakis (2013), may apply to Pamphylia. Considering this model, a similar agricultural model may be claimed for the region. As a matter of fact, alluvial plains, which are close to the major Pamphylian cities, large or middle scale water resources, and are suitable for

agriculture, might have been reserved for the cultivation of agricultural products that are not ideal for long distance transportation, while products such as grains, grapes and olives – which are more durable and require less artificial irrigation – were possibly cultivated far from the main cities, often in less arable areas (Fig. 12). In this context, Strabo (XII. 7. 1) mentions the Selgians who cultivate olives on the hills near Aspendos, which are full of olive trees. This narration may be attested to the agricultural focus of hilltop and hillside settlements in Pamphylia and its surroundings.

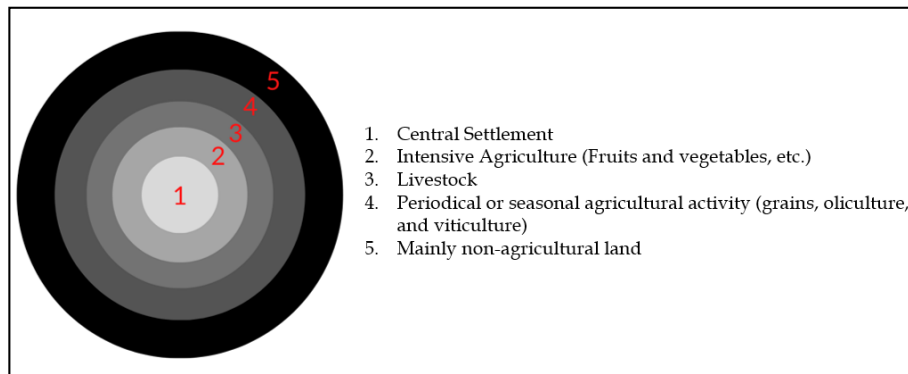


Figure 12. A simplified representation of Thünen's ring model adapted for Pamphylia

When the rural sites in Pamphylia are investigated, two distinctive settlement models draw attention; these models are hilltop and hillside settlements (Fig. 15). In fact, the abundance of hill settlements in the region, specifically in eastern Pamphylia, even drew Rott's attention in the early 1900s (Rott, 1908). Additionally, during his field survey in the territory of Sillyon, Küpper (1996) noted that rural sites are located on flat-topped hills and on slopes facing to Pamphylia plain. The reason for the concentration of rural

settlements on hills might be due to the goal and effort of taking advantage of terrace agriculture since it is a productive method for hot climate regions that experience hot and dry summers. As a matter of fact, the agricultural model mentioned above may be an important factor in explaining the density of hill and hillside settlements in the region. In this regard, the rural settlements Lyrboton Kome and Kocakepez Tepe, which are relatively well documented sites by surface surveys, are good examples of the hilltop settlement model in Pamphylia.

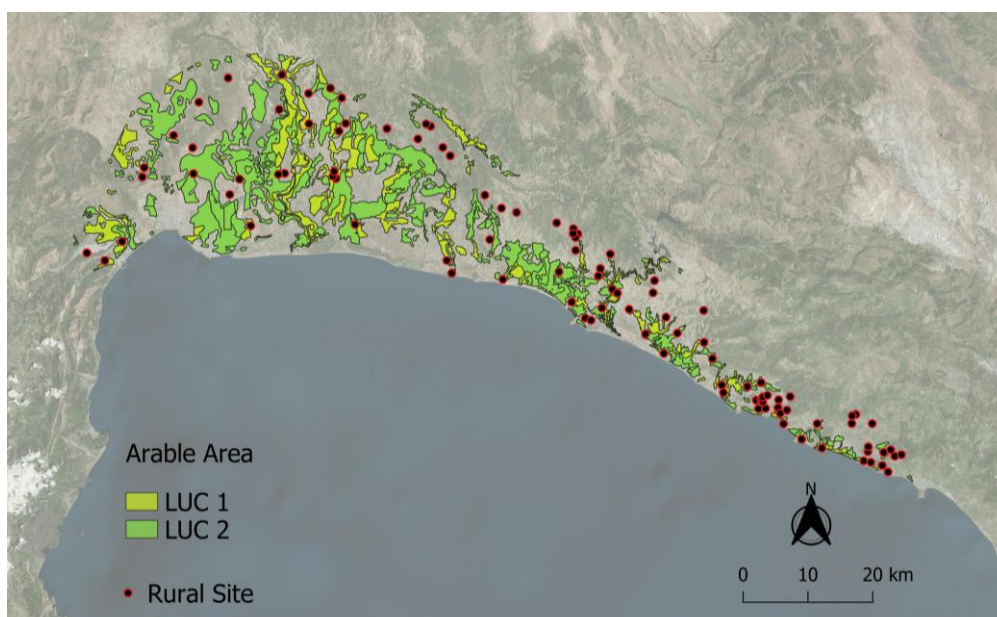


Figure 13. Map showing land use capacities LUC 1 and LUC 2 classed areas and rural sites (Map by Author).

There are no large water resources, which flow during all four seasons in the immediate vicinity of many rural sites in the region. It has been documented at some of the rural sites that the water requirement in the settlement, at least in the current state, was provided by cisterns and water reservoirs. These inferences may justify the spatial analysis results showing that the rural sites in the study area tend to concentrate in LUC 6 and LUC 7 classed zones, which are frequently close to fertile areas classified as LUC 1 and LUC 2 (Figs 11, 13).

As previously mentioned, numerous rural sites in the study area are located in the close vicinity of seasonal or potential water resources. Relying on this information the following inference may be considered: some rural sites in the region were mainly agriculture-oriented settlements that were possibly inhabited seasonally (Fig. 14).

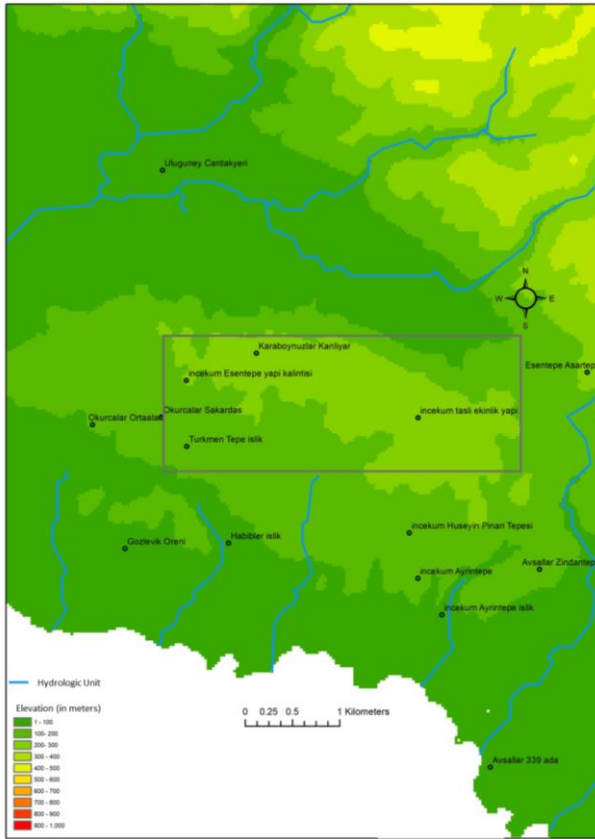


Figure 14. Map showing some of the settlements in Eastern Pamphylia that are possibly seasonal and agricultural-oriented (Map by Author).

Based on the locational tendencies of the rural settlements in Pamphylia, we may argue that the rural site distribution in the region was mainly shaped by practical and utilitarian factors that are based mainly on agricultural practices. Therefore, the majority of the settlements in the region seem to be agriculture-oriented. In connection with this argument, it can also

be claimed that the Pamphylian peasant seems to have made great effort to make significant use of the bedrock, just like the current examples in Lycia, which is an additional indicator of utilitarian habitation rural pattern. As a matter of fact, the technique of carving into bedrock has been frequently reported in the construction of *chamazorion* tombs and building foundations in the rural spots of the region. For example, bedrock cutting technique has been well documented at Lyrboton Kome (Çevik, 1997; Erdoğan, 2018) and Kocakepez Tepe (Bilgin, 2021), the region's relatively well-researched rural settlements. Frequent occurrence of rock cutting technique in the region supplements the fact that self-sufficiency was one of the core elements of Pamphylian countryside and the technique seems to have been chosen since it relies mainly on manpower rather than costly construction activities. As a parallel example, the rock cutting technique in architecture and tomb production is also frequently documented in Lycia. In this context, recent surface surveys conducted in Phaselis' territory have revealed a good example – a farmstead – formed around a rock. It could be observed that individuals of this farmstead placed their structures on bedrock and carved their tombs into the bedrock (Gürel et al., 2019).

It may also be worth noting that at least some of the hill settlements in the region might have been founded based on defensive purposes. However, the fact that no evidence of fortification has been documented for the vast majority of settlements in the region leads to questioning the predominance of a defence-oriented settlement model. In this regard, some minor sites dating from the fourth century BC to the fourth century AD are known to have existed in the flat areas of Pamphylia plain, which are not ideal for defensive occupation. For example, the remains that may belong to Masoura (SMM) in central Pamphylia, the necropolis of Attaleia -possibly Corycus- (Akman and Tosun, 2011), the remains in Arapsuyu in western Pamphylia (Spratt and Forbes, 1847; Çevik, 1994), possibly the rural bath located in western Pamphylia near the Mediterranean coast (Yener, 2011), and the workshop near the shore in eastern Pamphylia (Türkmen, 2015), suggest that defence in non-urban areas was not a priority in Pamphylia plain. Additionally, it is known that Pamphylia was not exposed to a long-term menace in antiquity at regional scale. Therefore, relying on the current evidence, it seems that the region must have had defensive occupations only in border areas and possibly on hills near major cities (Taşkıran, 2017). In this regard, although the current state in Pamphylia reflects the predominance of an agricultural-oriented settlement model in the region,

defence, of course, cannot be fully excluded as a locational factor. In this context, it can be thought that some settlements located on the borders of the region, especially in hilly areas, might have been founded based on defence as the priority. In this sense, although individual towers identified in the region, particularly in Eastern Pamphylia, might have been occupied as defensive spots, their exact functions are not clear yet. In fact, there is not one single model for explaining the functions of singular towers. Therefore, there is no consensus on the exact functions of the towers in the Greco-Roman world. In this context, for example, the examples that can be dated to the Late Hellenistic Period in Rough Cilicia are claimed to be watchtowers (Durugönül, 1998). Numerous towers on Thasos are identified as shelters and structures built to protect the local community (Bon, 1930). On the other hand, it is also possible that the Thasos towers might have been used for both agricultural and

defensive purposes, depending on the circumstances (Osborne, 1986). Similar examples on Leukas are claimed to be examples of civil architecture for private use (Morris, 2001). It has been claimed that the individual towers in Molossia in Epirus are structures that control the road network and are also functioned as monuments (Nakas, 2012). However, locational characteristics of the towers in Pamphylia (Fig. 2) imply that they might also have been used for agricultural purposes. The reason for this is that they are located on the slopes that are suitable for terrace agriculture, and they face the Pamphylia Plain, rather than the areas that might have required controlling, such as the border areas. Even today, local villagers adopt similar practices to prevent or retard rotting and spoiling of foods. However, some towers in remote areas might have been used for defence and surveillance at regional scale like similar examples (Akarca, 1998; Camp, 1991).



Figure 15. A selection of hilltop sites from the study area. Top left: Kocatepe in Kızılot (Eastern Pamphylia); top right: Kargılı Tepe in central Pamphylia. Bottom left: Google Earth satellite image of Kocatepe; bottom right: Google Earth satellite image of Kargılı Tepe (Photographs by Author).

Since surface finds constitute the main archaeological evidence from the Pamphylian countryside, the exact functions of the majority of the rural settlements in the region are not clear. However, the surface data and current state of archaeological evidence in the region indicate that a significant portion of the rural settlements in the region must have been small, self-sufficient settlements, which can be referred to as farm-

steads and villas. In this context, Ammianus' narration may shed light on the presence of a certain prevailing rural settlement model in the region. According to Ammianus (XXVII.9.6), when the Isaurarians came to the region they attacked the villas and wealthy settlements. Based on this, we may argue that villas and farmsteads may have been the widespread settlement model in the region. This argument supports the hypothesis mentioned in this study. In this

regard, it is worth drawing attention to Columella's, Varro's and Cato's narratives on farmsteads and agricultural practices, by keeping in mind the abundance of hill and hillside settlements in Pamphylia. Columella's (I.1) advice is to have a farm on a hill that is located in an area where climate is healthy, soil is fertile, close to a stream, partially flat, partially east or south facing slope, where crops can be transported. He also recommends planting olive trees and vineyards in hilly areas. Varro (I.6; I.13), on the other hand, is of the opinion that grain is better adapted to flat areas, while viticulture is more suitable for hills. Additionally, according to him, if there is no obstacle, farmsteads should be built on hills. Also, Cato (VI) states that the most ideal land for olives is a west-facing and sun-exposed land. Therefore, considering both the spatial characteristics of the settlements in the region and the ancient written sources, it can be thought that the majority of the hill settlements in Pamphylia might have been farmsteads and they might have mainly focused on agricultural practices such as oliculture and viticulture, benefiting from agricultural terraces as much as possible (Fig. 15). As mentioned earlier, these settlements reflect a regional trend of humble and self-sufficient occupations. In this context, as a similar example, the current research carried out in Chersonesus of Caria have revealed that the inner region settlements must have been self-sufficient settlements, highly engaged in terrace agriculture (Oğuz-Kırca and Demirciler, 2015).

In Attica, which has a partially rugged terrain, the modest farmsteads that are engaged in agriculture and spread throughout the region represent the rural landscape in the region (Dimakopoulos, 2016). In addition, a large number of rural settlements, identified during the surveys carried out in Boeotia between 1978 and 1987, have been identified as small-scale farmsteads, especially those dated to the Archaic, Classical and Early Hellenistic Periods (Bintliff and Snodgrass, 1985; Bintliff, 1991). As such, the settlements exemplified here show parallels with those in Pamphylia in terms of rural settlement trends and agricultural patterns. In the Mountainous Cilicia, on the other hand, it has been determined that olive oil workshops, which are close to settlements or cities, tend to be located in hilly areas that are suitable for terrace agriculture (Aydınoglu, 2008).

Although written evidence for agricultural production in Pamphylia is weak, it is still possible to argue interpretations relying on the current examples and generally accepted evidence. Firstly, it should be pointed out that, considering the climatic conditions in the region, the main agricultural products cultivated in Pamphylia must have included grains, olives and grapes (Brandt, 1992). Grain must have had an important place for Pamphylia, both as a nutritional

product and as a commercial commodity. As a matter of fact, the fact that it is easy to produce, lasts for a long time, and is rich in calories, brings grain to an advantageous position, making it privileged in people's daily diet. In this context, recent archaeobotanical studies carried out in western Anatolia and central Anatolia have shown the fundamental role cereal products played in the daily diet in antiquity (Fuller et al., 2012; Çakırlar and Marston, 2019). It is known from Philostratus (VA. 1.15) that grain constituted an essential part of the Aspendians' daily diet. Likewise, an inscription dating to second century AD and documented within the archaeological context of Arete Tower in Lyrboton Kome, reveals that bread was consumed by the villagers (Şahin, 1996). Additionally, Cicero (II.1.95) states that corn is collected in Pamphylia, along with Lycia, Pisidia and Phrygia. Finally, the relief on a recently discovered *sarcophagus* in western Pamphylia, depicting a farmer plowing a field (Çelik, 2019), may attest to grain cultivation.

Evidence for oliculture and viticulture in Pamphylia can also be found in written sources. According to Nollé (1993), the earliest evidence on the oliculture in Pamphylia dates to the fourth century BC. In this period, Pamphylia was possibly sending olive oil to Scythia (Nollé, 1993). According to *Expositio mund. Gent.* (45), Pamphylia was a self-sufficient region that exported its olive oil to other regions. More written evidence comes from Perge: an inscription dating to the first century AD refers to a place called Aronda, located in the vicinity of Perge, that had numerous vineyards (Şahin, 1999). Additionally, it has been reported that wine produced in Coracesium was exported to Egypt, and numerous amphorae carrying Coracesium wine were found in Egypt (Arca-Akdoğu et al., 2011).

In conclusion, based on the current evidence it can be claimed that the rural economy and agricultural production in Pamphylia must have mainly relied on oliculture, viticulture and grains. It seems that numerous rural settlements in the region focused on benefiting from arable land as much as possible by also practicing terrace agriculture frequently. Also, many hilltop and hillside settlements must have been practiced oliculture and viticulture.

As a matter of fact, unlike mid-western (Kaptan, 2008) and north-western Anatolia (Jesus, 1978; Pernicka, 1987; Pernicka et al. 2003), Pamphylia is not rich in mineral resources that can be used as a commodity. In this sense, according to *Expositio mund. Gent.* (45), Pamphylia is a self-sufficient region, which exports olive oil to other regions. Additionally, as can be inferred from Strabo's passage (XIV. 3), Pamphylia expanded its trade network to Italy and became an active actor in the Mediterranean trade from at least the first century BC onwards. Therefore, it can be claimed

that agricultural activity in Pamphylia must have been intense, since it was the main source of commercial activity in the region.

6. CONCLUSION AND DISCUSSION

With this study, the rural sites in Pamphylia are discussed, and the settlement patterns in the region are examined relying on the available archaeological evidence and various major environmental and anthropogenic datasets for the first time. The rural site data, which is the backbone of this study, was obtained from The Committee on Conservation of Cultural Assets in Antalya. This data has also been supplemented with the researched rural settlements in the region, by reviewing the available literature. As a result, 99 points could be classified as rural sites within the study area. These sites are included in and analysed with the spatial and statistical analyses in this study.

The environmental and anthropogenic factors, which are considered effective on the spatial aspects of Pamphylian countryside, have been investigated through geographic information systems-based spatial analysis applications performed in Quantum GIS 3.24.0, descriptive statistics, and Kolmogorov-Smirnov Goodness-of-Fit Tests.

The results of descriptive statistics and Kolmogorov-Smirnov tests have indicated that there are locational associations between the rural sites and the following factors: elevation, slope percentage, proximity to hydrologic units, proximity to ancient road network and land use capability classes. On the other hand, no locational association could be detected for the planar distances between the rural sites and major Pamphylian towns through the statistical analyses and the cost surface analysis that supplements the statistical results.

The outcome of the proximity analyses can be perceived as a promising step in shaping the future work in the region. In this regard, it should be pointed out that there is a strong association between the GIS-generated hydrologic units and the rural sites. Also, it has been revealed that there is statistically a strong association between the road network and the rural sites. This result may also be considered to offer supplementary insight into the ancient road network in Pamphylia, which has produced fragmentary data so far.

Considering the fact that the predominant portion of the current archaeological evidence on agricultural activity in Pamphylia comes from the rural sites, the observed association between the land use capability classes and rural site distribution has provided important insights into the agricultural practices in the region. In this sense, it has been revealed that there is a locational pattern between these classes and the rural

site distribution. Contrary to wide acceptance, it has been observed that the majority of sites in the study area do not tend to be located in fertile spots, although they still often tend to be located near fertile areas. In this study this pattern has been associated with the possible common settlement model in the study area, which is represented by self-sufficient and agriculture-centred settlements and the agricultural practices in the region's countryside. In other words, it seems that the fertile areas and/or the areas that are close to major rivers were mainly allocated to agriculture. In this regard, the abundance of hilltop and hillside settlements, which are located in infertile or partially fertile spots, correlates the statistical evaluation of the relationship between the rural site distribution and land use capability properties in the study area.

The evaluations of ancient sources, the rural landscape and researched rural settlements in the region, site registration reports, satellite images, and spatial and statistical analyses leads to the inference that Pamphylia might have harboured numerous modest settlements that were predominantly self-sufficient. The majority of these settlements may be classified as farmsteads or villas. In this context, it has been reported that the majority of settlements have cisterns that can supply needs to a small population, and the building remains, and sites do not spread over a large area in the majority of the settlements. As also revealed by the spatial analysis, it may also be argued that some of the rural sites were possibly inhabited seasonally.

It is noteworthy to indicate that the locational trends may vary from area to area in the region. In this regard, although the rural locational patterns highlighted in this study seem reasonable to accept, future fieldworks that will be carried out in the region's countryside will likely allow us to obtain more evidence on locational trends, the patterns behind the agricultural production, and in particular the functional properties of settlements. Thus, it will be possible to test the hypotheses put forward in this study with new data. In this context, this study endeavours to provide a basis for future studies. In addition to this, future fieldwork also has the potential for providing more textual evidence. Thus, it can be expected to expand our knowledge on the expansion of urban centres in Pamphylia and cultural organisational aspects of Pamphylian countryside. In this context, although Pamphylian countryside seems to have mainly consisted of small-scale rural occupations, the well documented rural organisations such as *dikomia*, *trikomia* (Schuler, 1998), or even *pentakomia* (Bean, 1986; Hild, 2004) may have been experienced in some areas in Pamphylia as well. As a result, similar

and/or a complex rural organisation, which can be revealed by further research, may be expected for Pamphylia.

Future research and fieldwork, which may benefit from geoarchaeology and archaeogeophysics (Liritzis et al., 2022) are required also for understanding and

shedding light on the possible terrestrial and hydrological changes that might have been other determinants in shaping the past human activity in the study area. Thus, the observed rural settlement patterns and site distribution in Pamphylia can be explained more elaborately.

AUTHOR CONTRIBUTION: Conceptualization, A.A. and E.Ö.; methodology, A.A.; software, A.A.; validation, A.A., E.Ö.; formal analysis, A.A.; investigation, A.A.; resources, A.A.; data curation, A.A.; writing – original draft preparation, A.A. and E.Ö.; writing – review and editing, A.A.; visualization, A.A.; supervision, A.A.; All authors have read and agreed to the published version of the manuscript.

ACKNOWLEDGMENTS

We would like to thank The Committee on Conservation of Cultural Assets in Antalya (Kültür Varlıklarını Koruma Kurulu), all its staff and especially Mr. Kenan Çolak for their helps in the data acquisition process, and for their sincere guidance. We would also like to thank all the researchers who have worked on and paid attention to Pamphylia's countryside. We thank anonymous referees for very constructive comments. Alper Aşınmaz is Post-Doctoral Researcher at Koc University.

REFERENCES

- Akarca, A. (1950) Varsak Kerch Vazosu. *Belleten*, Vol. 53/14, pp. 32-36.
- Akman, A. and Tosun, A. (2011) Attaleia Nekropolü (Eski Doğu Garajı – Halk Pazarı Mevkii) Kurtarma Kazısı 2010 Yılı Çalışmaları. *Müze Çalışmaları ve Kurtarma Kazıları Sempozyumu*, Vol. 20, Bodrum, April 2011, pp. 47-67.
- Alcock, S. (1996) *Graecia Capta: The Landscapes of Roman Greece*. Cambridge, Cambridge University Press.
- Ammianus (1935) *Ammianus Marcellinus*. J. C. Rolfe (trans.), London, Harvard University Press.
- Arca-Akdoğan, E., Gökalp, N. and Tüner-Önen, N. (2011) "Pamphylia Bölgesi'nin Mısır ve Kıbrıs ile Olan İlişkileri. *Olba*, Vol. 19, pp. 287-312.
- Arslan, M. and Tüner-Önen, N. (2013) 2012 Yılı Phaselis Antik Kenti ve Teritoryumu Yüzey Araştırması. *Araştırma Sonuçları Toplantısı*, Vol. 31, Muğla, May 2013, pp. 78-89.
- Arslan, M. and Tüner-Önen, N. (2013) 2015 Yılı Phaselis Antik Kenti ve Teritoryumu Yüzey Araştırması. *Araştırma Sonuçları Toplantısı*, Vol. 34, Edirne, May 2016, pp. 355-368.
- Athanasion, R. (2013) Rural Structures and Agrarian Strategies in Greece Under the Roman Rule. *Villae rusticae: Family and market-oriented farms in Greece under Roman rule: Proceedings of an international congress held at Patrai, 23-24 April 2010*, Patrai, April 2010, pp. 20-51.
- Aydinoğlu, Ü. (2008) Olive Oil Production in Rough Cilicia: Production Installations – Settlement Pattern – Dating. *Olive Oil and Wine Production in Anatolian During the Antiquity, International Symposium*, Mersin, December 2008, pp. 1-18.
- Aydinoğlu, Ü. (2010) "The Farms in Rough Cilicia in the Roman and Early Byzantine Periods. *Adalya*, Vol. 13, pp. 243-282.
- Ayşe, A. G. (2005) Antik Grek Yerleşim Tipleri, Kavramlar ve Tartışmalar. *Olba*, Vol. 12, pp. 69-83.
- Bean, G. E. (1986) *Kleinasien: ein Kunst- und Reiseführer zu den klassischen Stätten Bd. 4 Lykien*. Stuttgart, Kohlhammer.
- Beaufort, F. (1818) *Karamania, Or, A Brief Description of the South Coast of Asia-Minor and of the Remains of Antiquity with Plans, Views, &c.* London, R. Hunter.
- Bilgin, M. (2021) "Silyon Territoriyumu'nda Bulunan Kepez Yerleşiminin Kırmızı Astarlı Seramikleri Üzerine Ön Değerlendirmeler. *Arkhaia Anatolica – Anadolu Arkeolojisi Araştırmaları Dergisi*, Vol. 4, pp. 175-214.
- Bintliff, J. (1991) The Roman Countryside in Central Greece: Observations and Theories from the Boeotia Survey (1978-1987). In *Roman Landscapes. Archaeological Survey in the Mediterranean Region*, B. G. Lloyd (ed.), London, The British School at Rome, pp. 122-132.
- Bintliff, J. and Snodgrass A. (1985) The Cambridge/Bradford Boeotian Expedition: The First Four Years. *Journal of Field Archaeology*, Vol. 12, pp. 123-161.
- Bon, A. (1930) Les ruines antiques dans l'île de Thasos et en particulier les tours helléniques. *Bulletin de correspondance hellénique*, Vol. 54, pp. 147-194.
- Brandt, H. (1992) *Gesellschaft und Wirtschaft Pamphyliens und Pisidiens im Altertum*. Bonn, Rudolf Habert.
- Brixhe, C. (1976) *Le Dialecte grec de Pamphylie: Documents et Grammaire*. Paris, A. Maisonneuve.

- Bulut, S. (2018) Lykia'da Zeytinyağı ve Şarap Üretimi Üzerine Bir Ön Değerlendirme. *Cedrus*, Vol. 6, pp. 675-700.
- Çakırlar, C. and Marston, J. M. (2019) Rural Agricultural Economies and Military Provisioning at Roman Gordion (Central Turkey). *Environmental Archaeology, The Journal of Human Paleocology*, Vol. 24, pp. 91-105.
- Cato (1934) *Cato and Varro on Agriculture*. W. D. Hooper and H. B. Ash (trans.), Cambridge, Harvard University Press.
- Çelgin, V. (2008) Anydros-Eudokias, Suyla Hayat Bulan, İnsan Eliyle Yok Olan Bir Kültür Mirası ve Düşündürdükleri. *Colloquium Anatolicum*, Vol. 7, pp. 23-57.
- Çelik, A. (2019) Hurma Çiftçi Lahdi. *Phaselis*, Vol. 5, pp. 231-249.
- Çevik, N. (1995) Antalya-Hurma Köyü'nde Bir Çiftlik Yerleşimi. *Lykia*, Vol. 2, pp. 39-61.
- Çevik, N. (1996) Kent Antalya'nın Arkeolojik Envanteri Projesi II: Hurma Köy Yüzey Araştırmaları. *Araştırma Sonuçları Toplantısı*, Vol. 14, Ankara, May 1996, pp. 235-251.
- Çevik, N. (1997) An Olive Oil Production Center in Pamphylia: Lyrboton Kome. *Lykia*, Vol. 3, pp. 79-101.
- Çevik, N. (2017) Lyrboton Kome Excavations 2016 First Season Activities. *Anmed-Anadolu Akdenizi Arkeoloji Haberleri*, Vol. 15, pp. 301-311.
- Çevik, N. and Gülşen, F. (1998) Kent Antalya'nın Arkeolojik Envanteri Projesi III: Varsak (Lyrboton Kome) Yüzey Araştırması. *15. Araştırma Sonuçları Toplantısı*, Ankara, 1998, pp. 365-372.
- Çevik, N., Varkıvanç, B., Bulut, S. and Kızıgut, İ. (2004) Eine fast vergessene Stadt Die Wiederentdeckung der Stadt Trebenna im lykischpamphylischpisidischen Grenzgebiet. *Antike Welt*, Vol. 35, pp. 41-49.
- Columella (1954) *Columella on Agriculture: Book 5-9*. E. S. Forster and E. H. Heffner (trans.), Cambridge, Harvard University Press.
- Conolly, J. and Lake, M. (2006) *Geographical Information Systems in Archaeology*. Cambridge, Cambridge University Press.
- d'Anville, J. B.
- De Jesus, P. S. (1978) Metal Resources in Ancient Anatolia. *Anatolian Studies*, Vol. 28, pp. 97-102.
- Dimakopoulos, S. (2016) The Classical and Hellenistic Agricultural Landscape of Attica. *Landscape in the Past & Forgotten Landscapes (Cracow Landscape Monographs 2)*, P. Kołodziejczyk and B. Kwiatkowska-Kopka (ed.), Krakow, Institute of Archeology Jagiellonian University in Kraków, pp. 187-196.
- Diodorus Siculus (1954) *Diodorus Siculus. Library of History, Volume X: Books 19.66-20*. R. M. Geer (trans.), Cambridge, Harvard University Press.
- Doğan, S. (2005) Alanya ve Çevresinde Bizans Araştırmaları 2004. *Araştırma Sonuçları Toplantısı*, Vol. 23, Antalya, June 2005, pp. 135-146.
- Doğan, S. (2006) Alanya ve Çevresinde Bizans Araştırmaları 2005. *Araştırma Sonuçları Toplantısı*, Vol. 24, Çanakkale, May 2005, pp.533-544.
- Doğan, S. (2007) Alanya ve Çevresinde Bizans Araştırmaları 2006. *Araştırma Sonuçları Toplantısı*, Vol. 25, Çanakkale, May 2006, pp. 135-146.
- Doğan, S. (2008) Alanya ve Çevresinde Erken Hıristiyan - Bizans Evleri ve Kırsal Yaşam. In *Anadolu ve Çevresinde Ortaçağ 2*, M. Kadıroğlu (ed.), Ankara, Türkiye, pp. 1-20.
- Durugönül, S. (1998) *Türme und Siedlungen im Rauhen Kilikien: eine Untersuchung zu den archäologischen Hinterlassenschaften im Olbischen Territorium*. Bonn, Rudolf Habelt.
- Ercenk, G. (1992) Pamphylia Bölgesi ve Çevresi Eski Yol Sistemi. *Belleten*, Vol. 56/216, pp. 361-370.
- Erdoğan, O. (2018) *Pamphylia Lyrboton Kome Kırsal Yerleşimi: Geç Antik Çağ'da Yerleşim Kurgusu ve Mimarlık*. Unpublished Ph.D. Dissertation, Akdeniz University, Antalya, Türkiye.
- Expositio mund. Gent. (1966) *Expositio totius mundi et gentium*. J. Rougé (ed.), Paris, Éditions du Cerf.
- Finzi, C. V. and Higgs, E. S. (1970) Prehistoric Economy in the Mount Carmel Area of Palestine: Site Catchment Analysis. *Proceedings of the Prehistoric Society 36*, London, U.K.
- Fletcher, M. and Lock, G. R. (2005) *Digging Numbers: Elementary Statistics for Archaeologists*. Oxford, Oxford University School of Archaeology.
- French, D. H. (1991) Sites and Inscriptions from Phrygia, Pisidia and Pamphylia. *Epigraphica Anatolica*, Vol. 17, pp. 51-68.
- French, D. H. (1992) 1991 Yılı Roma Yolları, Miltaşları ve Yazıtları Araştırması. *Araştırma Sonuçları Toplantısı*, Vol. 10, Ankara, May 1992, pp. 199-206.
- French, D. H. (1994) 1993 Yılı Küçük Asya Roma Yolları ve Miltaşları. *Araştırma Sonuçları Toplantısı*, Vol. 12, Ankara, May 1994, pp. 29-37.

- French, D. H. (2016) Roman Roads and Milestones in Asia Minor: Vol. 4 The Roads, Fasc. 4.1 Notes on the Itineraria, *British Institute at Ankara Electronic Monograph 10*, 2016, pp. 1-86.
- Fuller, B., Cupere, B. D., Marinova, E., Van Neer, W., Waelkens, M. and Richards, M. (2012) Isotopic reconstruction of human diet and animal husbandry practices during the Classical-Hellenistic, Imperial, and Byzantine periods at Sagalassos, Türkiye. *American Journal of Physical Anthropology*, Vol. 149/2, pp. 1-16.
- Gaffney, V. and Stancic, C. (1991) *GIS Approaches to Regional Analysis: A Case Study of the Island Hvar*. Ljubljana, Znanstveni institut Filozofske Fakultete.
- Gümüş, M. G., Durduran, S.S., Bozdağ, A. and Gümüş, K. Gis Investigation of Site Selection of Historical Structures: The Case of Knidos (Datça, Turkey). *Mediterranean Archaeology and Archaeometry*, Vol. 17/2, pp. 149-157.
- Gürel, B., Akçay, A. and Önen-Tüner, N. (2019) Phaselis Teritoryumu'nda Kolalemis ve Ailesine Ait Khamosorion ve Çiftlik Yerleşimi. *Phaselis*, Vol. 5, pp. 413-424.
- Hacıgüzeller, P. (2007) "Testing Spatial Patterns and Hypotheses at Minoan Palaikastro, Greece. In *Digital Discovery. Exploring New Frontiers in Human Heritage. CAA2006. Computer Applications and Quantitative Methods in Archaeology. Proceedings of the 34th Conference*, J. T. Clark and E. M. Hagemester (ed.), Fargo, U.S.A., pp. 632-638.
- Heberdey, R. and Wilhelm, A. (1896) Reisen in Kilikien. Ausgeführt 1891 und 1892 im Auftrage der Kaiserlichen Akademie der Wissenschaften. *Dph ÖAW 44*, pp. 1-168.
- Hierocles (1893) *Hieroclis Synecdemus*. A. Burckhardt (trans.), Leipzig, Teubner.
- Hild, F. (2004) Komai in Lykien. *Gephyra*, Vol. 1, pp. 119-126.
- Hill, D. (2019) The formation and development of political territory and borders in Ionia from the Archaic to the Hellenistic Periods: A GIS analysis of Regional Space. *Journal of Greek Archaeology*, Vol. 4, pp. 96-129.
- Hodder, I. and Orton, C. (1976) *Spatial Analysis in Archaeology*. Cambridge, Cambridge University Press.
- İplikçioğlu, B. (2002) Doğu ve Kuzeydoğu Lykia-Güneybatı Pisidia Epigrafik-Tarihi Coğrafi Yüzey Araştırmaları Projesi 2000 Yılı Çalışmaları. *Araştırma Sonuçları Toplantısı*, Vol. 19, May 2001, Ankara, pp. 127-132.
- İplikçioğlu, B., Çelgin, A. V. and Çelgin, G. (1998) Termessos Egemenlik Alanı Epigrafik Tarihi Yüzey Araştırmaları 1997. *Araştırma Sonuçları Toplantısı*, Vol. 16, May 1998, Tarsus.
- Kaptan, E. (2008) Metallurgic Residues from Late Chalcolithic and Early Bronze Age Liman Tepe. *Proceedings of the International Symposium the Aegean in the Neolithic, Chalcolithic and the Early Bronze Age*, Urla, October 1997, pp. 243-250.
- Kartal, M. *Bilimsel Araştırmalarda Hipotez Testleri: Parametrik ve Nonparametrik Yöntemler*. Ankara, Nobel.
- Keil, J. (1926) Die Lyrboton Kome in Pamphylien, Jahreshefte des Österreichischen Archäologischen Instituts in Wien, Vol. 23, pp. 89-126.
- Köse, V. (2011) Aspendos Yüzey Araştırmaları 2010 Sezonu Çalışmaları. *Araştırma Sonuçları Toplantısı*, Vol. 29, Malatya, May 2011, pp. 251-268.
- Küpper, M. (1996) Sillyon, Research Work 1995. *Araştırma Sonuçları Toplantısı*, Vol. 14, Ankara, May 1996, pp. 451-462.
- Küpper, M. (1998) Sillyon, Bericht Über Die Arbeiten 1996. *Araştırma Sonuçları Toplantısı*, Vol. 16, Tarsus, May 1998, pp. 475-496.
- Kvamme, K. L. (1990) One-Sample Tests in Regional Archaeological Analysis: New Possibilities through Computer Technology. *American Antiquity*, Vol. 5/2, pp. 367-382.
- Lanckoronski, K. G. (2005) *Pamphylia ve Pisidia Kentleri 1. Cilt: Pamphylia*. İstanbul, AKMED.
- Le Bruyn, C. (1732) *Voyages de Corneille Le Bruyn au Levant, c'est-à-dire, principaux Endroits de L'Asie mineure, dans les Isles de Chio Rhodes, Chypre, & c. De breast que dans les plus considerables Villes d'Egypte, Syria, & Terre Sainte. Tome Seconde: Ou sont les plus celebres representees Villes, Pais, Bourgs, & autres choses dignes also remarque, le tout d'apres Nature dess: Corneille Le Bruyn*. Den Haag, Guillaume Cavelier.
- Leake, W. M. (1824) *Journal of a Tour in Asia Minor: With Comparative Remarks on the Ancient and Modern Geography of That Country*. London, John Murray.
- Li, K., Gong, P., Hu, H., Jia, W., Liu, X. and Gao, W. (2021) Spatial Variability of Human Subsistence Strategies During the Longshan Period (~4.6-~3.9 Ka Bp) and Its Possible Physical Environmental Contexts in The Yellow-Huai River Area, East China. *Scientific Culture*, Vol. 7/3, pp. 105-116.
- Liritzis, I. Evelpidou, N. Fikos, I. Stambolidis, A. Diamanti, N. Roussari, T. Tzouxanioti, M. Louvaris, P. and Tsokas, G.N. (2022). Novel Combined Approach of GIS and Electrical Tomography to Identify

- Marsh/Lake at Kastrouli Late Mycenaean Settlement (Desfina, Greece). *Quaternary*, Vol. 5/26, pp. 1-17.
- Lucas, P. (1712) *Voyage du Sieur Paul Lucas, Fait Par Ordre du Roy Dans La Grece, L'asie Mineure, La Macedoine et L'afrique: Tome Premier*. Paris, Nicolas Simart.
- Lynn, I., Manderson, A., Page, M., Harmsworth, G., Eyles, G., Douglas, G., Mackay, A. and Newsome, P. (2009), *Land Use Capability Survey Handbook: A New Zeland Handbook for the Classification of Land*. Lower Hutt, AgResearch; Landcare Research New Zealand; Institute of Geological and Nuclear Sciences.
- Metzger, H. (1952) Tête en terre cuite du Musée d'Adalia. *Revue des Études Anciennes*, Vol. 54, pp. 13-17.
- Morris, S. P. (2001) The Towers of Ancient Leukos: Results of a Topographic Survey. *Hesperia*, Vol. 70, pp. 285-347.
- Nakas, Y. D. (2012) Isolated Towers in the Fortification Network of Ancient Molossia: A Case Study. *Fokus Fortifikation Conference on the Research of Ancient Fortifications*, Athens, December 2012, pp. 426-435.
- Nollé, J. (1993) *Side im Altertum. Geschichte und Zeugnisse Band I*. Bonn, Rudolf Habelt.
- Oğuz-Kırca, E. D. (2014) Restructuring the Settlement Pattern of a Peraean Deme Through Photogrammetry and GIS: The Case of Phoinix. *Mediterranean Archaeology and Archaeometry*, Vol. 14/2, pp. 281-313.
- Oğuz-Kırca, E. D. (2015) The Chora and the Core: A General Look at the Rural Settlement Pattern of (Pre)Hellenistic Bozburun Peninsula, Turkey. *Pamukkale Üniversitesi Sosyal Bilimler Enstitüsü Dergisi*, Vol. 20, pp. 33-62.
- Oğuz-Kırca, E. D. and Demirciler, V. (2015) Antik Dünya'da Kırsal Ekonomi: Karia Kersonesos'undan Yeni Kanıtlar. *Anadolu*, Vol. 41, pp. 51-76.
- Onur, F. (2005) Trebenna Tarihi. In *Trebenna: Tarihi, Arkeolojisi ve Doğası*, N. Çevik, B. Varkıvanç and E. Akyürek (ed.), İstanbul, AKMED, pp. 7-20.
- Ormerod, H. A. and Robinson, E. S. G. (1911) Notes and Inscriptions from Pamphylia. *The Annual of the British School at Athens*, Vol. 17, pp. 215-249.
- Ormerod, H. A. and Robinson, E.S.G. (1911) Notes and Inscriptions from Pamphylia. *The Annual of the British School at Athens*, Vol. 17, pp. 215-249.
- Osborne, R. (1986) Island Towers: The Case of Thasos. *The Annual of the British School at Athens*, Vol. 81, pp. 167-178.
- Özer, E. (2011) 2010 Yılı Sillyon Antik Kenti ve Çevresi Yüzey Araştırması. *Araştırma Sonuçları Toplantısı*, Vol. 29, Malatya, May 2011, pp. 33-48.
- Özer, E. and Taşkıran, M. (2010) 2009 Yılı Sillyon Antik Kenti ve Çevresi Yüzey Araştırması. *Araştırma Sonuçları Toplantısı*, Vol. 28, İstanbul, May 2010, pp. 279-296.
- Panagiotidis, V. V. and Zacharias, N. (2022) Digital Mystras: An Approach Towards Understanding the Use of an Archaeological Space. *Scientific Culture*, Vol. 8, No 3, pp. 89-103.
- Paribeni, R., Romanelli, P. (1914) Studi e ricerche archaeologiche: nell'Anatolia meridionale. *Monumenti Antichi Pubblicati Per Cura Della Reale Accademia Dei Lincei*, Vol. 23, pp. 5-274.
- Pernicka, E. (1987) Erzlagerstätten in der Ägäis und ihre Ausbeutung im Altertum: Geochemische Untersuchungen zur *Herkunftsbestimmung archäologischer Metallobjekte*. *Jahrbuch Des Römisch-Germanischen Zentralmuseums*, Vol. 34, pp. 607-714.
- Pernicka, E., Eibner, C., Öztunalı, Ö. and Wagner, G. A. (2003) Early Bronze Age Metallurgy in the North-East Aegean. In *Troia and the Troad: Scientific Approaches*, G. A. Wagner, E. Pernicka and H. P. Uerpmann (ed.), Heidelberg, Springer, pp. 143-172.
- Plinius (1855) *The Natural History: Pliny the Elder*. J. Bostock (trans.), London, Taylor and Francis.
- Ptolemy (1845) *Claudii Ptolemaei Geographia*. K. F. A. Nobbe (ed.), Leipzig, Sumptibus et typis Caroli Tauchnitii.
- Roper, D. C. (1979) The Method and Theory of Site Catchment Analysis: A Review. *Advances in Archaeological Method and Theory*, Vol. 2, pp. 119-140.
- Rott, H. (1908) *Kleinasiatische Denkmäler aus Pisidien, Pamphylien, Kappadokien und Lykien: darstellender Teil*. Leipzig, Dieterich'sche Verlagsbuchhandlung Theodor Weicher.
- Ruge, W. (1949) Pamphylia. *Real Encyclopädie der klassischen Altertumswissenschaft*, Vol. 13, pp. 354-407.
- Şahin, S. (1996) Perge Territoriumundaki Antik Varsak Yerleşimi: Lyrboton Kome-Elaibarıs. *Çağlar Boyunca Anadolu'da Konut Sempozyumu*, İstanbul, June 1996, pp. 437-445.
- Şahin, S. (1999) *Die Inschriften von Perge: Teil 1*. Bonn, Rudolf Habelt.
- Şahin, S. (2001) Epigraphische um Mitteilung aus Antalya V: Olbia und andere Küstenort bei Einigen dem Band in Westpamphylien. *Epigraphica Anatolica*, Vol. 33, pp. 145-167.

- Şahin, S. (2002) Pamfilya/Likya Sınır Kentleri: Olbia ve Diğerleri. In *Likya İncelemeleri 1*, M. Adak (ed.), İstanbul, Arkeoloji ve Sanat Yayınları, İstanbul, pp. 9-32.
- Schuler, C. (1998) *Ländliche Siedlungen und Gemeinden im hellenistischen und römischen Kleinasien*. Munich, C. H. Beck.
- Selvi, H. Z., Bozdağ, A., Bozdağ, İ., Karauğuz, G. Spatial Analysis of the Eflatunpınar and Fasillar Hittite Monuments Using GIS (2020) *Mediterranean Archaeology and Archaeometry*, Vol. 20/3, pp. 243-256.
- SMM (2017) Stadiasmus Maris Magni, Anonim Birine Ait Büyük Deniz Kılavuzu veya Seyrüseferi. Ö. Acar (trans.), *Libri*, Vol. 3, pp. 388-433.
- Spratt, T. A. B. and Forbes, E. (1847) *Travels in Lycia, Milyas and the Cibyrtis*. London, John van Voorst.
- Stephanus Byzantinus (1678) *Stephanos Peri Poleon: Stephanus De Urbibus*. Amstelodami, Typis Jacobi de Jonge.
- Strabo (2015) *Antik Anadolu Coğrafyası Kitap: XII-XIII-XIV*, A. Pekman (trans.), İstanbul, Arkeoloji ve Sanat Yayınları.
- Talbert, R. J. A. (2000) *Barrington Atlas of the Greek and Roman World*. Princeton, Princeton University Press.
- Talbert, R. J. A. (2010) *Rome's World: The Peutinger Map Reconsidered*. Cambridge, Cambridge University Press.
- Taşkıran, M. (2017) *Sillyon Antik Kenti Savunma Sistemi ve Pamphylia Bölgesindeki Konumu*. Unpublished Ph.D. Dissertation, Pamukkale University, Denizli, Türkiye.
- Thünen, J. H., (1826) *Der isolirte Staat in Beziehung auf Landwirthschaft und Nationalökonomie*. Hamburg, Friedrich Perthes.
- Tobler, W. (1993) *Three Presentations on Geographical Analysis and Modeling: Non-isotropic Geographic Modeling; Speculations on the Geometry of Geography; and Global Spatial Analysis*. Santa Barbara, NCGIA.
- Tomaschitz, K. (1998) *Unpublizierte Inschriften Westkilikiens aus dem Nachlaß T. B. Mitfords*. Wien, Etam 21.
- Tosun, A. (2008) Lara-Fener Mahallesi, 1975 Sokak, 5745 Ada, 15 Parsel Mezar Kurtarma Kazısı. *Müze Çalışmaları ve Kurtarma Kazıları Sempozyumu*, Vol. 17, Side, May 2008, pp. 89-102.
- Türkmen, S. (2015) Antalya, Alanya, Avsallar Mahallesi, İncekum Tabiat Parkı, Zeytin İşliği Kurtarma Kazısı. *Müze Kurtarma Kazıları Sempozyumu ve 1. Uluslararası Müzecilik Çalıştayı*, Vol 24, Şanlıurfa, March 2015, pp. 89-102.
- Vanpool, T. L. and Leonard, R. D. (2010) *Quantitative Analysis in Archaeology*. London, Wiley-Blackwell.
- Varro (1912) *Varro on Farming*. L. Storr-Best (trans.), London, G. Bell and sons.
- Wheatley, D. and Gillings, M. (2002) *Spatial Technology and Archaeology: The Archaeological Applications of GIS*. London, Taylor&Francis.
- Yener, A. (2011) Antalya-Gürsu Roma Hamamı Kazısı. *Türk Arkeoloji ve Etnografya Dergisi*, Vol. 11, pp. 17-31.