ANALECTA PRAEHISTORICA LEIDENSIA 45

PUBLICATION OF THE FACULTY OF ARCHAEOLOGY
LEIDEN UNIVERSITY

EXCERPTA ARCHAEOLOGICA LEIDENSIA

EDITED BY
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LEIDEN UNIVERSITY 2015

Clearance for a medieval *curtis*, Black Death and buckwheat (*Fagopyrum esculentum* Moench): vegetation history of the area around the confluence of the rivers Swalm and Meuse, the Netherlands, AD 800-1900

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Two pollen diagrams obtained in the neighbourhood of Swalmen, a village in the southeastern part of the Netherlands, record a vegetation history ranging from c. 800 to c. 1900. The Swalmen diagram was obtained from an abandoned oxbow of the small river Swalm, a tributary of the river Meuse, and the other, the Syperhof diagram, from deposits in an oxbow of the river Meuse nearby. They reflect two important events. The Swalmen diagram displays the large-scale medieval clearance which led to a new parceling of the region, a parceling which is still functioning today. The Syperhof diagram shows the impact of the Black Death. Moreover, it prompts the suggestion that the start of buckwheat cultivation is somehow connected with the ravages of the Black Death. Initially buckwheat may have served as an emergency crop.

1 Introduction

In 2002 the Archeologische Diensten Centrum (ADC), Amersfoort, the Netherlands, excavated a terrain bordering the lower course of the river Swalm, a tributary of the river Meuse north of Roermond (fig. 1). The excavation preceded the construction of motorway A73. The site was named Swalmen-Nieuwenhof, Swalmen being the name of the nearest village and Nieuwenhof an important farm nearby. The excavation report appeared in 2013 (Vreenegoor and van Doesburg 2013).

Finds dated to the Early Middle Ages show that the area was inhabited during that period, but the most important finds are a set of buildings that belonged to a medieval site occupied between 950 and 1225. The buildings are interpreted as part of a major homestead, probably a *curtis*, a nobleman's estate. The site was abandoned as a residential site after 1225.

The Swalm is a relatively small meandering river with a source in Germany. Swalmen-Nieuwenhof is situated on its left bank at 1.5 km from the point where the river joins the river Meuse. Its valley has several oxbows filled with loamy and sometimes peaty sediments and one of these is situated close to the excavated area (fig. 1). Palynological investigations preceding the final excavation, and executed by Frans Bunnik (unpublished), suggested its value for vegetation reconstruction in connection with the medieval occupation. He also drew attention to an oxbow of the river Meuse close to the confluence of Swalm and Meuse. As more elaborate research was not envisaged as part of the archaeological work, it was suggested that the Archaeobotanical laboratory of the Faculty of Archaeology, Leiden University, the Netherlands, might be interested in taking over.

Coring, by Corrie Bakels and Wim Kuijper, took place in October 2003. Both oxbows of the Swalm and the Meuse were sampled.

In 2004 both cores were analysed by students under close supervision by Corrie Bakels. The oxbow of the Swalm, named 'Swalmen', was the subject of the MSc thesis of Marijke Langeveld and the oxbow of the Meuse, named 'Syperhof' after a farm close by, was the basis for the BA thesis of Iris van Tulder. As BA work requires far less pollen counting than MSc work, the Syperhof diagram was finished by Corrie Bakels.

Figure 1 The location of the cores (black dots)

2 Material and Method

A side-filling corer was used for sampling the infill of the oxbows. The cores were taken to Leiden and cut into samples 1 cm thick. From the slices selected for pollen analysis, pollen was retrieved by the usual treatment with KOH, HCl, gravity separation sg 2.0 and acetolysis. Before treatment a tablet with *Lycopodium* spores was added following the method Stockmarr (1971). Identification was achieved by using the works of Faegri *et al*. (1989), Moore *et al*. (1991), and for cereals Grohne (1957). At the time identification of non-pollen palynomorphs and counting of charcoal was no standard procedure in the laboratory and was therefore not asked of the students.

The pollen sum aimed at was 300. It is a strictly upland (dryland) pollen sum, excluding wetland trees like alder (*Alnus*) and willow (*Salix*) and possible wetland elements like grasses (Poaceae) and sedges (Cyperaceae). The diagrams were produced using the programs Tilia and Tilia Graph (Grimm 1991).

Both cores were AMS ^{14}C dated at Groningen (table 1). The loamy infill of oxbows is notoriously difficult to sample, because of the risk of displaced material. Also samples near the surface of the infill may suffer from contamination with recent matter brought down by, for instance, small burrowing animals. One sample of the series of five submitted for Swalmen and another of the series submitted for Syperhof fall outside their ranges and expectation.

The Swalmen GrA-29855 sample provided a date which is far too old. This sample consisted of terrestrial seeds but also of a piece of charcoal. To include a piece of charcoal was obviously a mistake. The Syperhof GrA-29722 sample contained post-bomb material and was therefore younger than expected. This sample was a collection of very small seeds which must have been displaced from the surface of the infill. Both dates are therefore rejected. The samples belonged to a first batch sent in for dating. Sampling for the second batch avoided both charcoal and very small seeds. Their results do meet the expectations.

	GrA	Age BP	calAD 95.4%
Swalmen			
40 cm	59688	670 ± 35	1270 - 1394
48-50 cm	29855	1495 ± 40	430 - 645
67-69 cm	29857	985 ± 45	981 - 1161
75-76 cm	29718	1125 ± 35	777 - 993
125 cm	59690	1180 ± 35	725 - 967
Syperhof			
30-32 cm	29721	265 ± 35	1681 - 1930
60 cm	59691	295 ± 35	1485 - 1663
80-82 cm	29722	134.2 ± 0.5%	recent
180 cm	59692	570 ± 35	1300 - 1427
450 cm	59760	895 ± 45	1029 - 1221

Table 1 The 14C dates obtained from the cores Swalmen and Syperhof

3 Results and discussion

3.1 Swalmen

The oxbow Swalmen is the older of the two. Silting up started somewhere before 725-967. The core comprises 204 cm of infill on top of gravel. From the bottom to 18 cm below the surface the sediment consisted of sandy, humic loam, while the uppermost deposit consisted of peat. At 70-72 cm the loam was of a different character, namely more compact with less sand. At first sight the narrow band was interpreted as a serious hiatus in the deposition, but the ^{14}C dates reveal that this interpretation is false. A sudden, not very long-lived event is considered the true cause of the disruption of the usual sedimentation process.

Pollen curves show sudden changes after the event (fig. 2). The tree cover, expressed in arboreal pollen percentages (AP), decreases whilst the curves of rye (*Secale*) and other cereals (wheat/barley/oats, *Triticum*/*Hordeum*/*Avena*) show important rises. Pollen curves of cereal weeds such as cornflower (*Centaurea cyanus*) react in the same way. The category grasses (Poaceae, not included in the pollen sum) show a rise, but the tree cover in the wetter part of the landscape, witness the curve of alder (*Alnus*), suffers too. The event is contemporaneous with the early phase of the medieval *curtis* Swalmen-Nieuwenhof. Most probably it marks its foundation.

The presence of an earlier use of the land, as witnessed by some pollen of cereals and walnut (*Juglans*) tallies with the Early Medieval occupation mentioned in the introduction. The AP percentage suggests that this earlier use had less impact on the general vegetation characterized by a local upland woodland which consisted of oak (*Quercus*), some lime (*Tilia*) and ash (*Fraxinus*), with fringes of hazel (*Corylus*) and birch (*Betula*). However, the proportion of oak rises before the main clearance, reflecting increasing human interference with nature, sparing oak (and hazel to a certain degree), but no other woody species. Beech (*Fagus*) is another important upland tree, but is considered to represent the echo of forests at some distance from the area under review.

The location of the core is close to the place where several large barns belonging to the *curtis* were erected and it could be that the event recorded in the diagram was of very local importance. Even the cereal pollen may have an origin in activities carried out next to these barns. However, the medieval newcomers are known to have restructured

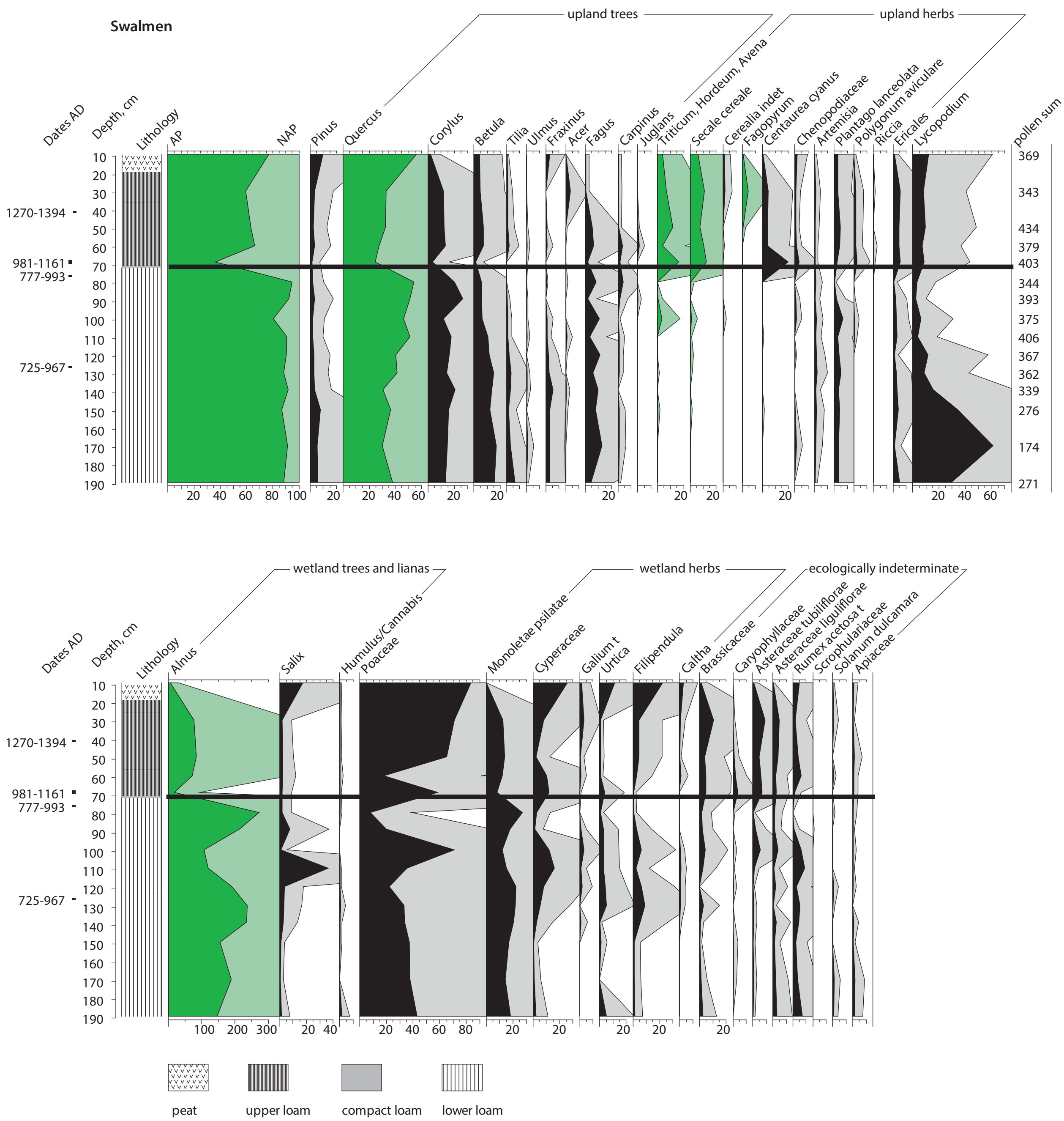

Figure 2 The pollen diagram Swalmen, selection of curves; curves discussed in the text in colour; exaggeration of curves 5x. A black horizontal line marks the level of clearance

the landscape in the wider surroundings. They are held responsible for the parceling of today (fig. 3). The rectangular system of rural roads dissecting the area goes back to their times. Excavation of one of these roads has proven this (Vreenegoor and van Doesburg 2013). This implies a large-scale opening-up of the landscape, and the decline in tree-pollen percentages most probably reflects not only the clearance made for building the homestead, but also clearance further away, including the wetter parts with alder carr. According to finds made during the excavation, the inhabitants of the farm bred horses, and for these animals pastures would have been needed. The low-lying land near

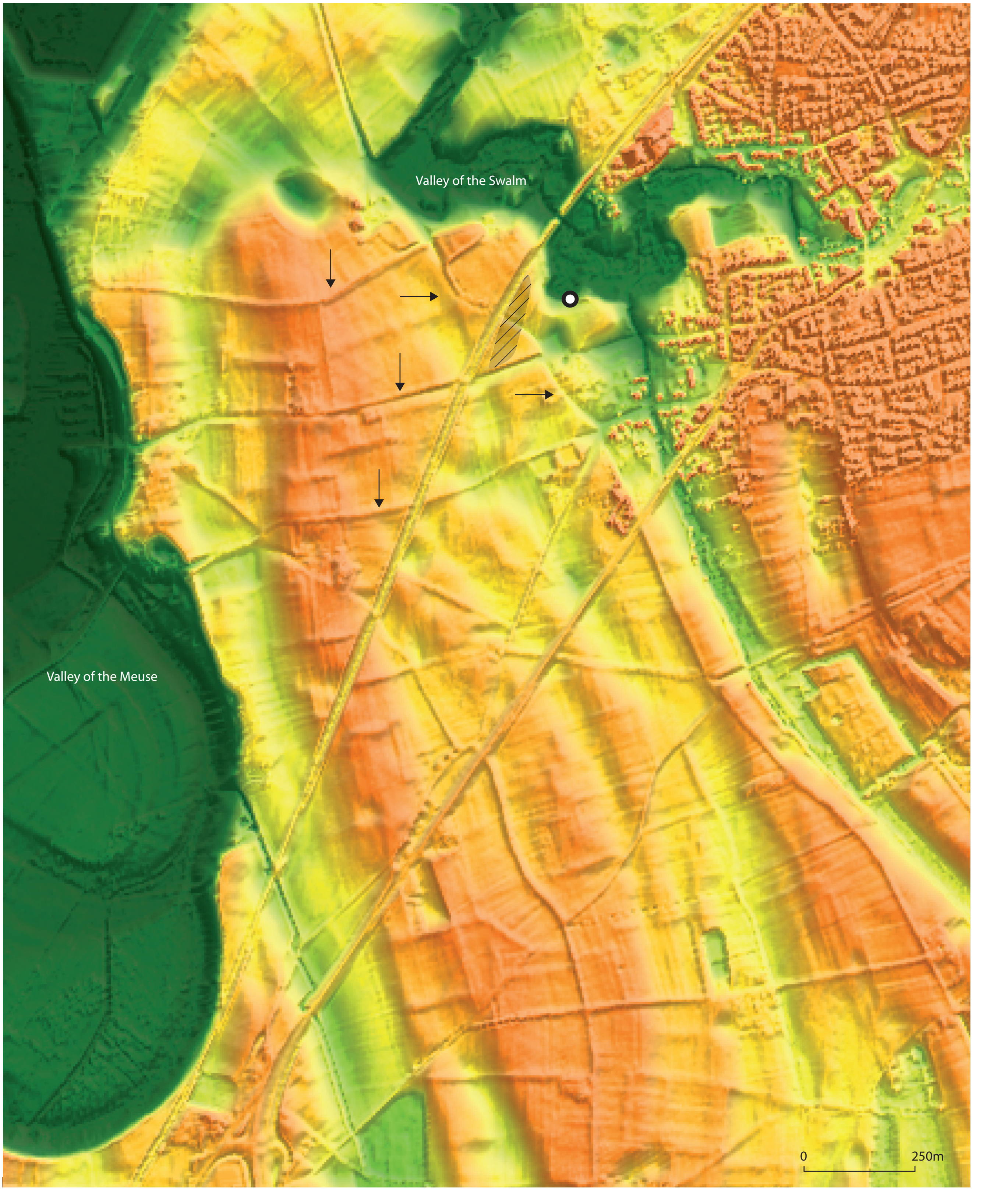

Figure 3 The Up-to-date Height Model of the Netherlands (AHN map) of the area south of the confluence of the rivers Swalm and Meuse. Elements of proven medieval origin are indicated by arrows, the excavation by hatching and the location of the core by a dot

the mouth of the river Swalm would have been perfect for that purpose. Today this land still serves as pasture land.

The botanical macroremains retrieved from the buildings included oats, rye, bread wheat and barley (van Beurden and Hänninen 2013) and pollen was counted of all four. In addition to cereals the pollen diagram shows walnut. Walnut shells have not been found, but as all macrobotanical material was charred, it would have been exceptional for them to have been found as they are commonly preserved waterlogged.

Another crop plant, buckwheat (*Fagopyrum*), appears in a later phase of land-use, dated to 1270-1394. As Swalmen-Nieuwenhof was abandoned as a residential site after 1225, to be reused as arable land, buckwheat growing would have belonged to this later activity. The crop plant is commented on below.

After this phase, rural activities slowed down. The deposition of loam in the oxbow stopped and the formation of peat was given a chance. The diagram does not suggest a serious hiatus between loam and peat. The tree pollen curves indicate that the local woods returned to some extent, with oak and ash on the dryer parts of the landscape, and willow (*Salix*) on the wetter parts. This return of trees may represent the same event as the rise of oak pollen in the Syperhof diagram discussed below.

3.2 Syperhof

At the location of coring, the former oxbow of the river Meuse revealed a 474 cm thick deposit of loam on top of gravel. According to the AMS dating, deposition started between 1029 and 1221 and continued to the twentieth century. The vegetation history reflected in its lower part should overlap with the history presented by the upper 50 cm of the Swalmen diagram. Some differences in pollen percentages may be expected, because part of the pollen in both Swalmen and Syperhof will have arrived by water transport and the Meuse is a much larger river than its tributary the Swalm. The Meuse has its a source in northern France and a large catchment area. The Swalm, and therefore the Swalmen diagram, provides a more local picture. Nevertheless, the general picture is the same (fig. 4).

The tree-herb ratio (AP-NAP) shows open landscapes with oak (*Quercus*) as the dominant tree. Hazel (*Corylus*) and birch (*Betula*) are prominent as well and represent the fringes of the woods. In the wetter parts of the landscape grasses (Poaceae) are more important than alder (*Alnus*), implying that wetland wood was at least partly replaced by meadows and pasture. Cereal pollen is rather dominant in the pollen rain released by the upland herb vegetation. During the counting of the Syperhof pollen the difference between cereal species was not systematically recorded, but rye, oats, wheat and barley were present with a dominance of rye.

From a depth of 300 cm upwards the tree cover steadily declines, whilst the cereals gain in importance. During this part of the Middle Ages rural activity was expanding and, if it is permitted to apply interpolation between the ^{14}C dates, this period has to be dated between 1150 and 1300-1427. It is followed by a rise in the upland tree (AP) curve, mainly due to a rise in oak (*Quercus*), but also in hazel (*Corylus*), and a decline in cereal pollen. This implies that rural activity changed, probably undergoing a setback. The onset of this phenomenon is also visible in the Swalmen diagram where it is dated later than 1270-1394. In the Syperhof diagram it ended before 1485-1663. The phase is marked in figure 4 by two horizontal lines.

The Swalmen and Syperhof cores are not the only providers of a pollen diagram reflecting the vegetation history of the region regarding this period. Van Hoof *et al.* (2006) published a diagram from an infill of an oxbow of the river Roer, also a tributary of the river Meuse and at nine km distance from the locations considered in this paper. There are eleven sound AMS datings for their core, which reflects the vegetation history and land use between 1000 and 1500. They conclude "the main feature of the analyzed pollen record is a long-term reduction of the arboreal component reflecting regional deforestation up to 1350 AD, parallel to the population increase during this period …". And "woodland is exceedingly transformed to arable fields, grassland (pastures and meadows) and heath land"… "Following the period with maximum values for non-arboreal pollen… a period of prolonged and pronounced agricultural regression can be identified in the regional pollen record… (ca AD 1360-1440)" (van Hoof *et al.* 2006, 406).

The regression is also recorded elsewhere in western Europe (Yeloff and van Geel 2007; Lager□s 2013) and has been linked to an agricultural decline that is also evident from historical sources. One of the features of this decline is abandonment of farms and rural settlements, leading to the 'lost villages' in England or the 'Wüstungen' in Germany (Bieleman 1992). Though true 'Wüstungen' are neither known from the Swalm-Roer region, nor from the adjacent part of Germany, it is quite possible that the area knew a less severe kind of 'Wüstung' in which not villages were abandoned but many fields were no longer tilled: the 'Flurwüstung' (Slicher van Bath 1963, 162).

In general the 14th-15th century crisis is considered to be due to a change of climate towards wetter conditions, but this change was already felt by the end of the 12th century (Lamb 1977; Buisman 1995). A more plausible reason is the ravages of the Black Death. The plague or Black Death arrived in the Swalm region in 1349 (Benedictow 2004). Though no chronicles are preserved to report on the number of victims in the villages around Swalmen, it is known that in cities not too distant, such as Cologne and Aachen in

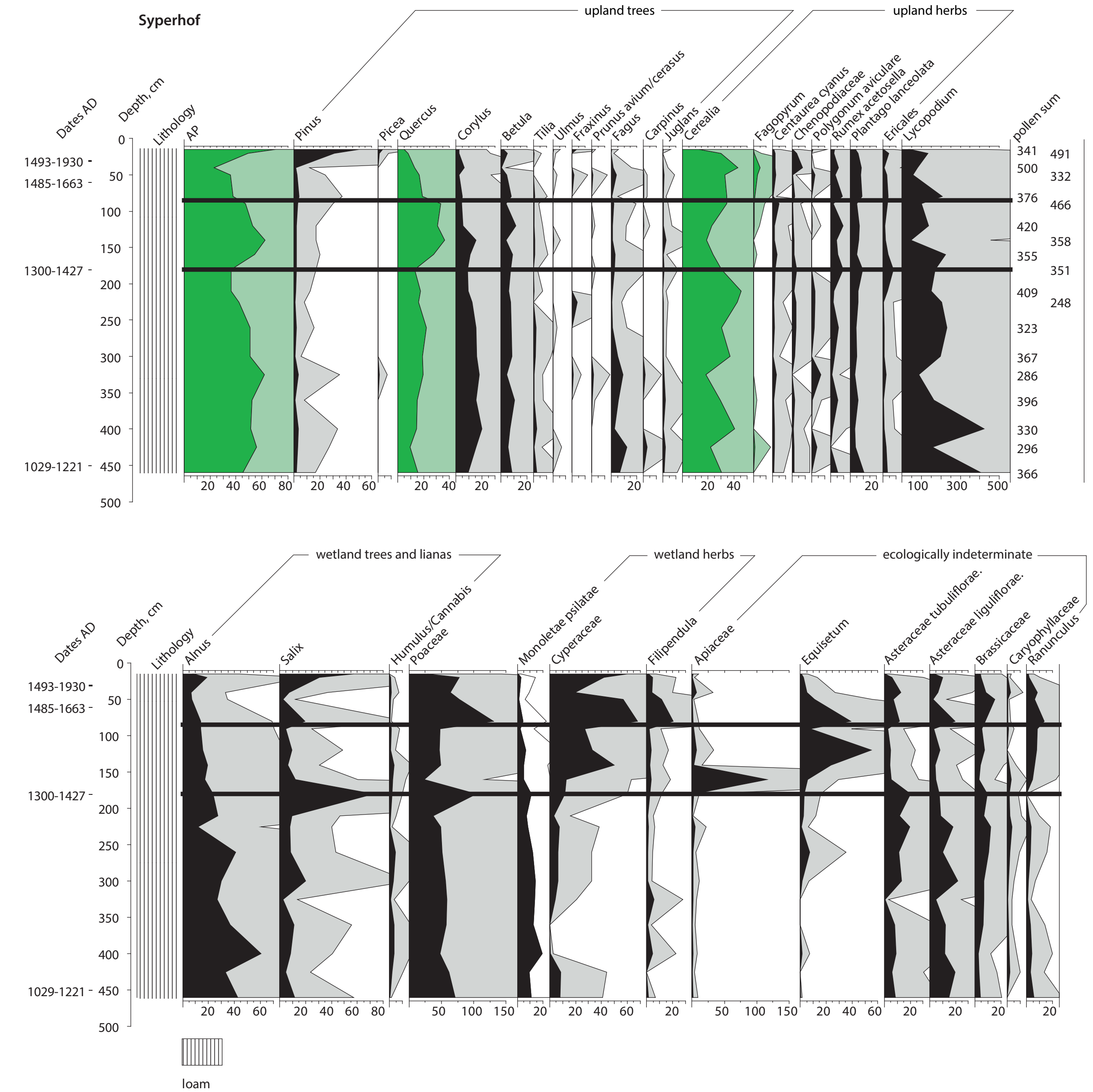

Figure 4 The pollen diagram Syperhof; selection of curves; curves discussed in the text in colour; exaggeration of curves 5x. Two black horizontal lines mark the beginning and the end of the agricultural regression

Germany, one third of the population perished (Creutz 1933; Schmitz-Cliever 1954). Such a decline in the population would have its effect on the extent of land under cultivation.

As cited above the agricultural regression recorded in the oxbow of the river Roer ended around 1440. In the Syperhof diagram it could not be pinpointed this sharply due to a lack of suitable material for dating, but the end occurred before 1485-1663. After that tree pollen percentages decrease and those of herbs, most conspicuously cereals, rise. Rural life had recovered.

The uppermost part of the diagram shows again a rise in tree pollen percentages, this time due to pine (*Pinus*). From historical sources it is known that pine was planted in the region between 1920 and 1950 (John Janssen, pers. correspond. with I. van Tulder 2004). The ^{14}C date allows this late arrival, but part of the pine pollen may have an extra-regional source, transported by air and/or river water. In the Southern Netherlands reforestation of sub-optimal soils with pine started already in the 19th century, to provide the coalmines with props. Therefore it is quite feasible that the uppermost spectra of the diagram reflect a longer period.

*3.3 Buckwheat (*Fagopyrum esculentum *Moench)*

Buckwheat appears in the Swalmen diagram between 1270 and 1394. In the Syperhof diagram the crop is already present at the start of deposition, 1029-1221, but this is not the start of a continuous presence. A period without buckwheat follows and its pollen reappear at 1300-1427. The Roer diagram reveals buckwheat in its upper part, deposited between 1430 and 1553 (van Hoof *et al*. 2006).

Buckwheat is a late addition to the range of crop plants cultivated in the Netherlands (fig. 5). Leenders (1996) writes "hard historical data show that buckwheat was introduced in 1389-1390 at at least two places: in Deventer on the river IJssel in the northern Netherlands and in the hinterland of Antwerpen in the southern Netherlands (Kempen-area). Within 50 years buckwheat was mentioned throughout the whole of the Kempen and also more and more in the IJssel valley and elsewhere in the northern Netherlands.". The dates provided by the Swalmen and Roer diagrams are in agreement with this history, but Syperhof is not. Some buckwheat is present before 1389. Four explanations can be offered: 1. the ^{14}C date is faulty, 2. the 'early' pollen grains were transported downwards from a higher level, 3. the 'early' pollen grains were brought in by river water from a region where cultivation started earlier, and 4. incipient cultivation is not recorded in the historical sources. A fifth possibility offered by Leenders (1996), namely that "buckwheat was always present as a weed" can be rejected because its pollen and macroremains are absent from prehistorical records before the Late Iron Age. The finds up to 1500, pollen and fruits together, are depicted in fig. 6 (RADAR 2010).

Figure 5 Buckwheat. Photo C. Bakels

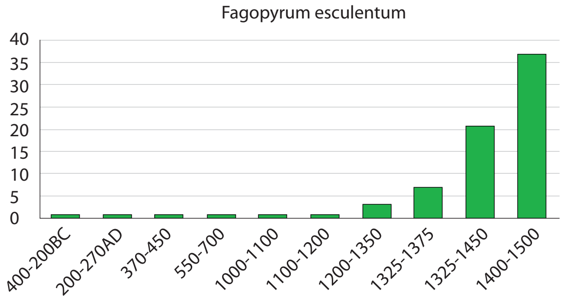

Figure 6 The occurrence of buckwheat (pollen and macroremains) in Dutch archaeological sites until 1500. The X-axis presents their date in chronological order; these dates are provided by their archaeological contexts which explains the hiatuses and overlaps on the time-scale. A site with buckwheat, irrespective of the numbers found, counts as one on the Y-axis. Before 1200-1350 the record mentions only six sites with buckwheat. After 1500 the plant is very common and this period is not depicted in the figure

A faulty ^{14}C date is always possible, but in the region immediately to the east/southeast, in Germany, buckwheat has been recorded from the second half of the 13th century (Bunnik 1999). An appearance before the first records in written sources should not be rejected off-hand.

The curve of buckwheat shows an interruption after the first appearance of the plant and therefore a downward transport is not very likely. The third possibility implies that buckwheat was cultivated in Belgium and northern France before 1300, but up to now no archaeobotanical finds have been recorded this early (Sigaut 2014, 110; Slicher van Bath 1963, 265). That leaves the fourth possibility: buckwheat as a crop of negligible importance.

Whatever its early appearances, buckwheat became only important as a staple crop from the second half of the 14th century onwards. Interestingly this is the period during which the Black Death struck the rural population. The contemporaneity may be coincidental, but could be just as well meaningful.

A buckwheat crop requires only three months from sowing to harvesting. The plant thrives on all kinds of soils, though in historical times it was mainly sown on sandy soils or on drained peat. In the Netherlands many varieties are known, grouped into two categories: sand buckwheat and peat buckwheat (Lenting 1853), but when these varieties came into existence is unknown. Regarding the sand buckwheats, the kind most likely sown in the medieval Swalm region as suitable peat deposits are absent there, three qualities stand out in addition to their short growing season: the crop requires little manuring, can be sown for several years on the same plot and represses weed growth (Lenting 1853). Therefore, it does not need much care. Of course there are disadvantages as well. Buckwheat does not survive frost and the plant requires loose soil. If the soil is not loose of its own, the field requires intensive ploughing. But except for the ploughing, buckwheat is a good emergency crop in times when labour is scarce. Therefore, it is quite feasible that buckwheat, possibly already known since late prehistory, but not much valued, was given a chance during a period of agricultural regression.

After that, the crop did not disappear, but gained steadily in importance instead. A document drawn up in 1635 concerning the output of the mill at Swalmen mentions 57 malder rye, 40 malder buckwheat, 20 malder malt, 4 malder wheat and 16 pounds of sugar (Ickenroth 1989). A malder is equal to 165 litres. The cultivation of buckwheat declined sharply in the 20th century because the adoption of artificial fertilizer made the growing of other crops more profitable. Indeed, in the Syperhof diagram buckwheat pollen are absent from the uppermost spectrum.

4 Conclusion

The Swalmen diagram clearly reflects the impact of land clearance connected with the foundation of a *curtis*, a nobleman's estate, around 950. Although the pollen diagram alone cannot assess the size of the area cleared and put into cultivation, archaeological research has shown that the clearance led to a considerable impact on the surrounding land. The parceling of an area of at least 2 km^2, still visible and functioning today, can be attributed to this medieval event.

Before this large-scale clearance the region was already exploited by a farming population, but to a much lesser extent. Intervention in the landscape grew from 725-967 onwards, but its effect is mainly visible in the growing importance of oak at the expense of other trees. After the abandonment of the large farm, around 1225, the region retained its use as agricultural land. After 1270-1394 the cultivation of wheat, barley, oats and rye was supplemented by buckwheat.

The Syperhof diagram reflects the same region. Its main feature is a rise in oak pollen percentages starting around 1300-1427, which is interpreted as the effect of the Black Death. The rise in oak pollen is matched by a decline in cereal pollen percentages. This reduction or change in agrarian activities may reflect a reduction in the overall population, but not to such an extent that the entire population was wiped out. At the same time the cultivation of buckwheat took hold and it is feasible that the two are connected. Buckwheat may have served as emergency crop.

Before 1485-1663 activities returned to normal. Only in the uppermost spectra the tree pollen percentages rise again, but that is due to the planting of pine to provide the nineteenth-twentieth century coalmines with props.

Acknowledgments

We should like to thank Frans Bunnik for sharing his preliminary research and for his advice regarding the optimal locations. We also thank José Schreurs for drawing our attention to the Swalmen-Nieuwenhof excavation which triggered the start of our work. Finally, many thanks to Kelly Fennema for the amelioration of our English.

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