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On byre-houses and husbandry: post-Roman settlement and landscape transformations in the central Netherlands

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Making Places, Making Lives.
Landscape and Settlement in Coastal Wetlands

Proceedings of the 72nd Sachsensymposium,
9-12 October 2021 Castricum-Alkmaar

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durch
Babette Ludowici

Making Places, Making Lives. Landscape and Settlement in Coastal Wetlands

Proceedings of the 72nd Sachsensymposium,
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Edited by Annet Nieuwhof, Egge Knol and Henk van der Velde

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Preface

This 14th volume of the series *Neue Studien zur Sachsenforschung* contains 15 papers that were presented at two meetings of the Internationales Sachsensymposium, the 71st and the 72nd, which both took place during the years of the Covid-19 Pandemic. The 71st meeting was initially planned as a normal physical meeting, but had to be postponed due to a resurgence of the pandemic. The 71st meeting therefore was a short online meeting, held in the evening of the 16th September 2020. It was a joyous gathering with several presentations, attended by about 80 members who were happy to see each other again after a long period of isolation, even if only on their computer screens.

The 71st meeting had been planned to take place in the province of North-Holland, the Netherlands, in Alkmaar and especially in Castricum in the Provincial Archaeological Centre and museum *Huis van Hilde* (House of Hilde). We could finally meet at this location during the 72nd meeting, which took place between the 9th and 12th of October 2021, in an interval between two lockdowns. As the pandemic was not yet over, a relatively small number of 54 first-millennium researchers were able to attend physically, while another 30 followed the programme via livestream. Participants were not only members, but also PhD students and recent graduates who presented their research.

North-Holland is the northwestern-most province of the Netherlands; it is a coastal region with wetlands that largely formed during the late Holocene. Castricum, at the foot of the coastal dunes and near the former Oer-IJ estuary, was an appropriate location for a symposium on the theme of landscape and settlement in coastal wetlands, under the title *Making places, making lives*. The choice of this theme and location was inspired by the “North-Holland-in-the-First-Millennium” project, initiated by Rob van Eerden, provincial archaeologist of North-Holland. He and Johan Nicolay (University of Groningen) together made this into a comprehensive project in which many researchers from various disciplines participated, together writing a new history of this region during the first millennium AD. The project concluded in 2023 with the publication of *Noord-Holland in het 1e Millennium*, edited by Nicolay and Van Eerden. The project was nearing completion at the time of the conference. The keynote lecture by Johan Nicolay and several papers during the conference presented the results of this project.

Geographically, the contributions to the conference covered a much wider area, from the Celtic Sea to the Baltic Sea. Contacts and connections along the coast and across the

North Sea, connections and exchange with inland regions that were under Roman or Frankish influence, discontinuity and resettlement, and the subsequent formation of new groups and creation of new identities were themes that kept recurring during the conference and also in this volume. The Introduction that opens the book elaborates on these themes and explains how the book is structured.

The conference organising and scientific committee consisted of Rob van Eerden (Province of North-Holland), Peter Bitter and Nancy de Jong-Lambregts (City of Alkmaar, Archaeological Centre), Arno Verhoeven and Menno Dijkstra (University of Amsterdam), Annet Nieuwhof (University of Groningen), Egge Knol (Groninger Museum) and Henk van der Velde (ADC, Amersfoort). The practical organisation was in the hands of Menno Dijkstra, Egge Knol, Henk van der Velde and Carla Jansen (Marbles Events).

This volume is edited by Annet Nieuwhof, Egge Knol and Henk van der Velde. We want to thank the authors for their willingness to publish their contributions in this volume. It was quite a time-consuming process, not least because all contributions were double peer-reviewed. We also want to thank all reviewers, and our British colleagues who were willing to correct the English texts: Diana Briscoe (London), Helena Hamerow (Oxford), Catherine Hills and Sam Lucy (Cambridge) and John Hines (Cardiff). We have enjoyed working on this book, even though it took three eventful years to complete.

Financially, the conference was made possible by the *Provincie Noord-Holland*, the *Gemeente Alkmaar*, the North-Holland Archaeological Centre *Huis van Hilde*, the University of Amsterdam, Leiden University and the *Stichting Roel Brandt* (ADC-ArcheoProjecten). Publication costs were covered by generous contributions from the *Provincie Noord-Holland* and *ADC-ArcheoProjecten*, Amersfoort.

Finally, we dedicate this volume to our dear colleague Babette Ludowici, thanking her for her great commitment and achievement as editor of the NSSF series in the past years.

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On Byre-houses and Husbandry: Post-Roman Settlement and Landscape Transformations in the Central Netherlands

Roeland Emaus

Introduction

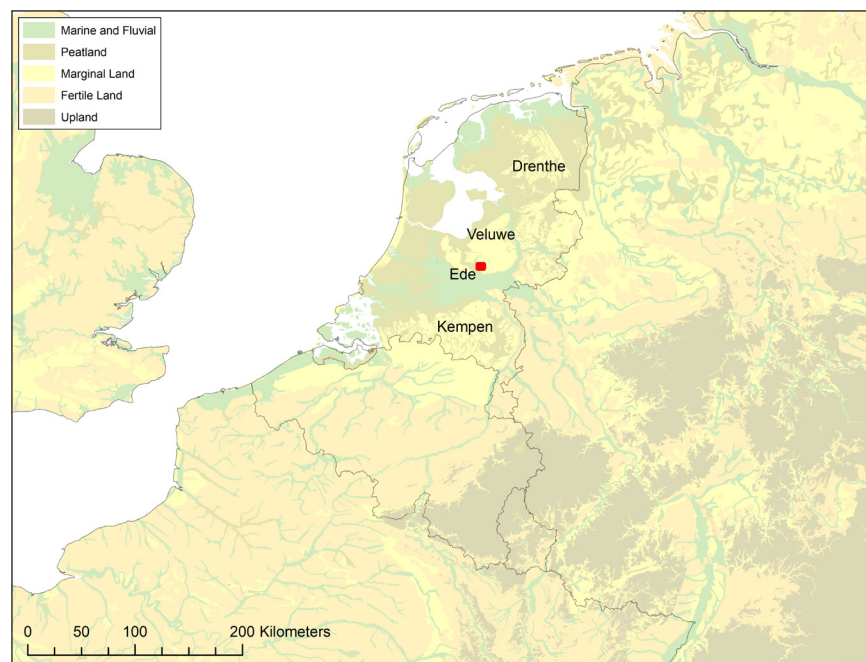
A landscape is shaped and formed by human beings according to their needs and wishes. One of the most important needs of a human being is the procurement of food from that landscape, and it is exactly this need to feed that has a profound influence on how a landscape is managed by its inhabitants and thus takes shape. The problem, however, when investigating the cultural landscape of some historical period, is that there often remains very little of that landscape intact. Archaeologists interested in the relationship between a community and its surroundings, therefore, experience a methodological disadvantage. However, understanding the subsistence activities of a community as evidenced by the internal organization within the settlement, can hold interesting clues as to how the wider landscape is organized and maintained. This paper will discuss the subsistence activities of local communities, particularly from the central Netherlands, at a pivotal point in time: the transition from the Roman to the medieval period.

To do so, I will focus my discussion on the functioning of the household economy as it can be reconstructed from the

excavated material: the layouts of byre-houses. The focus will be on what Tim INGOLD (2000) referred to as *Livelihood*, the activities people employ in procuring their subsistence since it is, arguably, these activities that form the basis of their daily life and routines. The aspects of livelihood can be investigated further by combining principles of animal husbandry and the layout of byre-houses. An analysis of livelihood, therefore, will aid the development of better models on socio-environmental processes (e.g., CARLSTEIN 1982).

Since the 1970's, the archaeological study of settlements has shifted from a descriptive approach, with its inherent emphasis on classification and ordering of material culture, to questions concerning a community's economy and social relations. In the Netherlands, the excavation of large surfaces has greatly aided the study of settlements and settlement patterns. Early medieval settlement archaeology in the sandy landscapes of the Netherlands has been going on for many decades. In the past, extensive archaeological research in the context of explicitly formulated research programmes has taken place in this type of landscape in the Kempen region (THEUWS 1999; 2019), the province of Drenthe (WATERBOLK 1995; 2009; DE VRIES 2019) and the Veluwe plateau (HEIDINGA 1987) (Fig 1). Current development-led archaeological practice

Figure 1. A simplified map of the Northwest European landscape during the Early Middle Ages, showing the case study area (red square) and regions named in the text. Map by R. Emaus, based on Vos et al. 2020; European Soil Database; ASTER GDEM.



in the Netherlands has rendered archaeological research of medieval settlements much less systematic (THEUWS 2014), although some overviews have been published (e.g., VAN DER VELDE 2007; 2011; THEUWS and VAN DER HEIDEN 2011; VAN DOESBURG 2014; VAN ENCKEVORT et al. 2017). The results of these studies have led to a better understanding of settlement development and intraregional economic development of the countryside. The former main objectives of categorizing house plans and classifying material culture into regional groups are now replaced by an interest in cultural systems and social histories.

However, the archaeology of this landscape is hindered by poor preservation of organic remains. The abovementioned regions are situated in the relatively acidic sandy areas of the Netherlands, leaving archaeologists with mostly postholes and ceramics. Ecofacts such as wood, bone, (macro)botanical remains and pollen are hardly encountered in these contexts. The discussion focuses on settlement patterns and is geared towards developments in house-building traditions, often linked to identity and ethnicity. The regional economy is understood through the spread of ceramics and, to a lesser extent, metal objects. Discussions on the functioning of the agricultural economy and land use are hampered and have been dominated by a few wet contexts, mainly wells, from which pollen and macro-botanical remains have been analysed. These contexts remain, however, difficult to interpret.

In this paper, I will propose an interpretation of livelihood based on house plans and settlement structures excavated in and around the town of Ede in the central part of the Netherlands (Fig. 1). This region is located just north of the river Rhine, which at the time functioned as the Roman Limes. The region is also seen as being the northern margin of the Merovingian kingdom. The case of Ede is particularly suitable because it contains several settlements dating to the 5th and 6th centuries that have been excavated in relative proximity: two settlements from the Roman Period with multiple contemporary house plans dating from the 1st to the 5th centuries and two farmsteads, possibly *Einzelhofe*, dating to the 6th and 7th centuries. Though not unique in the sandy areas of the Netherlands, Ede serves the purpose of further exemplifying what new interpretations a landscape-archaeological approach, by reconstructing livelihood, can offer. Ede can be compared to other localities that show signs of (local) continuity in the 5th to 6th centuries, such as Zelhem (VAN DER VELDE and KENEMANS 2002a; 2002b) and Zutphen-Eme (GROOTHEDDE 1996; BOUWMEESTER 2000), which consist of mainly *Einzelhofe* in the early medieval period. This comparison will have to show to what extent the observed results can be generalized for the sandy area of the Central Netherlands. The seven reportedly contemporaneous house plans at Odoorn-Sportveld in Drenthe, dated well into the 8th century (WATERBOLK 1973; LANTING and WATERBOLK 2002), make it clear that regional and diachronic variety is to be expected.

This study explores the impact of the role cattle husbandry has on social and economic systems and land use. I recognize that other livestock was likely housed in the byres of longhouses as well. The example of the burnt house of Norre Tranders (HARVIG et al. 2015), where seven cattle, four sheep, three horses and one pig were found in the byre, shows this to be the case. The question remains, to what extent this can be generalized to other regions and periods. In agricultural terms, the cattle dominated the economy of this particular household since four sheep and a pig together are hardly the equivalent to one larger livestock (horse or bovine) in terms of food consumption and the production of, e.g., meat, milk and manure. Workhorses can be kept in byres, but no more than two animals are needed per agricultural unit (before the introduction of heavy mouldboard ploughing). Pigs need to be socialized to handle them well (KREINER 2020). However, they do not need stalls (WATERBOLK 1975). Sheep and goats can be held in large, extensively tended herds and still allow to be milked.

I will build my discussion on the assumption that the byre of most Roman and medieval longhouses was primarily used to house dairy cattle. Although it is far better for the animal's health to house livestock outside year-round (ZIMMERMANN 1999), there are good reasons to stall them in a byre for certain parts of the day or year. Dairy cattle must be attended to closely and get used to being amongst people by, for instance, letting them live in the same building as humans (ZIMMERMANN 1999). It is important to distinguish between dairy cattle and beef cattle here. Beef cattle can range outside all year round and do not need to be socialized to the same degree as dairy cattle. The culling of stock is based on what INGOLD (1980) describes as a predatory relationship. Therefore, the presence of a byre can be seen as a proxy for tame bovines, rather than beef cattle that are best left to roam freely in a semi-feral state (i.e., a ranching economy). The presence and size of a herd of beef cattle is hard to establish archaeologically, especially in the absence of animal bones. However, the size of the byre and the number of stalls that can be identified, implies the (maximum) number of tame bovines providing meat, milk and labor; these are the products the byre produces.

There are alternatives to stalling dairy cattle in a byre-house. Still, as ZIMMERMANN (1999) argues, there may be valid psychological reasons to stall them close to people (cf. EVANS-PRITCHARD 1940). Following WATERBOLK (1975) and OLAUSSEN (1999), we assume the stalls found in byres were indeed used to stall cattle. Starting from the information we have, the remains of byres, and assuming that these were primarily used to stall dairy cattle, the question is: what are the implications of different byre sizes for the local economy and land use? Do they imply different scales of animal husbandry, or are there qualitative differences?

This contribution aims to discuss socio-economic behaviour based on the archaeological evidence. I will

first discuss the social and economic implications of having cattle. Second, I will approach the excavated house plans and settlement structures of Ede from the perspective of agricultural utilization and landscape adaptation. The aim is to combine landscape potential with the agricultural economy in order to advance our understanding of the medieval economy. It will be demonstrated for this particular case that this approach can bring to light a distinct socio-economic change in landscape utilization in the second half of the 6th century that has remained unnoticed thus far.

Economic implications of having cattle

Although the constructional elements and size of byre-houses changes between periods and regions, the general internal layout hardly does. The most significant changes between late antique and early medieval houses result from the marked shortening or disappearance of especially the byre section. A smaller byre implies fewer dairy cattle for the agricultural unit under discussion, that is if the cattle were regularly stalled in the byre instead of being kept outside year-round. In this section, I will discuss the organizational and economic implications that the number of dairy cattle has for an agricultural unit.

Herd size, composition and reproduction

Cattle have to be able to reproduce sustainably. Therefore, discussing cattle, even when considering the presence of just one cow, must include ideas about relations to the rest of a 'herd.' A *herd* in this context is a biological concept. It is not meant to indicate a number of animals owned by specific people or household¹ or co-residency with the people who own them. A herd is a self-reproducing cattle population that may be distributed between owners and stabled in various byres, pens or other enclosures or allowed to roam a territory freely. When studying cattle in any non-modern community, it is very hard to analyse ownership, and it is also not always clear where cattle are sheltered at night, but it seems to be a rule of thumb in cattle-rearing societies to have a minimum herd size of around 50 head (BOGUCKI 1988; DYSON-HUDSON and DYSON-HUDSON 1970).

The herd cannot contain just one bull and many cows. As bulls do not produce milk, it will be attempted to keep the mature males in the herd at a minimum. Biologically only one will suffice, but having two bulls in the herd is a safe option to secure reproduction. A small number of immature males is needed to replace the mature males in due time. The remaining portion of the male calves can be castrated to make them more manageable and suitable as draft animals and speed up their growth to maximize meat production (BOGUCKI 1988) and secondary products like hides. The mature females can be kept at a maximum number because they are the part of the herd producing milk and offspring, the crucial factor in maintaining a dairy herd. But as cattle can only be considered mature at the

age of two, there will also be a portion of immature females to replace or supplement the mature females. Assuming a minimum herd size of 50 cattle, the herd composition would resemble the numbers in Table 1.

Fifty cattle do not fit in the byre of most byre-houses, so the herd must be divided over several byres. An average of 16 cattle could be stalled in a byre of 10 m. This is a hypothetical number since the only evidence we have is the presence of compartments that are interpreted as stalls in one section of the house plans (WATERBOLK 1975). If we assume the 10-m byre to be completely fitted with stalls along two long sides of the building, it is still not certain that they were all used, and how and when they were used (e.g., HAMEROW 2002, 25). The only estimate is that there is room for a maximum of approximately 20 cattle, depending on age composition and cattle size (WATERBOLK 1975). However, due to biological factors (pests and diseases), livestock numbers are not always at a maximum, leading to the hypothetical number of 16.

The typical byre-house of late antiquity can only contain a partial (biological) herd. A byre of 10 m contains at most one-third of a functioning, self-reproducing herd (see Table 2).² This means that the occupants of this house needed to be part of a community or have some relation with at least two other similar-sized units that were regularly involved in livestock exchanges. I will explore the exact nature of these relations further on. A smaller byre house would accommodate an even smaller proportion of a viable herd; a byre section of 5 m can house approximately seven cattle (Table 3). This necessarily extends the community of similar-sized agricultural units to at least seven to accommodate a viable herd.

Cattle reproduction and its relation to food production

The amount of cattle attached to a household has implications for the amount of food (in kcal) the household can procure from it. There are some assumptions to be made here because there are uncertainties about the size, (re-)productive capacities and use of Late Roman and early medieval cattle. First is the assumption that mature cows give birth to a maximum of one calf yearly (with an equal ratio of male to female calves). Second is the assumption that cows lactate only for half a year after giving birth, and give 2.5 l of surplus milk daily (BOGUCKI 1988; DIJKSTRA 2011; EVANS-PRITCHARD 1940). Third is the assumption that the caloric value of raw milk is equal to today's raw milk, at roughly 660 kcal per litre. The fourth assumption is that all cattle were eventually eaten (EVANS-PRITCHARD 1940), unless their death could be attributed to disease or was otherwise unexplained or unexpected. Fifth is the assumption of their weight at slaughter: castrates are held to be 100 kg at the age of 2, providing 200,000 kcal, and a mature cow would be 200 kg at ten years, providing 480,000 kcal (DIJKSTRA 2011).

From the above assumptions it can be concluded that an average of 7450 kcal per day can be retrieved from a byre with 16 cattle on meat from castrates, mature females, and surplus milk (Table 2). Likewise, a byre with seven cattle will

Table 1. Composition and average daily caloric production of 50 cattle (after BOGUCKI 1988; DIJKSTRA 2011; DYSON-HUDSON and DYSON-HUDSON 1970; EVANS-PRITCHARD 1940).

No. of cattle		Cattle products (kcal)	
		Meat	Milk
Mature Male	2		
Immature Male	4		
Castrate	11	6050	
Mature Female	19	2550	15,850
Immature Female	14		
Total	50 (minimum herd)		24,450 kcal/day

Table 2. Composition and average daily caloric production of 16 cattle (after BOGUCKI 1988; DIJKSTRA 2011; DYSON-HUDSON and DYSON-HUDSON 1970; EVANS-PRITCHARD 1940).

No. of cattle		Cattle products (kcal)	
		Meat	Milk
Mature Male	1		
Immature Male	1		
Castrate	3	1650	
Mature Female	6	800	5000
Immature Female	5		
Total	16 (1/3 herd)		7450 KCal/day

Table 3. Composition and average daily caloric production of 7 cattle (after BOGUCKI 1988; DIJKSTRA 2011; DYSON-HUDSON and DYSON-HUDSON 1970; EVANS-PRITCHARD 1940).

No. of cattle		Cattle products (kcal)	
		Meat	Milk
Mature Male	0		
Immature Male	0		
Castrate	2	1100	
Mature Female	3	400	2500
Immature Female	2		
Total	7 (1/7 herd)		4000 kcal/day

produce 4000 kcal daily (Table 3). A byre of 16 cattle can provide approximately three-quarters of the minimum daily need of a household of five persons³ if we assume an average caloric need of 2000 kcal per person per day, while a byre of seven cattle can only provide approximately 40 percent of the daily minimum, for such a household. The assumption here is that, as some numbers will be an over- and some an under-estimate, the uncertainties will ultimately cancel out against each other, leading to a relatively robust estimate of caloric output per byre per day. To this number can still be added the meat from bulls after they die, which is negligible for the average daily consumption and, depending on custom, the possible offtake of blood from live animals to supplement the diet. These caloric sources are not included in the calculation.

There must be a secondary source of calories next to cattle, even for a household with 16 cattle. Even pastoral

communities do not depend exclusively on livestock of one type (CHANG and KOSTER 1986, 98). There is usually a small flock of sheep or perhaps some pigs on the side and some foraging opportunities and fishing or fowling activities. In addition, arable or vegetable plots are usually present (DYSON-HUDSON and DYSON-HUDSON 1970; EVANS-PRITCHARD 1940). From an agronomic perspective, a very intensive form of arable farming or horticulture can be practiced with a byre of 16 cattle. The manure collected in the byre from the stabling of the cattle will provide ample nutrients, even if the cattle are only kept in the byre at night or during the worst of the winter weather. A plot of only 0.5-1 ha of grain (or grain equivalent) would be needed to supplement the amount of kcal from the byre for a household of five persons (MAZOYER and ROUDART 2005) if this is the only secondary source of food. Because the amount of manure is more than sufficient, the original capacity of the soil

to contain or store nutrients is not likely to be the determining factor in the community's decision-making on settlement location. Local hydrology would be of more importance.

The economy of a household containing a byre of seven cattle is necessarily different from the above. The smaller number of cattle has a double effect: first, because there are fewer calories to be obtained from the byre, the secondary food-producing activities will have to be intensified, and second, there is less manure, so the secondary food-producing activity is probably less effective if this involves horticulture or arable farming (MAZOYER and ROUDART 2005; SLICHER VAN BATH 1987). Although the amount of manure from seven cattle will still provide enough nutrients to produce a decent grain crop, more time will have to be spent in the fields, and greater care has to be taken in choosing soil with good nutritional capacities.

Livelihood strategies related to cattle husbandry

Livelihood in a functioning herd-size situation

A community consisting of three agricultural units housing 16 cattle each can house a viable cattle herd without any extra-communal exchange relations regarding cattle. There are, however, some practicalities involved when living off a herd. There may be no need to exchange cattle outside the community, but there still is a need to make arrangements internally. First, the community will have to make agreements about the exact composition of the partial herds in their byres, especially regarding ownership and distribution of bulls and either or not castrating specific male calves.

Second, a butchered castrate, let alone a butchered mature cow or bull, cannot be eaten by a single household before the meat starts to suffer from decay. Preserving meat, e.g., through fermenting, curing or smoking, requires adding specific resources like salt or charcoal. A scenario of circulating meat within the community and thus storing other meat on the hoof is possible (GODELIER 2011, 44-45). In such a system, every household will take turns butchering an animal and providing meat, perhaps linked to some regular festivity or other ritual occasion. This will provide food security because most meat can be eaten before it decays, making storing or processing food less necessary, while also providing social cohesion within the community by sharing food and ritual.

Third, if we assume that adolescent children leave their parents' house when they marry and start a new household, we also have to take cattle to be part of this transition, perhaps as a dowry. When a household largely depends on cattle and cattle products, the newlyweds cannot start a new household with an empty byre. The number of cattle in the byre is linked to the household's life-cycle: beginning with a small number that will increase over the years, as does the number of people in the household with the arrival of children. The increase in the number of cattle over the years is necessary because there

are more mouths to feed in a growing household, and children will need a few cattle to start their own viable household in due time. The initial number of cattle in the byre should be large enough to increase within perhaps 20 years, so much so that the household can provide dowries for the children. The minimum amount of cattle related to a household is, therefore, only to a certain degree dictated by the caloric needs of a household but equally so by the social reproductive system of the community.

Fourth, there is also a maximum on the amount of cattle that can be sustained per household: cattle need to be kept tame, as it were, so there needs to be sufficient personal and close contact between cattle and people. The number of cattle in a byre is, therefore, again, dictated by the number of people in the household that can care for the animals.⁴ Equally important is the type of relationship between people and cattle. An economy primarily based on meat extraction has a very different practical and social logic than an economy involving milk extraction (INGOLD 1980). Allowing to be milked and handled without any reluctance from the animals does not come naturally in bovines; this behaviour has to be trained and maintained by keeping the animals near humans daily.

The number of cattle involved in the establishment of a new household is then very much a function of the number of cattle in the parents' byre and the number of children (siblings) that require a share of that stock. The circulation of live animals is therefore linked to the household life cycle, and the reproduction of the household and social system of the community. In a community containing a (minimum) herd, all daily social and economic activities can be performed without any relationship outside the local community, except from time to time an exchange of cattle to keep a healthy genetic pool and except for the reproduction of the household itself. Marriage and kinship relations can take various shapes, which will not be discussed here. However, the critical aspect is that they must preferably be outside the local community (GODELIER 2011, 60; LEVI-STRAUSS 1982).

A more geographical reflection of this socio-environmental system can be provided by looking at the grazing needs of the animals. The most efficient way is to herd them in the surrounding landscape. It is difficult to determine exactly the nature of the relationship a local community has with the surrounding landscape and how they would classify it themselves, as ancestral beliefs, and cosmological and imaginary aspects are also involved (GODELIER 2011, 35; SCHAMA 1995; PLATENKAMP 2019). Taking a functionalist approach, we can estimate a minimum grazing territory based on the minimum herd size. If we assume that a bovine in wet temperate regions needs 8 ha of land to feed itself (MAZOYER and ROUDART 2005), 50 cattle would need 400 ha. This results in a circle with a radius of just under 1130 m surrounding a settlement. This calculated grazing area is an estimate. The 8 ha is assumed to provide for a mature bovine, including what is needed for potential fodder collection, while only part of

the herd consists of mature animals. Also, the landscape will not be equally fertile throughout. It is assumed here that these factors will cancel each other out. Either way, this calculation provides an initial idea about grazing territory.

Livelihoods that involve alternative cattle-rearing strategies

A reduction of the size of the byre, therefore reducing the number of cattle attached to a household, has a profound impact on the social and economic organization of the local community. Having a byre of seven cattle implies a community (or network) of at least six other agricultural units of similar size to make up 49 cattle to (approximately) form a herd. Depending on the stabling regime, the manure collected in the byre would be sufficient to provide nutrients to an increased agricultural plot for one household (MAZOYER and ROUDART 2005). Since manure can be collected more efficiently in a byre than by letting the animals manure the fields directly while grazing, it would be more time-consuming but also more productive to bring fodder to the animals in the byre than to let them graze in the fields.

The production of fodder also has implications for the social organization of the local community. For example, certain parts of the landscape must be free of grazing animals until July to produce enough hay for winter fodder. Also, the increased surface area of arable fields will have to be free of grazing animals between sowing and harvesting. Therefore, formalized land use and ownership arrangements with neighbouring agricultural units are needed that cover not only pasture areas but also arable fields and hay meadows.

From the above model, there seem to be two possible scenarios regarding the intra- and intercommunal exchange for agricultural units with only seven cattle: either settlements or communities were smaller than the seven households needed to comprise a minimal herd, leading to extra-communal exchange relations regarding meat and livestock, or settlements were larger than seven households implying that regular exchange relations could be kept intra-communal.

Possibilities for surplus production in a functioning herd-size situation

It has been suggested that in the 4th century people outside the Roman Empire were *foederati* and received payments from the Late Roman administration (ROYMANS 2017). However, it is unlikely that the products of their byres were traded for these payments; as both the above scenarios show, the milk was produced in quantities sufficient for a household, and it is difficult to interpret this as a tradeable surplus (let alone imagine the logistics of transporting or processing it towards the frontier zone). If meat was the desired product, it is also difficult to envisage the cattle stalled in the byre providing it sustainably; again, the meat from these cattle hardly amounts to anything more than subsistence production. A separate beef herd might produce a surplus of meat, but as discussed above, the presence of a separate beef herd is archaeologically

invisible and unrelated to the number of dairy cattle stalled in the byre.

Still, the occasional presence of extraordinarily large longhouses begs the question of their intended use. It is tempting to link these structures to the production of a surplus that can then be traded or used for social events (WOLF 1966). But, following the principles of raising, handling and stalling cattle, the interpretation as surplus production is, although not impossible, not necessarily evident either. The number of cattle in a community cannot increase suddenly within a generation unless through exchange or theft. Furthermore, there is a maximum amount of cattle in relation to adult people if the animals are to be kept tame (see note 4). Therefore, the 'creation' and organization of the occasional extraordinarily large longhouse must be explained first before we can discuss the possibilities and nature of a surplus.

Early medieval landscape and settlement transformations in the Central Netherlands

A land of opportunity

The four excavated sites in and around Ede that provide the data for this case study are situated in a sandy landscape, between relatively fertile podzol soils on the east and peatland or seasonally inundated lands in the west (Fig 2). The local relief was mainly formed during the Saalien Ice Age when the Scandinavian glaciers reached to the south of Ede and shaped the higher Veluwe ridges to the east and the lower-lying Gelderse Valley to the west.

The Gelderse Valley slowly flooded during the Holocene, and an extensive peatland was formed in the basin. The *Atlas of the Holocene* (Vos et al. 2020) classifies the western half of the case study area as peatland, but the Dutch soil map provides a more nuanced interpretation of this landscape. This map shows a type of soil (*beekeerdgrond*, or brook ground) that implies seasonal flooding of this area, with dry summers and wet winters. This area provides excellent summer pasture because of the influx of nutrients that comes with the winter flooding while remaining too damp for arable farming.

The sandy soils to the east were relatively well drained but susceptible to the leaching of nutrients, resulting in the formation of podzols. However, the particular type of podzol formed in these areas remained relatively nutrient rich and non-acidic. The physical landscape, therefore, provides good opportunities for all sorts of livelihood strategies for growing crops as well as for raising livestock. We must look at the archaeological remains to see what strategies people choose to make a living.

The settlement structures and house plans of Ede

Looking at the excavated settlements from the Late Roman Period to early Middle Ages near Ede, we find four sites that are relatively close to each other: the site of Op den Berg, dating from the 1st to the 4th century AD (TAAYKE et al. 2012);

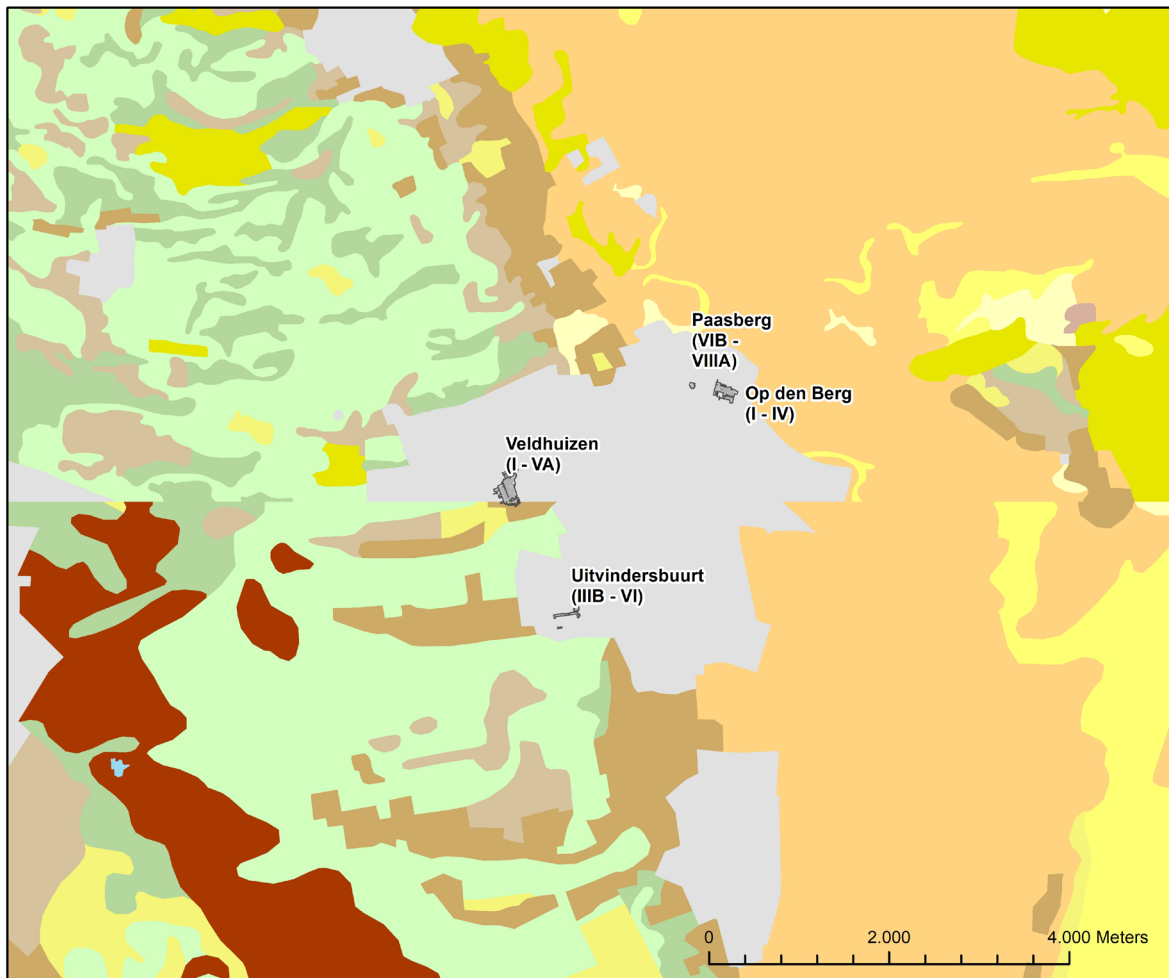


Figure 2. The case study sites are plotted on the modern soil map of the Netherlands. Grey areas are modern built environments, yellow and orange areas are dry sandy soils, and greens are wet sandy soils with remains of peat (brown). Map by R. Emaus, based on Stiboka soil maps.

Veldhuizen, dating from the 1st to the first half of the 5th century (TAAYKE et al. 2012); Uitvindersbuurt, dating from the second half of the 3rd to the 6th century (TER WAL and WITTE 2013) and finally Paasberg, dating from the second half of the 6th to the beginning of the 8th century (HOVEN 2014). For the Paasberg and Op den Berg sites, a continuation of settlement between these two sites has been suggested (VAN ENCKEVORT et al. 2017, 79). Considering the geographical proximity and the temporal distance between all these sites, it is very tempting to assume continuous habitation from the 1st to the 8th century. As I will argue later in this contribution, this is an improbable scenario. There is a very distinct and fundamental difference in the social organization of the community between the 5th and the 6th centuries.

In the following sections, I will discuss the settlement structure and house plans of these four sites. The discussion will focus mainly on the evidence from the 4th to 7th centuries. I will follow the datings given in the original publications. All four settlements were partially excavated, although the Op den Berg and Veldhuizen sites were excavated to a large extent.

No sampling (e.g., micromorphology, pollen or phosphate analysis) was done during the excavations that could shed light on any landscape characteristics or functional interior differentiation within the structures mentioned in the text.

Ede – Op den Berg (4th century)

The site of Op den Berg was occupied from the 1st to the 4th century with no notable changes in house typologies or settlement structure or location (Fig 3). Nine longhouses (byre-houses) and some ancillary buildings, such as sunken floored huts and possible storage buildings, were assigned to the 4th century. One of these buildings stands out as extraordinarily large (structure 63). It is internally divided into three sections and has clear stalls for livestock. A more ordinary building is structure 28 (Fig 4), with an internal division that can be interpreted as a byre in the western part, a central working area, and living quarters in the eastern section. Two of these nine structures overlap others, giving a maximum of seven contemporaneous buildings for this period. Assuming an average life span of 25 to 30 years for a longhouse (HAMEROW



Figure 3. Excavation Ede-Op den Berg, the grey (opaque) structures are from the 4th century. Map by R. Emaus, based on TAAYKE et al. 2012; VAN ENCKEVORT et al. 2017.



Figure 4. Plan of structure 28, excavated at the Ede-Op den Berg site and dating to the 4th century. Map by R. Emaus, based on TAAYKE et al. 2012; VAN ENCKEVORT et al. 2017.

2002, 54; HEIDINGA 1987, 32), the settlement would be occupied by three longhouse units per generation during the 4th century.⁵

Ede – Veldhuizen (5th century)

The site of Veldhuizen was occupied from the 1st to the first half of the 5th century, with no notable changes in settlement structure during this period. The last phase of this settlement consists of four longhouses and some ancillary buildings, such



Figure 5. Settlement structure Ede-Veldhuizen, the grey (opaque) structures are from the first half of the 5th century. Map by R. Emaus, based on TAAKE et al. 2012; VAN ENCKEVORT et al. 2017..

as sunken floored huts and possible storage buildings (Fig 5). A typical house plan from this site is structure 2 (Fig 6), with clear stalls for livestock in the western section of the house. Further, a central section and an eastern section can be discerned in the plan.

Ede – Uitvindersbuurt (6th century)

The site of Uitvindersbuurt contains only a few structures, of which only one house plan can be dated to the 6th century, with a possible barn, a sunken-floored hut and three haystacks (Fig 7). The other structures found here date to the Middle



Figure 6. Plan of structure 2, excavated at the Ede-Veldhuizen site and dating to the first half of the 5th century. Map by R. Emaus, based on TAAYKE et al. 2012; VAN ENCKEVORT et al. 2017.

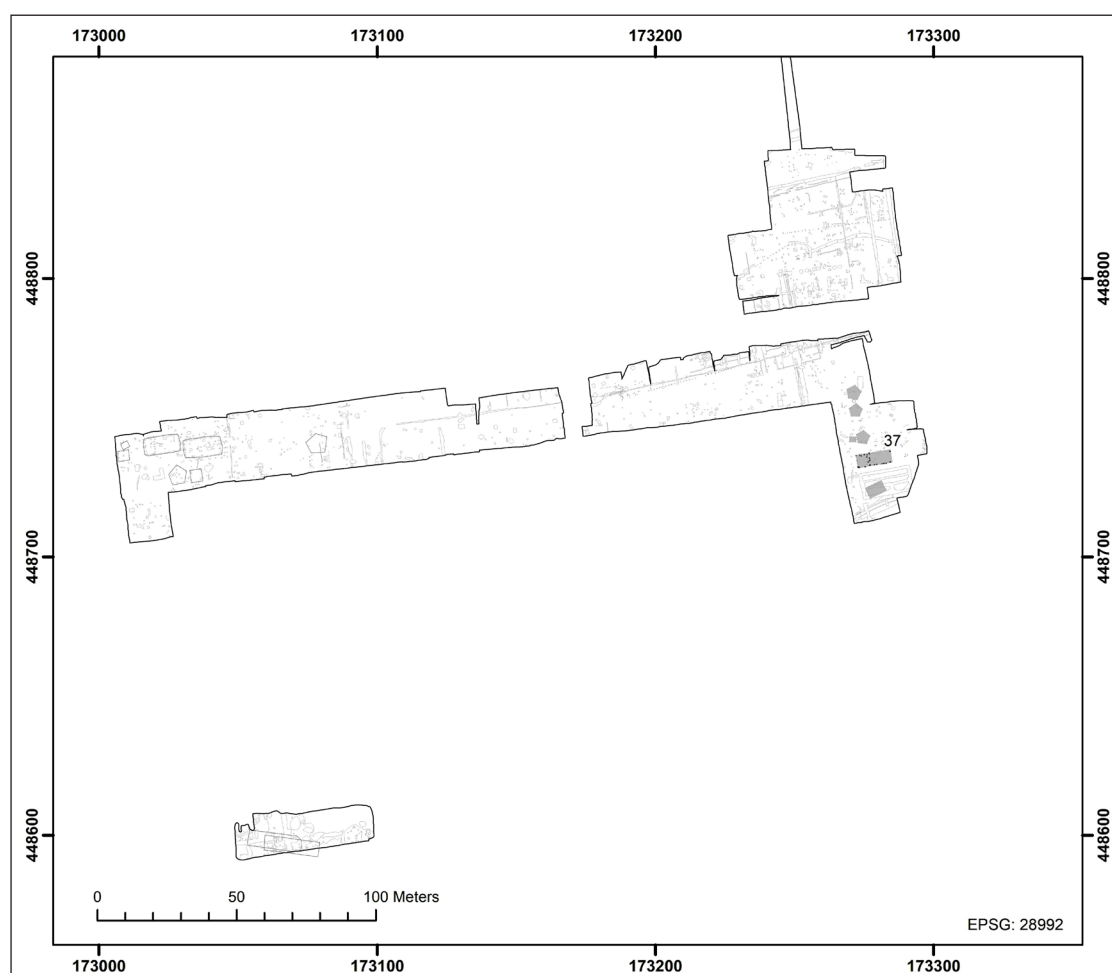


Figure 7. Settlement structure Ede-Uitvindersbuurt, the grey (opaque) structures are from the 6th century. Map by R. Emaus, based on TER WAL and WITTE 2013; VAN ENCKEVORT et al. 2017.

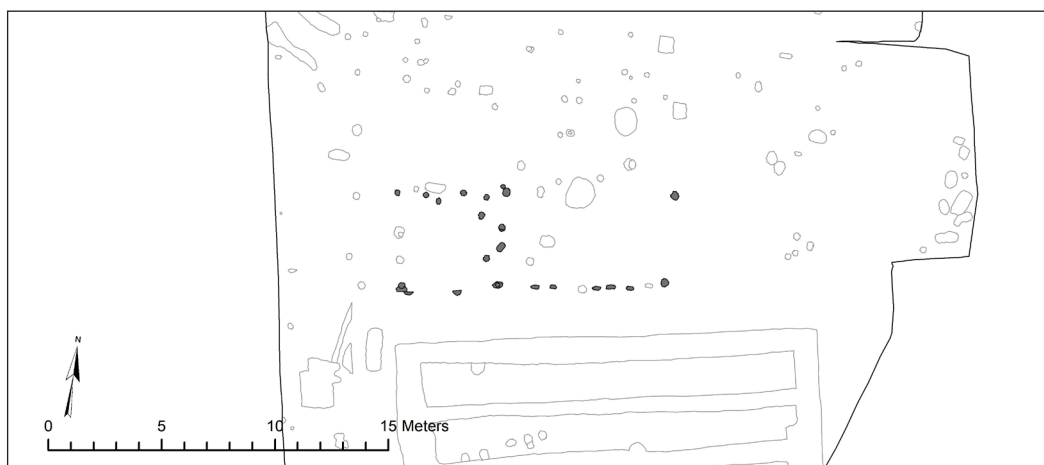


Figure 8. Plan of structure 37, excavated at the Ede-Uitvindersbuurt site and dating to the 6th century. Map by R. Emaus, based on TER WAL and WITTE 2013; VAN ENCKEVORT et al. 2017.

Figure 9. Settlement structure Ede-Paasberg, the grey (opaque) structures are from the second half of the 6th century. Map by R. Emaus, based on HOVEN 2014; VAN ENCKEVORT et al. 2017.

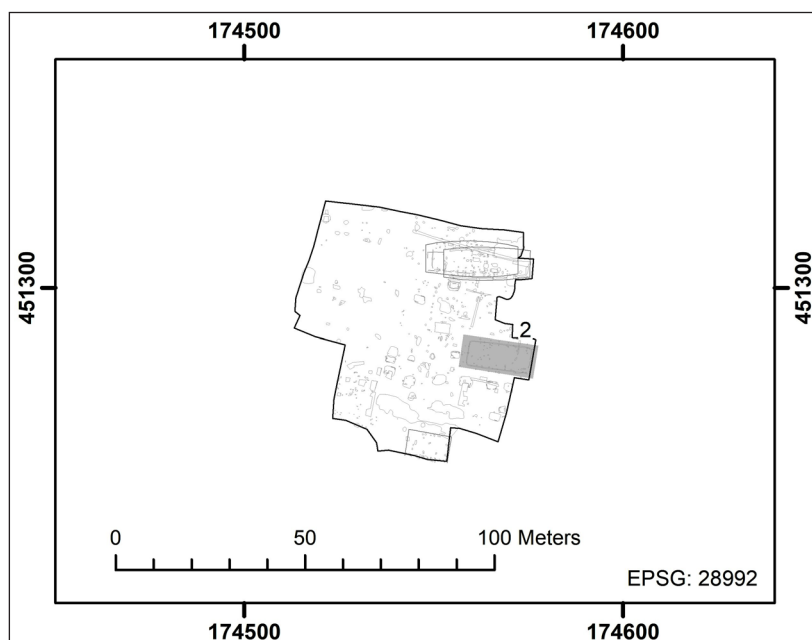
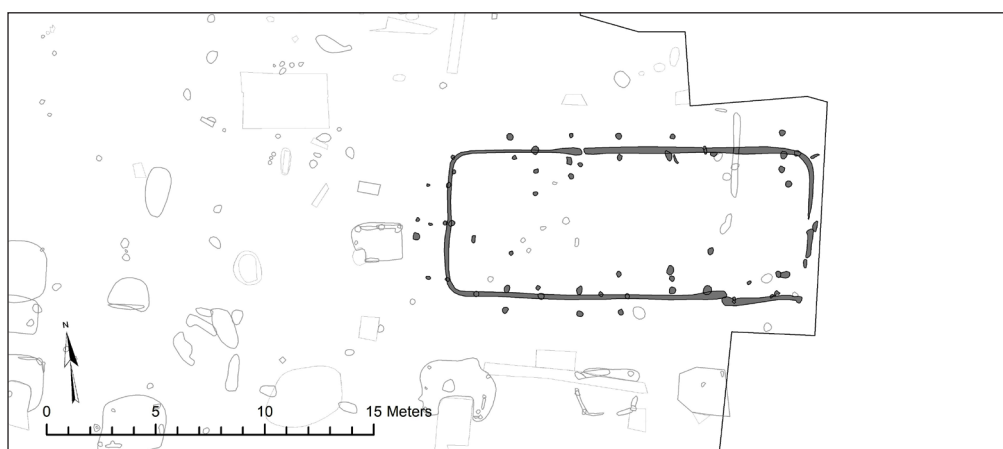


Figure 10. Plan of structure 2, excavated at the Ede-Paasberg site and dating to the second half of the 6th century. Map by R. Emaus, based on HOVEN 2014; VAN ENCKEVORT et al. 2017.



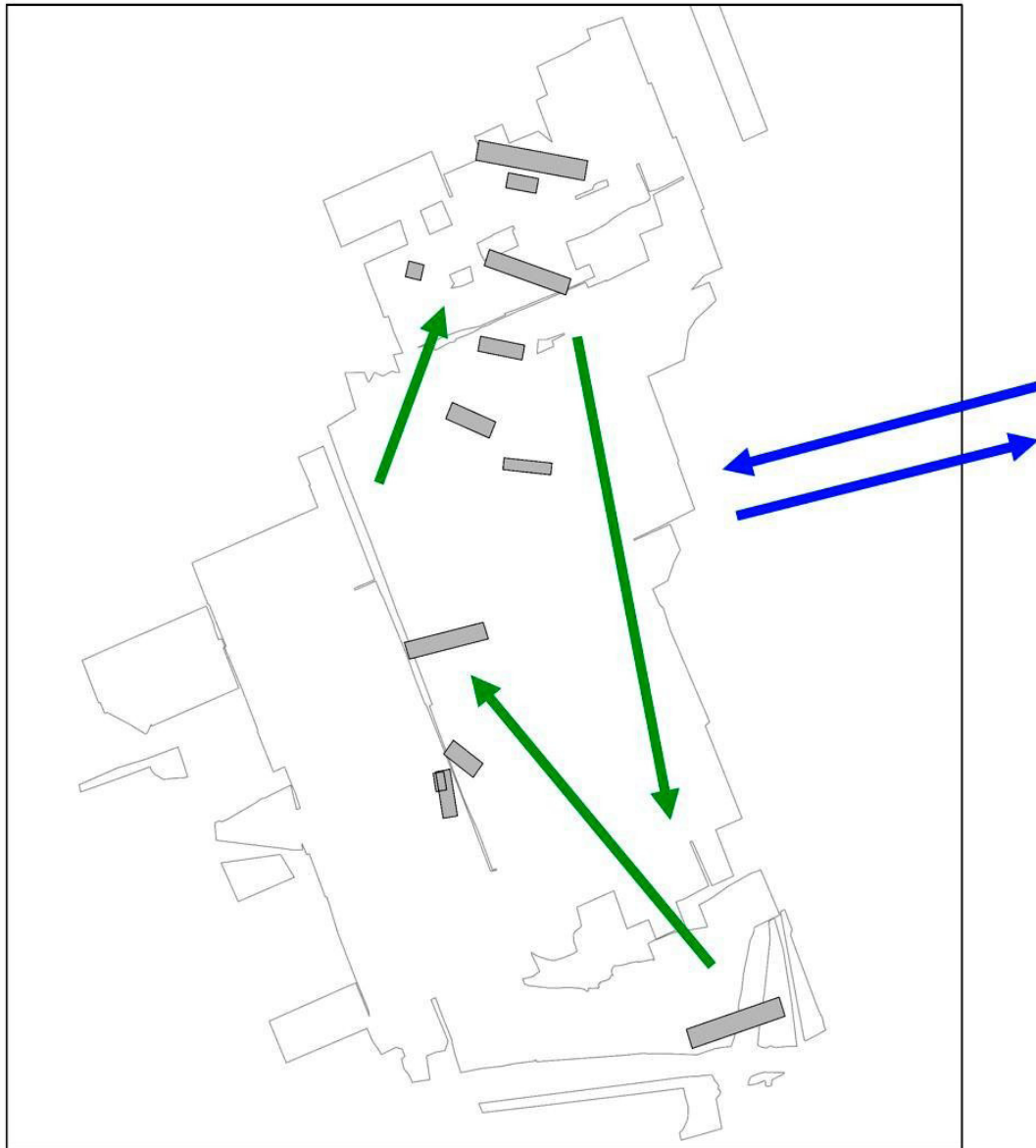


Figure 11. Internal circulation of meat and cattle through ceremony and life-cycle events (green arrows), and the external relations based on kinship and marriage partners (blue arrows). Map by R. Emaus, basemap based on TAAYKE et al. 2012; VAN ENCKEVORT et al. 2017.

Roman Period. This may be part of a larger settlement as only a small area could be excavated at the Uitvindersbuurt. The settlement structure is therefore uncertain. The house plan of this period is represented by structure 37 (Fig 8), which consists of a byre-house that is markedly shorter than the 4th and 5th-century ones from the other sites. Because of the poor preservation of the site, it isn't easy to distinguish clear internal sections other than the possible byre in the west.

Ede – Paasberg (6th century)

The site of the Paasberg contains probably three house plans, of which only one might date to the 6th century (Fig 9). The other structures in this excavation can be dated to the 7th or

even 8th century. Again, a relatively small area was excavated, possibly representing only a small portion of the settlement. Structure 2 is a relatively short byre-house. No internal divisions or entrances can be distinguished (Fig 10).

Settlement change in the Ede area

One of the most apparent distinctions that can be made when looking at these house plans is based on the length of the byre-house. Except for structure 63 of the Op den Berg site, all byre-houses of the 4th and 5th centuries are similar in size, ranging in length between 30 and 40 m. The two structures of the 6th century and later ones are approximately 20 m long. Generalizing the later house plans is difficult because

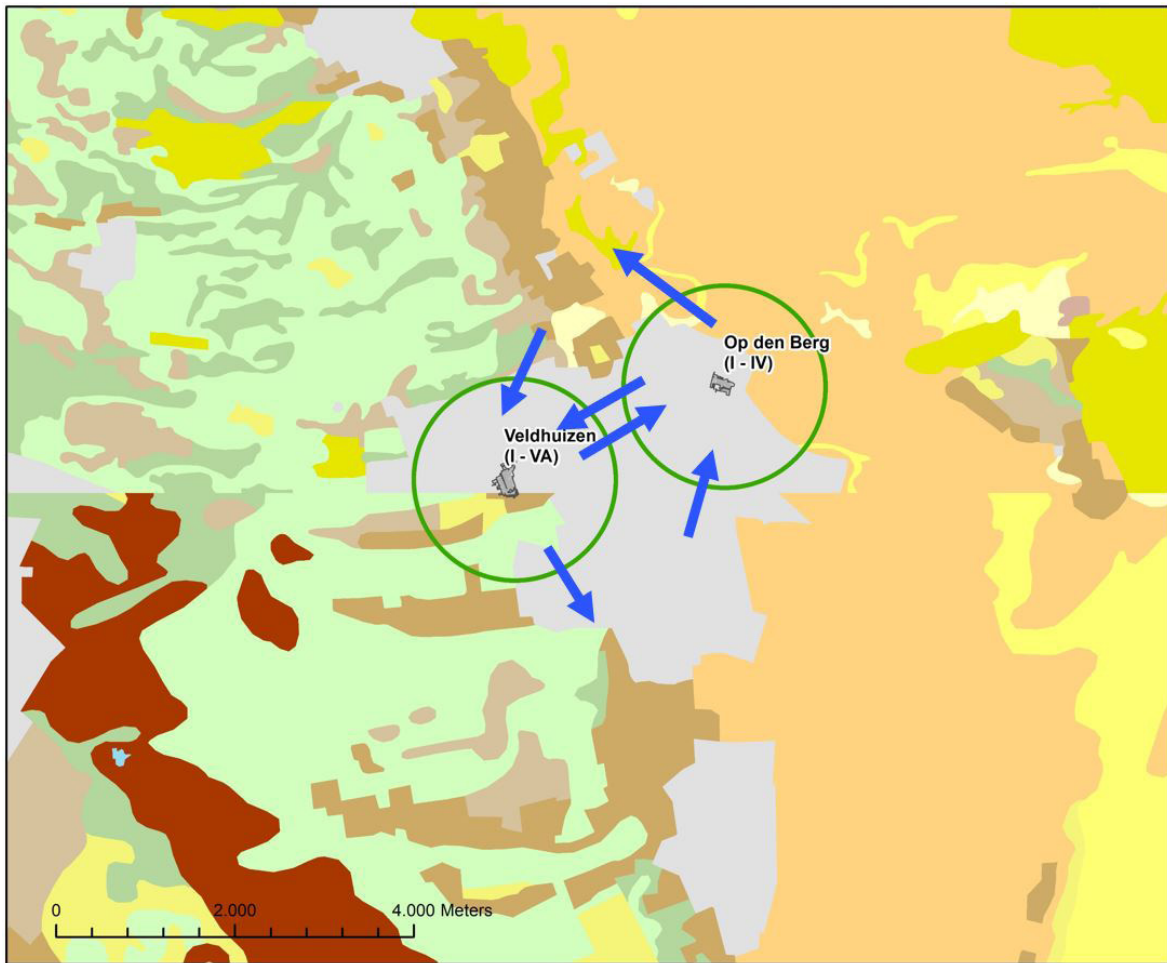


Figure 12. Territorial extent full herd-size situation (green circles) and the regional exchange network based on kinship relations (blue arrows) in the 5th century. Map by R. Emaus, based on Stiboka soil maps.

only two structures date to the 6th century. Since there is some regional variation in house construction between the northern and eastern parts of the Netherlands (VAN DER VELDE 2014), the general trend of a reduction in the size of byre-houses in Northwest Europe, as described by HAMEROW (2002, 18-19), should therefore be investigated in more detail. The discussion of the house plans of Ede, as discussed below, can add to this discussion.

Looking at the Op den Berg and Veldhuizen sites, four byre-houses of approximately the same size and type, with byres of 10 m long, possibly containing an average of 16 cattle, are present in the first half of the 5th century, averaging approximately three per generation, thus containing a full herd at any given time. Because all cattle in the community combined form a viable herd, there is no need for regular management of cattle and circulation of meat outside this community (Fig 11). If we take the Op den Berg and Veldhuizen settlements of Ede to be simultaneously occupied during the Late Roman Period and assume that they both maintained a herd of around 50 cattle, it is possible that they were in competition with each

other for the best grazing grounds. However, if we calculate and plot the assumed area that the cattle of each settlement needed, it is clear that their respective grazing ranges do not overlap (Fig 12). From a herding perspective, there is no need for inter-community arrangements regarding the exploitation of the land. Therefore, there is also no need for strict land ownership or conscious territoriality outside the settlement. From a livelihood perspective, these settlements were able to organize and sustain themselves largely without external relations, save for finding marriage partners and maintaining kinship relations.

In the house plan of Uitvindersbuurt (structure 37) at least one internal division into two parts can be recognized. And although no cattle boxes are visible, from the better-preserved plans of the Odoorn-A house type that have been excavated elsewhere, it can be assumed that the smaller part of the building had cattle boxes and was used as a byre (HUIJTS 1992; WATERBOLK 2009). If this were indeed the byre, based on its length of five metres, seven cattle would be a reasonable estimate if we follow the above-described

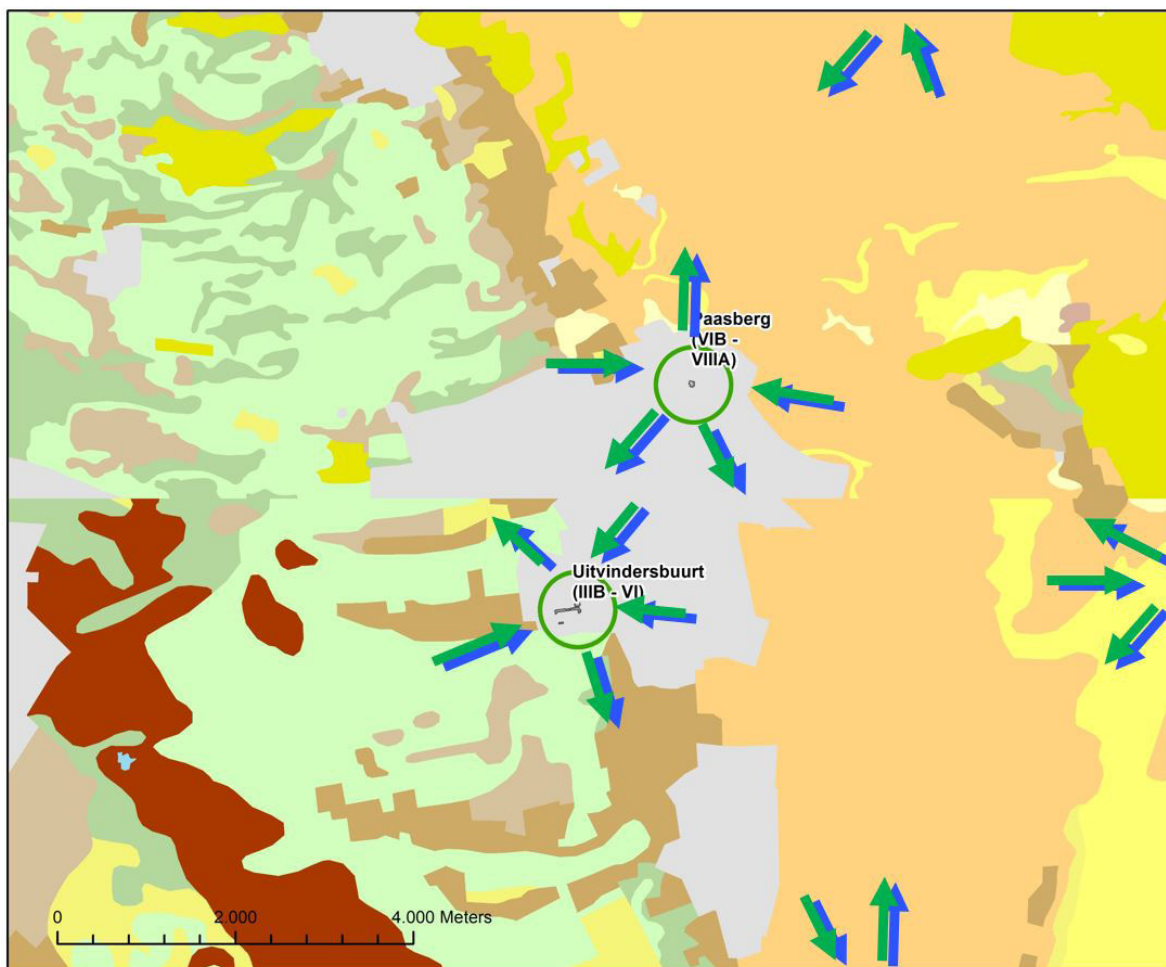


Figure 13. Territorial extent of an alternative herd-size situation (e.g., biennial rotation, green circles) and the regional exchange network based on economic (green arrows), social and kinship relations (blue arrows) in the 6th century. Map by R. Emaus, based on Stiboka soil maps.

model. This suggests that the community probably obtained a substantial part of their food through activities other than keeping cattle for milk and meat; the number of cattle that the size of the byre suggests could not have reasonably sustained a (dairy) economy. The presence of haystacks for storing fodder points toward stabling cattle for manure collection. It is possible that the people living here perceived themselves as being pastoralists or herds people, only having to spend a relatively large portion of their time on secondary food-producing activities because they ran into bad luck regarding herd reproduction, cattle disease or theft, making them *de facto* arable farmers (EVANS-PRITCHARD 1940).

A byre of seven cattle implies only three cows that produce offspring and milk (see Table 3). The community or network must comprise at least seven byres of similar size, which equals to probably seven functioning agricultural household units. Looking at the Uitvindersbuurt site, we see a single house with a single house plan. But, as this excavation covered a relatively limited area, more of these buildings may remain undiscovered. We do not know whether the local community

indeed consisted of the necessary seven households to compose a sustainable herd. There are, however, only a few settlements known from this period consisting of more than just a few contemporaneous households (HAMEROW 2002; HEIDINGA 1987; THEUWS 2019), making it unlikely that a full herd was kept in such a community. Therefore, we can hypothesize that most exchange of livestock was extra-local. We might hypothesize an inclination of the inhabitants towards open exchange systems and an outwards-oriented economy since the extra-communal exchange had to take place regularly to maintain and reproduce their livelihood, leading to complex and fragmented relations within the herding community (Fig 13).

Conclusions

From a settlement perspective, there is evidence for near-continuous occupation of Ede during the transition from

the Roman to the medieval period; there is a gap only from the second half of the 5th century to the beginning of the 6th century AD. But, as mentioned above, the excavations have not been exhaustive. Future evidence for the second half of the 5th century cannot be ruled out. Whether this occupational gap is real or an artifact of a development-led archaeology approach is not essential for the presented methodology.

However, there was a noticeable change in house plans between the 5th and 6th centuries. As I have shown here, the differences are more than just a shift in style or fashion (cf. DIJKSTRA 2011; KRUSE 2019; RAPOPORT 1969). A byre-house of 10 m long is much more than just a shorter version of a byre-house of 30 m long, even if they have the same internal divisions. Therefore, any difference in house size can no longer be interpreted as simply a difference in wealth but must be seen as a different type of economy and social organization. There is a fundamentally different way of life involved that goes beyond the ratio of cattle to people. This has implications on how a community was organized within a settlement and between settlements on all sorts of levels: regular exchange of food, the sharing of ritual, the exchange of marriage partners, their attitudes on land-use, inter-generational continuity and territoriality. The archaeology suggests that 6th century communities in this region are more outward looking and open to commodity exchange than 5th century communities. Detailed analysis of the material culture will have to corroborate this.

In this overview, I have made a case for a fundamental socio-economic change between the 5th and 6th centuries in Ede. Whether there is still occupational continuity is not so relevant here. What is relevant is what the cause of these changes might be. Are we dealing with a society with a subsistence system dominated by cattle-raising, e.g., a sedentary pastoral society, which changed its way of life? That is possible, as livestock can be decimated within days due to various diseases, predation, or other external factors, forcing the community to adopt a different livelihood. Or perhaps, we may have to look at migration to explain these changes. That is also possible since pastoral claims on land are often informal, and perhaps more importantly here, they are invisible to the outsider, making them very fragile in the face of incoming communities with a livelihood dominated by arable farming. World history provides ample evidence for the marginalization of pastoralists fuelled by an economy increasingly based on arable farming.⁶

Furthermore, we need to understand how the exchange of cattle was organized in the 6th century. We can suspect a need for an extra-communal exchange system for cattle because individual settlements were too small to contain a viable, self-reproducing herd. Was this a loosely organized system between settlements in some kinship structure? How was this exchange organized? Are we dealing with an open market where cattle are tradeable commodities? And if so, why were they still housed in the same buildings as humans? Or was there no open market but an exchange system in which

transactions were highly embedded in moral obligations? This might have produced asymmetrical exchanges that we today would not understand unless they took place within the family or among friends.

This paper does not deal with the political situation in this frontier zone of the fading Roman Empire, nor does it discuss the ethnic affiliation of the inhabitants of the Ede settlements. I wonder to what extent the identification of a local community with some larger (imagined) community will help us to describe and understand the workings of their livelihood or household economy. The approach taken here is rather cultural anthropological, and my interest is how these local groups organized their existence. Of course, the outside world is part of that, but maybe in a different way the written texts, written while wearing the glasses of the Roman imperial world, want us to believe.

The question we should try to answer in this respect is to what extent these local communities were connected to the outside world regarding exchange relations. Did these communities produce a food surplus beyond the caloric needs of inhabitants and animals? Although certainly not impossible, I'm inclined to answer this question negatively. We also need to account for a 'surplus' for the days and weeks needed to repair the house, fix a fence etc. and the need for keeping up social relations and ceremonial moments.⁷ It is possible that the community paid tribute to the Roman army, although it was not present in great numbers in the region in the 4th century. Maybe they exchanged some secondary (non-caloric) products, such as tanned leather for making shoes and belts, or they were involved in the production of iron or wooden products. However, there are no indications for such activities. Actually, archaeological evidence suggests only few and difficult to interpret indications for exchange relations with the wider world, apart from the need to find marriage partners.

The approach taken here provides us with basic conditions of reproduction. Still, I would like to avoid the impression that a society can be understood solely on the basis of economic rationalities. Just as the physical environment provides a frame within which daily activities will occur, the tools and technologies of a community pose a frame in much the same way. A better understanding of how people organize their lives does not in itself deepen our understanding of their motivations or identities. Nevertheless, the model I have tried to apply here does provide us with an insight into the form and functioning of some of the social and economic networks that are absent in current discussions of the economic organization of local communities (e.g., DEVROEY and NISSEN JAUBERT 2011, 2015; WICKHAM 2005; PEYTREMAN 2020). By making the relatively simple observation explicit that cattle were present and, therefore, part of the daily organization of a household, we can come to the most fundamental conclusion of this discussion: there is no such thing as a single household living in isolation practicing subsistence agriculture with just a few cattle. If there are cattle, there needs to be a herd.

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Notes

- 1 I will bypass the discussion of what ownership in this period may mean.
- 2 Generally, a number of 20 cattle is considered an absolute minimum for a cattle herd; it will only survive for a short time, however, if numbers do not increase (Bogucki 1988).
- 3 It is unknown how many people were living in a longhouse. Although I agree with the caution we must have regarding the nuclear family as 'the standard', an average of five persons is assumed here to make all described scenarios comparable.
- 4 For instance, for both the Nuer of Sudan and the Karimojong of Uganda, cattle-human ratios of around two adult cattle per human were recorded (DYSON-HUDSON and DYSON-HUDSON 1970; EVANS-PRITCHARD 1940).
- 5 It is uncertain what the average lifespan of a longhouse is and to what extent an average lifespan is meaningful. We must therefore handle the suggested average of 25 to 30 years with great care; research for other parts of the world (e.g., DENYER 1978; WATERSON 1997; GILLESPIE 2000; MARSHALL 2000) and other periods (e.g., TRINGHAM 2000; GERRITSEN 2003; ARNOLDUSSEN 2008; DE VRIES 2019) shows that there is a great variance in the life span of houses and, moreover, that the social, psychological and physical factors of beginning and ending the lifespan of a house, or a building in general, are not well understood yet.
- 6 Some modern examples are the Fulani of western Africa (TENUCHE and IFATIMEHIN 2009) and the Sami of Scandinavia (LANTTO and MÖRKENSTAM 2008).
- 7 These are, respectively, the replacement fund and the ceremonial fund in the model presented by Eric WOLF (1966).

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