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Title: Ancestral heaths: reconstructing the barrow landscape in the Central and Southern Netherlands
Issue Date: 2013-11-21
Chapter 10

Gooi

The previous two chapters have shown many examples of barrows, including several barrow alignments, on the push moraine complexes of the Veluwe that were all built in heath vegetation. In the following chapter another three groups of barrows (and one solitary barrow) will be discussed. These barrows are situated in a region in the centre of the Netherlands called Het Gooi (see figure 10.1). These barrows were also built on a push moraine complex. A more regional vegetation development covering most of the Holocene could be reconstructed based on a recently investigated sequence of podzols that was discovered in a nature reserve area, called the Laarder Wâsmeren area (Sevink et al. in press). This area is situated very close to one of the barrow groups (Hilversum, see figure 10.1).

10.1 Site description and sample locations

Baarn Group

Close to the Lage Vuursche, a small village in the municipality of Baarn, 6 barrows are situated of which three have been sampled and analysed for pollen (Baarn 1-3). The results of these analyses have been published by Casparie and Groenman-van Waateringe (1980, 30-31, 36). Baarn 1-3 were originally excavated in 1927 by van Giffen (van Giffen 1930) and re-excavated and sampled for pollen in 1965 by Addink-Samplonius and Glasbergen. Two barrows (Baarn 1 and 2) are single-period barrows that were dated to the Late Neolithic A period. From Baarn 1 two samples were taken from the old surface. From Baarn 2 one sample from the old surface and two sod samples were taken. The third (Baarn 3) barrow is according to Casparie and Groenman-van Waateringe a two-period barrow, although this could not be confirmed by excavation data. This barrow could not be dated since no grave goods were found. Samples were taken from the old surfaces of each period, a sod and a later interment.

Hilversum Group

The second group of barrows is situated in Hilversum. The barrows have been excavated in 1934 by Bursch (Bursch 1935). Samples for pollen analysis have been taken from the old surface and sods of three single-period barrows (Hilversum 1-3) during a re-excavation that has taken place in 1965 by van Giffen and Bakker (Bakker and van Giffen 1965). Pollen spectra have been published in 1980 by Casparie and Groenman-van Waateringe (1980, 31-32, 37). Hilversum 1 was dated to the Late Neolithic B period based on the find of a copper tanged dagger. Hilversum 2 was dated to the Late Neolithic A or B period based on the type of burial (northeast-southwest orientated crouched inhumation burial; pers. comm. Bourgeois). It should be noted that according to Casparie and Groenman-van Waateringe (1980, 37) this barrow was dated to the Bronze Age, which is now known to be incorrect. The third barrow (Hilversum 3) was dated to the Bronze Age, based on a 14C-date of 1609-1436 cal BC (3240 ± 35 BP; GrN-4885, calibrated with Oxcal 4.2). Measurements of the barrow could not be reconstructed.
The third group consists of 10 barrows and is located near Laren. Three of these barrows (Laren 1-3) were sampled and analysed for pollen (Casparie and Groenman-van Waateringe 1980, 30, 31, 34). The barrows were originally excavated in 1925/1926 by Remouchamps (1928). The oldest barrow (Laren 1) is a two-period barrow of which the first period was dated to the Late Neolithic A period based on the find of PF Beaker and a terminus post quem $^{14}$C date of 3139-2890 cal BC (4385 ± 75 BP, GrN-6683C, calibrated with Oxcal 4.2). During re-excavation by Lanting and van der Waals in 1971 pollen samples were taken from the old surface and sods belonging to the first period and from the old surface beneath the secondary mound. Laren 2 is also a two-period barrow. The old surface and a sod belonging to the first period were dated to the Late Neolithic B period (based on a copper tanged dagger), and were sampled for pollen analysis in 1958 (Lanting and van der Waals 1976). The third barrow (Laren 3) is represented by a pollen spectrum from the old surface underneath the mound. This is a single-period
barrow that was dated to the Late Neolithic B period (based on V-perforated amber buttons). Sampling took place in 1958 by Bakker and Casparie (Lanting and van der Waals 1976).

Roosterbos

Approximately 4 km to the northeast of the Lage Vuursche barrows a single-period barrow is situated in a forest called the Roosterbos. This barrow was excavated in 1926 by van Giffen. A PF Beaker and a flint scraper were found dating this barrow to the Late Neolithic A period. The barrow was re-excavated in 1970 for the collection of palynological samples only. Samples were taken from the old surface and from a sod. The pollen spectrum of one old surface sample (other samples were too poor in pollen for pollen analysis) was published by Casparie and Groenman-van Waateringe (1980, 30).

The Laarder Wasmeren area

In the same region in which the above described barrows were situated, very close to the barrows of Laren, a nature reserve called the Laarder Wasmeren is situated. The soil in this area shows three or four podzols on top of each other developed in layers of drift sand, which were discovered and studied by Sevink et al. (in press). The Laarder Wasmeren data on soil and sand drifting used in the following are derived from this study. Based on OSL dates (see table 5.1) a reconstruction of soil formation and drift sand phases in time could be made. Profile II consisted of four podzols (S1-S4). S1 has developed in Pleistocene cover sand that was deposited around 11500 years BP. Around 8800-6500 years BP this soil was covered by drift sand. In this sand layer another podzol was formed (S2) until it was also covered by a new layer of drift sand around 6400-5800 years BP. A distinct podzol (S3) could develop in this layer, which was marked by bioturbation in the form of presumed beetle burrows. Around 5300-4800 years BP a third layer of drift sand was deposited on S3. S4 developed in this layer. Profile V consists of three layers; S1 and S2 probably have merged together at this location (Sevink et al. in press). Both profiles were sampled for pollen analysis by van Geel (Sevink et al. in press). The prepared samples were kindly provided to the author of the present work who (re-)analysed the samples. The results of these analyses are shown in figure 10.3. The theory and discussion of pollen diagrams derived from mineral soils have been extensively described in Chapter 5. The site and methods of sampling have been described more in detail in section 5.2.

10.2 Results and discussion

What now follows is first a reinterpretation of all barrow pollen data, followed by a presentation of pollen data from the Laarder Wasmeren area analysed by the author. Following this, all data is combined with the results of the study by Sevink et al. (in press) and discussed.

Gooi area

The barrow pollen spectra (see figure 10.2a-c) represent three periods: the late Neolithic-A period, the late Neolithic-B period and the Bronze Age period. The oldest barrows show an arboreal pollen percentage of 30% (Roosterbos) – 55% (Baarn 1 and 2 and Laren 1). This indicates open spaces with an ADF of approximately 100 m for the barrows of Baarn and Laren (see table 7.1). The barrow of Roosterbos possibly was built in a large open space with an ADF that could reach up to 500 m. However, there seems to be an overrepresentation of
Figure 10.2a-c. Pollen spectra from the samples taken from the barrows in the Gooi area. Spectra are given in % based on a tree pollen sum minus Betula pollen. In the total AP (=arboreal pollen) Betula is included. In the total NAP (= non arboreal pollen) spores are included, non pollen palynomorphs are excluded. Different scales have been used, indicated with different colours.
Dryopteris spores, since the percentage is extremely high compared to all other pollen spectra. When Dryopteris spores are left out of the pollen sum the arboreal percentage is 57%. This indicates an open spot with an ADF of approximately 100 m, which is comparable to the barrows of Baarn and Laren. In the Neolithic A period the forest consisted of mainly Corylus (with a pollen percentage of 20-30%), Quercus (pollen percentage = 15-20%) and Tilia (pollen percentage = 2-5%), with an alder carr (Alnus) nearby. The pollen spectra from Baarn show a higher pollen percentage of Alnus (55-70%) than Laren and Roosterbos (45%). It is possible that the Baarn barrows were situated close to an alder carr. The open spaces the barrows were built in were covered with mixed heath-grass vegetation at Laren and Baarn, while grasses and ferns are dominant at Roosterbos. In the following period (late NEO-B) some changes are visible. Two barrows were built in the area of Laren (Laren 2 and 3). The open spots were probably larger than around the older Laren barrows, with an ADF of approximately 100-150 m. Two late Neolithic-B barrows were built in the group of Hilversum (Hilversum 1 and 2) in an open place with an ADF of approximately 100-150 m. The heath vegetation was still a mixture of Calluna vulgaris and grasses, their ratio more in favour of Calluna. Betula trees were probably present as solitary trees in the heathland, indicated by the fluctuating amounts of Betula in the pollen spectra from Hilversum (10-60%). The composition of the dry forest was comparable to the late Neolithic A period with mainly Corylus, Quercus and Tilia. Remarkable is the high percentage of Alnus in one of the Hilversum barrows (Hilversum 1). Perhaps an alder carr was situated very close to this barrow, which had then retreated when Hilversum 2 was built. This barrow shows similar percentages of Alnus as the Bronze Age barrow of Hilversum (Hilversum 3). This barrow was built in an open space with an ADF of approximately 50-100 m in heath vegetation that was dominated by Calluna vulgaris. Baarn 3 could not be dated, but it shows in general a similar vegetation pattern as the dated barrows of Baarn. A difference can be noticed in the composition of the herbal vegetation. At the time Baarn 3 was constructed it was dominated by grasses and contained very little Calluna vulgaris. Since the barrows of Baarn are located quite close together (about 100 m apart from each other, see figure 10.1b) it can be assumed that they were all built in the same open space covered with heath vegetation. This would indicate that Baarn 3 was not built contemporary with the other two barrows, since the herbal vegetation composition seems to have been fairly different when barrow 3 was built. Another possibility is that the open space Baarn 3 was built in was situated separate from Baarn 1 and 2. In that case nothing can be said about the simultaneity of the barrows. A sample taken from the grave pit of the barrow shows an increase in non arboreal pollen and Calluna vulgaris. However, it is not very clear where exactly this sample came from, yet it is difficult to draw any conclusions on this pollen spectrum. It could indicate an expansion of the open space, with an expansion of Calluna vulgaris. However, it is also possible that the deceased was buried on top of a layer of heather twigs.

Clearly open spaces with heath vegetation were present in this area since the late Neolithic A period. From this period onwards to the Bronze Age not much changed in vegetation composition. The open spaces varied from approximately 50 to 150 m ADF and consisted mostly of heath and grasses. The surrounding forest was dominated by Corylus, Quercus and Tilia and alder carr(s) were present in the environment. Comparable to the Echoput and surroundings (Chapter 8) and Renkum and surroundings (Chapter 9) this was a landscape that was managed to maintain its heath vegetation. The method of management could not be deduced from the pollen spectra. Some anthropogenic indicators were present, but only

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in very low amounts. Grazing could be indicated by the presence of Poaceae and, although in low amounts, *Plantago lanceolata* and *Succisa*.

**Laarder Wasmeren area**

The pollen diagrams from the Laarder Wasmeren (LWM) area (figure 10.3) show the vegetation development from approximately 8700 BP onwards, long before the first barrows were built in the area. The vegetation development per soil phase, consisting of a phase of deposition and a phase of soil development, can be reconstructed. The soil phases have been plotted continuously after each other. It should be noted however that each soil phase ended with a sand drifting period, probably resulting in a gap in vegetation development between each soil phase.

**LWM II – S1** (before 8700 years BP, ca. 6700 cal BC)

The first phase in profile II shows a period in which *Pinus* was the dominant species. The presence of large amounts of *Botryococcus* and ferns suggest the presence of shallow water at the site. When *Pinus* and *Botryococcus* decreased, *Corylus* increased. More open vegetation developed with first an expansion of Poaceae, followed by an expansion of *Calluna vulgaris*.

**LWM II – S2**

Arboreal species are dominant in the pollen diagram, with total AP percentages around 80%. An alder carr developed, as shown by the increasing percentages of *Alnus*. A dry forest was present in the surroundings, which consisted mainly of *Quercus, Tilia* and *Ulmus*, with *Corylus* at the forest edge. Heath vegetation was present, starting with low amounts (pollen percentages around 10%) and gradually increasing to pollen percentages around 50%. At the end of this phase AP had decreased to approximately 50%.

**LWM II – S3**

AP decreased further until percentages around 40%; the composition of the forest remained unchanged with mainly *Corylus, Quercus, Tilia* and *Ulmus* in the drier part of the area and alder carr in the wetter surroundings. Heath expanded together with Poaceae. At the end of this phase *Calluna vulgaris* is represented with percentages of more than 100% in the pollen diagram, Poaceae fluctuates around 30%. Other anthropogenic indicators were present in the area, but only in small amounts (pollen percentages <1%). Grazing indicators were present as well, in slightly higher amounts (pollen percentages <5%). This part of the soil

<table>
<thead>
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<th>Diameter (m)</th>
<th>Height (m)</th>
<th>Sod thickness (m)</th>
<th>Sod area (m²)</th>
<th>Radius (m)</th>
</tr>
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<tbody>
<tr>
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</table>

Table 10.1. The minimum size of the open space per barrow could not be determined for the barrows of the Gooi case-study, since measurements of the barrows were unknown.
Figure 10.3a. Pollen diagram from the Laarder Wasmeren area: LWM II. Percentage diagrams are shown, with % based on a tree pollen sum minus Betula. In the AP (=arboreal pollen) Betula is included. In the total NAP (=non arboreal pollen) spores are included, non pollen palynomorphs are excluded. Different scales have been used, indicated with different colours.
Figure 10.3b. Pollen diagram from the Laarder Wasmeren area: LWM V. Percentage diagrams are shown, with % based on a tree pollen sum minus Betula. In the AP (= arboreal pollen) Betula is included. In the total NAP (= non-arboreal pollen) spores are included, non pollen palynomorphs are excluded. Different scales have been used, indicated with different colours.
profile showed bioturbation. Consequently this part of the pollen diagram could be showing a mixture of the original vegetation development during this phase. S3 of profile LWM V, however, shows similar vegetation development and in this profile bioturbation was not recorded.

LWM II – S4
This phase started 5400 years BP and during it barrows were built in the Netherlands, including in the surroundings of the Laarder Wasmeren (see above). In this phase an open landscape existed with non arboreal pollen percentages of approximately 70%. Heath expanded further with pollen percentages around 200-300% and even a peak of over 1000%. The forest in the surroundings consisted mainly of Corylus, Quercus, Ulmus and Tilia, with alder carr in the wetter areas, as also shown by the barrow pollen spectra. The levels of anthropogenic and grazing indicators had increased slightly.

LWM V
In profile V the soil phases S1 and S2 probably have merged together. The oldest period, with a dominant Pinus presence, appears to be missing in this diagram. Alder carr in the surrounding area had already developed, as well as the deciduous forest with Corylus, Quercus, Tilia and Ulmus. The heathland is represented by pollen of Calluna vulgaris with percentages fluctuating around 50%. The soil phases S3 and S4 show, as expected, similar vegetation development as LWM II.

The (pre)barrow landscape of the Gooi
The pollen diagrams of the Laarder Wasmeren show a ‘normal’ Holocene forest development as has been described in section 2.1, starting with high percentages of Pinus, which decreased at the beginning of the Holocene. When Pinus decreased Corylus expanded and a deciduous forest developed with mainly Quercus, Tilia and Ulmus (see Chapter 2). Striking is the relatively open landscape with relatively high percentages of Calluna vulgaris already before the first sand drift phase around 6500-8800 years BP (4500-6800 cal BC), since the landscape in the Netherlands was assumed not to have been opened up before the Late Neolithic period (see also section 2.3.1).

The previous chapters have mentioned the presence of considerable heathland areas in the Late Neolithic, since the first barrows were built. This investigation places the occurrence of heath much earlier, to the Mesolithic (Boreal). In addition, periods of sand drifting as early as 8800-6500, 6400-5800 and 5300-4800 years BP (based on OSL, Sevink et al. in press; see table 5.1) are remarkable. Sand drifting could only occur when conditions are unstable. Due to unstable conditions vegetation becomes scarce and is not able to stabilize the soil. Under the influence of wind the topsoil is blown away. Periods of sand drifting are generally linked to human activities. For example due to extensive exploitation of the soil for crop cultivation, intensive grazing by cattle or sod cutting activities vegetation disappears, giving wind free play.

The first man-induced sand drifts in the Netherlands are known to have occurred since the Early Middle Ages (Castel et al. 1989, Riksen et al. 2006), but perhaps prehistoric man was inducing sand drifts long before then. This has also been suggested by Willemse and Groenewoudt (2012), who recorded prehistoric sand drifts along Dutch river valleys. They concluded that these sand drifts were mainly anthropogenic in the area north of the LWM area (the Wester- and Bussumerheide) some Mesolithic artefacts and flint fragments have been
found, indicating the use of the area by prehistoric man. For the Early and Middle Neolithic no archaeological finds have been reported (Wimmers et al. 1993) and also in the LWM area itself no Meso- or Neolithic archaeological artefacts were found (Sevink et al. in press). The third sand drifting period (5300-4800 years BP) occurred around the time the first barrows were built a few hundred metres from the LWM area. Prehistoric man's activities probably intensified, indicated by the slightly increased percentages of anthropogenic indicators. It cannot be determined whether the recorded human activities could induce sand drifting. The pollen diagrams and barrow pollen spectra only show few anthropogenic indicators and there are no indications that the area was used for crop cultivation. Therefore, it is not likely that the area was intensively used. However, given the constant presence of *Calluna vulgaris*, the maintenance of the heath by humans is indicated. This might have been accomplished by grazing, burning or sod cutting, as has been explained in Chapter 8. Grazing is slightly indicated in the LWM pollen diagrams and the barrow pollen spectra and it is not unlikely that the heath area was grazed. Perhaps overexploitation of the heathland was the cause of the sand drifting. However, Jungerius and Riksen state that these agricultural activities alone were probably not sufficient to cause large scale sand drifts (Jungerius and Riksen 2010). They emphasize the role that climate played. A dramatic shift in climate could bring with it adverse conditions for vegetation establishment and maintenance, such as in the case of drought. However, in general the Holocene climate was relatively stable and fluctuations in temperature and precipitation were probably not sufficient to destroy the vegetation cover (Jungerius and Riksen 2010). Therefore, it is not likely that severe climate change was the cause of the sand drifts in the LWM area. Jungerius and Riksen (2010) stress that climatic events such as violent storms were of great importance for the origin of sand drifts. However, this theory is purely hypothetical (Sevink et al. in press). At this moment the origin of the sand drifts in the LWM area, anthropogenic or natural or a combination of both, cannot be determined, although anthropogenic seems the most plausible explanation (in accordance with Sevink et al. in press).

In the preceding chapters it has been shown that from the Late Neolithic period onwards, barrows, including long alignments of barrows, were built in heath vegetation that must have been kept and maintained by human activities. In general it is assumed that before the Neolithic vegetation was dominated by forest, with man adjusting their way of life to the landscape. In this chapter it has been shown that the landscape was already open long before the first barrows were built, and that *Calluna vulgaris* was the prevalent species in the investigated area. This implies a landscape that was managed. The study in this chapter has also shown that very early periods of sand drifting have occurred in this area of which the cause may have been anthropogenic. Possibly overexploitation of the landscape resulted in sand drifting. If Late Neolithic barrow landscape management in itself was already a remarkable conclusion, it is even more surprising that heath management probably took place long before. This topic will be returned to in Chapter 13.