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Land Management as a Factor in the Transformation of Rural Landscapes. Comparative Case Studies with Special Attention to the Early and High Middle Ages

Recent research on environmental history, historical geography and landscape archaeology shows that land management can be an important factor of cultural transformation. This is true for modern agriculture, but also for agricultural practices of the past which were much less intensive. Even if land management varied depending on climate, natural environment and social settings, similar processes were going on in most cultural landscapes. In previous studies I have referred to cultural ecology as an important background theory to understand past transformations of societies as well as of landscapes[1]. In this paper however, the focus will be on the importance of fossil fields in order to recognise and to understand the role of past land management for cultural change. Special attention is paid to the 6th/7th century, which was a period of transformation in many and diverse landscapes. Examples from the Near East, Crimea and the Balkans will be completed by a look to Central Europe, which highlights the importance of land management practices for long-term transformation of landscapes and rural societies.

Field systems and soil management in the early Byzantine World

In the following, several case studies from different areas of the early Byzantine world will serve to illustrate field systems as well as soil sediments as a research topic and an important historical source to understand agricultural production.

Field systems in the Limestone Massif in Northern Syria

For many landscapes of modern Syria, Lebanon, Jordan, and Israel we know of the existence of extended fossil landscapes in the close surroundings of rural early Byzantine sites. Extensive land use in later time periods preserved these remains. Today these landscapes have little or no vegetation, which allows tracing these field systems in aerial photographs. The first example from the Limestone Massif in Northern Syria clearly demonstrates the potential of aerial photography for recognizing overall outlines of field structures and their outline within the landscape.

The Ǧebel Zawiyé, the southern part of the Limestone Massif, is a landscape with conditions suitable for agriculture. The agriculture of this karstic landscape was always dependent on regular rainfall, as precipitation over one year reaches just around 470 mm with no rains during the summer months[2]. Due to the presence of volcanic rocks there was fertile ground in the past, but today many hills are completely stripped of soil. At Serğilla (Arihah/SYR)[3], one of the so-called »Dead Cities« of the limestone plateau of Northern Syria, an extended system of former fields of around 290 m in length, enclosed by stone walls can be recognized (**fig. 1-2**)[4]. Despite some irregularities due to topography, this field system with its rectangular pattern refers to a planned organisation of bigger areas of economic land. This is characteristic for Roman *limitatio* systems, which are also known from Syria[5]. There are however other structures orientated differently to the above mentioned dry stone walls. These structures can best be described as »tracks«, which are accompanied on both sides by walls of dry stones that might have served for wrangling livestock. One of these can be found to the north of the village; while another one runs alongside a valley to its southeast. Within this valley, several dams crossing its width slowed down the water flow and created several gardens in the seasonally water-bearing valleys. As indicated by the remains of oil and wine presses in the village, in Serğilla as in most areas of northern Syria there was a strong focus on probably export-oriented olive and wine production. We may assume that olive trees and wine grew in the enclosed rectangular fields in the hills. Today they are stripped of soil. Maybe an increasing role of husbandry,

1 Schreg/Röhl, Eco systems. – Schreg, Ecological approaches.
2 Climate-Data.org https://de.climate-data.org/location/27966/ (20.07.2017). For comparison: annual precipitation at Mainz is around 675 mm.
3 Tchalenko, Villages. – Tate et al., Sergilla.
4 Own research based on maps available through Google Earth. See Schreg/Röhl, Eco systems.
5 Olesti Vila/Abdulkarim, Syrian cultural landscapes.

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Byzanz zwischen Orient und Okzident 22 (Mainz 2020). DOI: https://doi.org/10.11588/propylaeum.810

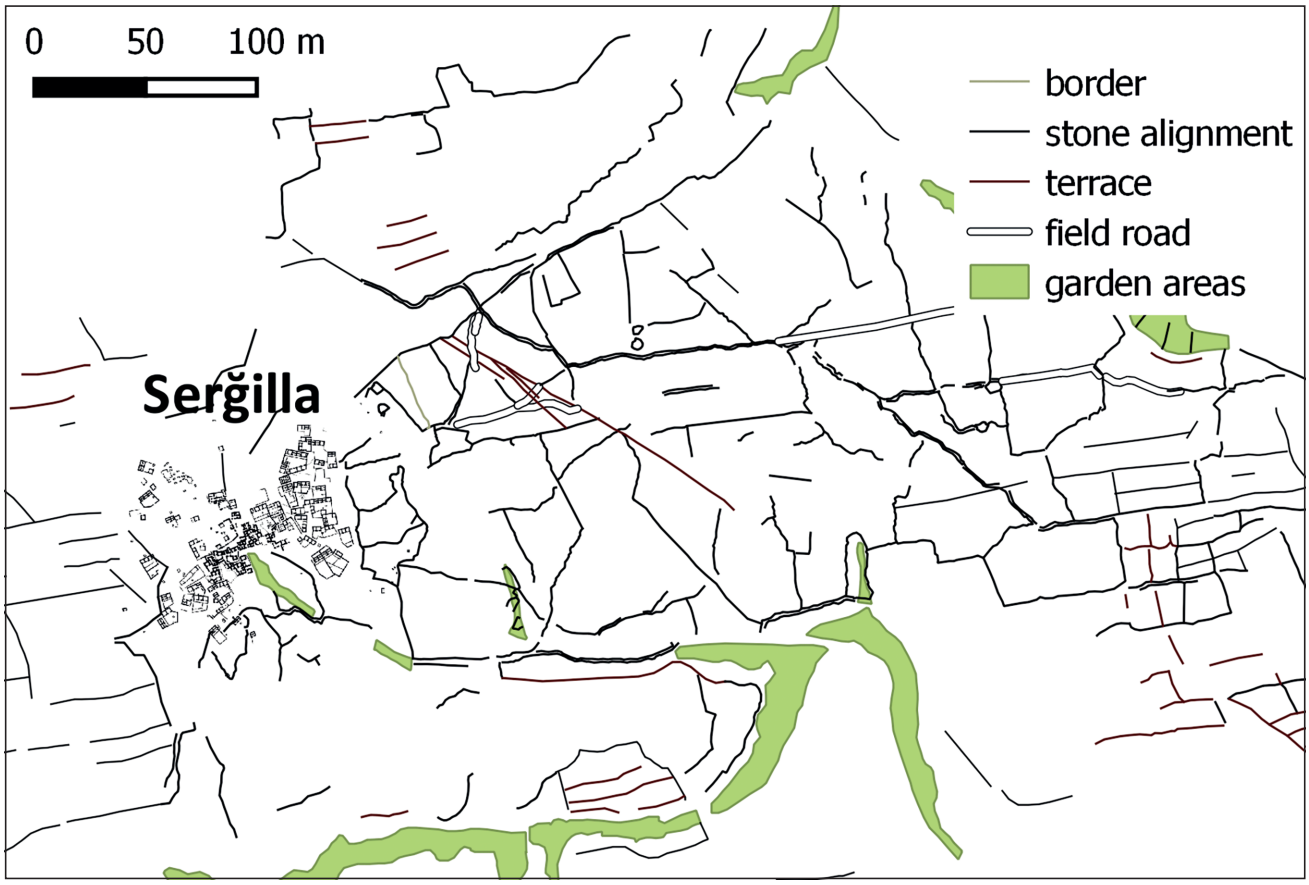

Fig. 1 Field systems around the site of Serğilla visible in aerial photographs. – (Graphics R. Schreg).

Fig. 2 Dry stone walls at Serğilla. – (Photo C. Roehl).

as indicated by the probably later livestock drives resulted in overgrazing, thereby triggering a loss of trees and soil degradation which accelerated the establishment of a dry microclimate. To verify this hypothesis the chronology of the field structures has to be clarified. On-ground research will be needed. Because the region is currently threatened by the Syrian Civil War and the Byzantine village is now a home for refugees, for now we have to rely on the aerial photographs.

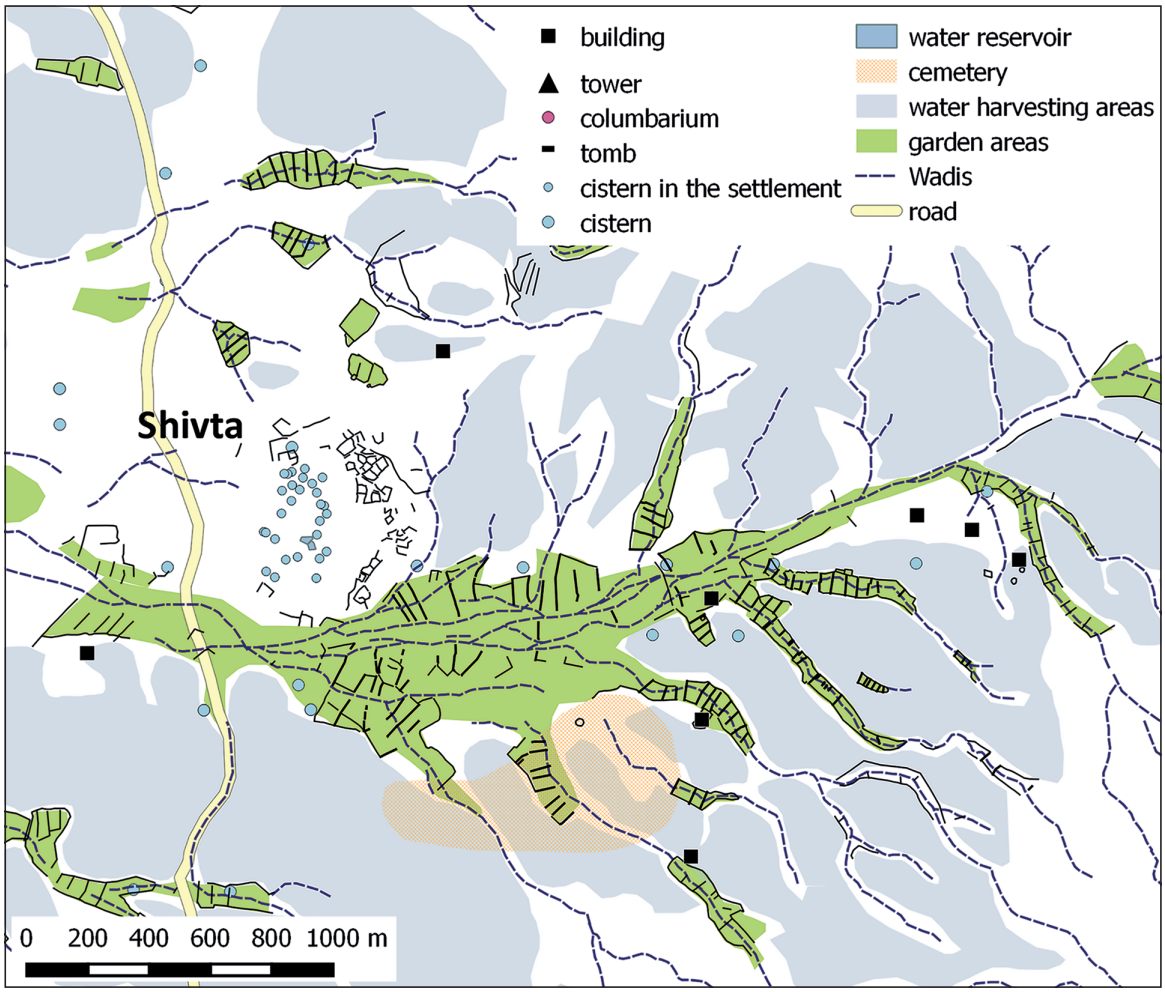

Fig. 3 Field systems and water harvesting at Shivta. – (Graphics R. Schreg).

Fig. 4 Field systems close to Shivta: Enclosures in the front, gardens in the middle ground and traces of water runoff systems at the hills in the background. – (Photo I. Grinberg 2009).

Water harvesting in the Negev desert

The second case study comes from the Negev desert. It even heightens the importance of the landscape remains for understanding past settlement communities. Close to the Byzantine settlement of Shivta (Mechoz haDarom/IL)[6], ca. 40 km south of Beersheba in Israel, there are extended remains of past field systems (**fig. 3**) as well as dams in the valleys resembling the example from Northern Syria[7]. There are however some important differences. The remains visible in the aerial photographs show fields in the wadi beds, which are completely enclosed by stone walls and which can in some cases be directly linked with small nearby farmsteads. The surrounding hills and slopes however do not bear any field structures. Instead they were used for collecting rain water. Aerial photographs show two different types of structures: long stone strips and small »hillocks«, often combined in a regular pattern (**fig. 4**). In some areas rather large stone heaps are regularly distributed. These stone structures accelerate the water runoff and reduce the evaporation after the sparse but heavy rain falls and change the water flow in the valleys, which in consequence received greater amounts of water[8]. The climate today is semi-arid and hot with around seven months of no or very little precipitation[9]. Research on these water harvesting systems, which were thought to be from late biblical times[10] started after the establishment of the state of Israel. There had been some efforts to recreate traditional agricultural practices within the desert environment[11]. Today agriculture depends in this region on the exploitation of deep fossil ground water, which now can be pumped to the surface and desalinated by modern energy-intensive technology.

There is little information on what was cultivated on the fields in the valleys. Archaeobotanical research of pigeon dung from Shivta however provides some direct evidence of the local environment during the Byzantine period[12]. Pigeons were held in columbaria surrounding the village[13], their dung was probably an integrative part of manuring the gardens. They were feeding on a mixed diet of seeds from wild plants and small domesticated fruits including grapes, figs, olives and dates. From Nessana (Mechoz haDarom/IL), a Byzantine settlement with traces of water run-off systems similar to those at Shivta and less than 20 km west of it, papyri finds refer to wheat, barley, grapes, dates and olives, complemented by peas, figs, pomegranates, peaches and almonds[14].

In the close surroundings of the settlement of Shivta there are numerous small enclosures (**fig. 5**), which might have been connected to camp site structures at the periphery of the village. Obviously the economic system of the Shivta community combined intensive gardening with revenues gained from the contact with nomadic groups and traders. Landscape archaeology in the Negev desert has found proof of several small, probably temporary lodges of herders south of Shivta[15].

The most important problem is the dating of the field systems. Only a valid chronology will allow discussing the various factors involved in landscape transformation. In a politically loaded debate nomadic »Arabs« have been blamed for mismanagement and the decline of agriculture in the Near East in the late first millennium AD[16]. In fact the region was once part of the fertile crescent where early agriculture spread in the Neolithic. Today huge areas are rather dry or arid zones less suitable for agriculture. Researchers have tried to find out when exactly the landscape changed, and whether this was due to climate fluctuations or caused by human economy[17]. However, climate reconstructions for Byzantine times are only in its beginnings. Due to the large variety of geographical settings in the Byzantine Empire this research has to be realized at a regional level integrating bio- and geosciences[18]. New data is being provided by geoarchaeology, dating sediments by radiocarbon or optic stimulated luminescence (OSL). These results have to be critically discussed in every single case, as they are influenced by many cultural and natural formation processes. According to modern data (**fig. 6**), the system of water harvesting in general peaked in the Byzantine era and might very well have lasted up until the Islamic era, as late as the 10th century[19]. Using OSL, Gideon Avni, Naomi Porat and Yoav Avni dated soil sediments preserved in terraced gardens from several valleys of the central Negev[20]. These dates are related to the time when the soils were deposited during the usage of the gardens. Their results show increased activities in the 6th and 9th century (**fig. 6**), but they also indicate that already since the early Holocene there had been the long-term process of a »natural desertification«, which had in fact been slowed down by human land use. According to their findings they conclude »that historic climate changes are not needed to explain the rise and fall of the great farming cultures«[21].

6 Röhl, Shivta.
7 Own research based on maps available through Google Earth. See Schreg/Röhl, Eco systems.
8 Lavee et al., Water harvesting.
9 Climate-data.org: https://de.climate-data.org/location/5418/ (20.7.2017).
10 Erickson-Gini, Nabataean agriculture.
11 Evenari et al., Negev 1971.
12 Ramsay/Tepper, Green desert.
13 Hirschfeld/Tepper, Columbarium towers.
14 Kraemer, Nessana.
15 Avni, Nomads.
16 Bottema, Man's role.
17 Izdebski, Agriculture. – Izdebski et al., Evidence.
18 See for example the study of C. Cordova on the 1st millennium AD in Jordan: Cordova, Millennial landscape.
19 Bruins, Desert agriculture 38.
20 Avni et al., Pre-farming environment. – Avni et al., Agricultural systems.
21 Avni et al., Pre-farming environment 26.

Fig. 5 Shivta. Water-runoff system ca. 2 km south of Shivta. – (Aerial photograph © 2017 DigitalGlobe, geodata © 2017 GoogleMaps).

Terraces, clearance cairns and sediments at Čardakli Bajre near Mangup cave town in Southwestern Crimea

Dating the traces of past field relics is also a major topic for our third case study. The mountains in Southwestern Crimea represent an early Byzantine settlement landscape characterized by numerous »cave towns«. According to Procopius »the land of Dory itself lies on high ground, yet it is neither rough nor hard, but has good soil and is productive of the best crops«[22]. However, this is not entirely true. In comparison to the previous case studies the region has a temperate climate with rainfall occurring during the whole year – but in fact the Crimean mountains are a rocky karst region with rather thin soils[23]. Water drains away in many parts of the landscape, but because of several levels of ground water within the limestone, there are also water sources at several spots in the landscape.

In 2006-2008, archaeological field work was conducted on fossil fields in the surrounding of the most famous »cave

22 Procopius, De aedificiis III, 10-17.

23 Climate and landscape reconstruction see Cordova, Crimea.

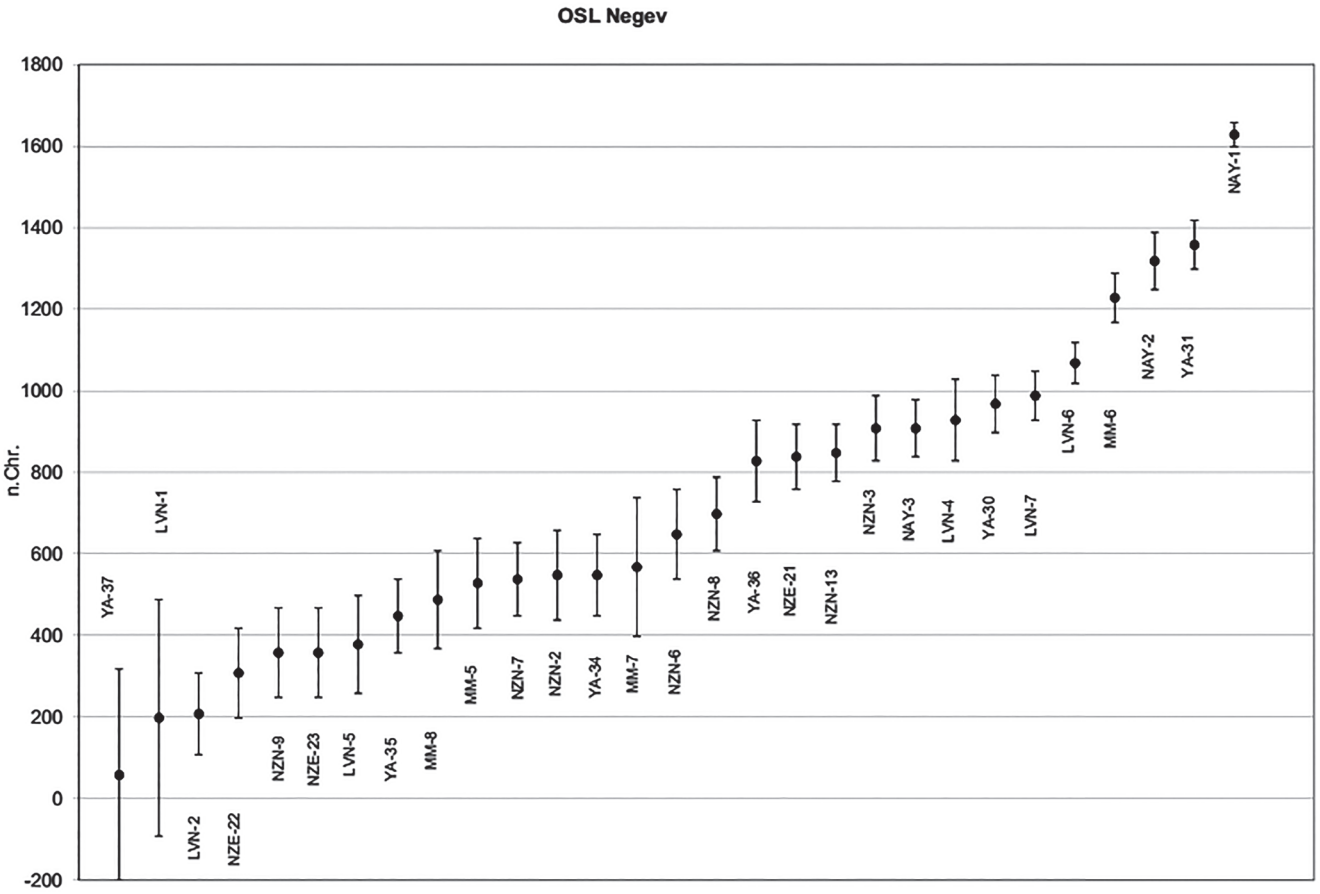

Fig. 6 OSL-dating from geoarchaeological research indicate increased activities in the 6th and 9th century. – (Data after Avni et al., Pre-farming environment. Graphics R. Schreg).

towns« Mangup and Eski Kermen in Southwestern Crimea, close to modern-day Sevastopol (Ukraine)[24].

At a plateau north of Mangup, called Čardakli Bajre, surveys identified extended remains of a past cultural landscape on a densely forested slope. By nature the limestone surface is covered with small rocks, only cleared in the field areas in the lower, northern part of the plateau, where the soil cover is very thin. There are hundreds of clearance cairns (**fig. 7**), some up to 3 m in height, but also stone lynchets and terrace walls. Due to the modern tree cover and the political situation there was no chance to work with aerial photographs or LiDAR scans. Attempts in 2006-2008 to get permission from Ukrainian institutions for LiDAR were not successful probably because of the short distance to the Russian Black Sea Fleet at Sevastopol. Research therefore was restricted to surveying on the ground. The extended field systems could only be tracked in early spring and were documented by hand-held GPS.

Only a small area of the field system of around 50 by 100 m was documented with a detailed topographical survey (**fig. 8**). At a nearby clearing no traces of the field system were visible at the surface, but geophysical prospection indicated several structures, two of them belonging to the Iron Age (4th/3rd century BC). Different features have been investigated with small-scale excavations in order to learn about their function and to gain a chronological framework. Radiocarbon dates as well as archaeological finds as stone tools and ceramic sherds showed a long-term development of this system of fossil fields, starting at the latest during the Iron Age and ending in the early modern period. An early Byzantine usage of the fields is shown by ceramic finds from clearance cairns, whereas the dates of the excavated stone lynchets are probably later and may be understood as a reaction to soil erosion.

Similar structures can be found south of the hillfort of Eski Kermen, where there are also Byzantine ceramic sherds with clearance cairns. Probably past field structures are widespread in the region, but in the forested landscapes LiDAR scans would be a precondition for their documentation.

As in the previous examples, land management had to deal with the risk of soil erosion. The traces of fossil fields show the transformation of the cultural landscapes in more detail. According to the soil sediments, the Byzantine period was an important phase of landscape transformation. The practice of removing field stones from the surface and col-

24 Research conducted by the RGZM, funded by the Leibniz-Gemeinschaft 2006-2009 and the Fritz Thyssen Stiftung. See Schreg, Höhlenstädte.

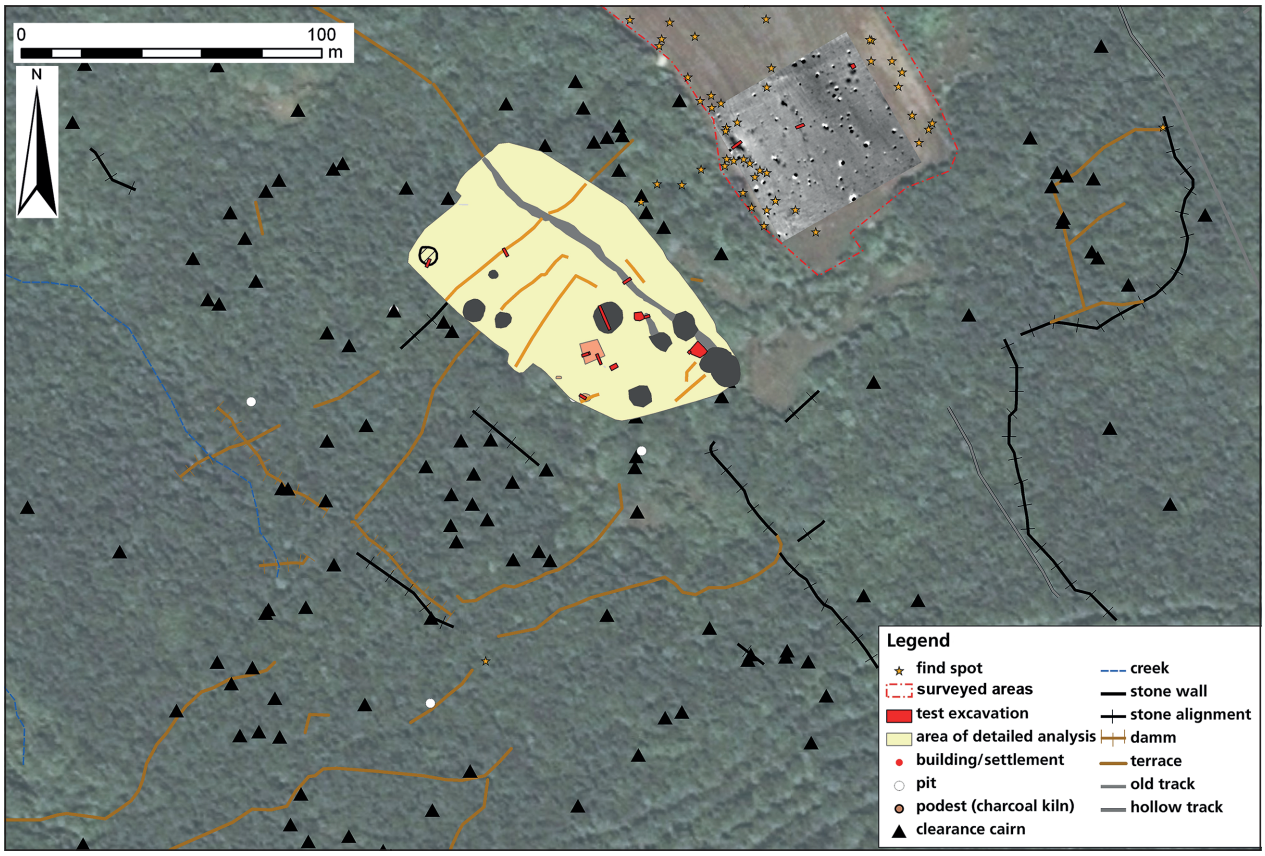

Fig. 7 Clearance cairn at Čardakli Bajree. – (Graphics RGZM, R. Schreg).

Fig. 8 Čardakli Bajre north of Mangup: Detailed topographical survey of a past field system covered by wood today including an adjacent geophysical prospection at a clearing, showing distinct preservation conditions at a very close distance. – (Photo R. Schreg).

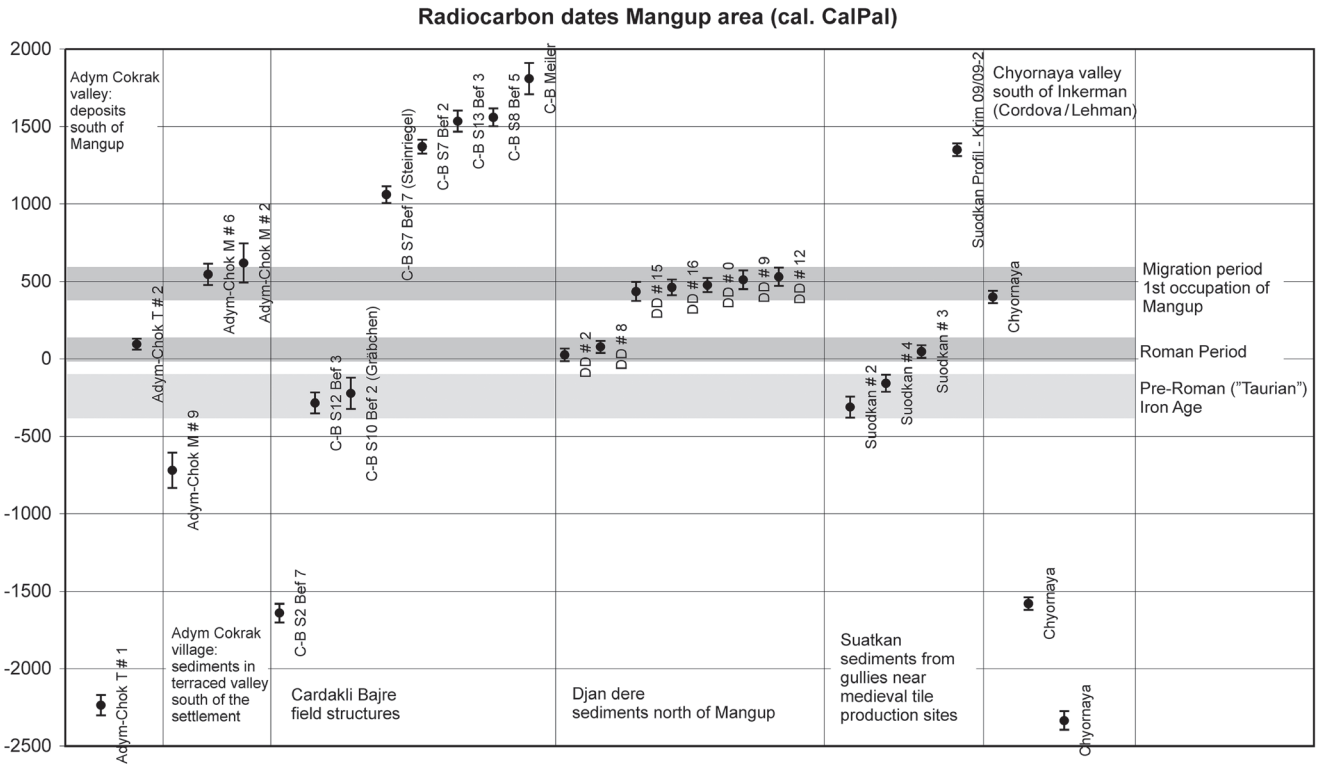

Fig. 9 Radiocarbon dates from sediments surrounding the site of Mangup. – (Graphics R. Schreg).

lecting them in cairns has improved the quality of the land for agriculture or rather husbandry but caused the risk of soil erosion since the Bronze Age. Geoarchaeological research in the valleys surrounding the cave town of Mangup showed the important role of erosion processes in this landscape. At several places, backhoe trenches in the valley were dug to document soil sediments. A series of radiocarbon dates (**fig. 9**) indicates several phases of soil erosion. The most important phase dates to the 5th/6th century when the cave towns were founded. However, there are no sediments of the Middle Ages in the valleys, even if ca. 5 km southeast of Mangup a medieval tile production site has been affected by an erosion gully. Probably the need for fuel wood caused just a local clearing with linear soil erosion in this case, whereas soil erosion at Čardakli Bajre had been diminished by new terraces. Late medieval to early modern dates might refer to changes of land use related to the Turkish expansion in Crimea.

Environmental impact of the imperial town Iustiniana Prima in southern Serbia

The next case study concerns the foundation of a town in the 6th century. The early Byzantine site of Caričin Grad (Stulac, okr. Jablanica) in southern Serbia represents the establishment of an urban centre within a previously rural landscape[25]. The site can be identified with the town of Iustiniana Prima which was founded by the emperor Justinian in the beginning of the 6th century. Prestigious architecture in the form of public places, baths, administrative buildings and many churches is part of this town, which was intended to be a kind of a capital for the Balkans[26]. Nevertheless the size of the population was modest. Based on geophysical prospection we are able to count the houses and to estimate the number of inhabitants at only around 1000-2000 people. Nevertheless we have to ask about the subsistence of the town and its impact on the local environment.

In contrast to our previous examples there are no fossil fields preserved. Only in some places, LiDAR scan shows fuzzy remains of terraces (**fig. 10**), which are ploughed over by modern agriculture. The outline of modern fields, visible in aerial photographs and present in maps represents an open field system with stripped parcels. This especially true for the economic land of the village of Prekopčelica (okr. Jablanica), which was the local centre during the Ottoman period. In other locations, as for example north of Caričin Grad there are in contrast rather compact fields. By now, it can only be assumed that these two field systems represent different phases of the development of the cultural land-

25 Research project at the RGZM funded by the Leibniz-Gemeinschaft 2014-17. See Schreg et al., Iustiniana Prima.

26 Bavant, Caričin Grad. – Ivanišević et al., Urban planning. – Ivanišević, Caričin Grad. – Schreg et al., Iustiniana Prima. – From a historical perspective Turlej, Justiniana Prima.

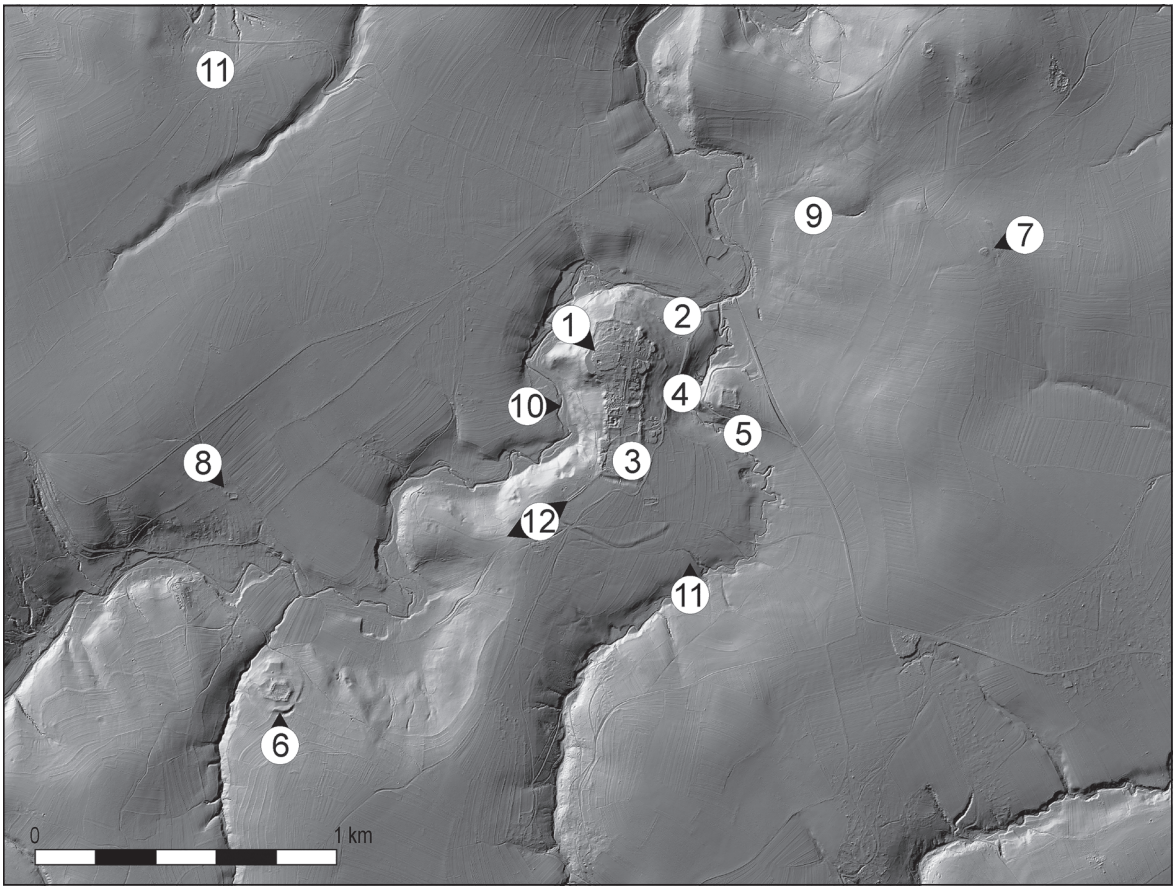

Fig. 10 LiDAR scan of the surrounding of Caričin Grad: **1** acropolis; **2** upper town; **3** lower town; **4** dam; **5-7** fortifications; **8** church; **9** agrarian fields; **10** kiln; **11** erosion gullies; **12** aquaeduct. – (ArcLand.eu, 2011).

scape. As in the Crimean case study, there was also a tile production site. In a valley below the town a kiln had been dug into mid-Holocene and Neolithic sediments. Some meters below there are traces of 6th-century sediment, which also cover a stone structure, probably related to old land or water regulation, maybe similar to the gardens at Serğilla. Therefore we may assume the existence of Byzantine field structures, but in contrast to the previous examples, an analysis of fossil fields does not provide a promising approach.

In order to understand the changes of the environment surrounding Caričin Grad geoarchaeological research was carried out in 2016[27]. At different spots surrounding the site soil sediments were documented mainly at natural outcrops at creeks and erosion gullies. The sediments in the valleys can be taken as some kind of a proxy for land use intensity. As in Crimea radiocarbon dates formed the basis of our understanding, but this time backed up by OSL-dating. In fact, the land use of the Bronze Age is better visible in the radiocarbon dated charcoal than Byzantine land use. However, OSL dating provides evidence that pieces of prehistoric charcoal were redeposited in Byzantine times. Therefore it is dangerous to rely just on the radiocarbon dates, as different methods of land usage produce different amounts of charcoal. Datings of sediments by ^{14}C and OSL are not accurate enough to verify or falsify this model. Charcoal finds depend on land use practices that involve burning of shrubbery. The impact of the foundation of the town on the landscape is less visible than in the case of Mangup, especially when looking only at the radiocarbon dates.

Preliminary conclusions

The previous case studies showed the overall potential of recording past field structures by aerial photography and terrestrial survey as well as the role of geoarchaeology for dating these traces. Aerial photographs are an important source for recognizing past agricultural landscapes, but a detailed assessment and dating of the field structures requires research on the ground. Geoarchaeological studies may help to understand long-term dynamics as sedimentation depends to a very high degree on agriculture. There are many different traces of past land use, but it is difficult to link them directly to specific land use practices. A heap of stones for example

27 Research conducted by M. Dotterweich (UDATA GmbH, Neustadt/Wstr.). Detailed publication is in preparation.

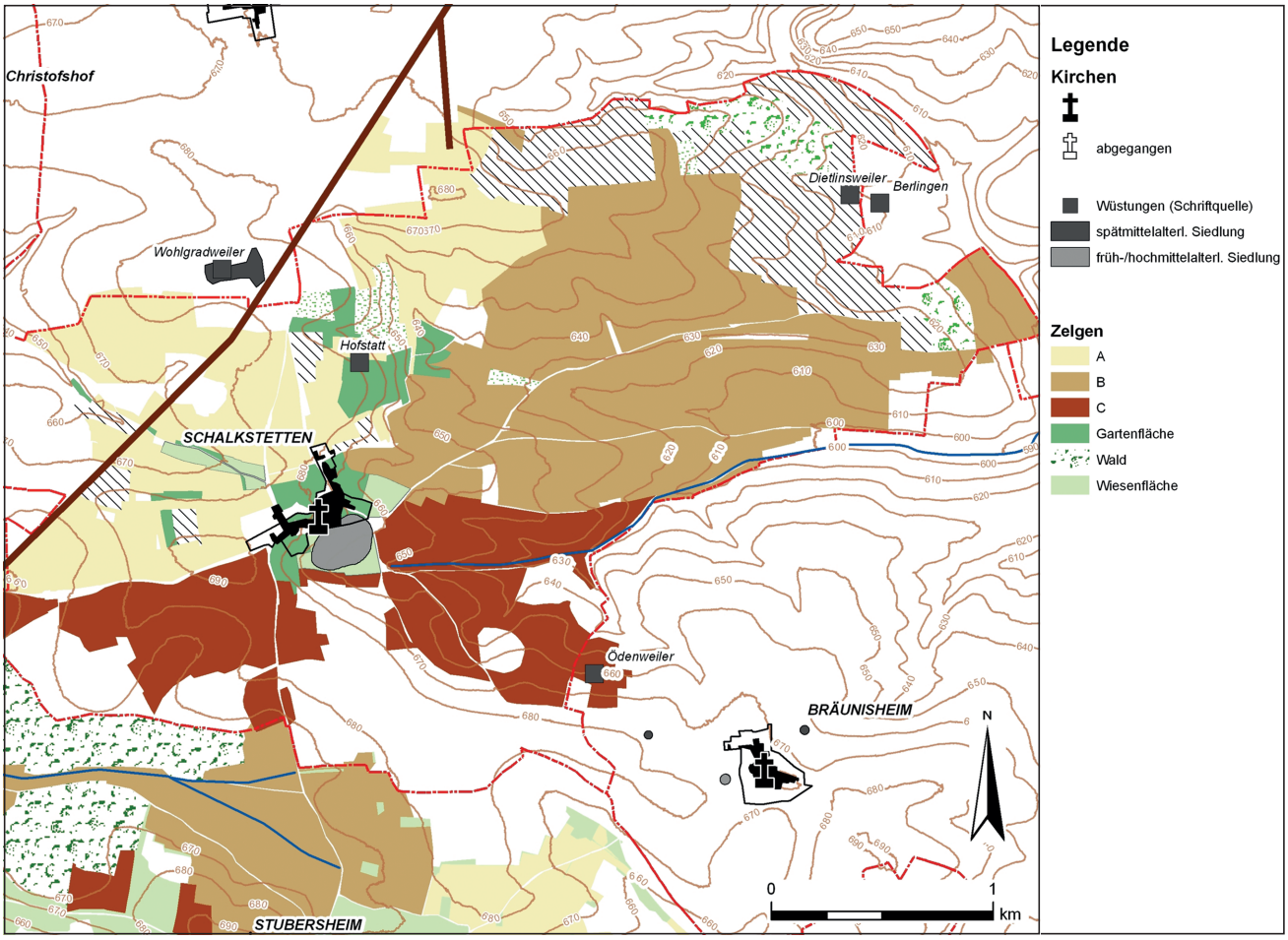

Fig. 11 Boundary of Schalkstetten with three field blocks of the open field system. Hatched: fields outside the regulated open field system, probably formerly belonging to the abandoned settlement of Dietlinsweiler. – (Graphics R. Schreg).

can belong to water harvesting systems or to a melioration of grassland. Stone walls do not necessarily represent the borders of field properties.

The development of the cultural landscape in southwestern Crimea starting with clearance cairns, increasing soil erosion and the establishment of terraces and field walls can be seen in other landscapes as well[28]. Despite individual differences, there are some repeated patterns like creating gardens by water dams in the valleys or protecting fields from soil erosion by terraces. Some of these measures were major investments, which needed cooperation among numerous people. This did not, however, necessarily lead to a central authority of a »hydraulic civilisation«, which established relations of power in order to maintain the agrarian land by irrigation[29]. The relation between land management and field structures and society mainly took place at a local level. Archaeological and historical research on settlement changes in Southwestern Germany provides some insights on how land management is deeply related to the development of rural communities.

Linking fields and social change: insights from medieval Southwestern Germany

The final case study leaves the Byzantine World and Late Antiquity / the early Middle Ages. Instead we will take a look at Southwestern Germany between the 10th and 15th century. This was the time when the medieval cultural landscape saw a fundamental transformation, which included not only the establishment of towns, but also the formation of the »typical« village. From this example we can learn about the complexity of how land management is connected with changes of the landscape on the one hand and changes in the society on the other hand.

Open fields on the old settled land: a case study from the Swabian Alb

In order to give an outline of medieval settlement patterns in Southwestern Germany, a case study from the Eastern

28 Evans, Environmental archaeology fig. 3.

29 Compare Wittfogel, Hydraulic civilisations.

Swabian Alb will be used[30]. The landscape at the Alb plateau around the villages of Schalkstetten, Stubersheim and Bräunisheim (Gde. Amstetten, Alb-Donau-Kreis, Baden-Württemberg), some kilometres east of Geislingen/Steige (Lkr. Göppingen, Baden-Württemberg) is typical for the agrarian landscapes of Southwestern Germany. It represents an agrarian landscape with intensively used fields surrounding nucleated settlements. As the land is still used for agriculture today, there are few traces of past fields. However, we can learn from maps and written documents about an open field system containing three field blocks for winter grain, spring grain and fallow.

Archaeological research provides evidence of early medieval settlements in the periphery of the modern villages. A spatial analysis of the ceramic distribution within a settlement area immediately south of Schalkstetten indicates that the location of these settlements shifted within small distances. The latest finds of these settlements date to the 10th/11th century. This is around the time when there are the first documents referring to the still existent villages, as they were linked to specific farmsteads located near the church.

Besides these early medieval settlement sites, there is also nearly a dozen deserted late medieval settlements at the Stubersheimer Alb, mainly known from written sources and toponyms. Few archaeological traces have been found either by field walking or by geophysics, therefore we can hardly tell anything about their beginnings or about their abandonment. By analysing the late medieval field system (**fig. 11**), however. we recognise that their land was integrated in various ways into the later field system. In the case of abandoned Dietlinsweiler its former agrarian land was never integrated into the open field system of neighbouring Schalkstetten. It remained in individual land use as outfields or was abandoned and forested, as is shown by traces of terraces visible in LiDAR scans. Other abandoned settlements were either completely integrated into the agrarian land of the surviving villages or can be traced within written sources as a separate administrative district over centuries.

Despite some unique characteristics by its location at a karst plateau, the Stubersheimer Alb represents the typical situation of medieval settlement changes in Southwestern Germany: There are several examples indicating that early medieval farmsteads were quite often shifting over small distances in close proximity to the later village[31]. Most of them were abandoned in the 11th/12th century and point to a crucial phase within the process of village formation at that time. One important factor among many others – as the new medieval towns[32] – was the reorganisation of the agrarian land from individually cultivated, most probably enclosed land towards open fields organised in a compulsory crop rotation.

In the early Middle Ages the shifting settlements were most probably a method of maintaining the fertility of the soil by changing the usage of land over decades between settlements, gardens, fields, and sometimes maybe even woods. Crop rotation took place on individual plots. This required the enclosure of fields by stone walls or hedges to prevent damage by animals grazing on nearby fields. These were however an obstacle for harnessed teams of oxen, which need space to turn around. The new coordinated cultivation in a regulated open field system in which adjoining fields were subject to corresponding crop and pastoral regimes (»Dreizelgenwirtschaft«) reduced the need for enclosures and allowed turning the plough team on neighbouring ground. This new land management included the removal of hedges and made it possible to enlarge the agrarian fields in the heart of densely used areas settled at least since the beginning of the Middle Ages (»Altsiedelland«).

Historical and geographical research judged the introduction of the regulated open field system as a major advance in agrarian technology[33]. However, looking at the long-term changes of the settlement structure and land use practices we need to reconsider whether in fact this innovation was a factor of environmental risk and part of the causalities of the late medieval crisis.

As a result of the open field system large areas were simultaneously planted with the same crop; enclosures, hedges and terraces were most probably removed. This had effects on soil erosion, hydrology and microclimate, but also on the settlements, which now became permanent. The former long-term shift of land usage came to an end and the regenerative effect of shifting land use ceased. On large open fields heat emission, evaporation as well as the hydrology changes and can cause more severe weather events. Fields become more attractive for locusts and the practice of common grazing of husbandry during the fallow periods probably increased the risk of epizootic pests. In fact, we know all these disasters from the 14th century: epizootic pests in 1315/16, a plague of locusts in 1338, the Black Death in 1347-49 and heavy rain events as in July 1342[34].

There is still more research to be done, as so far we can not trace the changes of the cultural landscape within the necessary details.

An abandoned settlement in low mountain ranges

In order to understand the effects of the open field system and the village formation it is helpful to take a closer look at a landscape where there has never been a compulsory open field crop rotation. The last case study deals with the village

30 Schreg, Geislingen. – Kastowsky-Priglinger et al., Stubersheimer Alb.
31 Schreg, Kontinuität.
32 Schreg, Entstehung.
33 White, Medieval technology 69.
34 Fouquet/Zeilinger, Katastrophen. – Schreg, Plague.

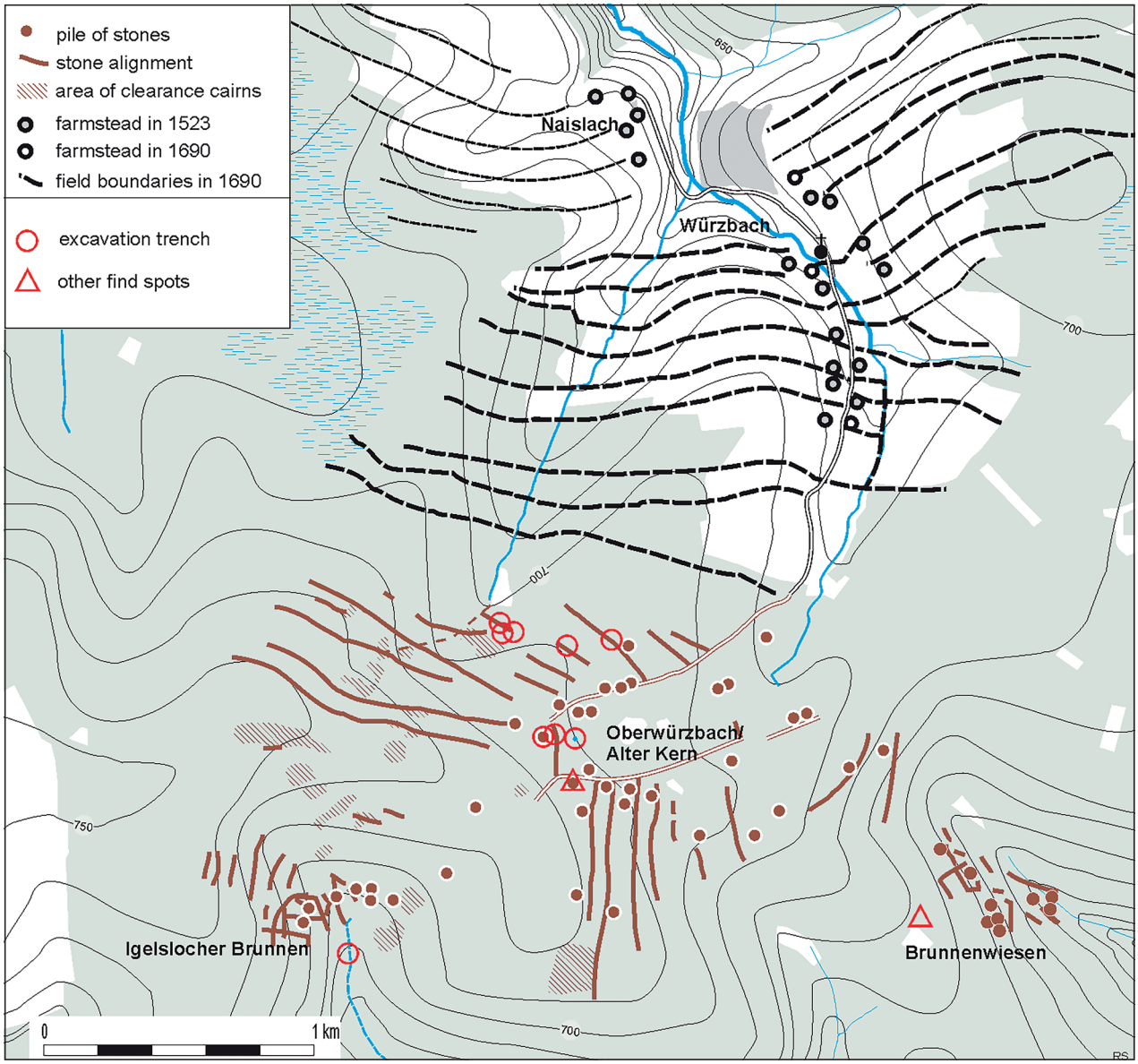

Fig. 12 Deserted settlement of Oberwürzbach south of the still existing village of Würznach. – (Graphics R. Schreg).

of Würzbach (Gde. Oberreichenbach, Lkr. Calw, Baden-Württemberg) in the northern Black Forest. It is a forest village with long strip plots behind the farmsteads (»Waldhufendorf«), as is very common in that region. This kind of villages has been seen as planned settlements, methodically founded in the 11th/12th century.

However, in the forest south of the existing village extended traces of settlement activities as well as of its economic land are very well preserved[35]. There are stone heaps of former farmsteads, traces of old roads, agrarian terraces, stone alignments, lynchets and clearance cairns which show altogether the remains of earlier medieval settlements. Surveys are challenged by the coniferous forest, as there is low visibility in aerial photographs but also in available LiDAR scans. Based on intensive ground survey an archaeological map (**fig. 12**) has been prepared. It shows different structures of earlier, medieval settlements. Dated by radiocarbon as well as by ceramic sherds we can reconstruct a development starting with two small, irregular settlements at the head of small valleys. A nearby geoarchaeological backhoe trench indicates first soil erosion before around 1000 AD.

In a second stage a first row village developed on the plateau in close proximity to the previous settlements. The farmsteads were organized side by side with their economic land behind the houses. Close to the houses there was a garden area with some installations of still unknown function. At

35 Schreg, Würzbach. – Ongoing doctoral thesis by Katja Thode, Tübingen University (SFB RessourcenKulturen).

the adjacent agrarian land there are small balks from ploughing. More prominent however are the long stone alignments delimiting the long sides of the farm land. They consist of stones weathered out of the underlying rock, collected by the farmers to improve their land. Behind the agrarian fields there is in many cases a zone characterized by hundreds of small clearance cairns. As excavations show, they were collected around standing trees and therefore do not indicate open grassland or fields. Probably peasants already collected litter in the wood in order to mix up the dung of the cattle in the stable for manuring the fields. This practice was intensively followed in modern times and caused an acidification of soils and a degradation of the forest.

In contrast to the early settled landscapes and their problems due to an increasing intensity of agrarian land-use and a subsequent vulnerability against various risks, agriculture in the Black Forest was less intensive. In many other low mountain ranges, where there had been an intensive agrarian land use according to written sources, there are many deserted settlements[36]. The situation is different in the Black Forest. There are only few deserted settlements and even the situation in Würzbach rather refers to continuity than to collapse. The existing village is possibly a direct successor of the settlement remains covered by forest today. The latest ceramics at the abandoned site belong to the beginning of the 15th century, whereas the existing village was probably already in existence around 1415, when a small church was constructed by the inhabitants of 20 farmsteads.

Settlement history in Central Europe and especially in Southwestern Germany can be sketched as part of a long-term interaction between men and landscape (**fig. 10**). There have been other aspects, as the influence of the emerging towns and rearrangements of the feudal system, aristocratic power and the shaping of territories[37]. But the long-term transformation of settlements and rural communities in Southwestern Germany from a highly flexible settlement pattern to the medieval village was primarily connected to changes in land use practices and the cultural landscape. In the context of this process many settlement sites were abandoned, either in the course of an early medieval system of shifting settlements or in the course of a settlement concentration. By now – as modern research on field systems is missing and bio- and geoarchaeological research only provides punctual data – these settlement sites in the periphery of later settlements are the most important source for tracing this transformation. However, we urgently need to look beyond the settlements and to understand the agrarian landscapes, not only in their physical outline, but also in their ecological settings. Material cycles and energy flows changed, climate, soil and the biosphere of plants and animals were affected.

Conclusion: Transformations of landscapes

What can we learn from the late Middle Ages in Germany for the understanding of transformations of towns and landscapes in the Byzantine World?

The situation in Southwestern Europe shows how agrarian land use was in fact an important factor for the formation of village communities and a major contribution of landscape changes.

Keeping in mind the crucial role of land management for the long-term economic and social development of local communities, we need to ask whether there had been similar processes in the Byzantine World. From our case studies we can see the possible role of soil erosion and field enclosures. However, the situation in the Syrian Limestone Massif, in the Negev desert, the Crimean mountains and the Leskovac basin in the Central Balkans are very different, historically as well as in their natural settings. Therefore it is only possible to transfer the results of research from one region to another heuristically, indicating possible information and possible methodological approaches in order to understand every single case individually.

An important aspect of this conclusion is therefore the methodology of research. All case studies presented in this article highlighted the role of fossil fields for understanding past land use practices. They also illustrated different methods of surveying and dating them. They showed a methodological bias in establishing a chronology of landscape changes, as there is by now a lack of interest in fossil field systems and an insufficient amount of specific geoarchaeological projects. Modern methods in researching field systems have improved the possibilities of documenting and dating them[38], and even if problems of resolution in time will probably remain, this will allow tracing the development of cultural landscapes in more detail. However, these field systems have not to be seen just as anthropogenic transformation of the physical landscape but also as a crucial element of human ecosystems[39]. The practice of land management had far-reaching consequences, as it is closely related to matters of cooperation within the local community, organisation of land property and local power. Furthermore it is linked to the ecology of the cultural landscape and may trigger soil erosion, changes of microclimate as well as the outbreak of diseases[40].

36 Compare e. g. Stephan/Tönsmeyer, Sölling. – Bergmann, Wüstungen.
37 Schreg, Entstehung. – Schreg, Commons.
38 Schreg, Feldstrukturen.
39 Schreg, Ecological approaches.
40 Acknowledgments: Research on this paper has been realized in the framework of the research field »Gesellschaftliche Wandlungsprozesse und Dynamiken« of the RGZM and the WissenschaftsCampus Mainz »Byzanz zwischen Orient und Okzident«. Thanks to Constanze Röhl (Cottbus) and Miriam Steinborn (Mainz).

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Zusammenfassung / Summary / Résumé

Landnutzung als Faktor des Kulturlandschaftswandels. Vergleichende Fallstudien unter besonderer Berücksichtigung des Früh- und Hochmittelalters

Der Wandel der Kulturlandschaft ist in erster Linie von der Art und Weise abhängig, wie der Mensch das Land nutzt und bearbeitet. Altflurrelikte und geoarchäologische Forschungen stellen dazu eine wichtige Informationsquelle dar. Vorliegender Artikel skizziert Beispiele aus dem byzantinischen Raum, speziell aus Nordsyrien, der Negevwüste, der südwestlichen Krim und vom Zentralbalkan. Da diese Flurrelikte in der Forschung relativ wenig Aufmerksamkeit gefunden haben, greift der Artikel in einem zweiten Teil auf Erfahrungen aus dem mittelalterlichen Südwestdeutschland zurück, die nahelegen, dass Umweltveränderungen und soziale Transformation gerade auch im ländlichen Raum eng aufeinander bezogen waren.

Land Management as a Factor in the Transformation of Rural Landscapes. Comparative Case Studies with Special Attention to the Early and High Middle Ages

The transformation of cultural landscapes is highly dependent on human land use. Remains of ancient fields are an important source for learning about the factors of transformation. Present article presents research on land use practices from Northern Syria, the Negev desert, Southwestern Crimea and central Balkans based on fossil fields and geoarchaeological studies. As this topic was not studied intensively in the Byzantine world the second part of the article refers on the example of Southwestern Germany, where a complex interaction between landscape change and social transformation is at least plausible.

L'exploitation du sol comme facteur de l'évolution du paysage cultivé. Etudes de cas comparatives tenant compte particulièrement du haut Moyen Age et du Moyen Age central

L'évolution du paysage dépend avant tout de la manière dont l'homme utilise et travaille le sol. Les anciens parcellaires et les recherches géoarchéologiques sont une source d'information importante. Cet article décrit des exemples pris dans l'Empire byzantin, spécialement du Nord de la Syrie, du Négev, du Sud-Ouest de la Crimée et du Centre des Balkans. Ces anciens parcellaires n'ayant suscité que peu d'intérêt auprès des chercheurs, l'article intègre dans un deuxième volet des expériences tirées du Sud-Ouest de l'Allemagne médiéval, prouvant que les changements environnementaux et les transformations sociales sont étroitement liés aussi en milieu rural.

Traduction: Y. Gautier