Acta Bot. Neerl. 32(4), August 1983, p. 313–321.

A LATE MEDIEVAL CLEARING AT THE EDGE OF THE DINKEL VALLEY (EASTERN NETHERLANDS)

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SUMMARY

A late medieval clearing of *Alnus* forest at the edge of the Dinkel valley and at the foot of the Ootmarsum hill (Twente, Eastern Netherlands) is revealed from pollen analysis of peat developed near a source of a vanished brooklet. The clearing later developed from a wet sedge-meadow to a pasture. Details on the medieval forest history are also discussed.

1. INTRODUCTION

A 40 cm thick superficial peat at the foot of the hill ridge at Ootmarsum (Twente, Eastern Netherlands) was analysed on its pollen content in order to reveal some of the late-Subatlantic vegetation history of the hill side and the adjacent part of the Dinkel valley. VAN ZEIST's (1960) observation that most of the many pollen records from the Twente region stop before or at c. 1000 A.D. and thus little is known about the history of the large-scale deforestations afterwards, still holds to the present. The profile under study shows some local aspects of this history, including the natural and artificial vegetation development after deforestation.

The Dinkel valley in the north-eastern corner of Twente is about 6 km wide and is bordered on the west side by the push-moraine hill of Ootmarsum. This hill partly consists of Tertiary loams and is covered by a few meters of weathered till, mostly developed as loamy sand. The Dinkel valley is mainly filled with Pleistocene eolian sand (coversand), of which low ridges lie between stretches of thin Holocene brook deposits, formed along the present and former Dinkel river courses. Small brook valleys (with accompanying Holocene sediments) run from the low-angled push-moraine hill into the Dinkel valley. The small, isolated, thin peat occurrence considered here fills a barely detectable depression in the coversand fringing the hill between two of the small brook valleys, the Springendal to the North and the Poelbeek to the South (see *fig. 1*). Like the surrounding coversand, the peat is presently covered by dry grassland, but is indicated on the topographic map of 1860 as marshy meadow. (In fact, a very small and poor remnant of this characterised the sampling site at the time of sampling, but afterwards the peat was covered by sand.) On the map of 1860, this marshy

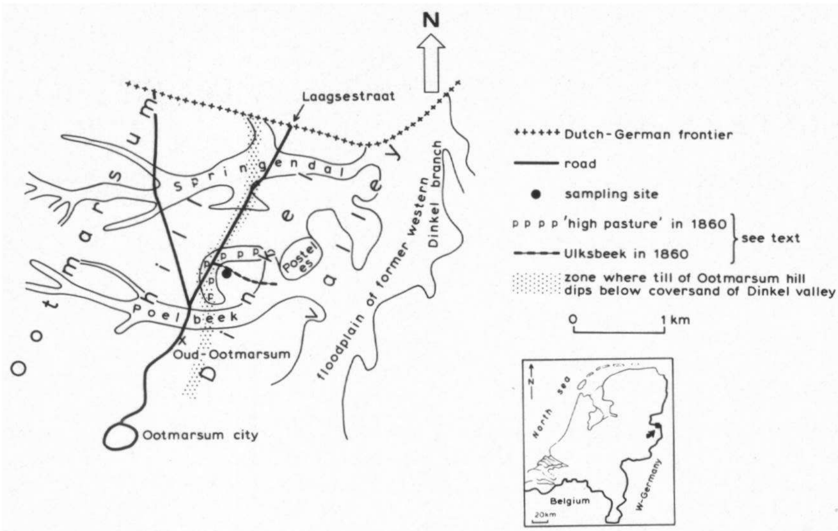


Fig. 1. Location of sampling site. Details on topography and geomorphology. Based on: Geomorphological map of The Netherlands 1:50000, sheet 28/29; Topografische Militaire Kaart 1:50000, sheet Almelo, ed. 1860; Geological map of The Netherlands 1:50000, sheet 28 Almeloo II, ed. 1930. Topographic coordinates of the sampling site: x = 258.990, y = 493.970.

meadow contacts to that of the Poelbeek valley to the ESE via a very small and now vanished brooklet, the Ulksbeek. This brooklet must have been located near the sampling site, beginning c. 250 m W of the sampling site where the till of the push-moraine hill dips below the coversand. At least this is where the source is indicated on the old topographic map of 1860. Of course there may have been smaller sources downstream too, e.g. at or near the sampling site. In a sense, the whole small depression may have served as a source for the brooklet.

In 1860, a stretch of "high pasture" 200 m wide bordered the marshy meadow terrain of the sampling site to the W in a semi-circle. Uphill from this extensive heath areas were located, at present largely forested. More to the SW several large *es* fields were present and still exist on the hill sides, the nearest situated 1 km SW of the sampling site, near the hamlet of Oud-Ootmarsum. A small *es*, the Postel es, is situated 800 m E of the sampling site, on an isolated coversand knoll.

The lower part of the analysed profile (see *fig. 2*) consists of amorphous, gyttja-like peat, with 2 cm of very humic sand at the base. The upper part of the section is *Sphagnum* peat, of which the top 11 cm is rather decomposed. The pollen content was counted on the basis of a tree pollen sum of 300 grains where possible, by means of a Reichert phase-contrast microscope. Sampling was done continuously per cm, but because of the low pollen content in the samples between 22 and 16 cm depth, spectra of combined samples have been given. The pollen-type nomenclature follows FAEGRI & IVERSEN (1975).

2. THE FOREST BEFORE CLEARING (ZONE 1)

Pollen zone 1 (see *fig. 2*) shows high tree pollen values (c. 90%, see curve "%AP"), so the area must have been densely forested, at least locally. In view of the position of the sampling site close to the hill, many forest stands would have persisted there as well.

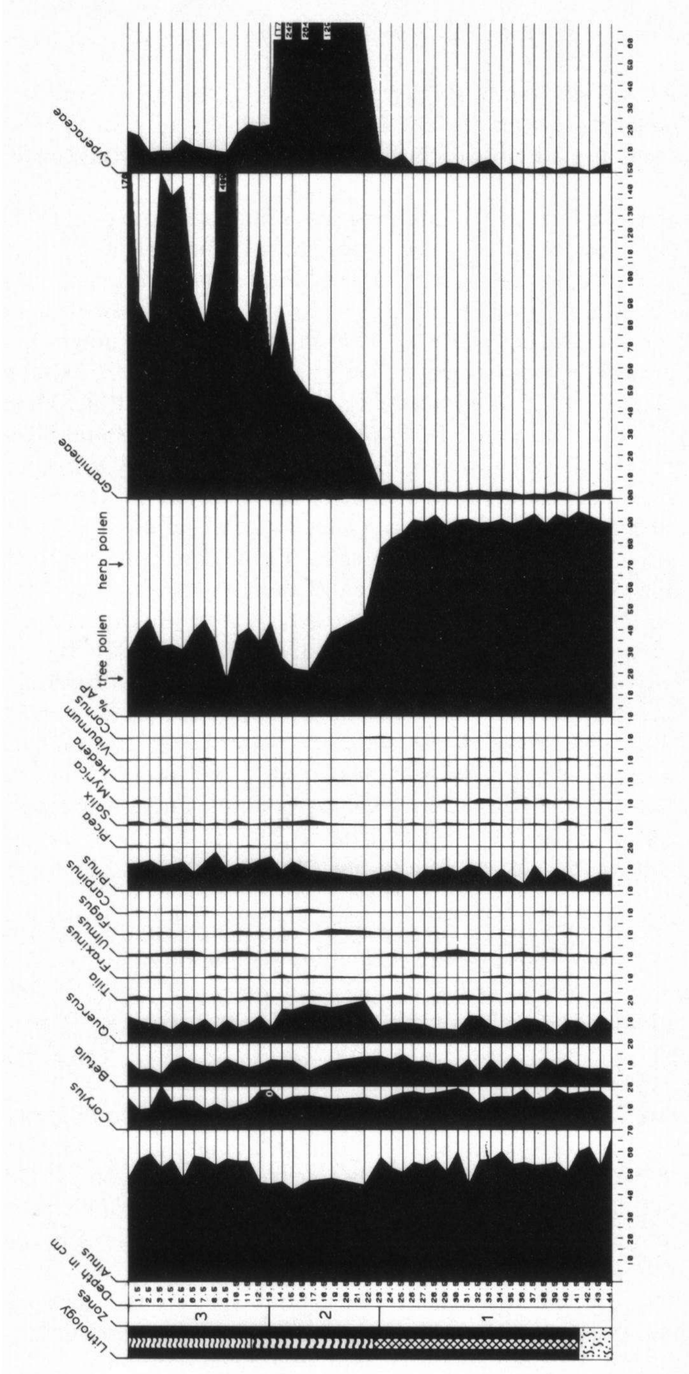
Within an alder carr, at the sampling site a small shallow pool existed where *Potamogeton, Sparganium* and *Sphagnum* grew. In the surrounding swamp forest, *Alnus* and some *Salix* grew, with *Myrica* (and *Betula*?) also present at poorer sites. Slightly uphill, as well as at higher elevations within the local coversand area, there would have been an Alno-Padion-like forest including *Ulmus, Viburnum* and *Corylus*; this is in agreement with VAN DER HAMMEN & BAKKER's (1971) postulated sketch of the late-Holocene vegetation pattern in the Dinkel valley east of our study area. Present-day remnants of such an *Alnus* swamp forest (e.g. Agelerbroek, SE of Ootmarsum) have been described by VAN DIJK (1965).

The forest stands on the loamy-sandy push-moraine hill (Ootmarsum hill) would have been composed largely of *Quercus, Tilia* and possibly *Betula. Fagus* may have occurred there too, but its share in the forests seems to have been rather limited. In the natural vegetation of the late-Holocene on the hill sides in this region, *Fagus* would certainly have been a more important element (VAN ZEIST 1960; DANIËLS 1964; VAN DER HAMMEN & BAKKER 1971, fig. 85-legend). Felling of *Fagus* before the onset of the registrating peat formation might explain its low pollen values in zone 1. OVERBECK (1975, p. 515), in summarizing pollen diagrams from Schleswig-Holstein, states that from c. 800 A.D. onwards, *Fagus* was cut out of oak-beech forests. Transferred to the situation in Twente, this might indicate that peat formation at the sampling site only started in the Middle Ages. In view of the dating of the forest clearing (see below), this would still give a reasonable amount of time (a few centuries) for the filling of the local pool in zone 1.

The low values but persistent presence of Cerealia pollen (mainly *Secale* type) indicate that arable fields already existed on the hill, possibly to a rather large extent. This agrees with datings of the development of arable *es* fields in the Eastern Netherlands, which cover a period of many centuries from the Early Middle Ages, or perhaps even earlier, onward (PAPE 1972, VAN DER HAMMEN & BAKKER 1971).

The meagre possibilities of detecting heathlands by pollen analysis on a regional scale (cf. JANSSEN 1972, p. 429 f.) hamper the completion of the hill vegetation picture. Heathlands, being mostly part of the *es* system (sod dunging), would indeed have existed on the hill. The low Ericaceae pollen values may, however, also derive from some *Erica* at the above-mentioned minor oligotrophic sites.

Summarizing, we can state that in the centuries before the (local) deforestation, *Quercus* forests, arable fields and possibly heathlands occupied the Ootmarsum hill, and Alnetum and Alno-Padion grew in the Dinkel valley; locally at the foot of the hill there were also poorer sites with *Myrica*.


Cyperaceae
Gramineae
herb pollen
tree pollen
% AP
Cornus
Viburnum
Hedera
Myrica
Salix
Picea
Pinus
Carpinus
Fagus
Ulmus
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Quercus
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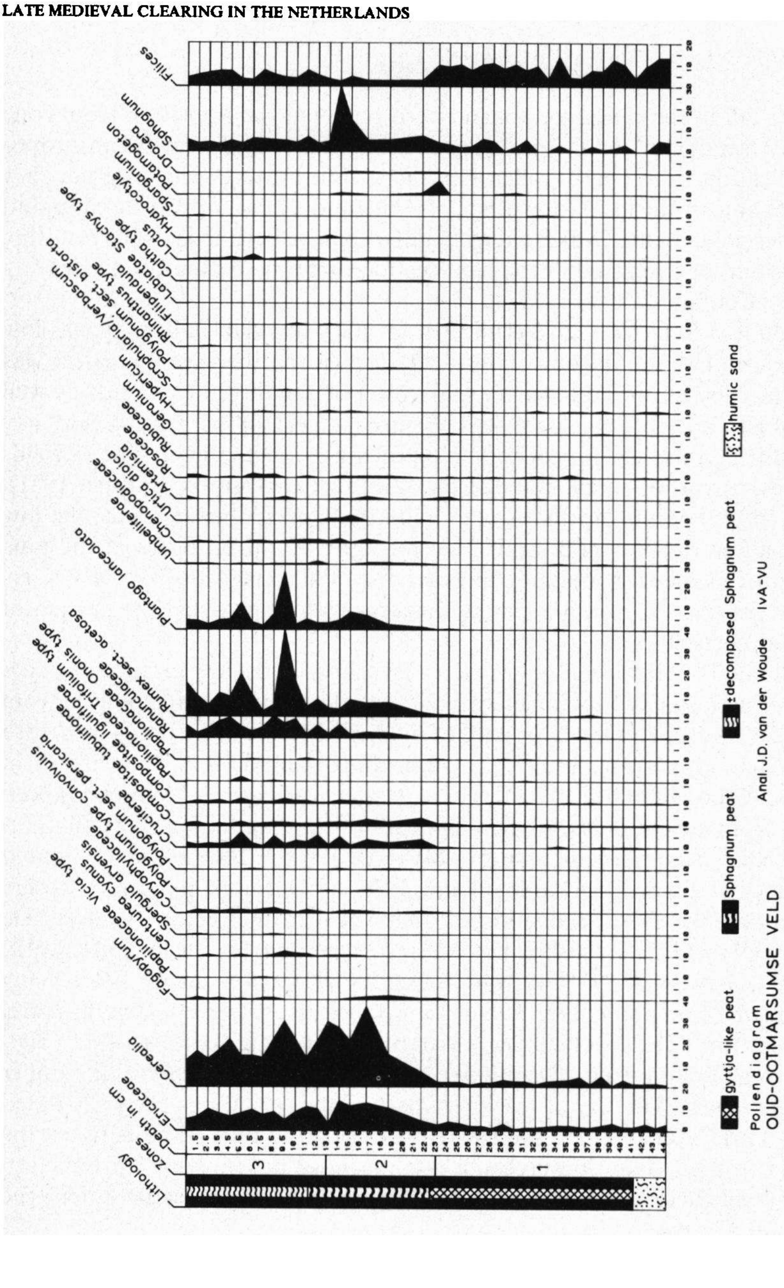

Fig. 2 (p. 316 and 317). Pollen diagram Oud-Ootmarsumse Veld.

3. THE CLEARING (TRANSITION ZONE 1–2)

The sharp fall in the ratio tree pollen : herb pollen at the transition from zone 1 to zone 2 (see curve "$\%_0$AP") and the concomitant rise of the typical anthropogenic indicators in the herb pollen (see discussion in next section) point to a clearing of at least the local forest, esp. of *Alnus* and *Ulmus*. Forest stands uphill and further down in the Dinkel valley might also have been felled. The resulting landscape will be discussed in the next section; here the dating of the clearing activities is examined.

According to SLICHER VAN BATH (1970, p. 102), population density was low in the region (Twente) up to c. 1200 A.D. Population increase thereafter was accompanied by a more intensive exploitation of the dry hill grounds as well as the moist valleys. This space was required especially as grazing and hay grounds for a considerable strengthening of the *es* field system. The *es* fields themselves, spread of course too (see e.g. VAN DER HAMMEN & BAKKER 1971). LAMBERT (1971) points out that generally in the Eastern Netherlands, the low wet grounds were used on a large scale for agricultural purposes at the time of this strong medieval population increase only. Pollen records from NW. Germany (OVERBECK 1975, p. 513) show that this mostly involved the cutting of *Alnus*-rich vegetations.

A pollenanalytical dating tool is found especially in the appearance of *Fagopyrum* in zone 2. Buckwheat is generally supposed to have been introduced from Asia to NW. Europe in the later part of the Late Middle Ages only (14th/15th century A.D.; cf. OVERBECK 1975, p. 522); this dating derives from historical evidences. Although in pollen analysis the *Fagopyrum* type has sometimes been recorded from earlier dates, its first appearance in diagrams usually fits into the late medieval date (see discussion in MUNAUT 1967, p. 161 f.). Two C^{14}-dated pollen sections from Denekamp, 8 km ESE of Ootmarsum, give a rough minimum date for the introduction of buckwheat to the region. Section "De Borchert" (VAN GEEL et al. 1981) extends to some time (centuries?) after 1010 $\pm$ 50 B.P. (GrN 8487 and 9319; 940 A.D.). Its nearness to arable fields being clear from the Cerealia curve, *Fagopyrum* pollen is completely lacking there. Another section, "De Klokkenberg" (VAN DER HAMMEN & BAKKER 1971), originates from an *es* soil itself. *Fagopyrum* pollen only appears here in the upper part of the *es* soil. The top of the lower part of the *es* soil has been C^{14}-dated as 950 $\pm$ 25 B.P. (GrN 2815; 1000 A.D.). Considering time delay between the formation of the two *es* soil layers, a late medieval date for the introduction of *Fagopyrum* there seems reasonable. In both sections, the same holds true for *Centaurea cyanus* pollen.

As there is no indication of peat drying out in the underlying zone 1, the possibility of a considerable time hiatus in the peat formation between zones 1 and 2 is rejected. Thus the appearance of *Fagopyrum* and *Centaurea cyanus* in zone 2 dates the preceding clearing at the Late Middle Ages. This fits into the historical picture given above: increasing agricultural use of the low soils from c. 1200 A.D.

4. FROM WET MEADOW TO PASTURE (ZONES 2 AND 3)

Zones 2 and 3 are characterised by high percentages of herb pollen, several of which indicate anthropogenic (agricultural) influences on the vegetation. The ecological evaluation of esp. these indicators is partly based on the compilations made by BEHRE (1981) and ELLENBERG (1974) and the stratigraphic arrangemeht by JANSSEN (1972).

4.1. Zone 2

At the sampling site moss peat developed, but pools with *Potamogeton* persisted nearby, as in the preceding zone (before clearing) at the sampling site itself. Again oligotrophic habitats with *Sphagnum, Drosera* (and *Erica*?) probably alternated laterally with more mesotrophic or eutrophic habitats (*Polygonum bistorta* type; *Lotus uliginosus*?; *Potamogeton*?). There is some resemblance to the vegetation described by WESTHOFF et al. (1973, p. 215) at the source of a small brook (the Mosbeek) on the other side of the Ootmarsum hill. It is unique for the Netherlands and is called a "stroomhoogveen" ("flow peat bog") because of the fine pattern of alternating *Sphagnum* highs (with *Erica* and *Drosera*) and lows with upwelling mineral-rich water . Such a source-like situation may have prevailed at the sampling site too (see Introduction).

The fact that moss peat developed at the sampling site just after the deforestation may be accidental. It may also reflect a start of drier soil conditions as shown more clearly in the overlying zone 3 (see below).

The large quantity of Cyperaceae pollen would have been partly derived from *Carex* or *Eriophorum* in the local small-sized mire. In the surrounding space cleared from *Alnus*, inside and outside the narrow spot of peat formation, abundant Cyperaceae growth would have occurred. Together with the grasses (increasing towards the top of the zone) and *Caltha* (and *Polygonum bistorta*?) this presents the picture of a wet sedge-meadow, small remnants of which are still found alongside brooks in the region (WESTHOFF et al. 1973. p. 214, 199).

In view of the rising values of *Rumex* (*acetosa*) and *Plantago lanceolata* pollen, a pasture would already have developed slightly uphill from the wet meadow, anticipating the situation in the overlying zone 3 (see below). Up there too, a ruderal vegetation (Chenopodiaceae, *Urtica dioica, Artemisia*) would have grown locally, e.g. along tracks which are supposed to have existed there at the relatively dry rim along the moist Dinkel valley.

Whereas the origin of the wet meadows (hay fields) is related to cutting of the Alnetum, the pastures (grazing ground) would have originated where the slightly higher situated Alno-Padion-like forests with *Ulmus* were cleared. According to KNÖRZER (1975, p. 212) a mixed meadow-pasture vegetation might have existed in the Middle Ages because of records of cattle grazing in hay fields, not only in late summer and autumn, but also in spring. By comparing pollen zones 2 and 3, however, the distinction between wet meadow and pasture is believed the be possible here.

Alnus carr would have remained on many places further down in the Dinkel valley. Especially along the western Dinkel branch (see *fig. 1*) vast *Alnus* swamps persisted up to recent times (VAN DIJK 1965). The arable *es* fields on the Ootmarsum hill were probably enlarged and new ones would have been created. The same might hold for heathlands. In the remaining forest stands *Quercus* seems to have been favoured, which may be related to its use as coppice and/or grazing ground for pigs. This phenomenon has been inferred from many other medieval pollen records (MUNAUT 1967, p. 164; JANSSEN 1972, p. 431 f.; OVERBECK 1975, p. 514; VAN GEEL et al. 1981, p. 402). VAN GEEL et al. mention the same for *Fagus*, and this can be seen in our pollen diagram as well.

4.2. Zone 3

The further evolution of the local moss peat as well as of the surrounding grasslands points to drier soil conditions. The moss peat is more decomposed and pools would have vanished (*Potamogeton* is lacking in this zone). Much of the surrounding wet sedge meadow has turned into pasture, as appears from the strong decrease of Cyperaceae and the increase of Gramineae, *Rumex* (*acetosa*) and *Plantago lanceolata*. Probably the increase of Ranunculaceae and *Trifolium* (*pratense*?) is also related to this. Even the change in composition in the group of ruderal species, namely the disappearance of *Urtica dioica* and the persistence of Chenopodiaceae, may be related to drier conditions.

These drier soil conditions may have resulted from artificial drainage. The digging of some ditches would have improved the accessibility and quality of the grasslands, especially for grazing. The need for more grazing grounds may have been prompted by a change in the farming system, keeping cattle outside the *pot* stalls more than before (JANSSEN 1972, p. 431 f., where a change from wet meadow to pasture is also demonstrated by pollen analysis). In fact, the increase of pasture land near the sampling site may be related to the later stretch of "high pasture' indicated on the 1860 topographic map (see Introduction and *fig. 1*).

The rise of *Alnus* and *Ulmus* pollen need not be related to a regeneration of the brook forests. It may rather point to the creation of timber fences (*houtwallen*) in connection with the increase of the cattle grazing inferred above; many of them could be found in this locality until recent times.

The favoured *Quercus* (and *Fagus*) stands on the hill would have decreased. In general, there may have been a further deforestation in the region, as would appear from the increase of *Pinus* and *Picea* pollen. Long-distance transport of these saccate pollen types is better recorded (in a tree-pollen sum), as the deposition area is less forested.

ACKNOWLEDGEMENTS

Thanks are due to M. Konert and A. Meyer for preparing the pollen samples, to C. Verstand and H. Sion for preparing the figures and to T. Dueck for correction of the English text.

REFERENCES

BEHRE, K.-E. (1981): The interpretation of anthropogenic indicators in pollen diagrams. *Pollen et Spores* **23**: 225–245.

DANIËLS, A. G. H. (1964): A contribution to the investigation of the Holocene history of the beech in the Eastern Netherlands. *Acta Bot. Neerl.* **13**: 66–75.

ELLENBERG, H. (1974): *Zeigerwerte der Gefässpflanzen Mitteleuropas. Scripta geobotanica* 9. Göttingen: Goltze.

FAEGRI, K. & J. IVERSEN (1975): *Textbook of pollen analysis*. 3rd. ed. Blackwell Sc. Publ.

JANSSEN, C. R. (1972): The paleoecology of plant communities in the Dommel valley, North Brabant, The Netherlands. *J. Ecol.* **60**: 411–437.

KNÖRZER, K.-H. (1975): Entstehung und Entwicklung der Grünlandvegetation im Rheinland. *Decheniana* **127**: 195–214.

LAMBERT, A. M. (1971): *The making of the Dutch landscape*. London: Seminar Press.

MUNAUT, A. V. (1967). Recherches paléo-écologiques en Basse et Moyenne Belgique. *Acta Geogr. Lovan.* **6**.

OVERBECK, F. (1975). *Botanisch-geologische Moorkunde*. Neumünster.

PAPE, J. C. (1972). Oude bouwlandgronden in Nederland. *Boor en Spade* **18**: 85–114.

SLICHER VAN BATH, B. H. (1970): Welvaart op wankele basis. In: B. H. SLICHER VAN BATH (ed.). *Geschiedenis van Overijssel*: 93–105. Deventer: Kluwer.

VAN DER HAMMEN, T. & J. A. BAKKER (1971). Former vegetation, landscape and man in the Dinkel valley. In: T. VAN DER HAMMEN & T. A. WYMSTRA (ed.) The Upper Quaternary of the Dinkel valley. *Meded. Rijks Geol. Dienst, N.S.* **22**: 55–213.

VAN DIJK, J. (1965). De Twentse maten en beekmoerassen. In: Twente natuurhistorisch 5. *Wet. Meded. Kon. Ned. Natuurh. Ver.* **56**.

VAN GEEL, B., S. J. P. BOHNCKE & H. DEE (1981). A paleoecological study of an upper Late Glacial and Holocene sequence from "De Borchert", The Netherlands. *Rev. Palaeobot. Palynol.* **31**: 367–448.

VAN ZEIST, W. (1960). De geschiedenis van het Twentse bos. In: Twente natuurhistorisch 2. *Wet. Meded. Kon. Ned. Natuurh. Ver.* **37**.

WESTHOFF, V., P. A. BAKKER, C. G. VAN LEEUWEN, E. E. VAN DER VOO & I. S. ZONNEVELD (1973). *Wilde Planten* **3**. Ver. Beh. Natuurmon. Ned.