POLLENSPECTRA FROM THE LATE BRONZE AGE URNFIELD AT HILVARENBEEK-LAAG SPUL, PROV. NOORD-BRABANT NETHERLANDS

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The long beds in southern Dutch Late Bronze Age urnfields have been thought to represent a type of ritual field. Pollenspectra from the ditches of long beds, excavated at Hilvarenbeek-Laag Spul, give no indication that long beds were used for raising crops. The spectra show that the urnfield was situated in more or less open country. Other Late Bronze Age urnfields show the same kind of spectra. Fundamental changes in the human influence on vegetation since Early and Middle Bronze Age times seem to be absent

A certain number of the southern Dutch Late Bronze Age urnfields show, in addition to circular ditches, elongated ditchse: the so-called long beds or long ditches (Verwers 1966). The significance of these structures is not clear. One of the current explanations is that the long beds belong to a kind of arable fields (Hochäcker). Since the situation of these Hochäcker amidst graves is considered somehow unusual, they are thought to have been some type of ritual field. Food could have been grown for funeral meals or for offerings (Verwers 1966). A hint in this direction was the discovery of 10% Papilionaceae pollen in the filling of the ditch of a long bed at Veldhoven-Steensel-De Heibloem by Waterbolk (Waterbolk 1954). The pollen could have been released by Vicia faba, the horse-bean. The relation between this plant and urnfields has been pointed out by Jäger (Jäger 1965). The excavation of an urnfield with long beds at Hilvarenbeek-Laag Spul afforded the opportunity to make further observations.

The urnfield is situated on the border of the valley, through which the rivulet of Spruitenstroompje flows. The soil on the site consists of loamy coversand. In later times the urnfield was used for farm-land; the land was treated with sod and dung manure, as a result of which there came into existence a thick, so-called, old arable (Plaggenboden). The prehistoric traces consist of both circular ditches and long ditches. The grave-field was constructed in a relatively short time. During the excavation campaign samples were taken from five long ditches. To provide comparisons, other samples were taken from the filling of six circular ditches. The exact situation of the samples is given on the published map (Verwers 1975, Appendix). At first sight the circular and long ditches have the same type of filling: dark coloured, humic sand. The reliability of the age of the pollen in the filling of the ditches was not without question. The traces of the urnfield emerged from under an old arable. Between the visible part of the ditches and the old arable there was a brown humic layer: a so-called transition layer. Pollen from the old arable or the 'transition layer' could have filtered into the ditches, washed down by rain water or brought down by animals. A second origin of errors might have been the possible occurrence of pollen in the coversand, on which the urnfield was constructed. To check the fillings of the ditches for the occurrence of younger, respectively older pollen, special control samples were taken. One series of controls consists of samples from the yellow undisturbed coversand next to the ditches. A second set of controls came from the soil on top of the ditches, that is, from the 'transition layer' and the old arable. The scheme for

Table 1. Pollen spectra from the Late Bronze Age urnfield at Hilvarenbeek-Laag Spul.

	long ditches					circular ditches					
no.	1	3	5	7	9	11	14	15	18	19	22
Σ AP - Betula	322	323	357	329	309	212	328	318	388	346	381
Acer	0.3	+	–	0.3	–	–	–	0.3	–	–	–
Alnus	62.1	61.9	56.0	60.8	64.7	62.3	61.0	51.9	51.6	57.8	41.7
Betula	8.7	5.6	17.7	11.6	13.3	4.7	4.6	5.4	27.6	7.5	23.6
Corylus	17.4	17.7	23.3	18.5	19.1	18.9	20.4	25.5	23.2	19.4	28.4
Fagus	2.8	3.1	2.3	1.8	3.9	1.9	2.1	1.9	3.6	3.2	2.9
Fraxinus	–	0.6	0.6	0.9	–	0.5	–	0.9	1.0	0.6	0.5
Pinus	0.6	+	0.3	0.6	0.3	–	0.3	0.6	–	0.3	0.8
Quercus	16.2	15.5	17.4	15.2	12.0	16.0	14.9	16.7	18.3	17.1	21.5
Salix	–	–	0.3	0.6	–	–	–	0.9	–	–	–
Tilia	0.6	1.3	–	0.9	–	0.5	0.9	1.3	1.8	1.7	2.9
Ulmus	–	–	–	0.3	–	–	0.3	–	0.5	–	1.3
NAP	145.0	174.9	98.0	126.9	198.3	128.9	141.7	209.1	77.0	202.3	86.2
Anemone-t.	–	–	–	0.3	–	–	–	+	–	–	–
Artemisia	–	–	0.8	–	–	–	0.3	–	–	–	–
Calluna	24.2	51.1	34.2	45.9	32.0	26.9	59.2	82.2	24.5	69.1	21.8
Caryophyllac.	0.3	+	–	0.3	–	–	0.3	–	0.3	0.3	1.8
Cerastium-t.	–	–	0.3	–	–	–	–	0.3	–	–	–
Cerealia-t.	2.2	1.2	0.8	3.0	1.0	–	2.7	1.9	1.0	4.3	0.3
Chenopodiac.	0.3	–	–	–	–	–	–	–	–	–	–
Comp. lig.	1.9	5.0	1.7	0.3	7.8	3.8	2.4	4.1	0.5	3.5	0.8
Comp. tub.	1.2	1.9	0.8	1.2	–	2.4	0.9	1.6	0.8	2.3	0.8
Cruciferae	–	–	–	0.3	–	–	–	–	–	–	–
Cyperaceae	–	1.2	3.1	1.5	1.3	–	–	0.9	2.6	–	5.0
Gramineae	104.4	109.3	49.3	66.3	150.2	90.6	71.7	103.8	40.2	109.0	41.7
Mentha-t.	–	–	–	0.3	+	–	–	–	0.3	–	–
Plantago lanc.	3.4	1.9	2.8	1.5	0.3	2.8	0.6	5.4	2.3	6.1	0.3
Potentilla	–	–	–	0.9	0.3	–	–	0.3	–	–	0.8
Ranunculus	0.6	1.2	0.8	1.5	2.9	0.5	0.3	3.1	2.1	1.2	3.4
Rhinanthus	–	–	–	0.3	–	–	–	0.3	0.3	–	0.5
Rosaceae	–	–	–	–	–	–	–	–	0.3	–	–
Rubiaceae	–	–	–	–	–	–	–	–	0.5	–	0.8
Rumex ac.-t.	1.9	0.6	0.6	1.5	0.3	0.5	0.6	3.8	0.8	3.8	1.8
Sagina	–	–	0.6	–	–	–	–	0.3	–	–	0.3
Spergula arv.	–	–	–	–	–	–	0.3	0.3	–	–	2.1
Spergularia	1.2	0.9	–	0.3	0.3	–	–	–	–	–	–
Stachys-t.	0.6	–	–	–	–	–	–	+	–	–	–
Umbelliferae	–	–	–	–	–	–	–	–	–	–	+
Urtica	–	–	–	–	–	–	–	–	–	–	0.8
Dryopteris	0.9	–	0.8	0.3	0.3	–	0.6	–	–	1.2	1.6
Polypodium	0.3	–	–	0.3	1.6	0.9	0.9	0.3	0.5	0.6	0.5
Sphagnum	1.6	0.6	1.4	0.9	–	0.5	0.9	0.6	–	0.9	1.1
Indeterminatae	5.6	0.9	1.1	2.4	1.9	3.8	1.8	3.5	0.8	3.2	4.7

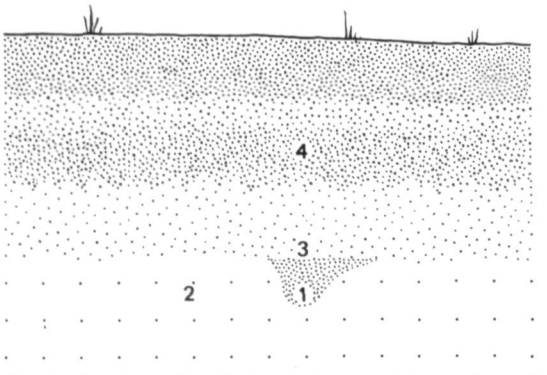

Fig. 1. Section of a ditch under an old arable indicating where pollen samples were taken from the ditch (1), coversand (2), 'transition layer' (3) and old arable (4).

sampling is given in figure 1. Because of the scarcity of reliable ditches in sections, we could follow the sampling scheme only in two instances. Therefore we took an additional series of samples from a section without a ditch. The samples were treated in the laboratory successively with 10% KOH, 40% cold HF during 8 hours, bromoform-alcohol specific gravity 2.0, acetolysis. Small particles of charcoal were left untreated.

The eleven controls, which were taken next to the ditches on the same horizontal plane, do not contain pollen grains. This means that contamination with older pollen is not feasible. Contamination with younger pollen is improbable, but not out of the question, as the filling of the ditches could have attracted more soil fauna than the undisturbed coversand. The spectra of the vertical sample series are given in figure 2. The series without ditch has been completed with the spectrum of a ditch that was situated at a few meters distance. The spectra are given in % Total Pollen. The ditches contain more tree pollen than the layers on top of them but never Secale. They show very few Rumex acetosa-type pollen (here almost certain originating from Rumex acetosella). Perhaps Secale is, because of its size, not subject to vertical transport, but this is not the case for Rumex acetosa-type. The quantity of Rumex in the ditches is of a normal order of magnitude for fillings of ditches and can be considered as original. There seems to be no obvious vertical transport and contamination with younger pollen may be considered as unimportant. The pollen spectra from the eleven ditches are given in table 1. The spectra are calculated on the base of the pollensum Σ AP-Betula (Van Zeist 1967), usual for this kind of spectra. The tree pollen values from the long ditches do not differ from those of the circular ditches. The absence of Carpinus, the low Tilia percentage and a value for Fagus between 1% and 5% place the spectra at the end of the Subboreal or at the transition of the Subboreal to the Subatlantic (Waterbolk 1954, Munaut 1967). The C 14-

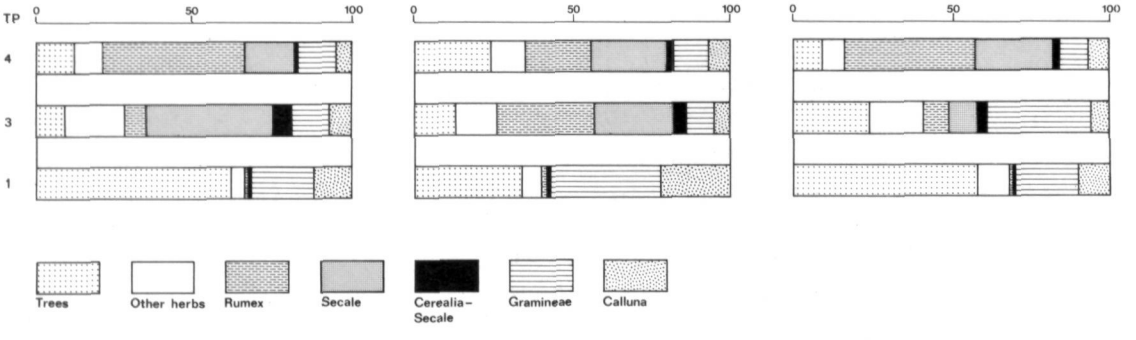

Fig. 2. Pollen spectra from three vertical sample series with ditch (1), 'transition layer' (3) and old arable (4).

dates for the filling of two long ditches are 2830 ± 35 B.P., i.e. 880 ± 35 B.C. (GrN 6950) and 2855 ± 35 B.P., i.e. 905 ± 35 B.C. (GrN 6954). The agreement between the C 14-date and the palynological date underlines once more the reliability of the fillings of the ditches.

Not only the percentages of tree pollen, but also the values for the different kinds of herbs, are in all spectra the same. If the long beds ever had a special function, this is not expressed in the pollen spectra from Hilvarenbeek-Laag Spul. This is, of course, no proof that the long beds never were used for a special purpose. Circular ditches and long ditches touch each other, so that the pollen from the long beds easily could have fallen in the ditches of the circular monuments. There are no indications as that the beds were used as arable fields. The only crop plants that have been seen are Cerealia. The percentages of this pollen type are however so low, that it is not necessarily of local origin (Heim 1970 and the therein mentioned literature). From the spectra one gets the impression that the small barrows as well as the long beds, after their construction, were overgrown with grasses and some heather, via a first phase with Sagina, Spergularia, Spergula arvensis, Cyperaceae and others. The Gramineae pollen is dominant in the herb spectrum. The percentage NAP, which constitutes a measure for the treelessness of the landscape, lies between 77 and 209, with an average of 144,4. Three spectra have values below 100%. Values above 100% belong to open country (Jonassen 1950, Heim 1970). The urnfield of Hilvarenbeek-Laag Spul was thus not situated in a completely open landscape. Among the tree pollen there is a dominance of Alnus pollen, which must have originated in the valley of the 'Spruitenstroompje'. The other trees could have grown in the valley as well as out of it. Pinus was absent given the low pollen percentage.

There are only a few spectra with which the spectra of Hilvarenbeek-Laag Spul can be compared. On the whole, urnfields seem not to lend themselves well to pollen analysis (Van Zeist 1967). Waterbolk analysed five monuments that are considered to belong to the Late Bronze Age (Waterbolk 1954). One of them is the above mentioned long bed in the urnfield Veldhoven-Steensel-De Heibloem. At least a part of this urnfield is dated in the Late Bronze Age (Modderman 1966). Waterbolk placed the long bed in the Iron Age, but this was later corrected by van Zeist to a date between 1000 and 500 B.C. From the long bed two spectra were counted: one from the original surface under the bed, and one from the ditch. The four other monuments belong to the urnfield at Knegsel. The majority of the urns belong to the Late Bronze Age (Braat 1936). A circular ditch (Knegsel a), two long-oval ditches (Knegsel b and c) and a long-oval ditch with inside posts parallel to the ditch (Knegsel d) were analysed. The four spectra were considered as belonging to the Late Bronze Age. Another monument described by Waterbolk that could also have belonged to the Late Bronze Age is a rectangular-oval ditch at Toterfout-Halve Mijl (nr. 22A). The ditch cuts through a barrow with double post circle and is thus younger than Middle Bronze Age. A better archaeological dating is impossible to give (Glasbergen 1954). The pollen spectrum is not in contradiction with a dating in the Late Bronze Age, so that the monument is mentioned here with reserve. Van Zeist investigated the contents of a rectangular ditch under tumulus 100: a barrow near Veldhoven that does not belong to the above mentioned urnfield. The ditch could belong to the Late Bronze Age, but the dating is not certain. The spectrum dates the ditch between 1000

and 500 B.C. (Van Zeist, cited in Modderman 1966). The pollen was badly preserved and the investigation was not published.

The comparison of the spectra of the above mentioned monuments and those of Hilvarenbeek-Laag Spul is difficult because of the fact that the variation within every separate urnfield remains unknown. Only at Knegsel was it possible to investigate more than one monument. Here the spectra resemble each other very well, except for a high Tilia value in nr. c (6.1%) and a high value for Quercus in nr. d (33%). The greatest difference with Hilvarenbeek-Laag Spul is found in the number of Gramineae pollen. The NAP-index at Knegsel is, in the case of a, b, c and d respectively: 80%, 92%, 113% and 59%. Waterbolk suggested, with reference to one of the ditches, that this one could have been constructed on the fringe of an oak-wood (Waterbolk 1954, p. 108). This could apply to the urnfield as a whole. The relatively high Tilia-percentage in ditch c points in the same direction and the NAP-% is indeed of an order of magnitude that can exist at the fringe of woods. In addition, a good deal of Corylus pollen has been found: this pollen-type dominates, with Alnus, in the tree pollen spectrum. The grave-field bordered three sides of a small lake (Braat 1936). It is possible that the urnfield consisted of an open stretch of land between a more or less wooded country and the woodbelt around the water.

That urnfields could have been constructed on existing open spaces is illustrated by the only spectrum from an old surface, i.e. from the long bed at Veldhoven-Steensel-De Heibloem. The NAP-value is here 156%. On the spot grew, among others, Calluna. How long the terrain had been open is impossible to trace. The filling of the ditch of this long bed contains still more herbs than the old surface: the very high values for Rumex and Papilionaceae must be of a strongly local origin. The ditch of Toterfout-Halve Mijl 22A shows a comparable spectrum. The spectrum of Veldhoven (tum. 100) lies in its value between that of Hilvarenbeek-Laag Spul and Knegsel. All five grave-fields seem to have been situated in the same type of landscape: near water, not under trees, but also not in wholly open country. The heather had not then greatly expanded. The highest Calluna percentage is 111% in the ditch of the long bed at Veldhoven-Steensel-De Heibloem.

The measure to which Calluna is present in a distinct region together with the percentages Cerealia, Plantago lanceolata, Rumex and Gramineae, is thought to indicate the use of open terrain by man. Comparison of spectra with those from earlier periods can give indications of changes, especially concerning agricultural practices (Van Zeist 1967). The spectra from the Late Bronze Age urnfields in the southern Netherlands, in casu Noord-Brabant (fig. 3) can be compared with the spectra from Early and Middle Bronze Age periods that are represented in figure 6 in the article of Van Zeist (Van Zeist 1967). The spectra from Knegsel concur with those of the preceding period. The others show more grass. This fact need not to have any economic significance. The low barrows, linked together and overgrown with grass, have the aspect of grassland while this terrain does not necessarily have to have been used as grassland. The grave-fields of the Early and Middle Bronze Age are of a quite different lay-out. Otherwise there are no great differences between the spectra of both periods. There are no indications of fundamental changes in vegetation. Verwers assumes a continuity in population during both periods (Verwers 1969). The pollen spectra give no arguments against this view.

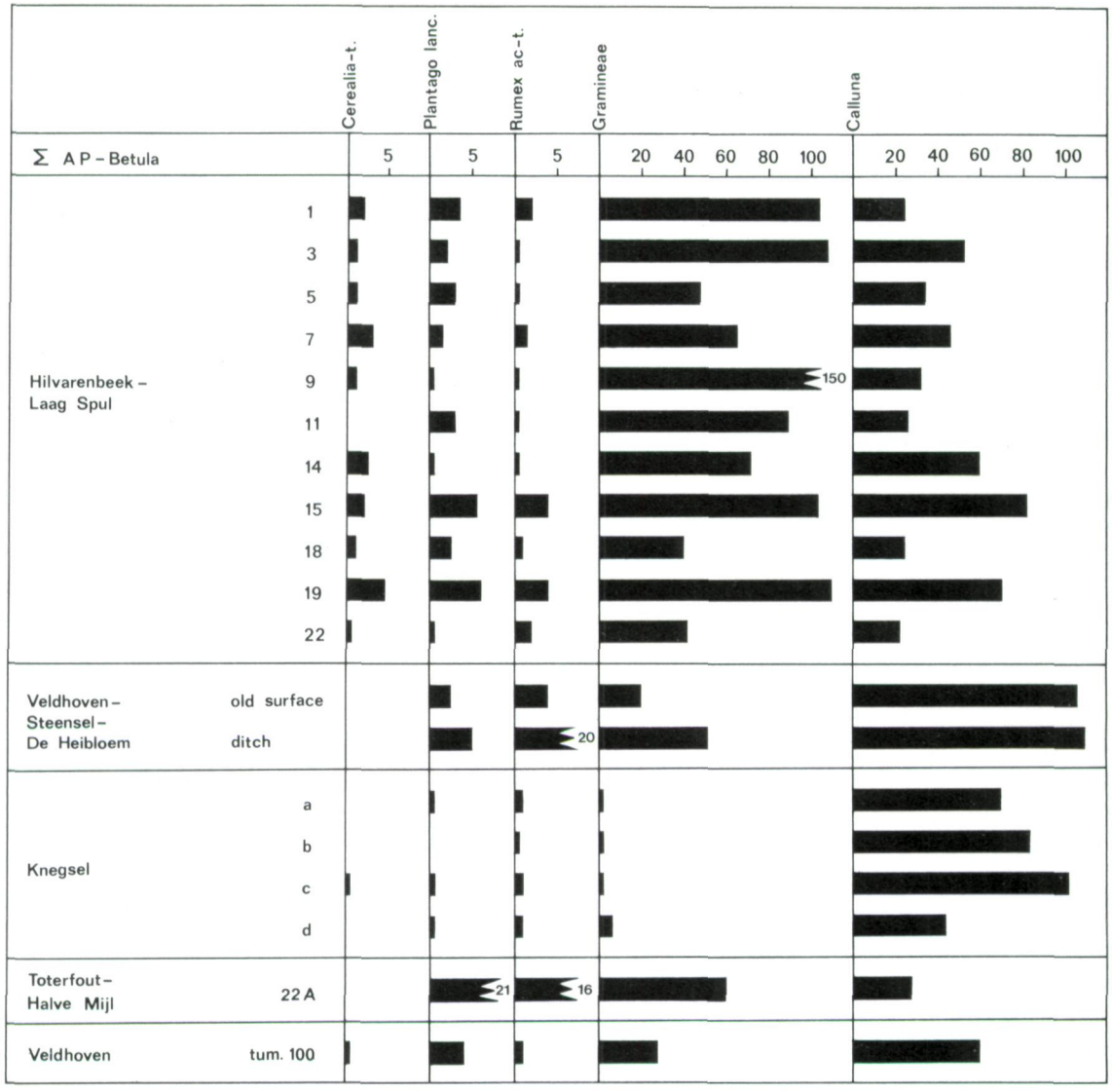

Fig. 3. Some pollen frequencies in spectra from Late Bronze Age urnfields in Noord-Brabant (Netherlands).

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