MEDIEVAL PLANT REMAINS FROM PEELO, THE NETHERLANDS

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ABSTRACT: Information on plant cultivation and vegetation at medieval Peelo was obtained from dry soil samples and waterlogged well deposits. Rye (*Secale cereale*), barley (*Hordeum vulgare*) and common oat (*Avena sativa*) were the cereal crop plants. Other cultivated plants included flax (*Linum usitatissimum*), field pea (*Pisum sativum*), Celtic bean (*Vicia faba* var. *minor*), celery (*Apium graveolens*) and probably black mustard (*Brassica nigra*). There is scarce evidence of fruit growing. Weeds of cornfields and vegetable gardens are well represented. Grassland is attested by a great number of species. Other vegetations demonstrated for Peelo include those of ruderal habitats, trodden places and heathlands.

KEYWORDS: Charred and waterlogged plant remains, rye, barley, oats, garden crops, weed vegetations, heathland, grassland, tread-resistant species.

1. INTRODUCTION

In this volume of *Palaeohistoria*, Kooi (1993/1994) discusses the results of the Peelo excavations carried out on the parcels designated as Hovinge, Derkinge, Bremer and Haverland (for location, see fig. 1). Settlement remains uncovered on the Hovinge, Derkinge and Bremer parcels date mainly from the Middle Ages, whereas those at the Haverland are predominantly of the pre-Roman and Roman Iron Age. In the present botanical report the medieval plant remains are treated. This implies that, except for the fill of two wells, the data obtained for the Haverland will not be presented. They will be included in the proposed third report on the Peelo plant remains.

Peelo is situated on the central plateau of Drenthe, just as the medieval sites of Gasselte, Pesse and Odoorn which have been examined for plant remains (van Zeist & Palfenier-Vegter, 1979; van Zeist et al., 1986) and to which reference will be made in this paper. The soil of the central plateau consists of coversand deposits of varying thickness, in part underlain by boulder clay.

The features excavated on the Bremer parcel belong partly to the Hovinge and partly to the Derkinge farmsteads. For that reason all botanical samples discussed in this report are attributed to one of the two farmsteads, except the two well samples from the Haverland mentioned above. Each farmstead consisted of a house, one or more barns and sheds, corn-stacks, a well and a yard (with a vegetable garden), and was (in part) surrounded by an enclosure. In the course of the medieval occupation the buildings and other structures had been repaired and rebuilt several times.

Two types of samples are distinguished, viz. dry soil samples in which seeds and fruits are preserved in a carbonized condition only, and well samples which yielded waterlogged plant remains. Plant nomenclature in this paper is in accordance with *Heukels' Flora van Nederland* (van der Meijden, 1990). English and Dutch names of the plant taxa recorded from medieval Peelo are presented in the appendix.

Information on the site and the samples was received from Dr. P.B. Kooi. Mr. G. Delger prepared the drawing (fig. 1). The English text was corected by Dr. A.L. Brindley.

2. THE CHARRED SEED SAMPLES

The majority of the dry soil samples are from the fill of post-holes; some are from pits and other features. No charred grains were observed in the field. Samples for botanical examination were taken more or less randomly by the excavators, for instance, every third post-hole. In the laboratory, the charred plant remains were retrieved by means of manual water flotation. In total, 149 dry soil samples from medieval contexts were examined. A substantial number (c. 40%) did not yield any seed, but at most sclerotia of the fungus *Cenococcum geophilum* and/or charred stem fragments, presumably of *Calluna vulgaris* (heather). As the significance of the durable *Cenococcum* sclerotia in an archaeological context is still obscure, no attention to these remains will be paid here. In the present report, only samples that yielded seeds and fruits which could be identified at least to the family level are included.

Unfortunately, many of the samples included are poor in cereal grains and/or other seeds. Few samples

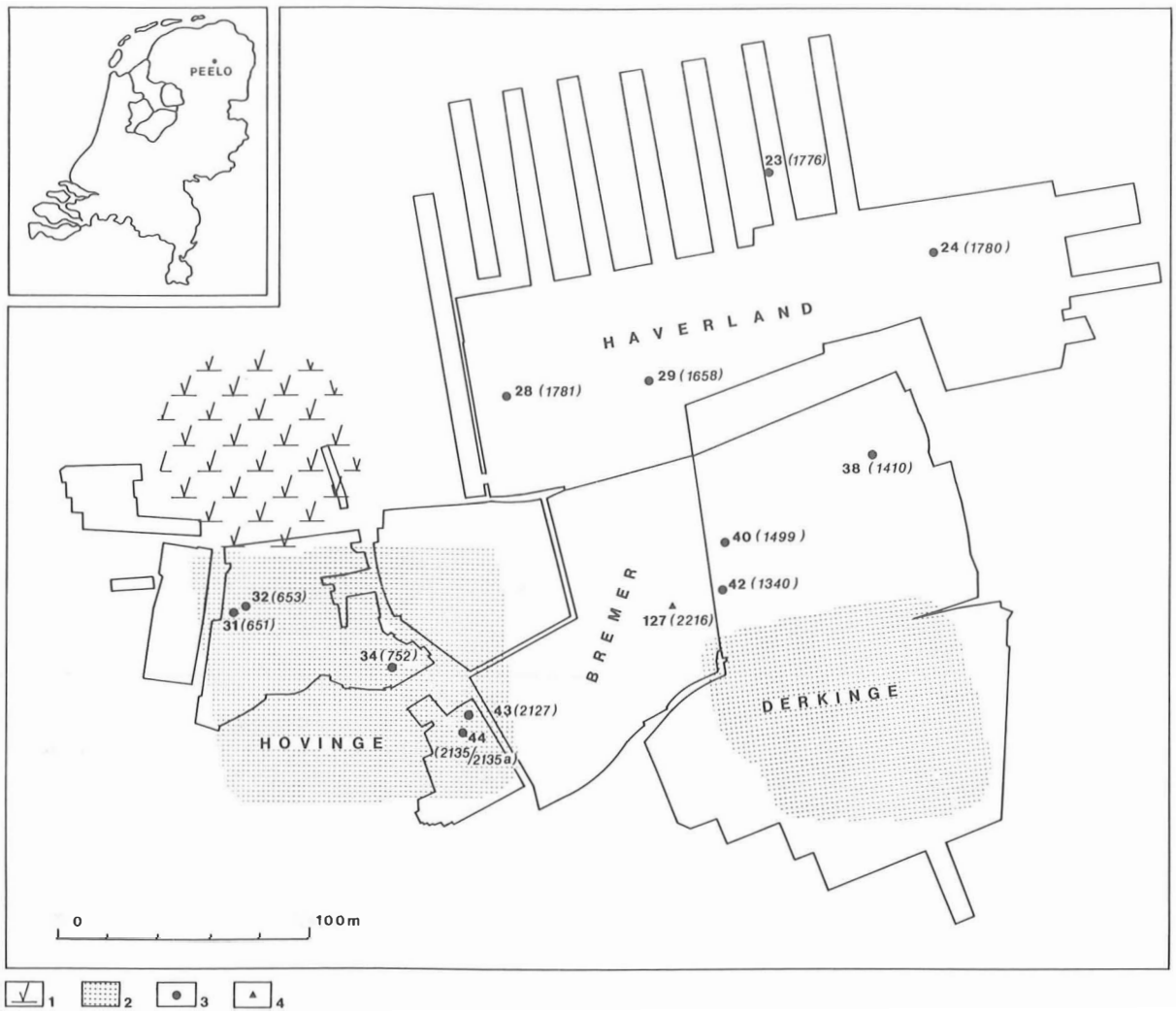

Fig. 1. Map of the Peelo settlement terrain excavated in 1981, 1982, 1986, 1987 and 1988 (Kooi, 1993/1994). The wells from which samples for botanical examination were secured are shown. In addition to the well numbers, the sample numbers (in brackets) are given. Wells Nos 28 and 29 date from the Roman Iron Age (and are not included in the present study). Sample 2216 is from a pit which yielded waterlogged plant remains. 1. Small peat-bog; 2. Approximate extent of the Hovinge and Derkinge farmsteads; 3. Wells; 4. Pit.

yielded more than a few tens of seeds. As an example, in table 1 the results of the examination of the fill of post-holes belonging to a late-medieval three-period farm are listed. Some of these samples are comparatively rich, others are poor. The category 'Unidentified' is problematic in that some of the remains may be of seeds, but others are certainly not. Compared to the other samples, sample 1342 yielded a notably large number of weed seeds (table 2).

Because of the predominantly poor recovery, the results are combined into a few groups of samples. The first distinction is that between the samples from Derkinge and Hovinge. Within these two groups a differentiation is made between early-medieval (up to about AD 1000) and late-medieval samples (table 3). For some of the samples it could not be determined whether they are of early- or of late-medieval age. The results from these samples are included in the total numbers of seeds and fruits. In addition to the sums of seeds, the sample frequencies (the number of samples in which the species concerned is represented) are shown in table 3. The cultivated and wild plant taxa listed in table 3 will be discussed in sections 4 and 5, but here a few more general comments with respect to the charred plant record will be made.

From table 3 it is evident that the cereals (oats, barley, rye) are relatively well represented: comparatively large numbers of grains and fairly high sample frequencies. Of the wild plant taxa, only *Polygonum lapathifolium* shows a comparable representation. *Rumex acetosella* is relatively frequent at Hovinge, but the large total number of seeds at Derkinge is due to one

Table 1. Hovinge. Samples from post-holes belonging to a late-medieval three-period farm (Nos67, 68, 69; Kooi, 1993/1994: figs 18,20,21). Some of these samples yielded a comparatively large number of cereal grains.

Sample number	696	697	698	702	704	724	725	729	730	731
Avena (sativa)	-	1	1	-	-	-	-	-	2	-
Hordeum vulgare	1	1	-	-	6	12	18	9	3	5
Secale cereale	2	1	-	5	-	-	2	5	3	47
Cereal grain fragments (in grams)	-	-	-	0.01	0.03	0.04	0.08	0.05	0.02	0.05
Pisum sativum	-	-	-	2	-	-	-	1	-	-
Vicia faba var. *minor*	-	-	-	-	-	-	-	1	-	-
Linum usitatissimum	-	1	-	-	-	-	-	-	-	-
Bromus hordaceus/secalinus	-	-	-	-	-	-	-	1	-	-
Carex rostrata/vesicaria	-	1	-	-	-	-	-	7	-	-
Eleocharis palustris	-	-	-	1	-	-	-	-	-	-
Gramineae indet.	-	-	-	-	-	-	-	1	-	-
Polygonum lapathifolium	-	1	-	-	-	2	-	-	2	-
Rhinanthus spec.	-	1	-	-	-	-	-	-	-	-
Rumex acetosella	-	2	-	-	-	-	-	5	1	21
Spergula arvensis	-	-	-	-	-	-	-	-	-	1
Vicia spec.	-	-	-	-	-	-	-	-	-	1
Unidentified	-	1	-	-	-	-	-	-	2	2
Twigs[1], *Calluna vulgaris*	x	xx	-	xx	-	xx	-	xxx	xx	xx

[1] x = 1-9; xx = 10-99; xxx = 100 and more specimens

Table 2. Sample 1342 (Derkinge, Early Middle Ages). Of the charred seed samples, this one yielded by far the greatest number of weed seeds.

Secale cereale	3
Agrostis spec.	1
Carex hirta-type	1
Matricaria maritima	1
Polygonum convolvulus	2
Polygonum lapathifolium	8
Potentilla erecta	1
Ranunculus repens	1
Raphanus raphanistrum, pod segments	3
Rumex acetosella	65
Rumex obtusifolius	1
Spergula arvensis	90
Stellaria media	2

sample (table 2). The generally poor representation of the wild plant taxa makes it impossible to determine possible differences between the two farmsteads and/or between the Early and Late Middle Ages with respect to the (exploitation of the) ancient vegetation. There is one obvious botanical difference between Hovinge and Derkinge, and that concerns the charred heather twigs. From many of the Hovinge samples appreciable numbers of these twigs were retrieved, whereas they are conspicuously absent from Derkinge (table 3). Unfortunately, an explanation for this difference is not readily available. Why would for many centuries the inhabitants of Hovinge have used heather, e.g. in the sheep-fold as was common practice until the 20th century, and those of Derkinge not?

In spite of the comparatively good representation of the cereal species, the absolute numbers of grains recovered are small. Various samples from medieval Gasselte (van Zeist & Palfenier-Vegter, 1979) and Pesse (van Zeist et al., 1986) yielded each more charred cereal grains than those from Peelo together. No distinct remains of grain supplies that had caught fire were retrieved from medieval Peelo. This is surprising in that the remains of corn-stacks uncovered indicate that the cereal crop was stored in the farmyard, probably in sheaves. Could this indicate that the Peelo inhabitants were very cautious with fire?

The assumption that the crop was stored in sheaves implies that threshing was done on the farm, either in the yard or in a barn. However, no threshing remains in the form of rachis internode fragments of barley and rye were recovered. One could argue that at Peelo, threshing remains were not burnt and that for that reason they are absent from the charred plant record. As a matter of fact, threshing waste is good food for farm animals (cf. Hillman, 1984: fig. 2). However, the waterlogged well samples (section 3) equally yielded no cereal threshing remains, and one might expect that at least some of the light chaff had been blown in the well. Thus, we are left with the problem of reconciling the presence of corn-stacks for storing unthreshed cereal crop with the absence of threshing remains from the archaeological plant record. Or had the structures indicated as corn-stacks perhaps served as hay-stacks?

As has been mentioned above, because of the generally poor representation the charred wild plant record does not allow conclusions as to possible differences between farmsteads and/or periods. What about the cereals which occur more frequently than most of the wild plant taxa? Table 3 shows distinct differences

Table 3. Sums (N) and sample frequencies (Sfr) of seeds, fruits and other remains in charred seed samples. Only samples that yielded identifiable diaspores are included. Numbers of unknowns are not shown. EMA. Early Middle Ages (up to about AD 1000); LMA. Late Middle Ages; +. Present (fragments); xx. Many (twigs). For explanation and discussion, see text.

	HOVINGE						DERKINGE					
	EMA		LMA		Total[1]		EMA		LMA		Total[1]	
	N	sfr	N	sfr	N	sfr	N	sfr	N	sfr	N	sfr
Avena (sativa)	3	2	17	10	21	13	6	4	16	11	25	17
Hordeum vulgare	3	2	130	24	133	26	12	5	29	8	45	15
Secale cereale	14	5	83	15	102	22	14	7	63	13	81	22
Cereal grain fragments	-	-	+	12	+	13	+	4	+	7	+	13
Pisum sativum	-	-	5	2	5	2	-	-	3	1	3	1
Pisum/Vicia sativa	-	-	-	-	-	-	-	-	2	1	2	1
Vicia faba var. *minor*	-	-	1	1	1	1	-	-	-	-	-	-
Linum usitatissimum	-	-	1	1	2	2	-	-	4	2	4	2
Corylus avellana	-	-	+	1	+	2	+	1	-	-	+	1
Prunus avium/cerasus	-	-	1	1	1	1	-	-	-	-	-	-
Rubus spec.	-	-	1	1	1	1	-	-	-	-	-	-
Agrostis spec.	-	-	-	-	-	-	1	1	-	-	1	1
Bromus hordaceus/secalinus	-	-	1	1	1	1	-	-	2	2	2	2
Carex cuprina	-	-	-	-	-	-	-	-	1	1	1	1
Carex hirta-type	-	-	-	-	-	-	1	1	-	-	1	1
Carex nigra-type	-	-	-	-	1	1	-	-	-	-	-	-
Carex rostrata/vesicaria	-	-	9	3	9	3	-	-	-	-	-	-
Carex spec.	-	-	1	1	1	1	-	-	-	-	-	-
Chenopodium album	-	-	2	2	2	2	2	1	12	2	17	4
Chenopodium/Atriplex	-	-	-	-	-	-	1	1	-	-	1	1
Echinochloa crus-galli	-	-	-	-	-	-	1	1	-	-	1	1
Eleocharis palustris	-	-	2	2	2	2	-	-	2	2	2	2
Erica tetralix, leaves	-	-	1	1	1	1	-	-	1	1	1	1
Festuca pratensis	1	1	1	1	6	3	3	1	-	-	3	1
Gramineae indet.	3	1	1	1	4	2	-	-	2	2	2	2
Lolium perenne	2	2	-	-	2	2	-	-	-	-	-	-
Matricaria maritima	-	-	-	-	-	-	1	1	-	-	1	1
Plantago lanceolata	-	-	-	-	-	-	-	-	1	1	1	1
Poa annua	1	1	-	-	1	1	-	-	-	-	-	-
Polygonum aviculare	1	1	-	-	1	1	-	-	-	-	-	-
Polygonum convolvulus	-	-	-	-	-	-	2	1	1	1	3	2
Polygonum hydropiper	-	-	-	-	-	-	-	-	-	-	1	1
Polygonum lapathifolium	8	5	19	14	31	22	15	6	18	11	42	19
Polygonum persicaria	-	-	-	-	-	-	-	-	1	1	1	1
Potentilla erecta	2	2	-	-	2	2	1	1	-	-	1	1
Ranunculus repens	-	-	-	-	-	-	1	1	-	-	1	1
Raphanus raphanistrum, pod segments	-	-	-	-	-	-	3	1	1	2	4	3
Rhinanthus spec.	-	-	1	1	1	1	-	-	-	-	-	-
Rumex acetosella	10	5	33	7	44	13	65	1	6	3	74	5
Rumex obtusifolius	-	-	-	-	-	-	1	1	-	-	1	1
Rumex spec.	1	1	-	-	1	1	1	1	-	-	1	1
Setaria viridis	-	-	-	-	-	-	2	2	1	1	4	4
Sherardia arvensis	-	-	-	-	-	-	-	-	1	1	1	1
Spergula arvensis	2	2	2	2	5	5	90	1	5	2	96	4
Stachys palustris	-	-	-	-	-	-	-	-	1	1	1	1
Stellaria graminea/palustris	-	-	1	1	1	1	-	-	-	-	-	-
Stellaria media	-	-	-	-	-	-	2	1	-	-	2	1
Vicia spec.	-	-	2	2	4	4	1	1	-	-	1	1
Twigs, *Calluna vulgaris*	xx		xx		xx		-		-		-	
Number of samples included	8		32		47		14		22		42	
Number of samples examined	11		47		65		19		56		84	

[1]Includes samples attributed to Middle Ages unspecified

Table 4. Mean values of cereal grains per sample. Left columns: values calculated on the number of samples that yielded identifiable grains and/or seeds; right columns: values calculated on the number of samples examined. EMA. Early Middle Ages; LMA. Late Middle Ages.

	HOVINGE						DERKINGE					
	EMA		LMA		Total		EMA		LMA		Total	
Avena	0.4	0.3	0.5	0.4	0.4	0.3	0.4	0.3	0.7	0.3	0.6	0.3
Hordeum	0.4	0.3	4.1	2.8	2.8	2.0	0.9	0.6	1.3	0.5	1.1	0.5
Secale	1.8	1.3	2.6	1.8	2.2	1.6	1.0	0.7	2.9	1.1	1.9	1.0
Σ Cereals	2.5	1.8	7.2	4.9	5.4	3.9	2.3	1.7	4.9	1.9	3.6	1.8
Number of samples	8	11	32	47	47	65	14	19	22	56	42	84

in total numbers of grains, but these numbers give a distorted picture because of unequal numbers of samples. For that reason, the mean numbers of grains per sample are determined (table 4). Two mean values are shown: one calculated on the number of samples that yielded identifiable grains and/or seeds (left columns of each series), and one calculated on the total number of samples examined (right columns). Table 4 suggests that at Hovinge, the late-medieval grain densities are higher than the early-medieval ones, but no such difference appears to exist at Derkinge, particularly if one compares the values calculated on the total numbers of samples examined. Comparison between Hovinge and Derkinge shows higher mean values for the former. Thus, it looks as though, on average, Hovinge has higher cereal grain densities than Derkinge. A 'richer' charred plant record at Hovinge is also suggested by the higher proportion of samples that yielded identifiable grains and/or seeds, viz. 68% at Hovinge and 50% at Derkinge. Admittedly, prior to flotation the soil volumes were not been measured, but routinely samples of about 5000 cc had been secured in the field. A few samples may have been larger or smaller. One may safely assume that the differences in mean cereal grain densities are not occasioned by differences in mean soil volumes. It remains the question what these differences in grain densities mean.

3. THE WATERLOGGED SAMPLES

The remains of 26 wells were excavated (Kooi, 1993/1994: fig. 7). From 12 of them, indicated in figure 1, a sample from the fill at the bottom of the well was secured for botanical examination (in one case, two samples). In various instances it was not possible to obtain such a sample because the well collapsed before the bottom had been reached. Two of the sampled wells (Nos 28 and 29) date from the Roman Iron Age and will be discussed in a third report on the archaeobotany of Peelo. Two medieval wells (samples 1776 and 1780) are from the Haverland with predominantly pre-Roman and Roman Iron Age settlement remains. Samples 2135 and 2135A are from a 17th-18th century well. Sample 2216 is not from a well, but from a pit which had been dug to below the groundwater table.

In the fill of a well, in so far as it has always been below the groundwater table, plant remains are preserved in a non-carbonized, waterlogged condition. Only samples from the bottom of the wells were thought to be appropriate for a botanical examination. In this connection the following should be remarked. It is unlikely that at the time the well was in use, waste was intentionally thrown into it. However, in drawing water, through the action of wind and such-like, seeds and other plant remains must have fallen in the well and subsequently sunk to the bottom, where they became incorporated in the mineral sediment. One may assume that after the well had fallen into disuse, it was filled in quite soon, covering the bottom layer. Thus, this bottom layer is a sealed context in which plant remains had accumulated for quite some time. The plant remains in this context all had the same deposition and preservation history. If waterlogged plant remains were already present in higher-lying levels, in the fill thrown in by man, they probably were scarce and, moreover, of uncertain origin. Be this as it may, sampling for botanical analysis was confined to the bottom fill of the well, but quite often no undisturbed sample from this layer could be obtained.

At first glance the well samples did not look much promising. They consisted of almost pure sand, with at most some dark humous bands or spots. However, most of them turned out to be quite rich in seeds. The well samples were treated (washing through a set of sieves) and examined in the way usual for waterlogged material. The results are presented in table 5. Moss remains have not (yet) been identified. In addition to the economic and ecological aspects discussed in sections 4 and 5, the waterlogged plant record gives occasion to the following comments.

The contention that the sealed bottom layer contains only plant remains that inadvertently had landed in the well, may not be quite true. It looks as though some vegetable waste had been dumped in the well, probably after this had been abandoned and prior to the filling in

Table 5. Numbers of seeds, fruits, etc. in waterlogged samples. EMA. Early Middle Ages.

	HOVINGE						DERKINGE				HAVERLAND	
Sample number	651	653	752	2127	2135	2135A	1410	1499	2216	1340	1776	1780
Well number	31	32	34	43	44	44	38	40	pit	42	23	24
Date (centuries AD)	8-9	8-9	10-12	12-14	17-18	17-18	8-9	9-10	EMA	11-12	6-10	6-10
Part of sample examined	1/3	1/7	1/1	1/6	1/1	1/3	1/4	1/3	1/1	1/8	1/3	1/3
Avena (*sativa*) (carb.)	-	1	1	-	-	-	-	1	1	-	1	-
Fagopyrum esculentum	-	-	-	-	5	1	-	-	-	-	-	-
Hordeum vulgare (carb.)	-	1	-	-	-	-	-	-	1	1	1	-
Linum usitatissimum	2	-	-	1	-	-	-	-	-	-	-	1
Secale cereale (carb.)	-	-	-	-	-	-	-	1	-	1	1	-
Apium graveolens	-	1	-	-	-	-	-	-	-	-	-	-
Brassica nigra	-	2	-	-	-	-	-	-	-	-	-	-
Corylus avellana	-	-	-	-	-	-	-	-	-	-	-	+
Malus sylvestris/Pyrus malus, endocarp	-	-	-	-	-	-	-	-	-	-	-	+
Prunus domestica ssp. *insititia*	-	1	-	-	+	-	-	-	-	-	-	-
Rubus fruticosus/spec.	5	1	2	1	1	-	-	+	3	1	2	2
Rubus idaeus	1	1	-	-	-	-	-	-	-	-	-	-
Sambucus nigra	-	-	1	-	3	-	-	-	1	2	-	-
Vaccinium myrtillus	-	-	-	-	-	-	-	-	-	-	1	-
Achillea millefolium	-	-	-	-	-	-	-	8	-	-	-	-
Agrostis spec.	2	-	-	4	8	1	2	12	-	-	1	2
Alnus glutinosa	-	-	-	-	1	-	-	-	-	-	-	-
Alopecurus geniculatus	2	3	-	-	1	-	1	3	1	26	-	-
Anagallis arvensis	-	-	-	-	-	-	-	-	-	6	2	-
Anthemis arvensis	7	-	1	-	-	-	-	1	-	-	-	-
Aphanes arvensis	-	-	-	-	-	-	-	-	-	-	-	1
Arctium (*pubens*)	-	1	-	-	-	-	-	-	-	-	-	-
Atriplex patula/prostrata	-	-	-	-	10	-	-	2	-	-	2	-
Betula pubescens/spec.	1	-	-	-	-	2	-	-	-	-	-	-
Bidens tripartita	-	-	-	-	-	-	-	-	-	1	1	-
Bromus hordaceus/secalinus	-	-	-	-	-	-	-	-	-	-	10	-
Callitriche spec.	-	-	-	-	-	-	-	-	-	-	87	-
Calluna vulgaris, leafed stem tips	15	-	-	-	-	-	-	3	-	9	-	-
Calluna vulgaris, flowers/capsules	13	-	-	-	-	49	-	5	-	16	-	10
Calluna vulgaris, seeds	-	-	-	-	-	62	-	-	-	5	-	2
Capsella bursa-pastoris	-	6	-	-	4	3	-	7	-	7	31	2
Carex cuprina	1	-	-	-	-	1	45	11	-	-	-	-
Carex disticha	1	-	-	2	3	-	184	-	-	1	2	-
Carex nigra-type	26	-	1	18	9	11	16	2	-	-	-	-
Carex oederi	-	1	-	7	-	-	2	1	1	-	-	1
Carex panicea	3	-	-	2	-	1	-	-	-	1	-	-
Carex paniculata	2	-	-	2	-	-	-	2	-	-	-	-
Carex pilulifera	21	-	-	1	-	-	-	-	-	-	-	5
Carex rostrata/vesicaria	44	-	1	22	4	-	-	16	-	1	-	1
Carex spec.	-	-	-	3	-	1	-	-	-	-	-	-
Cerastium fontanum	-	5	-	7	1	4	1	-	-	-	-	-
Chenopodium album	133	14	5	-	6	-	1	6	1	30	84	1
Chenopodium polyspermum	-	-	-	3	9	1	-	-	67	-	-	-
Chrysanthemum segetum	-	-	-	-	7	5	-	1	-	-	-	-
Cirsium arvense	-	59	-	-	-	-	-	-	-	-	-	-
Cirsium vulgare	-	3	-	-	-	-	-	-	-	-	-	-
Compositae indet.	-	-	-	-	1	-	-	-	-	-	-	-
Conium maculatum	-	-	-	1	2	-	-	-	-	-	-	-
Echinochloa crus-galli	1	-	-	1	-	-	-	-	-	1	7	-
Eleocharis palustris	34	1	-	5	1	-	3	2	1	1	1	-
Epilobium palustre	-	-	-	-	-	-	-	3	-	-	-	-
Erica tetralix, leaves	180	-	-	8	4	140	-	40	4	186	-	113
Erica tetralix, flowers	1	-	-	-	-	-	-	1	-	26	-	4
Erica tetralix, seeds	-	-	-	-	-	4	-	-	-	25	-	2
Euphorbia helioscopia	1	-	-	-	-	-	-	-	-	3	1	-
Euphrasia spec.	-	-	-	-	-	-	-	2	-	-	-	-
Galeopsis tetrahit/speciosa	2	11	2	-	-	-	-	-	-	8	8	-
Galium aparine	-	-	-	4	-	-	-	-	-	-	-	-
Glyceria fluitans	-	-	-	1	-	-	-	-	1	-	-	-

Table 5. (Continued).

	HOVINGE						DERKINGE				HAVERLAND	
Sample number	651	653	752	2127	2135	2135A	1410	1499	2216	1340	1776	1780
Well number	31	32	34	43	44	44	38	40	pit	42	23	24
Date (centuries AD)	8-9	8-9	10-12	12-14	17-18	17-18	8-9	9-10	EMA	11-12	6-10	6-10
Part of sample examined	1/3	1/7	1/1	1/6	1/1	1/3	1/4	1/3	1/1	1/8	1/3	1/3
Gramineae indet.	6	1	-	-	-	-	-	8	1	-	3	-
Hydrocotyle vulgaris	13	-	-	5	-	-	1	4	-	-	-	-
Hypochaeris radicata	-	-	-	1	-	-	-	-	-	-	-	-
Juncus articulatus	-	-	-	39	-	3	11	3	-	-	-	2
Juncus bufonius	-	-	-	61	-	55	65	45	-	19	1	34
Juncus effusus-type	-	-	-	2	-	-	7	4	-	-	-	6
Juncus squarrosus	5	1	-	17	2	12	14	23	-	1	1	18
Juncus spec.	-	-	-	-	3	-	-	-	-	-	-	-
Knautia arvensis	-	-	-	-	-	-	-	1	-	1	-	-
Lamium album	-	-	-	-	2	-	-	-	-	-	-	-
Lamium purpureum	-	-	1	-	-	-	-	-	-	19	3	-
Leontodon autumnalis	-	-	-	-	1	3	-	-	-	-	-	-
Lychnis flos-cuculi	-	-	-	4	-	2	-	-	-	-	-	-
Lycopus europaeus	-	-	-	-	1	-	-	-	-	-	-	-
Lythrum salicaria	-	-	-	-	-	-	-	1	-	-	-	-
Matricaria maritima	-	-	-	-	-	-	-	3	-	-	1	-
Matricaria recutita	-	-	-	-	-	-	-	1	-	1	-	-
Mentha aquatica/arvensis	-	-	-	-	-	-	-	1	-	3	1	-
Moehringia trinervia	-	-	-	1	2	-	-	-	-	-	-	-
Montia fontana	-	-	-	3	-	-	-	-	-	-	-	-
Myosotis arvensis/palustris	-	-	-	-	-	-	-	1	-	16	-	-
Myrica gale	-	-	-	-	-	-	-	1	-	-	-	1
Oenanthe aquatica	-	-	-	1	-	-	-	-	-	-	-	-
Pedicularis palustris	-	-	-	-	1	-	-	-	-	-	-	-
Plantago major	-	1	-	2	14	11	8	3	6	21	46	-
Poa annua	2	4	-	15	31	92	34	2	-	6	4	27
Poa pratensis/trivialis	1	4	-	-	3	3	12	8	-	7	1	4
Polygonum aviculare	183	3	3	19	39	49	4	11	-	18	49	14
Polygonum convolvulus	-	-	1	-	-	-	-	-	-	1	-	-
Polygonum hydropiper	6	538	1	36	11	12	2	1	2	3	12	8
Polygonum lapathifolium	154	2	5	1	2	5	2	14	12	138	36	4
Polygonum minus	-	-	-	2	-	-	-	-	-	-	-	-
Polygonum persicaria	-	424	5	1	-	-	-	1	-	1	1	-
Polygonum spec.	-	-	-	10	-	-	-	-	-	-	-	-
Potentilla anserina	-	-	-	-	1	-	-	-	-	-	-	-
Potentilla erecta	31	-	-	88	1	7	4	18	-	2	-	2
Prunella vulgaris	1	2	-	-	-	-	-	-	-	-	-	-
Quercus spec., buds, bud-scales	+	+	-	+	+	+	+	+	-	+	+	+
Ranunculus acris	-	-	-	3	-	-	-	-	-	-	-	1
Ranunculus flammula	-	-	-	-	-	1	154	1	1	-	-	-
Ranunculus repens	3	7	-	4	-	-	15	-	-	2	-	-
Ranunculus sardous	9	2	1	18	-	-	37	15	-	1	27	38
Ranunculus spec.	1	-	-	4	-	-	-	-	-	-	-	-
Raphanus raphanistrum, pod segments	6	1	-	-	-	-	-	+	-	-	-	+
Raphanus raphanistrum, seed	-	-	-	-	-	-	-	-	-	-	-	1
Rorippa palustris	-	18	-	45	-	-	-	-	-	40	-	-
Rumex acetosella	70	22	-	34	81	75	18	27	-	8	7	12
Rumex crispus	-	-	-	-	1	-	-	-	-	-	-	-
Rumex obtusifolius	2	12	2	13	-	-	-	2	13	16	49	-
Sagina (procumbens)	-	-	-	2	-	-	88	5	-	-	-	22
Scirpus maritimus	-	-	-	-	-	-	-	-	-	-	2	-
Scirpus setaceus	-	-	-	2	-	-	-	-	-	-	-	-
Scleranthus annuus, calyces	17	2	-	1	-	-	-	1	-	1	1	-
Senecio aquaticus	-	1	-	4	1	4	-	-	-	3	-	-
Sinapis arvensis	-	-	-	-	-	-	-	-	-	1	-	-
Solanum dulcamara	-	-	-	-	1	-	-	-	-	-	-	-
Solanum nigrum	8	7	11	-	2	-	1	2	-	3	27	34
Soncus asper	-	56	-	-	2	4	-	1	1	10	-	-
Sparganium erectum	-	-	-	-	-	-	1	-	-	-	-	-
Spergula arvensis	19	-	-	1	2	17	2	2	-	3	6	4
Stachys arvensis/sylvatica	-	-	-	-	-	-	-	-	-	-	7	-
Stellaria media	50	300	4	7	28	29	3	50	1	110	152	2

Table 5. (Continued).

	HOVINGE						DERKINGE				HAVERLAND	
Sample number	651	653	752	2127	2135	2135A	1410	1499	2216	1340	1776	1780
Well number	31	32	34	43	44	44	38	40	pit	42	23	24
Date (centuries AD)	8-9	8-9	10-12	12-14	17-18	17-18	8-9	9-10	EMA	11-12	6-10	6-10
Part of sample examined	1/3	1/7	1/1	1/6	1/1	1/3	1/4	1/3	1/1	1/8	1/3	1/3
Taraxacum spec.	-	2	-	-	-	-	-	-	-	-	-	-
Thelypteris palustris, frond fragment	-	-	+	-	-	-	-	-	-	-	-	-
Thlaspi arvense	-	1	-	-	-	-	-	-	-	10	-	-
Triglochin maritima	-	-	1	-	-	-	-	-	-	1	-	-
Urtica dioica	-	24	-	10	139	41	-	55	-	34	-	-
Urtica urens	5	2	-	1	3	1	-	10	-	3	12	12
Valeriana officinalis	1	-	-	-	-	-	-	-	-	-	-	-
Viola spec.	5	2	-	3	-	-	-	1	2	-	-	-

Table 6. Ecological affinity of the plant taxa recorded from medieval (and post-medieval) Peelo. Sfr. Number of waterlogged samples in which the species is represented (maximum is 12); C. Charred seeds only. 1. Weed vegetations of winter cereals (Secalietea); 2. Weed vegetations of summer cereals, root crops and vegetable gardens (Polygono-Chenopodietalia); 3. Ruderal vegetations consisting of annual and biennal species (Sisymbrietalia); 4. Ruderal vegetations consisting predominantly of perennial species (Artemisietalia vulgaris); 5. Tread-resistant species; 6. Species of (damp) ditches; 7. Wet heath; 8. Dry heath; 9. Grasslands on soils of low to moderate nutrient availability; 10. Grasslands on soils of moderate to high nutrient availability; 11. Species of marsh vegetations (Phragmitetea); 12. Alder-carr species; 13.Species of woods, wood edges and hedges.

Sfr		1	2	3	4	5	6	7	8	9	10	11	12	13
3	*Anthemis arvensis*	+	.	.	.	.	.	.	.	.	.	.	.	.
1	*Aphanes arvensis*	+	.	.	.	.	.	.	.	.	.	.	.	.
2	*Matricaria recutita*	+	.	.	.	.	.	.	.	.	.	.	.	.
2	*Polygonum convolvulus*	+	.	.	.	.	.	.	.	.	.	.	.	.
6	*Scleranthus annuus*	+	.	.	.	.	.	.	.	.	.	.	.	.
C	*Sherardia arvensis*	+	.	.	.	.	.	.	.	.	.	.	.	.
5	*Viola (arvensis/tricolor)*	+	.	.	.	.	.	.	.	.	.	.	.	.
10	*Rumex acetosella*	+	.	.	.	.	.	.	.	+	.	.	.	.
5	*Galeopsis tetrahit/speciosa*	+	.	.	+	.	.	.	.	.	.	.	.	+
2	*Myosotis arvensis/palustris*	+	.	.	.	.	.	.	.	+	.	+	.	.
1	*Bromus hordaceus/secalinus*	+	.	.	.	.	.	.	.	.	+	.	.	.
1	*Cirsium arvense*	+	+	.	.	.	.	.	.	.	.	.	.	.
4	*Raphanus raphanistrum*	+	+	.	.	.	.	.	.	.	.	.	.	.
1	*Sinapis arvensis*	+	+	.	.	.	.	.	.	.	.	.	.	.
9	*Spergula arvensis*	+	+	.	.	.	.	.	.	.	.	.	.	.
2	*Anagallis arvensis*	.	+	.	.	.	.	.	.	.	.	.	.	.
4	*Chenopodium polyspermum*	.	+	.	.	.	.	.	.	.	.	.	.	.
3	*Chrysanthemum segetum*	.	+	.	.	.	.	.	.	.	.	.	.	.
4	*Echinochloa crus-galli*	.	+	.	.	.	.	.	.	.	.	.	.	.
3	*Euphorbia helioscopia*	.	+	.	.	.	.	.	.	.	.	.	.	.
3	*Lamium purpureum*	.	+	.	.	.	.	.	.	.	.	.	.	.
12	*Polygonum lapathifolium*	.	+	.	.	.	.	.	.	.	.	.	.	.
12	*Polygonum persicaria*	.	+	.	.	.	.	.	.	.	.	.	.	.
C	*Setaria viridis*	.	+	.	.	.	.	.	.	.	.	.	.	.
2	*Thlaspi arvense*	.	+	.	.	.	.	.	.	.	.	.	.	.
3	*Atriplex patula/prostrata*	.	+	+	.	.	.	.	.	.	.	.	.	.
10	*Chenopodium album*	.	+	+	.	.	.	.	.	.	.	.	.	.
2	*Matricaria maritima*	.	+	+	.	.	.	.	.	.	.	.	.	.
9	*Solanum nigrum*	.	+	+	.	.	.	.	.	.	.	.	.	.
6	*Sonchus asper*	.	+	+	.	.	.	.	.	.	.	.	.	.
12	*Stellaria media*	.	+	+	.	.	.	.	.	.	.	.	.	.
9	*Urtica urens*	.	+	+	.	.	.	.	.	.	.	.	.	.
7	*Capsella bursa-pastoris*	.	+	+	.	+	!	.	.	.	.	.	.	.
7	*Juncus bufonius*	.	+	.	.	.	+	.	.	.	.	.	.	.
12	*Polygonum hydropiper*	.	+	.	.	.	+	.	.	.	.	.	.	.
3	*Mentha aquatica/arvensis*	.	+	.	.	.	.	.	.	+	.	+	.	.
1	*Stachys arvensis/sylvatica*	.	+	.	.	.	.	.	.	.	.	.	.	+
1	*Arctium (pubens)*	.	.	.	+	.	.	.	.	.	.	.	.	.
1	*Cirsium vulgare*	.	.	.	+	.	.	.	.	.	.	.	.	.

Table 6. (Continued).

Sfr		1	2	3	4	5	6	7	8	9	10	11	12	13
2	*Conium maculatum*	.	.	.	+	.	.	.	.	.	.	.	.	.
1	*Lamium album*	.	.	.	+	.	.	.	.	.	.	.	.	.
6	*Urtica dioica*	.	.	.	+	.	.	.	.	.	.	.	.	.
8	*Rumex obtusifolius*	.	.	.	+	.	.	.	.	.	+	.	.	.
1	*Galium aparine*	.	.	.	+	.	.	.	.	.	.	.	.	+
9	*Plantago major*	.	.	.	.	+	.	.	.	.	.	.	.	.
10	*Poa annua*	.	.	.	.	+	.	.	.	.	.	.	.	.
11	*Polygonum aviculare*	.	.	.	.	+	.	.	.	.	.	.	.	.
4	*Sagina (procumbens)*	.	.	.	.	+	.	.	.	.	.	.	.	.
2	*Leontodon autumnalis*	.	.	.	.	+	.	.	.	.	+	.	.	.
1	*Potentilla anserina*	.	.	.	.	+	.	.	.	.	+	.	.	.
C	*Lolium perenne*	.	.	.	.	+	.	.	.	.	+	.	.	.
4	*Hydrocotyle vulgaris*	.	.	.	.	+	+	.	.	+	.	+	.	.
2	*Bidens tripartita*	.	.	.	.	.	+	.	.	.	.	.	.	.
1	*Montia fontana*	.	.	.	.	.	+	.	.	.	.	.	.	.
1	*Polygonum minus*	.	.	.	.	.	+	.	.	.	.	.	.	.
3	*Rorippa palustris*	.	.	.	.	.	+	.	.	.	.	.	.	.
1	*Scirpus setaceus*	.	.	.	.	.	+	.	.	.	.	.	.	.
5	*Juncus articulatus*	.	.	.	.	.	+	.	.	.	+	.	.	.
9	*Ranunculus sardous*	?	.	.	.	.	?	.	.	.	?	.	.	.
8	*Erica tetralix*	.	.	.	.	.	.	+	.	.	.	.	.	.
10	*Juncus squarrosus*	.	.	.	.	.	.	+	.	.	.	.	.	.
2	*Myrica gale*	.	.	.	.	.	.	+	.	.	.	.	.	.
6	*Carex oederi*	.	.	.	.	.	.	+	.	+	.	.	.	.
4	*Carex panicea*	.	.	.	.	.	.	+	.	+	.	.	.	.
8	*Potentilla erecta*	.	.	.	.	.	.	+	+	+	.	.	.	.
5	*Calluna vulgaris*	.	.	.	.	.	.	.	+	.	.	.	.	.
3	*Carex pilulifera*	.	.	.	.	.	.	.	+	.	.	.	.	.
7	*Carex nigra* (type)	.	.	.	.	.	.	.	.	+	.	.	.	.
1	*Euphrasia* spec.	.	.	.	.	.	.	.	.	+	.	.	.	.
1	*Hypochaeris radicata*	.	.	.	.	.	.	.	.	+	.	.	.	.
4	*Juncus effusus* (type)	.	.	.	.	.	.	.	.	+	.	.	.	.
2	*Knautia arvensis*	?	.	.	.	.	.	.	.	+	.	.	.	.
2	*Lychnis flos-cuculi*	.	.	.	.	.	.	.	.	+	.	.	.	.
1	*Pedicularis palustris*	.	.	.	.	.	.	.	.	+	.	.	.	.
4	*Ranunculus flammula*	.	.	.	.	.	.	.	.	+	.	.	.	.
5	*Senecio aquaticus*	.	.	.	.	.	.	.	.	+	.	.	.	.
1	*Valeriana officinalis*	.	.	.	.	.	.	.	.	+	.	.	.	.
C	*Rhinanthus* spec.	.	.	.	.	.	.	.	.	+	.	.	.	.
C	*Stachys palustris*	.	.	.	.	.	.	.	.	+	.	.	.	.
6	*Carex disticha*	.	.	.	.	.	.	.	.	+	.	+	.	.
7	*Carex rostrata/vesicaria*	.	.	.	.	.	.	.	.	+	.	+	.	.
1	*Achillea millefolium*	.	.	.	.	.	.	.	.	+	+	.	.	.
8	*Agrostis* spec.	.	.	.	.	.	.	.	.	+	+	.	.	.
5	*Cerastium fontanum*	.	.	.	.	.	.	.	.	+	+	.	.	.
C	*Plantago lanceolata*	.	.	.	.	.	.	.	.	+	+	.	.	.
9	*Poa pratensis/trivialis*	.	.	.	.	.	.	.	.	+	+	.	.	.
2	*Prunella vulgaris*	.	.	.	.	.	.	.	.	+	+	.	.	.
C	*Stellaria graminea/palustris*	.	.	.	.	.	.	.	.	+	+	.	.	.
7	*Alopecurus geniculatus*	.	.	.	.	.	.	.	.	.	+	.	.	.
4	*Carex cuprina*	.	.	.	.	.	.	.	.	.	+	.	.	.
2	*Ranunculus acris*	.	.	.	.	.	.	.	.	.	+	.	.	.
5	*Ranunculus repens*	.	.	.	.	.	.	.	.	.	+	.	.	.
1	*Rumex crispus*	.	.	.	.	.	.	.	.	.	+	.	.	.
1	*Taraxacum* spec.	.	.	.	.	.	.	.	.	.	+	.	.	.
C	*Carex hirta* (type)	.	.	.	.	.	.	.	.	.	+	.	.	.
C	*Festuca pratensis*	.	.	.	.	.	.	.	.	.	+	.	.	.
9	*Eleocharis palustris*	.	.	.	.	.	.	.	.	.	+	+	.	.
2	*Glyceria fluitans*	.	.	.	.	.	.	.	.	.	+	+	.	.
1	*Lythrum salicaria*	.	.	.	.	.	.	.	.	.	+	+	.	.
1	*Epilobium palustre*	.	.	.	.	.	.	.	.	.	.	+	.	.
1	*Oenanthe aquatica*	.	.	.	.	.	.	.	.	.	.	+	.	.
1	*Sparganium erectum*	.	.	.	.	.	.	.	.	.	.	+	.	.
3	*Carex paniculata*	.	.	.	.	.	.	.	.	.	.	+	+	.
1	*Thelypteris palustris*	.	.	.	.	.	.	.	.	.	.	+	+	.
1	*Alnus glutinosa*	.	.	.	.	.	.	.	.	.	.	.	+	.

Table 6. (Continued).

Sfr		1	2	3	4	5	6	7	8	9	10	11	12	13
1	*Solanum dulcamara*	.	.	.	.	.	.	.	.	.	.	.	+	.
2	*Betula pubescens*/spec.	.	.	.	.	.	.	.	.	.	.	.	.	+
1	*Corylus avellana*	.	.	.	.	.	.	.	.	.	.	.	.	+
1	*Malus sylvestris*	.	.	.	.	.	.	.	.	.	.	.	.	+
2	*Moehringia trinervia*	.	.	.	.	.	.	.	.	.	.	.	.	+
C	*Prunus avium*	.	.	.	.	.	.	.	.	.	.	.	.	+
10	*Quercus* spec.	.	.	.	.	.	.	.	.	.	.	.	.	+
10	*Rubus fruticosus*/spec.	.	.	.	.	.	.	.	.	.	.	.	.	+
2	*Rubus idaeus*	.	.	.	.	.	.	.	.	.	.	.	.	+
4	*Sambucus nigra*	.	.	.	.	.	.	.	.	.	.	.	.	+
1	*Vaccinium myrtillus*	.	.	.	.	.	.	.	.	.	.	.	.	+

by man. At least, the anomalously large numbers of seeds of one or a few species in some samples seem to point in this direction. For example, *Polygonum hydropiper*, *Polygonum persicaria* and *Stellaria media* in sample 653, and *Carex disticha* and *Ranunculus flammula* in sample 1410. The large number of *Callitriche* seeds in sample 1776 suggests that this water-plant grew in the well, maybe after it had fallen into disuse.

The waterlogged seed record includes a much larger number of plant taxa than have been preserved in a carbonized condition. On the other hand, a number of wild taxa are represented by charred seeds only. In table 6, these taxa are indicated with a 'C' (of carbonized). *Lolium perenne* caryopses (seeds) are rarely reported from waterlogged deposits, but are fairly common in a charred condition. Evidence of *Setaria viridis* in ancient times is almost exclusively made up of charred seeds. In general, leguminosous taxa are poorly represented in waterlogged deposits, so that it is no surprise that of *Vicia* only charred seeds were found at Peelo. Although waterlogged seeds of *Plantago lanceolata* are mentioned in the literature, this species appears to be much better represented in the charred seed record, this in contrast with *Plantago major*.

As will be discussed in section 5, almost all plant taxa recorded can more or less easily be accomodated in and near medieval Peelo. However, a few of them, such as *Triglochin maritima* and *Scirpus maritimus*, raise questions. *Triglochin maritima* is a typical salt-marsh species, which is well represented in prehistoric and early-historical settlement sites in the coastal area of the north of the Netherlands (van Zeist, 1974). It is very unlikely that at the time, brackish conditions were found somewhere in the Peelo area. In spite of its name 'maritimus', *Scirpus maritimus* is not confined to areas exposed to marine influence, but it also occurs in fresh-water environments. Weeda et al. (1994: p. 249) mention that in the Netherlands this species is common in a 50-km-wide zone along the North Sea coast, but that it is sporadic in Pleistocene districts, such as the Peelo area. *Sherardia arvensis* occurs mainly in areas with clay and calcareous soils; it is (was) a weed typical of cornfields on loessic and calcareous soils in South Limburg. At present, it is not found in Drenthe (Weeda et al., 1988: pp. 104-105). However, Peelo is not an isolated case: *Sherardia* seeds have also been secured from Gasselte (van Zeist & Palfenier-Vegter, 1979). The surprisingly good representation of *Ranunculus sardous* gives occasion to some speculations (see section 5).

4. FOOD PLANTS AND FRUITS

Secale cereale (rye), *Hordeum vulgare* (hulled barley) and *Avena* (oats) were the cereals cultivated at medieval Peelo. The same cereal crop plant assortment was established for other medieval sites on the central plateau of Drenthe (Gasselte, Pesse, Odoorn). The species identity of the charred oat grains poses problems. In principle three species come into consideration, viz. wild oat (*Avena fatua*), common oat (*A. sativa*) and bristle oat (*A. strigosa*). The only reliable distinguishing feature between the charred remains of oat species is the flower base, but not a single oat flower base was retrieved from Peelo. Pesse and Gasselte yielded convincing evidence of common oat, while at Gasselte also bristle oat must have played an important part. *A. strigosa* is reported from various medieval sites (cf. van Zeist & Palfenier-Vegter, 1979). In spite of the fairly large numbers of oat flower bases at Pesse and Gasselte, not one specimen of *A. fatua* was found, suggesting that wild oat was absent or very scarce. Based upon the evidence from other medieval sites, it is assumed here that *A. fatua* did not or hardly occur at Peelo. The cultivated oat probably was of *A. sativa*, but it cannot be excluded that also *A. strigosa* was grown.

The total numbers of charred cereal grains (table 3) suggest that barley and rye were of about equal importance, whereas oats probably played a less prominent role. Compared with hulled barley, free-threshing rye may be under-represented in the charred seed record, implying that its proportion in the corn-crop was higher than is suggested by the numbers of grains recovered.

Of barley, winter (autumn-sown) as well as summer (spring-sown) varieties occur. It is usually assumed that rye was grown as a winter crop, but Bieleman (1987: p. 522) mentions that in 17th century Drenthe, summer rye must have been a major crop. Oats are summer crop. The finds of buckwheat (*Fagopyrum esculentum*) in the post-medieval well samples fit in with the fact that in the 16th and 17th centuries, this species became an important crop in western Europe (cf. Körber-Grohne, 1987: p. 346).

There are too many uncertain factors, such as acreage sown and crop yield per hectare, to estimate the cereal grain production at Peelo. Apart from the corn consumed on the farm where it was produced (feeding of people and animals), the rent of the farmsteads, which were hold on long lease, had to be paid in corn, especially rye. One may assume that in addition, some surplus was produced for being sold on the market.

Flax (*Linum usitatissimum*) was probably grown on a small scale. Flax fields may have been laid out in a nearby stream valley (see section 5), as was usual in 19th century Drenthe (Tiesing, 1974, vol 1: p. 210). Flax was cultivated for the fibres (home-spun linen) as well as for the seeds. The latter were appreciated particularly for their curative properties (Tiesing, 1974, vol 1: p. 212).

Typical garden crops found at Peelo are field pea (*Pisum sativum*), Celtic bean (*Vicia faba* var. *minor*) and celery (*Apium graveolens*). It is likely that more vegetables and kitchen herbs were cultivated, but species that were grown for the roots or leaves are usually poorly represented in the archaeobotanical record. Probable raised garden-beds bordered by ditches came to light at the Derkinge farmstead (Kooi, 1993/1994: fig. 6, squares AU-AV/8-9). *Brassica nigra* (black mustard) is listed here as a cultivated plant (table 5). It is true that in the Netherlands, this species occurs in the wild, but it is fairly rare outside the valleys of the large rivers (Weeda et al., 1987: p. 48). The sandy Peelo area does not offer suitable habitats for wild-growing *Brassica nigra*. Until recently black mustard was cultivated in many countries in and outside Europe; among other things, for the manufacture of mustard (Schultze-Motel, 1986: p. 317). For that reason it is assumed here that the species was cultivated at Peelo, probably in the vegetable garden.

Evidence of fruit cultivation and consumption is scarce. This may in part be due to the nature of the deposits examined. Cesspits, which are usually absent from rural settlements, offer better perspectives in this respect. Of the fruits identified from Peelo, *Prunus domestica* ssp. *insititia* (bullace) was certainly cultivated by the inhabitants. This plum species does not occur wild, and was introduced as a cultivated tree. Apple and cherry may have been cultivated on the farmsteads, but this is not wholly certain. The pericarp fragment of apple recovered from one of the well samples does not tell us whether it was of the domestic species (*Pyrus malus*) or of the wild one (*Malus sylvestris*). Only half a charred cherry stone was found, and of this specimen it could not be determined whether it was of sweet cherry (*Prunus avium*) or of sour cherry (*P. cerasus*). Sweet cherry is a natural constituent of the forest in the Netherlands, but it is also cultivated. Sour cherry occurs as a tree of cultivation only.

It is likely that elder (*Sambucus nigra*) was found in the settlement. This native shrub thrives well on disturbed soil rich in nitrates. Elderberry wine is made by fermenting the juice extracted from the ripe fruits. Blackberry (*Rubus fruticosus*) and raspberry (*Rubus idaeus*) may have been cultivated in the garden, but particularly blackberries could plentifully have been gathered from the wild; brambles must have been quite common in hedges and at forest edges. Conspicuously few remains of the sturdy hazelnut (*Corylus avellana*) shells were found.

5. THE ANCIENT VEGETATION

It has already been mentioned (section 2) that with respect to the charred remains of wild plants, no distinction between farmsteads and/or periods can be made. Although the waterlogged well samples yielded many more seeds and plant taxa than the charred seed record, it looks as though similarly no botanical differentiation between groups of samples is evident. Table 5 shows that a small number of taxa are represented in most of the samples, e.g. *Chenopodium album*, *Polygonum aviculare*, *Polygonum hydropiper*, *Polygonum lapathifolium*, *Rumex acetosella* and *Stellaria media*. On the other hand, many taxa occur in one or two samples only. Although differences between samples are clear, no consistent patterns emerge from the whole of the waterlogged plant record. As a consequence, in reconstructing the vegetation in and around medieval (and post-medieval) Peelo, the results of all samples, charred and waterlogged, are taken together. This does by no means imply that no changes in the local flora would have taken place in the course of 1000 years and more. However, the vegetation types inferred are thought to have been present here during the whole of the period under consideration.

It is assumed here that the majority of the wild plant taxa recorded were found on and near the farmsteads. As for the local conditions for plant growth, the following should be remarked. Medieval Peelo was situated on a place where the coversand is underlain by boulder clay and where consequently the groundwater table is fairly high. Moist soil conditions are thought to have prevailed in the village. The many ditches which came to light during excavation indicate that the inhabitants had taken measures to drain off surplus water. There must have been question of impeded drainage. Even today, after heavy rainfall, water may stay on the surface for quite some time.

The Hovinge farmstead bordered on a small bog, measuring about 70 m in diameter (fig. 1). At the time, this bog must have had open water and was probably used as a watering place for farm animals. On the terrain of the farmsteads no remains were found of ponds which could have served as watering places. Two stream valleys occurred in the vicinity, one to the south and southeast of the village and another to the north and northeast (cf. Kooi 1991/1992: fig. 2). The fields were located to the west of the farmsteads (Peeler Es), and a smaller complex to the north, on the Haverland. Heathland with some pools extended to the east of the village. To the west, at a somewhat greater distance from the habitation, a large raised bog area was found.

The reconstruction of the vegetation as presented in this paper starts from the current ecological and phytosociological behaviour of the plant species. The vegetation types which after this principle have been established for medieval Peelo are shown in table 6. A plus-sign (+) indicates that the species concerned occurs in one or more of the inferred vegetation types numbered 1 to 13. The reconstruction of the vegetation is primarily based upon Westhoff & den Held's (1969) work on plant communities in the Netherlands. Further, the division of the flora of the Netherlands in ecological groups (Runhaar et al., 1987) and the Ecologcal Flora of the Netherlands (Weeda et al., 1985-1994) were extensively consulted.

5.1. Weed vegetations

Cereals were grown outside the village proper and cornfield weed seeds must have arrived on the farmstead together with the harvested crop. Following Westhoff & den Held (1969), in table 6 a phytosociological distinction is made between weed vegetations under winter cereals (Secalietea) and those under summer cereals (Polygono-Chenopodietalia). On the other hand, in German phytosociological literature no such distinction is made, but all cereal weed vegetations are assigned to the Secalietea (cf. Ellenberg et al., 1991). Moreover, one wonders whether the alternate cultivation of winter and summer cereals in a three-course rotation system, as was probably applied at Peelo, may have resulted in a more uniform type of cornfield weed vegetation, the composition of which depended upon the local soil conditions (moisture, nutrient availability). In discussing the macroscopic plant remains from the medieval settlement of Kootwijk (central Netherlands), Pals (1987) questions to what extent arable weeds can be adduced as evidence of the cultivation of summer or winter cereals in ancient times. The question whether or not a strict differentiation between weed vegetations of summer and winter cereals can be made, must be left aside here. Most of the species listed under ecological group 1 may also have been found under summer cereals, whereas species like *Chenopodium album* and *Polygonum lapathifolium* probably occurred in fields of winter cereals, too.

Of the 'typical' cornfield weeds identified from Peelo (group 1), *Rumex acetosella* is best represented: the highest sample frequency and comparatively large numbers of seeds (table 5), suggesting that sheep's sorrel was a very common weed of arable. It is true that the species also occurs in other habitats, such as dry, poor grasslands, open spots in dry heathland and places where the vegetation has been burnt. However, archaeobotanical and palynological evidence clearly indicate that in medieval times, *Rumex acetosella* became a predominant cornfield weed on the sandy soils of the Netherlands and Northwest Germany (cf. Behre, 1981).

It is likely that one or more *Vicia* species formed part of the cornfield flora, but the species identity of the few charred vetch seeds recovered (table 3) could not be determined. The absence of the characteristic cornfield weeds *Agrostemma githago*, *Arnoseris minima* and *Centaurea cyanus* is difficult to explain, because at Pesse, where soil conditions must have been quite similar to those at Peelo, these species did occur.

The Polygono-Chenopodietalia species (group 2) are thought to have occurred predominantly as garden weeds. High sample frequencies and large numbers of seeds for some of the Polygono-Chenopodietalia species suggest that these weeds were found at no great a distance from the wells.

It is likely that in and around the settlement, waste places were found where ruderal vegetations could develop. Evidence of ruderal vegetations consisting of annual and biennal species is not particularly strong, because no species with a strong preference for the Sisymbrietalia are documented for Peelo. Nevertheless one may assume that this type of ruderal vegetation was present. Artemisietalia vegetations (group 4) are largely made up of perennial species and are found in places which are not disturbed regularly, e.g. unused corners on the farmstead. Attention is drawn to *Conium maculatum* (hemlock), a very poisonous plant which formerly must have been more common than at present.

5.2. Species of trodden places and ditches

The archaeobotanical record of settlement sites usually includes a number of tread-resistant species (ecological group 5). This is no surprise as more or less frequently trodden places must have been common in localities where man lived. The markedly good representation of *Plantago major*, *Poa annua* and *Polygonum aviculare* at Peelo suggests that vegetations of tread-resistant species were well developed around wells.

The category 'species of ditches' poses some problems. It was the archaeological evidence of ditches (see above) which induced us to speculate which species could have been found in this particular environment. Species like *Juncus bufonius*, *Juncus articulatus*, *Scirpus setaceus* and *Montia fontana* are specifically reported to occur in damp ditches. *Bidens tripartita*,

Polygonum hydropiper, *Polygonum minus* and *Rorippa palustris* are Bidention species. As according to Westhoff & den Held (1969: p. 78) Bidention vegetations may occur in periodically dry ditches, the species mentioned above are, with some reserve, listed here under group 6. However, it cannot be excluded that at the edge of the small bog near the Hovinge farmstead (fig. 1), a Bidention vegetation had developed in places where livestock came to drink.

Most problematic is *Ranunculus sardous* which, judging from the seed record, must have been quite common at Peelo. In the Netherlands, hairy buttercup is predominantly found in coastal areas. Thus, in the north of the country, the species is locally common in grasslands on more or less brackish soil. In the southern part of the province of Limburg, it occurs in cornfields on loessic soil (cf. Weeda et al., 1985: pp. 243, 246). Hairy buttercup is absent from Drenthe and other Pleistocene districts. Where to place this species in Peelo? As *Ranunculus sardous* is reported to be characteristic of soil which is liable to surface sealing (Weeda et al., 1985: p. 243), it is suggested here that the species may have grown in ditches. As alternative habitats, cornfields and grasslands may come into consideration. Peelo is not an isolated case. *Ranunculus sardous* is also reported for medieval Pesse (van Zeist et al., 1986) and Kootwijk (Pals, 1987). It looks as though in medieval times, the species had a wider distribution than at present.

5.3. Heaths and grasslands

Wet as well as dry heathland are represented (ecological groups 7 and 8). These vegetation types are rather poor in species, which explains why in the archaeological plant record they are attested by few taxa only. Missing at Peelo are *Danthonia decumbens* (heath grass) and *Molinia coerulea* (purple moorgrass), a species of wet heaths. The plant record does not allow any conclusion with respect to the extent of heathland in the Peelo area. One may expect that in the course of the Middle Ages, in particular dry heathland expanded considerably at the expense of oak woodland.

The great number of grassland species demonstrated for Peelo (groups 9 and 10) suggests that the grassland acreage was quite large. Grassland was found not only in the stream valleys, where it may have been exploited as hay meadow, but also on the higher-lying soils, where it was in use as grazing-land. The moist soil conditions (see the drainage ditches in the settlement!) must have been favourable for grassland vegetation. Small plots of pasture-land may have been present on the farmsteads. In addition to heathland, grassland must have played a prominent role in feeding livestock.

The distinction between groups 9 and 10 is based upon nutrient availability of the soil and not on moisture conditions. Most of the grassland species attested prefer (moderately) moist soil. Only few species characteristic of dry, poor grassland are represented: *Euphrasia* spec. and *Hypochaeris radicata*. Some species of swampy grassland, such as *Carex disticha* and *Eleocharis palustris* form, as it were, the transition to marsh vegetation.

5.4. Marsh vegetation

Marsh vegetation (group 11) probably was of limited extent; this group is represented by relatively few species. The bog near the Hovinge farmstead may have offered suitable conditions for marsh plants. If, indeed, the bog served as a watering place for livestock, eutrophication should have taken place. A species like *Eleocharis palustris* tolerates trampling (Weeda et al., 1994: p. 266).

5.5. Woodland species

The species listed under groups 12 and 13 do not give occasion to comments. Various fruit-bearing woodland species may have been grown on the farmsteads (section 4).

6. REFERENCES

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

BIELEMAN, J., 1987. *Boeren op het Drentse zand 1600-1910: Een nieuwe visie op de 'oude' landbouw*. HES Uitgevers, Utrecht.

ELLENBERG, H., H.E. WEBER, R. DÜLL, V. WIRTH, W. WERNER & D. PAULISSEN, 1991. *Zeigerwerte von Pflanzen in Mitteleuropa*. Scripta Geobotanica 18. Verlag Erich Goltze KG, Göttingen.

HILLMAN, G., 1984. Interpretation of archaeological plant remains: The application of ethnographic models from Turkey. In: W. van Zeist & W.A. Casparie (eds), *Plants and Ancient Man*. A.A. Balkema, Rotterdam etc., pp. 1-41.

KOOI, P.B., 1991/1992. Project Peelo: Het onderzoek in de jaren 1977, 1978 en 1979 op de es. *Palaeohistoria* 33/34, pp. 165-285.

KOOI, P.B., 1993/1994. Project Peelo: Het onderzoek in de jaren 1981, 1982, 1986, 1987 en 1988. *Palaeohistoria* 35/36.

KÖRBER-GROHNE, U., 1987. *Nutzpflanzen in Deutschland: Kulturgeschichte und Biologie*. Konrad Theiss Verlag, Stuttgart.

MEIJDEN, R. VAN DER, 1990. *Heukels' Flora van Nederland*. 21st edition. Wolters-Noordhoff, Groningen.

PALS, J.P., 1987. Reconstruction of landscape and plant husbandry. In: W. Groenman-van Waateringe & L.H. van Wijngaarden-Bakker (eds), *Farm Life in a Carolingian Village*. Van Gorcum, Assen/Maastricht, pp. 52-96.

RUNHAAR, J., C.L.G. GROEN, R. VAN DER MEIJDEN & R.A.M. STEVENS, 1987. Een nieuwe indeling in ecologische groepen binnen de Nederlandse flora. *Gorteria* 13, pp. 277-359.

SCHULTZE-MOTEL, J. (ed.), 1986. *Rudolf Mansfelds Verzeichnis landwirtschaftlicher und gärtnerischer Kulturpflanzen (ohne Zierpflanzen)*. 2nd ed., 4 vol. Akademie Verlag, Berlin.

TIESING, H., 1974. *Over landbouw en volksleven in Drenthe*. Verzameld en samengevat door C.H. Edelman. 2nd ed., 2 vol. Van Gorcum, Assen.

WEEDA, E.J., R. WESTRA, Ch. WESTRA & T. WESTRA, 1985-1994. *Nederlandse oecologische flora: wilde planten en hun relaties*. 5 volumes: vol. 1, 1985; vol. 2, 1987; vol. 3, 1988; vol. 4, 1991; vol. 5, 1994. IVN/VARA/VEWIN, Amsterdam.

WESTHOFF, V. & A.J. DEN HELD, 1969. *Plantengemeenschappen in Nederland*. Thieme & Cie, Zutphen.

ZEIST, W. VAN, 1974. Palaeobotanical studies of settlement sites in the coastal area of the Netherlands. *Palaeohistoria* 16, pp. 223-383.

ZEIST, W. VAN & R.M. PALFENIER-VEGTER, 1979. Agriculture in medieval Gasselte. *Palaeohistoria* 21, pp. 267-299.

ZEIST, W. VAN, G.J. DE ROLLER, R.M. PALFENIER-VEGTER, O.H. HARSEMA & H. DURING, 1986. Plant remains from medieval sites in Drenthe, the Netherlands. *Helinium* 26, pp. 226-274.

APPENDIX. English and Dutch names of plant taxa identified from medieval (and post-medieval) Peelo.

Achillea millefolium	Yarrow	Gewoon duizendblad
Agrostis spec.	Bent-grass	Struisgras
Alnus glutinosa	Alder	Zwarte els
Alopecurus geniculatus	Marsh foxtail	Geknikte vossestaart
Anagallis arvensis	Scarlet pimpernel	Gewoon guichelheil
Anthemis arvensis	Corn chamomile	Valse kamille
Aphanes arvensis	Parsley piert	Grote leeuweklauw
Apium graveolens	Celery	Selderij
Arctium (*pubens*)	Burdock	(Middelste) klit
Atriplex patula/prostrata	Common/ spear-leaved orache	Uitstaande melde/ Spiesmelde
Avena (*sativa*)	(Common) Oat	Haver
Betula pubescens	Downy birch	Zachte berk
Betula spec.	Birch	Berk
Bidens tripartita	Trifid bur-marigold	Veerdelig tandzaad
Brassica nigra	Black mustard	Zwarte mosterd
Bromus hordaceus/secalinus	Soft brome/chess	Zachte dravik/Dreps
Callitriche spec.	Water-starwort	Sterrekroos
Calluna vulgaris	Heather	Struikhei
Capsella bursa-pastoris	Shepherd's purse	Herderstasje
Carex cuprina	False fox-sedge	Valse voszegge
Carex disticha	Brown sedge	Tweerijige zegge
Carex hirta-type	Hairy sedge	Ruige zegge
Carex nigra-type	Common sedge	Zwarte zegge
Carex oederi	Yellow sedge (*Carex flava* agg.)	Dwergzegge/ Geelgroene zegge
Carex panicea	Carnation sedge	Blauwe zegge
Carex paniculata	Greater tussock-sedge	Pluimzegge
Carex pilulifera	Pill sedge	Pilzegge
Carex rostrata/vesicaria	Bottle sedge/ bladder sedge	Snavelzegge/ Blaaszegge
Carex spec.	Sedge	Zegge
Cerastium fontanum	Common mouse-ear	Gewone hoornbloem
Chenopodium album	Fat hen	Melganzevoet
Chenopodium polyspermum	Many-seeded goosefoot	Korrelganzevoet
Chrysanthemum segetum	Corn marigold	Gele ganzebloem
Cirsium arvense	Creeping thistle	Akkerdistel
Cirsium vulgare	Spear thistle	Speerdistel
Compositae indet.	Daisy family	Composietenfamilie
Conium maculatum	Hemlock	Gevlekte scheerling
Corylus avellana	Hazel	Hazelaar
Echinochloa crus-galli	Cockspur grass	Hanepoot
Eleocharis palustris	Common spike-rush	Gewone waterbies
Epilobium palustre	Marsh willowherb	Moerasbastaard-wederik
Erica tetralix	Cross-leaved heath	Dophei
Euphorbia helioscopia	Sun spurge	Kroontjeskruid
Euphrasia spec.	Eyebright	Ogentroost
Fagopyrum esculentum	Buckwheat	Boekweit
Festuca pratensis	Meadow fescue	Beemdlangbloem
Galeopsis tetrahit/speciosa	Common/large-flowered Hemp-nettle	Bleekgele hennepnetel/ Dauwnetel
Galium aparine	Common cleavers	Kleefkruid
Glyceria fluitans	Floating sweet-grass	Mannagras
Gramineae indet.	Grass family	Grassenfamilie
Hordeum vulgare	Hulled barley	Bedekte gerst
Hydrocotyle vulgaris	Marsh pennywort	Waternavel
Hypocharis radicata	Common catsear	Gewoon biggekruid
Juncus articulatus	Jointed rush	Zomprus
Juncus bufonius	Toad rush	Greppelrus
Juncus effusus-type	Soft rush	Pitrus
Juncus squarrosus	Heath rush	Trekrus
Juncus spec.	Rush	Rus
Knautia arvensis	Field scabious	Beemdkroon
Lamium album	White dead-nettle	Witte dovenetel
Lamium purpureum	Red dead-nettle	Paarse dovenetel
Leontodon autumnalis	Autumn hawkbit	Vertakte leeuwetand
Linum usitatissimum	Flax, linseed	Vlas
Lolium perenne	Perennial rye-grass	Engels raaigras
Lychnis flos-cuculi	Ragged robin	Echte koekoeksbloem
Lycopus europaeus	Gipsywort	Wolfspoot
Lythrum salicaria	Purple loosestrife	Grote kattestaart
Malus sylvestris/ Pyrus malus	(Crab) Apple	(Wilde) appel
Matricaria maritima	Scentless mayweed	Reukeloze kamille
Matricaria recutita	Scented mayweed	Echte kamille
Mentha aquatica/arvensis	Water/corn mint	Akker-/Watermunt
Moehringia trinervia	Three-veined sandwort	Drienerfmuur
Montia fontana	Blinks	Bronkruid
Myosotis arvensis/ palustris	Field/water forgetmenot	Akker-/Moeras-vergeet-mij-nietje
Myrica gale	Bog myrtle	Gagel
Oenanthe aquatica	Fine-leaved water-dropwort	Watertorkruid
Pedicularis palustris	Marsh lousewort	Moeraskartelblad
Pisum sativum	Field pea	Erwt
Plantago lanceolata	Ribwort plantain	Smalle Weegbree
Plantago major	Greater plantain	Grote weegbree
Poa annua	Annual meadow-grass	Straatgras
Poa pratensis/trivialis	Meadow grass/ rough meadow-grass	Veldbeemdgras/ Ruw beemdgras
Polygonum aviculare	Knotgrass	Varkensgras
Polygonum convolvulus	Black bindweed	Zwaluwtong
Polygonum hydropiper	Water-pepper	Waterpeper
Polygonum lapathifolium	Pale persicaria	Knopige/Viltige duizendknoop
Polygonum minus	Small water-pepper	Kleine duizendknoop
Polygonum persicaria	Redshank	Perzikkruid
Polygonum spec.	Knotweed	Duizendknoop
Potentilla anserina	Silverweed	Zilverschoon
Potentilla erecta	Common tormentil	Tormentil
Prunella vulgaris	Self-heal	Brunel
Prunus avium/cerasus	Sweet cherry/ sour cherry	Zoete kers/Zure kers
Prunus domestica ssp. *insititia*	Bullace	Kriekpruim
Quercus spec.	Oak	Eik
Ranunculus acris	Meadow buttercup	Scherpe boterbloem
Ranunculus flammula	Lesser spearwort	Egelboterbloem
Ranunculus repens	Creeping buttercup	Kruipende boterbloem
Ranunculus sardous	Hairy buttercup	Behaarde boterbloem
Ranunculus spec.	Buttercup	Boterbloem
Raphanus raphanistrum	Wild radish	Knopherik
Rhinanthus spec.	Yellow-rattle	Ratelaar
Rorippa palustris	Marsh yellowcress	Moeraskers
Rubus fruticosus	Blackberry	Gewone braam
Rubus idaeus	Raspberry	Framboos
Rubus spec.	Bramble	Braam
Rumex acetosella	Sheep's sorrel	Schapezuring
Rumex crispus	Curled dock	Krulzuring

Rumex obtusifolius	Broad-leaved dock	Ridderzuring
Rumex spec.	Dock	Zuring
Sagina (procumbens)	(Procumbent) Pearlwort	Liggend vetmuur
Sambucus nigra	Elder	Vlier
Scirpus maritimus	Sea club-rush	Heen
Scirpus setaceus	Bristle club-rush	Borstelbies
Scleranthus annuus	Annual knawel	Eenjarige hardbloem
Secale cereale	Rye	Rogge
Senecio aquaticus	Marsh ragwort	Waterkruiskruid
Setaria viridis	Green bristle-grass	Groene naaldaar
Sherardia arvensis	Field madder	Blauw walstro
Sinapis arvensis	Charlock	Herik
Solanum dulcamara	Bittersweet	Bitterzoet
Solanum nigrum	Black nightshade	Zwarte nachtschade
Sonchus asper	Prickly sow-thistle	Gekroesde melkdistel
Sparganium erectum	Branched bur-reed	Grote egelskop
Spergula arvensis	Corn spurrey	Gewone spurrie
Stachys arvensis/sylvatica	Field/hedge woundwort	Akker-/Bosandoorn
Stachys palustris	Marsh woundwort	Moerasandoorn
Stellaria graminea/palustris	Lesser/marsh stitchwort	Grasmuur/ Zeegroene muur
Stellaria media	Common chickweed	Vogelmuur
Taraxacum spec.	Dandelion	Paardebloem
Thelypteris palustris	Marsh fern	Moerasvaren
Thlaspi arvense	Field pennycress	Witte krodde
Triglochin maritima	Sea arrow-grass	Schorrezoutgras
Urtica dioica	Nettle	Grote brandnetel
Urtica urens	Annual nettle	Kleine brandnetel
Vaccinium myrtillus	Bilberry	Blauwe bosbes
Valeriana officinalis	Common valerian	Echte valeriaan
Vicia faba var. *minor*	Celtic bean	Duiveboon
[*Vicia sativa* ssp. *sativa*	Common vetch	Voederwikke]
Vicia spec.	Vetch	Wikke
Viola spec.	Violet	Viooltje