Celtic field banks and Early Medieval rye cultivation

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Abstract

The discrepancy between [14]C and OSL dates of Celtic field banks and the high values for Secale in these banks in Denmark, Germany and the Netherlands calls for an explanation. This article shows that downward movement of pollen must have caused this discrepancy. It also means that it will not be possible to get an impression of the cultivation of the Celtic fields in the Iron Age-Early Roman period by pollen analysis of these soils, because the pollen evidence from this period is overshadowed by the Early Medieval data. Only the old surface layers underneath the banks, sometimes with traces of early/pre-Celtic field cultivation, may provide some information concerning that period. However, in some cases this picture is also disturbed by the penetration of younger pollen.

The Early Medieval pollen data from the banks point to summer rye cultivation taking place on the banks, in accordance with high phosphate values, particularly in the top layers of the banks.

Keywords: Early Medieval times, cultivation, pollen analysis

1 Introduction

Earlier descriptions of Celtic fields in the Netherlands range from *Heydensche legerplaatsen en wallen* (pagan settlements and walls; 17th c.), Roman camps (18th c.) to camps in general (19th c.). The interpretation as arable land was given by Van Giffen (1928) following English publications introducing the name Celtic fields. As early as 1911 these landscape structures had been described for Denmark by Sophus Müller and interpreted by him as arable fields. Hatt (1931) called the system *Oldtidsagre* (old arable fields) and gave an explanation for the formation of the banks by the accumulation of debris from the fields. Van Giffen (1944 a.o.) thought that the banks were gradually formed by the removal of the exhausted and thus infertile topsoil. Modderman (1955) strongly opposed this with the argument that it would mean removing the best part of the soil.[1] So did Jankuhn (1956-57): after taking away the humic upper layer and so exposing the infertile sand underneath, arable cultivation would have been made impossible.

According to Brongers (1976, Ch. V) the banks were formed by clearing the fields of stones and tree stumps. He also brought forward stratigraphical arguments for the transport of material from the fields on to the banks, and a mathematical model showing that in a later stage humic material must have been brought in from outside, to improve soil fertility.

Spek *et al.* (2003) concluded that the banks were deliberately raised at the field boundaries during the last stage of cultivation (Middle Iron Age, Early Roman period), by bringing in material both from inside the banks (the fields) as well as from outside. In the last stage (Late Iron Age to Roman period) cultivation would have taken place on the banks.

It seems that there was ample space for such practice: the width of the earthen banks measures between 3-16 m: Examples are: Øster Lem Hede, Denmark, 3-6 m (Helt Nielsen [2009]), Noordse Veld, Zeijen, 6-12 m, and Vaassen, *c.* 8 m in the Netherlands (Spek *et al.* 2003), Brongers 1976) and Flögeln Haselhörn, Germany, up to 16 m (Zimmermann 1976).

2 Celtic fields and rye cultivation

The oldest finds of rye in the Netherlands, NW Germany and Denmark date from the Late Iron Age/Roman period, and probably represent a weed grown in fields with other cereals. The start of rye cultivation in NW Europe has to be placed later, in the first centuries AD, with a rapid expansion in the Migration/Early Medieval period, and becoming most intensive in the 2nd millennium AD (Behre 1992, 2000; Behre & Kučan 1994; Mikkelsen 2003).

In the grain finds of the middle of the first century, rye is equal in numbers to or even exceeds other cereals (Behre & Kučan 1994, 39, tab. 6). It is assumed to have been grown as a summer crop. Summer rye should produce less pollen than winter rye (see also Behre & Kučan 1994, 36-41, 57-62, 69-70, 85-87).

Around AD 1000 there is a strong increase of rye in the pollen diagrams in NW Germany, together with an explosion of *Rumex acetosella* (sheep's sorrel), one of the most important weeds of rye fields. Typical weeds of winter rye fields, such as *Agrostemma githago* (corn cockle) and *Centaurea cyanus* (cornflower) follow in the course of time. Mikkelsen (2003, 152-154) summarizes the introduction of rye in Denmark, already starting in the pre-Roman Iron Age (2nd and 1st c. BC), again probably as weeds in cornfields. From the middle of the first millennium onwards there are numerous finds of carbonized rye grains, here supposed to be of winter crops, because of a much earlier rise in *Rumex acetosella* in Danish pollen diagrams. However, this species is furthered by, but not dependent on, rye and may also occur in abundance in sandy grassy areas. Moreover, the similarity between weeds in summer and winter corn fields in the same habitat is great, the difference lying mainly in the cover percentages (Haveman *et al*. 1998, 206). Pollen data from Western Jutland, show low values for Cerealia around the beginning of our era, the start of rye cultivation in Jutland around AD 300, gradually increasing in the second half of the first millennium (Odgaard 1994, 155-157; 2010).

Rye pollen data from archaeological sites in the central part of the Netherlands show a slight increase from the Roman period to the 12th century and from then on a steep increase (fig. 1) (Groenman-van Waateringe 2010, fig. 3.9). The latter is in accordance with Behre's ideas on the link between winter rye cultivation and the development of plaggen soils.

3 Palynological data from Celtic fields

Stratigraphical data, ceramic finds, ^{14}C and OSL dates place the origin of the earthen banks somewhere in the Iron Age (Zimmermann 1976; Behre 2000; Spek *et al.* 2003; Helt Nielsen [2009]).

There is ample evidence underneath the excavated Celtic fields in NW Europe for earlier pre-Celtic field arable activity Brongers 1976; Zimmermann 1976; Spek *et al.* 2003; Eriksen 2006). This can be in the form of ard traces underneath the walls or pollen data. However, in the

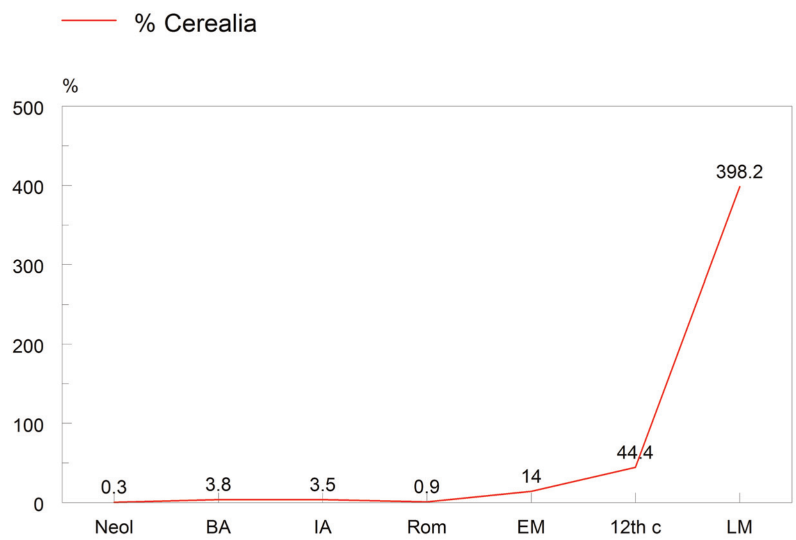

Figure 1 Increase in cereal pollen over time in archaeological sites on the Veluwe, central Netherlands.

pre-Celtic field period the amount of cereal pollen is extremely low, since the cereals grown were self-pollinating, producing low amounts of pollen which would not have been released in the air, and were only to be found in quantity where threshing took place.

This changes drastically in pollen samples taken from within the banks. The total amount of cereal pollen – part of which is clearly identified as *Secale* (rye) – has increased considerably, sometimes up to more than 20%, in relation to the numbers in the pre-Celtic field layers. In Vaassen (Casparie 1976) and Flögeln-Haselhörn the increase in cereal pollen can also be observed in layers interpreted as pre-Celtic field layers. How can this be explained, since the formation of the banks took place hundreds of years before rye was cultivated in NW Europe?

To solve this problem four sample series from Celtic field banks will be discussed in detail.

1 Øster Lem Hede (Eriksen 2003; Helt Nielsen [2009]; Helt Nielsen & Groenman-van Waateringe, 2012). Analysed by the author (fig. 2).

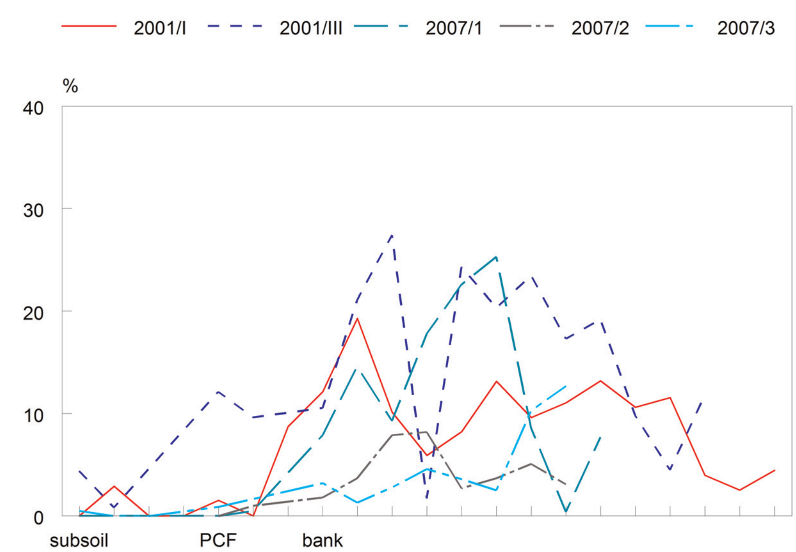

Figure 2 Øster Lem Hede. Cereal pollen from four banks and a lynchet.

In 2001 samples for pollen analysis were taken from top to bottom in consecutive layers with distances of 2-5 cm from two banks and two fields in one section. In 2007 the same was done from two banks and one lynchet (2007/2) and from three fields in three different sections. Cereal pollen from underneath the banks was sparse. The banks themselves have high percentages (up to 20%) of cereal pollen, as far as identifiable, nearly all *Secale*. Values for Poaceae (grasses), Asteraceae liguliflorae (Composite family) and *Spergula/Spergularia* (spurry species) and for herbs in general are high.

In the samples from the fields and from the lynchet the amount of cereal grains is lower than in the samples from the banks in the strict sense.

2 Noordse Veld Zeijen (Spek *et al.* 2003). Analysed by the author (fig. 3).[2]

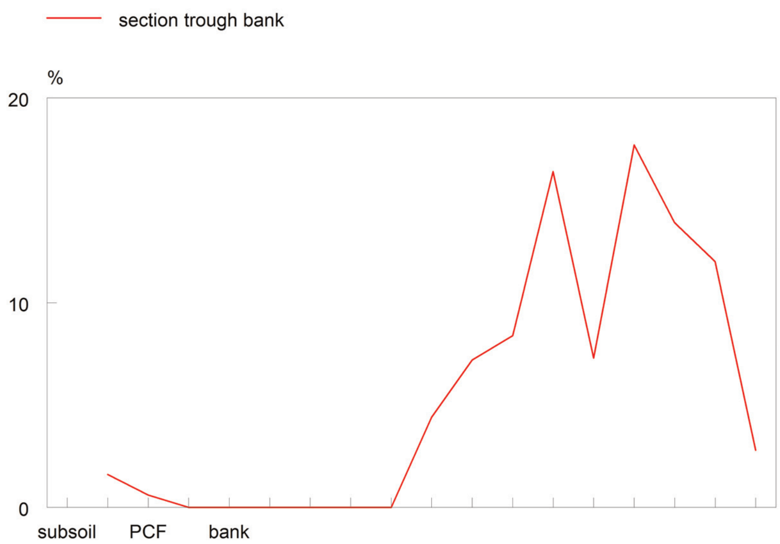

Figure 3 Noordse Veld, Zeijen. Cereal pollen from a bank.

Samples were taken as in Øster Lem Hede from a bank and field. Again the bank is characterized by rather high cereal percentages, partly identified as *Secale* (up to 10%, but total cereal percentages up to *c.* 20%). Values for Poaceae, Asteraceae. *Spergula arvensis* type, Chenopodiaceae (Goose-foot family), *Polygonum persicaria* type (lesser persicaria), *Rumex*-a type (sorrel) and *Succisa pratensis* (devil's bit scabious) are high. The topmost samples of the field show the same high herb percentages. As stated "The combination of pollen types together with high values for Ericales strongly recalls the pollen assemblages of medieval plaggen soils" (Spek *et al.* 2003, 165). Also here are higher cereal values in the bank than in the field samples.

3 Flögeln-Haselhörn (Zimmermann 1976; Behre & Kučan 1994; Behre 2000) (fig. 4).

Behre & Kučan (1994) published four sections through Celtic field walls. In all four diagrams the percentages for Cerealia are high (with percentages of *c.* 28 and 34 in two of the samples, stratigraphically assigned to the pre-Celtic field phase.[3] Not much can be said about the herbs, because the published diagrams are a selection of curves. The highest Cerealia percentages go together with rather high values for *Succisa*.

4 Vaassen (Casparie in Brongers 1976) (fig. 5).

Pollen analysis in Vaassen comprises eight samples taken from various layers, spread over different parts of the excavation. Six samples belong to the pre-Celtic field phase. Cerealia were sparse. Only two samples (4 and 5) above each other in one of the banks – sample 4 from the old arable layer beneath the bank and 5 from within the bank – show slightly higher values for

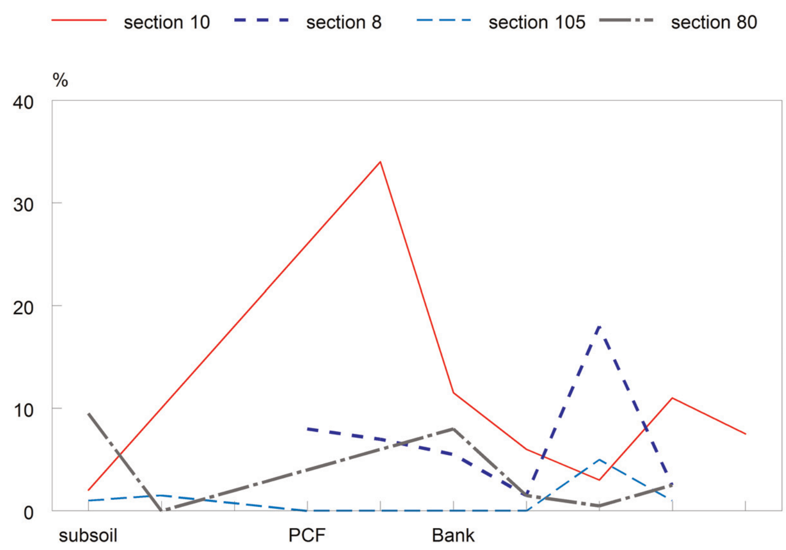

Figure 4 Flögeln-Haselhörn. Cereal pollen from four sections through banks.

Cerealia, *c.* 5%. Casparie writes about these two samples: "From the very high percentages of Cerealia in spectra 4 and 5 it may be inferred that cereals, probably wheat, were grown here". Spectra 7 (pre-Celtic field) and 8 (bank) have, according to Casparie, relatively many agriculture indicators, such as *Plantago lanceolata* (ribwort plantain), *Rumex* and *Artemisisa* (mugwort). Percentages for Poaceae, *Polygonum persicaria* and Asteraceae are specifically in sample 8 higher than in 7. He also mentions the presence of the hepatics *Anthoceros laevis* and *A. punctatus* (hornworts) (samples 4-5, 7-8).

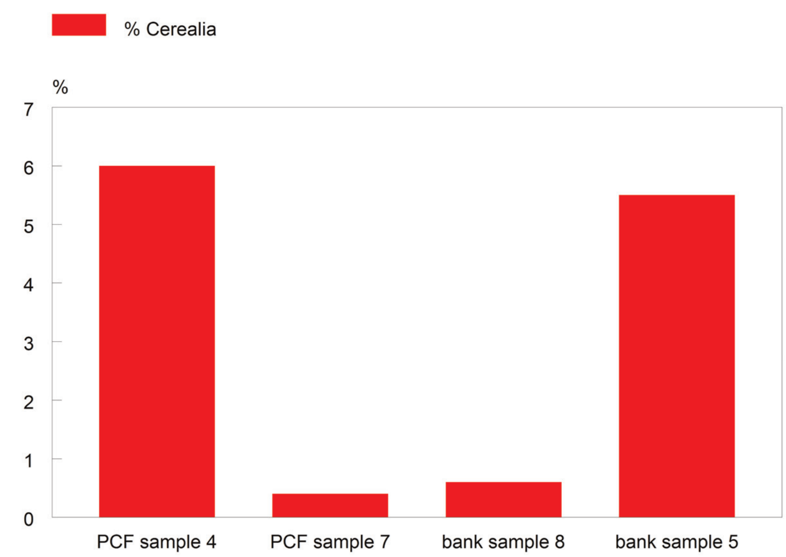

Figure 5 Vaassen, Cereal pollen in four samples from banks.

4 Cultivation on the banks of the Celtic fields

Brongers (1976, 71) was one of the first to point to the use of the banks for cultivation, considering "the rather high percentage (40%) of land otherwise not used". After a period of lying fallow the soil in the banks should have recovered and could be used for agriculture.

The data of Gebhardt (1976) showing the highest phosphate values occurring in the banks and not in the fields, made Zimmermann (1976) argue for the possibility that the banks, in stead of the spaces in between, had been used for agriculture. The same holds true for the Celtic field of Zeijen (Spek *et al.* 2003). The analyses of Øster Lem Hede excavations in 2001 and 2007 have not yet been published. However, there is a list of analyses carried out by K. Dalsgaard (oral communication), concerning the 2001 excavation, pointing in the same direction.

Micromorphological research in the Celtic field of Zeijen has shown that regular soil tillage took place at the ridges, with an intensification in the top layers, which also show the highest phosphate values.

But when did this cultivation of the banks begin? Zimmermann (1976, 88) writes that the use of the banks for arable, wide and humic through long-lasting traditional cultivation could only have occurred in the last phase of the Celtic field. They were then probably used for cultivation of specific plants and prepared by necessary manuring, while the fields in between were used for extensive agriculture.

However, Behre (2000, 140) and followed by Spek *et al.* (2003) suggest another scenario. According to Spek *et al.* the start is with fields without banks, but probably some other kind of boundary in the Late Bronze Age and Early to Middle Iron Age. Zimmermann has proposed to call these early Celtic fields instead of pre-Celtic fields (Behre 2000). The development of the banks would have occurred in the last phase (Late Iron Age, Early Roman period), and it was mainly in these last phases that the banks were intensively cultivated. Behre (2000) is less specific concerning the dating of this cycle, he writes only of a later phase for the formation of the banks and for cultivation on them in a younger phase.

5 Discussion

In the following I will show that it is not possible through pollen analysis to get an idea of the cultivation during the existence of the Celtic fields in general or to determine the start of the cultivation on the banks. The pollen so far found in the banks has to be dated to the Migration/Early Medieval period and it overshadows all traces of cultivation from earlier periods.

The discrepancy between the archaeological dating of the banks somewhere in the middle of the Iron Age and the high amount of *Secale* pollen can be explained either by tillage activities, mixing older and younger material, or by intrusion of younger pollen in older layers as result of percolation and bioturbation. Tillage activities cannot be excluded, but are dependent on the type of activity and its depth. As soon as the banks have reached a certain height and the spade or plough (ard?) no longer reaches into the lowermost layers the situation in these layers will be fossilized. This process must have taken place in the banks, otherwise the ^{14}C dates and the OSL dates would have shown a rather mixed picture. This is not the case (Helt Nielsen 2009). The rate of downward movement of pollen is dependent on the type of soil and the soil fauna, reaching less deep in more acid soils (Stockmarr 1975, Groenman-van Waateringe 2012). After the formation of a humus podzol and an iron pan the downward movement stopped and the situation became frozen.

A dating of the rather high *Secale* values in the Early Medieval period, higher compared to the Roman period, but not as high as in the later plaggen soils, corresponds well with Behre's idea of summer rye cultivation in the 1st millennium AD and is clearly shown in the pollen diagrams IV and VI from Flögeln (Behre and Kučan 1994). Considering the distance between the Celtic field of Flögeln-Haselhörn and these two pollen diagrams, *c*. 800-1000 m as the crow flies, the increase of cereal pollen from the Roman to the Migration period matches well with the Early Medieval data from the walls of the Celtic fields (*cf*. Behre & Kučan 1986, Table 1).

Zimmerman's (1976) and Behre's (2000) questions as to where to find the fields of the Late Roman/ Migration period (the settlement of Flögeln-Eekhöltjen (1st-5th c. AD) may now have received an answer. Mikkelsen (2003, 126) asks for more research concerning the supposed abandonment of the Celtic field system in the early Roman period, because in his view this is still an unanswered question.

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Notes

1 See for more details and references Brongers 1976, 18-29.
2 In figs 2-4 *Secale* pollen and Cerealia in general have been taken together. The rather poor preservation of the pollen hampers the certain identification specifically of cereal pollen, because most of them are heavily crumpled. High values in arable fields point to the wind-pollinated *Secale*.
3 The higher values for *Pinus* (pine) and the presence of *Centaurea cyanus* and *Fagopyrum* (buckwheat) in some of the top samples point to pollen from Late Medieval and even younger periods.

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