The Chora of Camarina from Archaic to Roman Times: a Sustainable Cultural Landscape?

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Interest in economic pressures on the environment is a rather new topic in archaeology. In the last four decades, several scholars and their studies focussed on landscape archaeology and ecological change.[1] While especially earlier studies have highlighted possible reasons for landscape change and ecological problems, approaches have also emphasized biases for research. Recent publications have also dealt with risk avoidance strategies and schemes of the ancient settlers to consolidate their cultural landscapes.[2]

The following case study from Camarina,[3] in Sicily, will add another view on landscape change and its implications for settlement patterns in antiquity, looking especially for problems in maintaining the landscape and efforts to guarantee sustainability.

Archaeological investigations in the chora of Camarina have evidenced a land division. Much like in Metaponto and the Black Sea area, the area surrounding the polis shows regular divisions of kleroi from the 5th and 4th centuries BC until Hellenistic times. Farms, streets, and other infrastructure were aligned to the city grid.[4]

The city itself experienced several periods of instability and change during antiquity. The third foundation of the city in 461 BC aimed at persistence, but external circumstances led again to disruptive phases. Camarina suffered destructions by the Mamertines in 275 BC and was conquered by the Romans in 258 BC during the First Punic War. These events have been interpreted as a deadly blow for Camarina, especially at the early stages of archaeological research in Camarina.[5] Investigations that are more recent have shown that there is no absolute break in the settlement patterns. Archaeological evidence for rural sites in the wider territory, mainly alongside the rivers, and continued use of structures on the acropolis do evidence a continuity of settlement.[6] The Göttingen surface survey has shown that the regular Greek grid of farmsteads fell out of use before the Roman expansion in southeastern Sicily. The sites of the Roman phases are dispersed in the hinterland. The latest archaeological evidence from the acropolis was dated between 50 BC and 50 AD.[7] The settlement of Caucana and its harbor became a more suitable nucleus of Roman activities in the area.[8]

Landscape Reconstruction

The rivers Ippari and Oanis and their adjacent plains are the dominant features of the modern landscape. The area developed into a swamp later and was ameliorated in the 19th century to create arable farmland. Moreover, the promontory near the coast, which housed the ancient city (fig. 1), is an important point of reference. The annual precipitation of the area amounts today to between 501–550 mm,[9] and it is safe to

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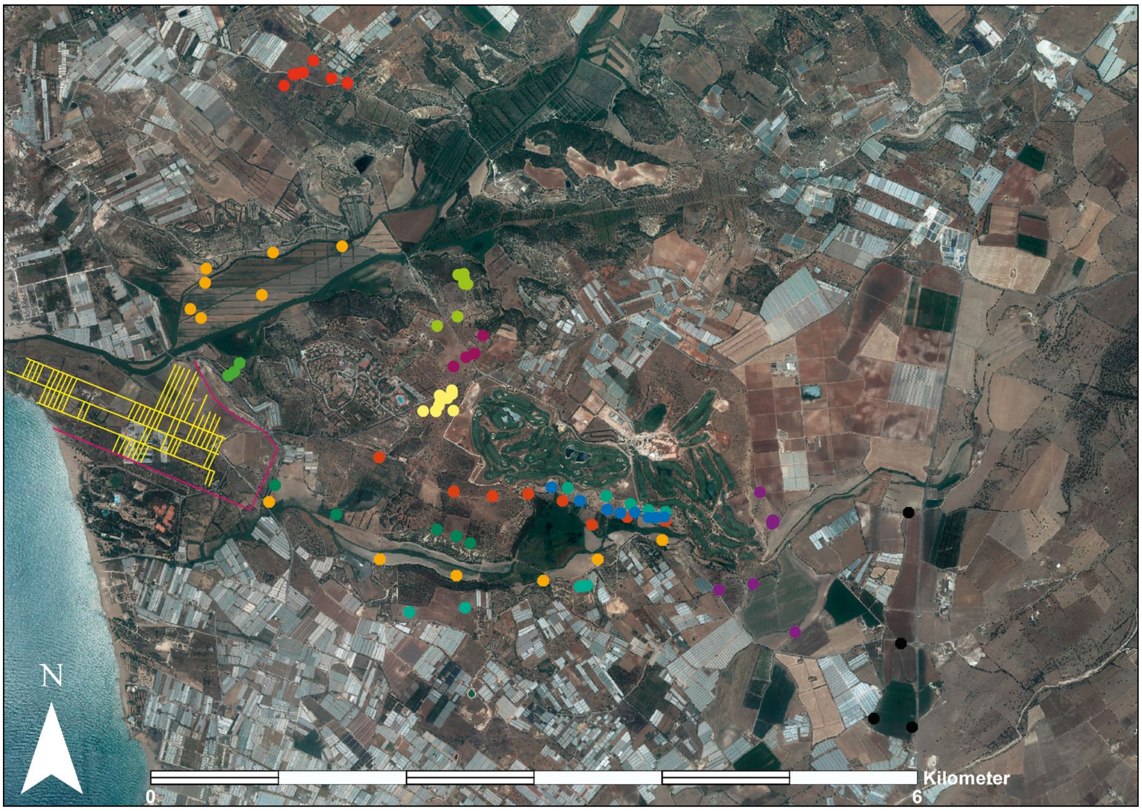

Fig. 1: Satellite Image of the area around ancient Camarina.

assume, that the ancient city of Camarina received its water from the hilly hinterland. Furthermore, numerous indications of rock-cut cisterns and channels near farms and settlement sites[10] hint to practices of water management.

Understanding sediments, soils, and vegetation changes is crucial to reconstruct the palaeo-landscape. Regarding the dissolution of the grid of farmsteads in the Camarina chora in Roman times, environmental degradation, like erosion processes or shortage of resources is a possible hypothesis, rendering an understanding of the landscape in antiquity even more desirable.

To get a first impression of sedimentation processes in the area we built a RUSLE model in ArcGIS. It gives good indications of sedimentation dynamics, without displaying absolute realities (fig. 2). High sedimentation and deposition rates can be expected only at the fluvial terraces. The slopes, which are moderately steep, seem to be prone to wind erosion as well as colluvial transport of sediments. Alluvial depositions in the area do only play a minor role nowadays. The Oanis and Ippari rivers are fairly slow currents with shallow riverbeds.

Higher potential for deposition is observable only where alluvial and colluvial sedimentation coincide. Several excavation reports remark that the ancient structures detected were reached quickly. The contexts were buried in depths between 50–100 cm,

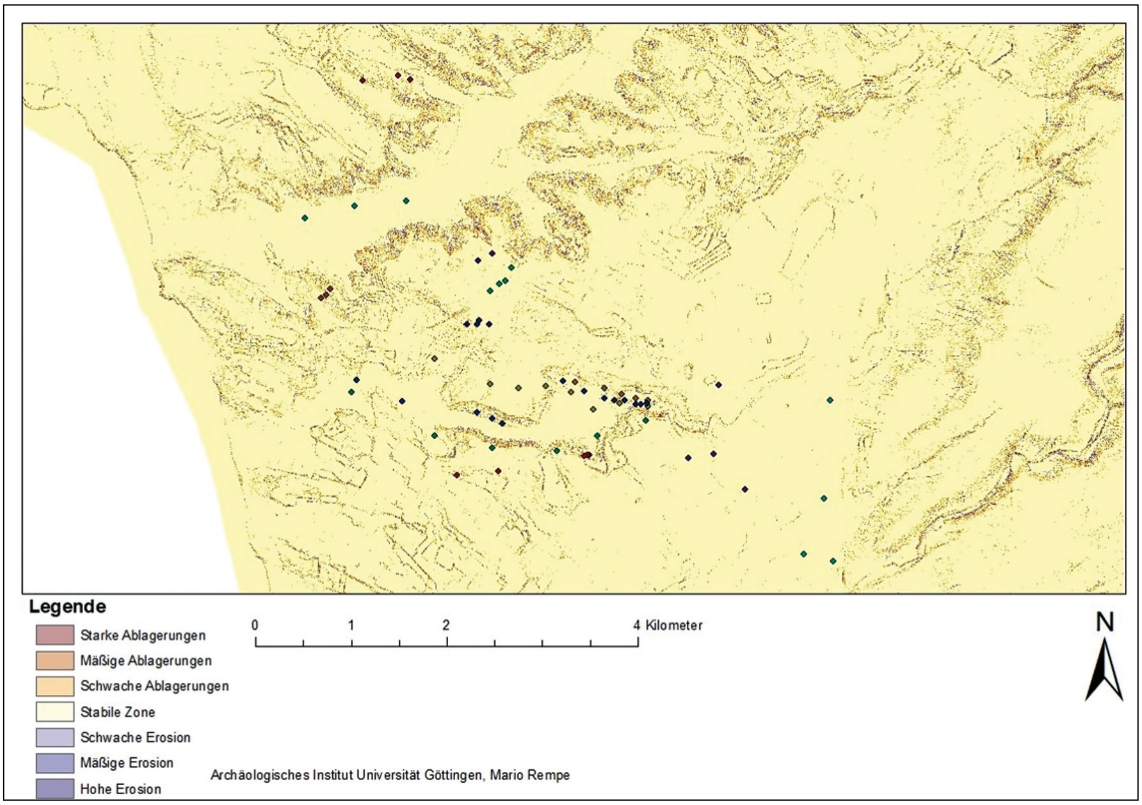

Fig. 2: RUSLE model for Camarina.

often even less.[11] Most of the farms and the infrastructure in the chora were not covered by thick layers of soil. We can thus agree with the following assessment of Orsi on both city hill and chora: "È falso che Camarina sia nascosta sotto enormi masse di sabbie; (…) Noi vedremo invece che il livello archeologico trovasi generalmente ad un metro di prof., se non anche a meno; il che vuol dire, che fra il piano antico della città ed il moderno della campagna vi època differenza".[12]

Several geological reports on the area are published.[13] Sandy, gravely layers and conglomerates of Pleistocene age are built upon six older strata of alternating marl and sandstone layers. Above the Pleistocene formations, there are alluvial sediments and other recent deposits, none of which are dated yet.[14]

Despite the information from geological reports, excavation reports, and the model, an augering campaign was conducted to understand recent soil formation processes better. Rows of coring points were created in the inner and outer chora (fig. 3), avoiding steeper slopes. As many archaeological sites were recorded around the fluvial terraces, these areas were included.

With the exception of some areas around the Ipparis and directly at the Oanis, the cores consisted of sandy, dry soils. The cores[15] did not show remarkable layers hinting to uneven distribution of sediments or conspicuous beddings. The well-sorted sediments

Fig. 3: Location of OSL dated cores taken in the chora of Camarina.

did not give any indication for massive and sudden erosion events. It seems more likely, that soils were generated by slow alluvial, colluvial or aeolian deposition, depending on the local microenvironments. There are only very few spots in the Camarina landscape, where higher sedimentation rates, originating from different sources, lead to thicker deposits of sediment, mainly in the floodplains in close vicinity to the river courses.

Three cores from three different levels of the river terraces near the survey site Donzelli (fig. 4) shall be discussed briefly. Their positions are corresponding but differ in height above sea level, as they are taken from the upper, middle and lower fluvial terraces.

At the upper terrace (fig. 4) not much soil has accumulated above the underlying rock. The layers are thin and do not differ greatly from one another. One the middle terrace, the layers are thicker, but remain similar to each other, consisting mainly of very dry, sandy sediments. At the lowest terrace, near the river course, the lower layers consist of loamy and silty layers.

In terms of soil taxonomy, we are dealing with entisols at the upper and middle terraces, of the subgroup torripsammets, following USDA classification.[16] Thus, we are discussing sandy soils with rather non-descriptive layers, which are built upon the typical fine yellow Pleistocene loess of the area. A fine chronological differentiation of the layers is not possible until now, as there have not been found any organic materials. OSL dating at some selected spots will procure a clearer chronological framework for the layers.[17]

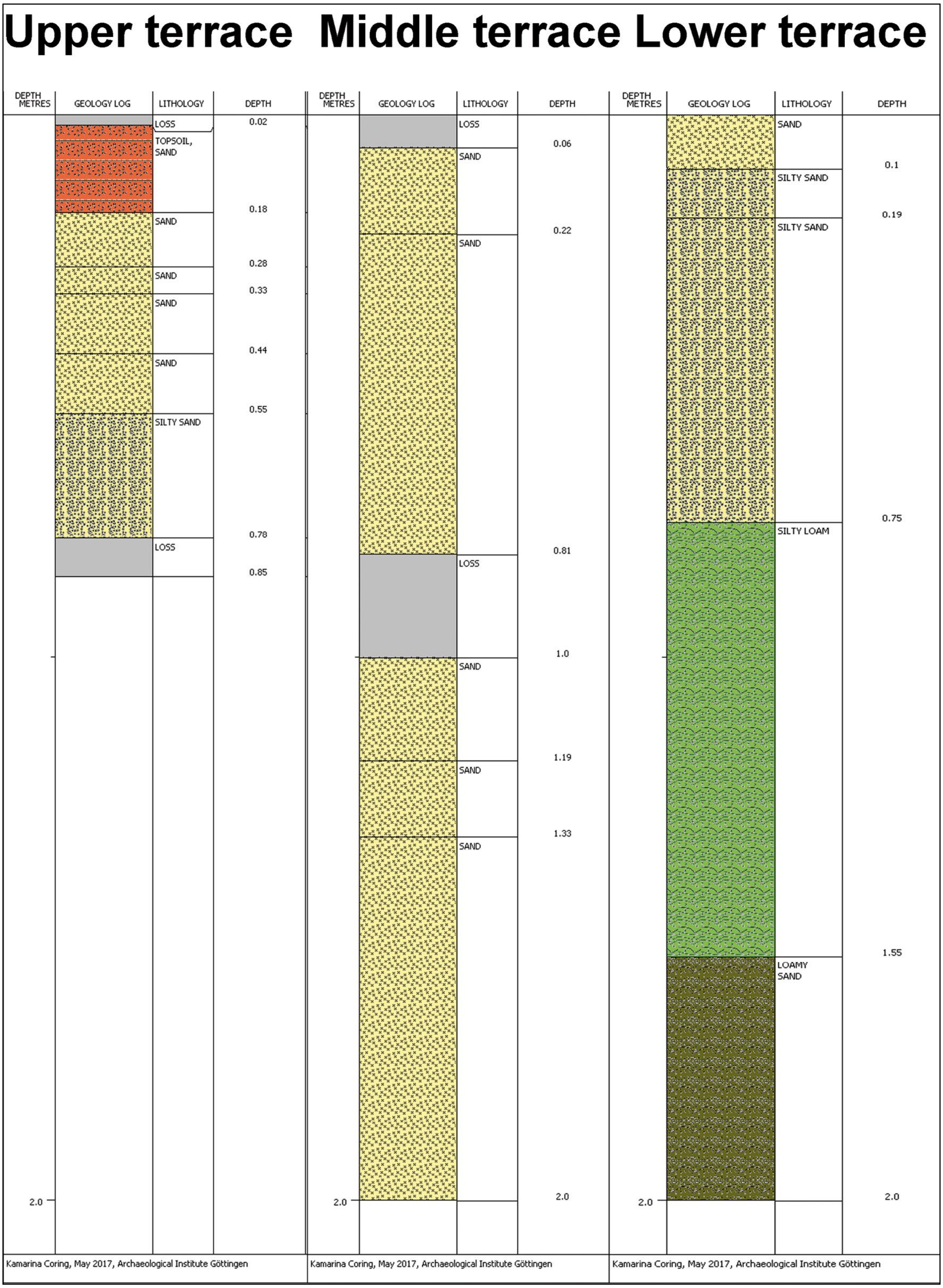

Fig. 4: Cores from three different rows at Donzelli, Oanis Valley.

Recalling sedimentation dynamics in the research area, deposition rates are rather marginal and in many cases, the auger hit solid rock well before 2 m depth. Looking at other regions in Sicily and their characteristics, like for example the Gornalunga, Troina and Simeto valleys,[18] it seems evident, that sediment dynamics differ to high degree locally and that low deposition rates are not a unique feature of the Camarina area. Sediments seem to have been distributed in regular spatial and temporal patterns over the three terraces at Donzelli, rendering it difficult to argue for massive, human-induced soil erosion. Human-induced deposition processes should create different sediment patterns than slow natural deposition processes.[19] Thus, the sediments do probably not evidence overexploitation, which led to erosion around the river terraces and in the river plains. Greek land use, given the archaeological record and results from geophysics most likely farming in small agricultural units, did apparently not overstrain the landscape.

Environment and Land Use in Ancient Camarina

If landscape change apparently did not take place on a major scale at the terraces, then why is the key area of Greek farming untapped for a period of more than 300 years[20] from Hellenistic times onwards?

During the Greek phase, farmers seem to have cultivated preferably wheat varieties, not only for subsistence but mainly to export it. Sicily had great agricultural potential as well as fame as a wheat producer,[21] and archaeological and palynological evidence directly from Camarina does speak in favor of export. Several indicators for grain cultivation and export have been highlighted. In 1958 a tower of the city wall was excavated. Inside, a grain storage and other agricultural products were discovered, still containing the charred remains of different crops.[22] While hulled barley was dominant within a sample analyzed by Hans Helbaeck, club wheat has also been detected. The charred seeds were well developed, pointing thus to irrigated fields. Besides these cerealia, leguminous plants, as well as wild oat (avena), occur.[23]

In Contrada Maestro, near the mouth of the Irminio River, a lead tablet dealing with the purchase of an unknown amount of grain was found at a farm.[24] Standard grain measures from the times of Hieron are also pointing to intensive grain cultivation.[25] Furthermore, the farms, as well as the agora, evidenced high numbers of amphora and in Roman times, when the city as a civic center had already ceased to exist, a large depot of amphora was found in one of the stoai of the agora.[26] The depot of about 800 “anfore commerciali, quasi tutte greco-italiche”[27] does speak in favor of considerable trade, also in Roman times, while a granary on the agora hints to grain transactions.[28]

Within the scope of the Göttingen research in Camarina several pollen cores were taken, the most promising sequences in the area near Bellaccio[29] in the Oanis valley (fig. 5)

Fig. 5: View on the Oanis valley, in the background area of Bellaccio (hills).

The area in the floodplain and near the fluvial terraces offered a relatively high amount of wet sediments. One core has been dated linear[30], indicating a time horizon reaching back to around 2650 BC (fig. 6). Analysis on the preserved pollen generated a chance to compare the development of physical landscape, vegetation and settlement history, as the pollen core site is situated near several Greek sites on the fluvial terraces of the Oanis.

More than 50 taxa were counted during the palynological analysis.[31] The loss on ignition analysis shows a steady decline in carbonates in the sediments from 600 BC onwards, while the fire activity analysis hints to a settlement peak in the Classical era (fig. 7). The landscape in the Oanis valley became open from around the 8th century BC onwards, a significant increase in cerealia taxa is observable between 680–220 BC. A parasitic fungus in the pollen record, *tilletia caries* is a further indicator for grain cultivation,[32] much like other pollen indicators of human activity such as Plantago (fig. 8).

The loss on ignition analysis results and pollen of aquatic plants do speak in favor of segmentation of the river valley. Thus, wet areas and dry or drained zones are to be envisioned. These signals could derive from the river environment, but also from drained areas with irrigation systems. Looking at other areas in the Camarina chora, irrigation networks are attested by literary sources and archaeological finds. Pindar[33] tells us about the channels at the Ippari, which were set up around 461 BC.[34] Cisterns and rock-cut channels, providing water for agricultural purposes, are moreover important and reoccurring features of the farms around th rivers.[35] The pollen of aquatic plants and the sediments of the core (fig. 6), which indicate phases of a dry environment, are supporting the reconstruction of a similar system at the Oanis. Looking at the land use,

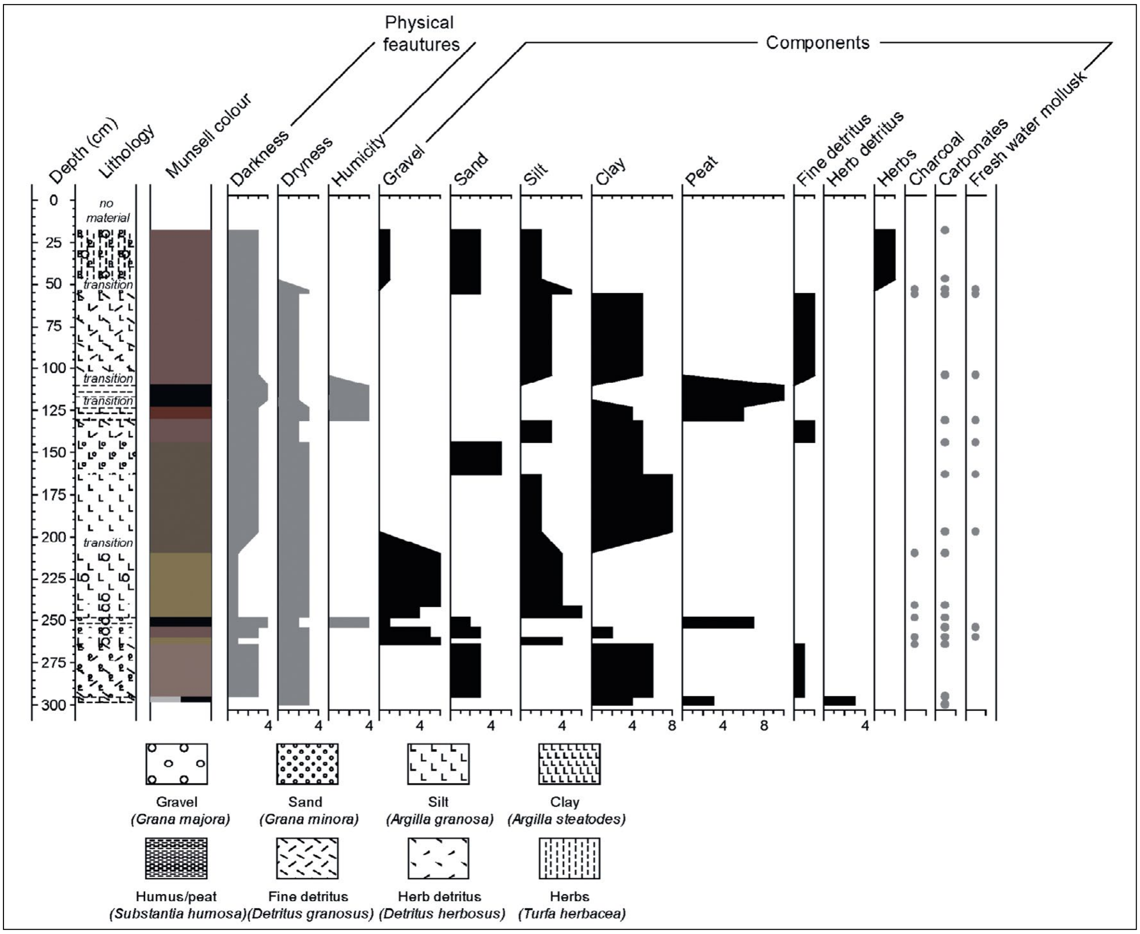

Fig. 6: Linear dating of the pollen core in the valley near Bellaccio.

the Oanis valley served as pasture area before the polis of Camarina was founded. The fire activity analysis indicates slash and burn in this period. After deforestation of the area, the pollen record makes the hypothesis of intensive cereal agriculture possible.[36] Agriculture in the area does seem to come to a definite end from the end of the late 4th century BC onwards. This is to a certain degree surprising as the overall vegetation and the landscape are not subject to deterioration, but remain stable. The change in land use is thus probably reducible to socio-economic changes and new limitations and views on the land use at the Oanis.

The sediments of the pollen cores should shed light on this change. Layers containing peaty and loamy sediments are as well observable as layers with sandy, rather dry sediment conditions. The development of the area into a swamp after the late 4th century BC seems highly plausible. Given the implementation of irrigation systems in the area in Classical times, one could deduce the later landscape change to the abandonment of the valley by human agents. The irrigation systems, which fell out of use before Roman times turned the area at the Oanis into a swamp.[37]

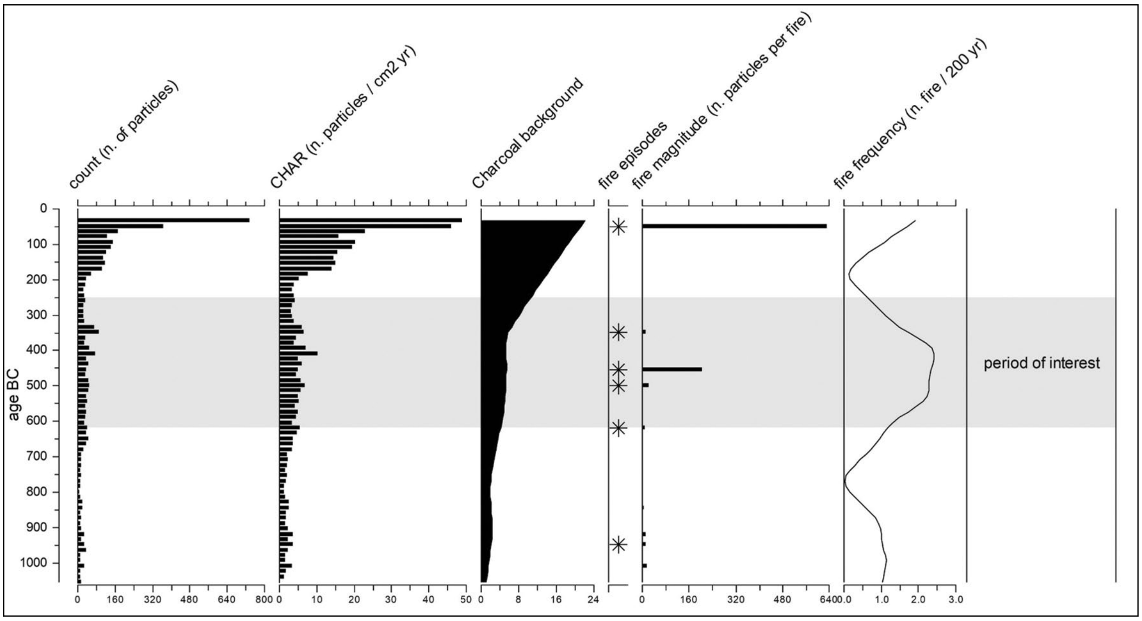

Fig. 7: Charcoal analysis of the pollen core.

Economy and Nature at the Oanis River: a Sustainable Equilibrium?

As far as there are no indications for overexploitation in the area around the lower Oanis valley, Greek farming seems to have been sustainable. Along the Oanis and its river terraces, a lot of small sites with a rural character can be envisioned. The ancient farmers relied on different methods to sustain their environments and had an awareness of thresholds and concepts of dealing with agricultural bottlenecks.[38] Efforts of sustainable exploitation of resources are crop rotation, diversification,[39] water management, storage, and fertilization.[40] Fallows, slash and burn cultivation, as well as countermeasures against erosion like terracing, are further indicators.[41] Moreover, it seems reasonable to assume, that the ancient farmers used well-suited places and explored ecological niches.[42] The areas in and between the floodplains, which were divided into agricultural units (kleroi) were probably producing cash crops. The Oanis area was well suited to produce different types of grain. Soils and water availability support intensive cultivation of wheat and other cereal types as stated by ancient agronomists and supported by modern suitability analyses.[43]

It seems plausible to argue that the foundation of 461 BC led to an efficient and sustainable exploitation of the chora, as indicated by the farm grid and irrigation networks. After the Carthaginian expansion, these systems fell out of use, at least in the area of the Oanis valley.

As the former agriculturally exploited zone at the Oanis became boggy because irrigation systems could not be maintained anymore, this could have happened in the wider territory of Camarina. Roman settlers could have preferred to move further

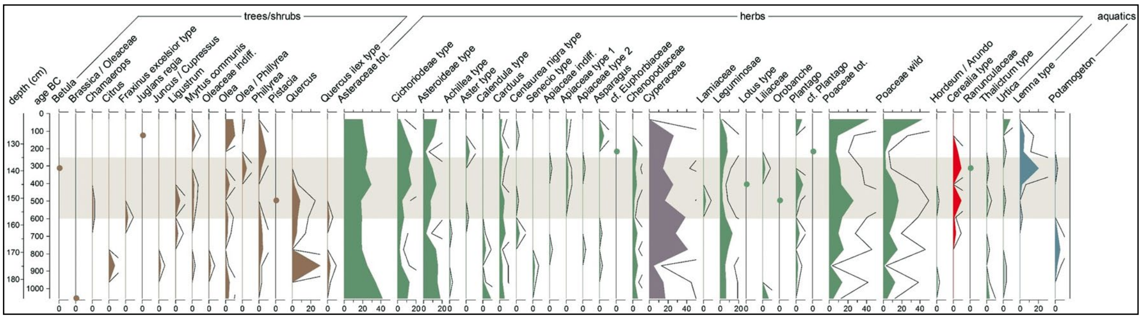

Fig. 8: Taxa represented in the pollen core.

inland. Looking at general trends of Roman Sicily,[44] dispersed Roman settlement and exploitation is a likely hypothesis, with Roman settlers acting for economic success on isolated estates.[45] It seems however reasonable to argue that differences between Greek and Roman exploitation and settlement preferences as well as landscape change induced by short-termed catastrophic events rather than human overexploitation led to the shift in settlement patterns in Roman times.

Notes

[1] Butzer 1964; Dincauze 1987; Hughes 1994; Leveau et al. 1999; Horden – Purcell 2000; Grove – Rackham 2001; Attema et al. 2010; Sinclair et al. 2010; Dincauze 2013, to name only a few. For considerations on the state of the art, especially at German universities see Meier 2009 and Teichmann 2010.

[2] Forbes 1982; Gallant 1991; Redman 1999; Redman 2005; Marston 2011; Marston 2015.

[3] I would like to thank Prof. Dr. Johannes Bergemann for the possibility to publish preliminary results from the Camarina Survey as well as all collaborators who helped me conducting my studies there.

[4] Pelagatti 1981, 725–728; Bergemann 2012, 37.

[5] Schubring 1873, 503; Orsi 1899, 204; Pace 1927, 63–66.

[6] Di Stefano 1982, 332–335. 339; Uggeri 2015, 89 f.; Sulosky Weaver 2015, 62 f.

[7] Di Stefano 2006, 158 f.; Sulosky Weaver 2015, 62 f.; Di Stefano 2013, 60.

[8] Di Stefano 1982, 336–337; Di Stefano 1997, 463; Pace 1927, 130–135.

[9] Di Piazza et al. 2011, 396–408.

[10] Di Stefano 2001, 698 f.; Di Stefano 2002, 21–23; Pelagatti 1981,724 f.; Collin Bouffier 2006, 188–193; Cordano – Di Stefano 1997, 292–300.

[11] Besides the already cited examples one can find thickness of topsoil layers in several excavation reports: Orsi 1899, 201–278; Orsi 1904, 853 f. fig. 62. 63; Di Stefano 1984, 124; Pisani 2008, 21; Di Stefano 2000, 200; Di Stefano 1992, 120 fig. 4

[12] Orsi 1899, 207 note 1

[13] Ragusa 1902; Ragusa 1903; Rigo – Barbieri 1959; Di Grande – Grasso 1977; Pedley 1981; Amore – Randazzo 1997; Reuter et al. 2002.

[14] See Di Grande – Grasso 1977, 212–216.

[15] A more detailed discussion of our results from the augerings in the chora of Camarina will be found in my PhD thesis, which I would like to present in autumn 2019; all results presented here a preliminary.

[16] USDA Soil Survey Staff 1999, 436.

[17] The team took samples to do OSL dating during the final campaign in 2018, results pending. For method and application of OSL dating in mediterranean environments see e.g. Fuchs et al. 2004, 335–338.

[18] Cfr. Ayala – French 2005, 149–167; Chester – Duncan 1979, 293–315; Judson 1963, 287–289.

[19] van Andel et al. 1986, 110–113; Goldberg – MacPhail 2013, 194 f.; May 1991, 224 f.

[20] Di Stefano 2006, 158 f; Di Stefano 2013, 60; Sulosky Weaver 2015, 62 f.

[21] See for example Semples 1921, 59–63. 70–74; Dunabin 1948, 211–216; Casson 1954, 168; Nenci, 1993, 3; Fantasia 1993, 25–31; de Angelis 2000, 109; Pazdera 2006, 165; de Angelis 2016, 267–296; for a critical discussion on Sicily as wheat producer see de Angelis 2006, 29–47.

[22] Di Vita 1958, 84–86; Di Vita 1983, 32–36.

[23] Di Vita 1983, 32–34.

[24] Cordano 1997, 349–354.

[25] Walthall 2011, 159–164.

[26] Pelagatti 1985, 687–692; Di Stefano, 1994, 1369; Di Stefano 2000, 196; Uggeri 2015,140. Excavations at the farms and the Göttingen survey evidenced high numbers of amphora as well.

[27] Uggeri 2015,140.

[28] Uggeri 2015,140.

[29] The author and collaborators from the department of Palynology and Climate Dynamics in Göttingen took the cores together. One core has been analysed already, its geographical position is x=45.4239 y= 40.7968. The palynologists signed responsible for the analysis and made the core and its implications comprehensible. I would like to express my sincere thanks to Herman Behling, Siria Biagioni and Alena Vieregge. For helpful discussions I would like to thank the aforesaid researchers as well Hans Jörg Küster, Wiebke Kirleis and Willy Tinner.

[30] It is a common practice to hand in only two samples when testing pollen cores for their chronology. There are currently more samples being analysed, as the general timeframe provided by linear dating seems to fit well.

[31] The analysis was carried out by Alena Vieregge and Siria Biagioni from the Department of Palynology and Climate Dynamics at the University of Göttingen.

[32] Tilletia caries and its effects are described in ancient sources, Theophr. hist. plant. 8, 10; Plin. nat. 18, 44.

[33] Pind. O. 5, 4. 9–14.

[34] For a discussion of the archaeological remains and Pindars song on Camarina see Schubring 1873 498; Pace 1927, 9–12; Brunel 1971, 327–342; Cordano – di Stefano 1997, 291; Di Stefano 1998, 266; Collin Bouffier 2006, 186; Uggeri 2015, 67–75.

[35] Di Stefano 2001, 698 f.; Di Stefano 2002, 21–23; Pelagatti 1981,724 f.; Collin Bouffier 2006, 188–193; Cordano – di Stefano 1997, 292–300.

[36] It remains still open to debate which cereal types are visible in the core.

[37] For a similar development in the Pontine region see Attema 2017, 466–468.

[38] See Marston 2015, 586–588; for risk avoidance strategies and it's archaeological implications see Marston 2011, 195–197 and Forbes 1982 passim.
[39] Butzer 2005, 1775 f.; Hughes 1994, 132–134.
[40] Berger – Jung 1999,161 f.; Butzer 2005, 1775 f.; Thommen 2012, 57 f.; Winiwarter 1999, 205–201; Hughes 1994, 138 f.; Grove – Rackham 2001, 226 f.; Forbes 1982, 422 f.
[41] Berger – Jung 1999, 162; Winiwarter 1999, 205–210; Hughes 1994, 138–141; Isager – Skydsgaard 1995, 22–24. 80–82; Fussel 1967, 31 f.; Grove – Rackham 2001, 107–113. 115–117.
[42] Fussel 1967, 21; Forbes 1982, 325–328. 334.
[43] For example Cato, de agricultura 34, 49; for a discussion of agronomers and land use requirements as hypothesized for ancient South Italy see van Joolen 2003, passim and especially 122-127; Spurr argues for intensive cultivation of barley in South Italy and Sicily. Wheat as cash crop would in Sicily certainly calls for irrigation, see Spurr 1986, 14 f. 20–22.
[44] Belvedere 1996, 81–89; Wilson 1990, 33–45. 221–232; Bergemann 2010, 161–170; Manganaro 1988, 22–54; Wilson 1988, 189–204.
[45] See for example Bintliff 2013, 285–290 and Rizakis 2013, 23–27.

Image Credits

Fig. 1–3: Maps created by the author. – Fig. 4: Diagram created by the author. – Fig. 5: Photo from the Göttingen institute survey database. – Fig. 6–8: Diagrams created by S. Biagioni and A. Vieregge, Department of Palynology. and Climate Dynamics University of Göttingen.

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