Sowing the seed ? : human impact and plant subsistence in Dutch wetlands during the Late Mesolithic and Early and Middle Neolithic (5500-3400 cal BC)

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9. Evidence of human impact and plant subsistence from macroremains: use plants and food plants from the natural vegetation

9.1 INTRODUCTION

This chapter aims to reconstruct human impact and plant subsistence by analysis of plant macroremains. It is investigated which taxa represent use plants and how these were used, with special attention to food plants. Furthermore, the variety of food plants is compared between the wetland regions studied. Finally, it is investigated whether the assemblage of use plants shows changes through time, and how the assemblage relates to the neolithisation process. This analysis is in the first place based on waterlogged and carbonised remains of seeds and fruits and roots (*e.g.* roots, tubers, rhizomes, *etc.*), since these are the remains most often preserved, retrieved and identified. The analysis furthermore only contains remains of plants other than crop plants and remains other than wood. The use of crop plants and wood is discussed in other chapters.

The data presented here provide a wealth of information due to the relatively good preservation at the wetland sites, both for the Late Mesolithic and the Early and Middle Neolithic. The aim is however not to discuss the presence of potential use plants, but to analyse the evidence of use. The criteria considered for the use of plants are: the presence of carbonised remains, the relative high frequency of taxa, the presence of plant remains in hearths, the presence of concentrations of single taxa, spatial distribution and the distribution in relation to quantity (*cf.* Bakels 2005; Dietsch 1996; Jacomet *et al.* 1989; Knörzer *et al.* 1999). In addition, the finds of botanical remains in coprolites and the results from use-wear analysis of artefacts are also considered as evidence of use. The analysis of the combined evidence results in indications that taxa functioned as use plants. Fragmentation of plant remains can also be indicative of human handling (Bakels 2005) but this is not discussed here since no such data are available from the studied sites. In this chapter, as far as frequency calculations are concerned, only the frequency of carbonised remains is calculated and not the frequency of waterlogged remains. The waterlogged remains are not included in the analysis since these are expected to represent partly the natural vegetation rather than a pure anthropogenic assemblage.

The sites included in this analysis are Hardinxveld-Giessendam Polderweg and De Bruin, Brandwijk-Kerkhof, the Hazendonk, Bergschenhoek, Randstadrail CS, Hoge Vaart, Swifterbant-S3, Schokland-P14, Schokkerhaven-E170, Emmeloord, Schipluiden, Ypenburg (preliminary data set based on Van Haaster 2001 and Koot and Van der Have 2001), Wateringen 4, Rijswijk-A4 and Doel Deurganckdok-sector B. These are all comparable Late Mesolithic and Early and Middle Neolithic Dutch wetland sites. The sites that have not been included in the analysis are Meerdonk, Zijdeweg, Rechthoeksdonk, Bergambacht, Benschop system, Alblasserdam-Nieuw Kinderdijk, Barendrecht 20.126, Barendrecht 20.125, Ypenburg (complete data set) and Sion. The reason is either that data from these sites only became available to the author after writing this chapter or that the context of the finds is unclear (see chapter 6 for more information on these sites). However, wherever the results from these sites are highly relevant, they have been incorporated in the discussion.

9.2 Analysis

9.2.1 Carbonised remains

The carbonised state of plant remains forms a first indication that people handled taxa in some way, and therefore the taxa found in a carbonised state are considered as potential use plants. Table 9.1 (at the end of this chapter) shows the large number of taxa of which macroremains, mainly seeds and fruits, have been found in a carbonised state at the studied sites. The taxa found in a carbonised state represent all possible ecological groups represented in the natural vegetation of the wetlands. The list of taxa includes taxa that are known as use plants from other Mesolithic and Neolithic sites in Europe but also many taxa that are not known as typical use plants. There is a large group of taxa which are found at several sites. As becomes clear from the discussion below, for many of these taxa, there are additional indications that they represent use plants. The taxa that are found in a carbonised state at many sites are *Corylus avellana*, *Galium aparine* and *Malus sylvestris* (found at 13, 11 and 8 sites respectively), of which *C. avellana* and *M. sylvestris* are known as food plants.

Many taxa are found in a carbonised state only at a few sites. There are, furthermore, few indications that these taxa represent use plants (see below). How can we then explain the carbonised state of these taxa? Carbonisation of taxa may occur *e.g.* during preparation of food (food plants), burning activities (fuel), burning of waste (plant waste resulting from domestic activities), burning of huts and houses (various use plants), intentional or accidental burning of the vegetation present at the site (natural vegetation), burning of small vegetative matter to light a fire (natural vegetation and drift litter used as fuel). The list of possible processes involving carbonisation of plant matter shows that carbonisation may have occurred intentionally with known and unknown use plants, but also with random plants, unknown as use plants and which simply happened to be present in the natural vegetation. This implies that people did not intentionally use all taxa found in a carbonised state. This is indeed the way in which various authors explain the carbonisation of wetland taxa in particular (Bakels and Van Beurden 2001; Bakels *et al.* 2001; see also Dark 2004; Robinson and Harild 2002, 93).

Few taxa in a carbonised state were found at sites investigated on a small scale or at sites where preservation conditions were limited. In contrast, the quantity and variety of taxa found in a carbonised state is especially large at Schipluiden, Hoge Vaart and the Hazendonk, a fact which can be related to the size of the excavated surface, the number of samples, the contexts of the samples, the site function and/or the occupation intensity (length of occupation, frequency of occupation, number of people per visit). It is a subject for further research whether the number of taxa found in a carbonised state can predict aspects of site function and occupation intensity in case of comparable preservation and a standardised sampling program.

9.2.2 Frequency analysis

For each site for which data were available, this study investigates which taxa found in a carbonised state were most frequently present, *i.e.* which taxa are present in a high number of samples. Differences in the frequency of carbonised remains between sites are not only the result of human activities, but are also influenced by taphonomy, excavation methods and sampling methods that were not equal for all studied sites. The site Swifterbant-S3, for example, was selected for excavation by the investigators because of the good preservation of waterlogged remains (Van Zeist and Palfenier-Vegter 1981), and other sites near Swifterbant that were possibly richer in carbonised remains were not excavated.

Table 9.2 shows the result of the frequency analysis. It includes only the sites that produced sufficient and representative data on carbonised macroremains. In case of a high number of relative frequently found taxa, only the most frequent taxa are included. For some sites, the frequency analysis is based on the primary or completely published data (frequency analysis). The results of this analysis are indicated in classes in the frequency analysis table. For some other sites, the analysis is based on a general discussion of data in publications or on the numbers of macroremains of all samples together, rather than on the precise numbers of macroremains in relation to the number of samples (approach of frequency analysis). The results of these sites are indicated with + or ++. The two resulting classes (frequency analysis and approach of frequency analysis) cannot simply be compared on the general level since they are not based on the same analysis. Nevertheless, in the absence of better data, the two classes are combined together.

The species found at most sites in a high frequency is *Corylus avellana*. The taxa that follow in importance are the cereals *Hordeum vulgare* var. *nudum* and *Triticum dicoccon*, discussed in chapter 11. A third group frequently found is a group of taxa not very frequent at many sites but still considerably frequent at two sites: *Prunus spinosa*, *Cornus sanguinea*, *Crataegus monogyna*, *Trapa natans* and *Stellaria neglecta*. The high frequency of all these taxa supports the idea of human handling. Most taxa are known as potential food sources, except for *Stellaria neglecta*. Table 9.2 shows some sixteen other taxa found in relatively high frequency but only at a single site (see table 9.3, group 1). These taxa are further discussed below if they appear to be relevant.

The frequency analysis table only shows taxa that are found frequently at the site-level. Taxa found in a carbonised state at many sites but only with moderate frequency may therefore be underrepresented. In order to investigate the importance of taxa found at many sites with moderate frequency, the results of the frequency analysis were considered again and this time all taxa found at sites with a frequency higher than 10% and not yet recognised earlier as a frequently found taxon were listed (see table 9.3, group 2). This percentage of 10% was selected because the frequency of a large group of taxa at most sites is below 10%. Most taxa found in a moderate frequency are found in such a frequency at one site only, which suggests that the importance of these taxa as use plants is restricted (see however the discussion below). Therefore, exploration of taxa that are moderately frequent apparently has restricted value for detection of use plants. Only *Galium aparine* is found at several sites in a frequency higher than 10% while it was often not one of the most common taxa of individual sites.

In total, a group of sixteen taxa are present with high frequencies at single sites, and another 13 taxa are found (at individual sites) in a frequency higher than 10% (both shown in table 9.3). How to explain these moderate frequencies in the overall data set? Most taxa represent potential food plants, indicators of disturbed and eutrophic conditions representing arable weeds and/or possibly food plants, or reeds/grasses/sedges/rushes that can be used for various domestic purposes but were generally well represented in the natural vegetation as well. There are a few exceptions that do not fit into these three categories: *Galium aparine* (discussed below), *Hedera helix* (discussed below), *Althaea officinalis* and *Ruppia maritima*. *A. officinalis* may, as the name suggests, have been used for medicinal purposes.[1] The scarce high or moderate frequency of the taxa shown in table 9.3 may indicate that the taxa were not used on a large scale. It is also possible that the taxa were important use plants but that they are for some reason not regularly found (specific methods of use, destruction during use, taphonomy, *etc*.).

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[1] *R. maritima* is discussed in note 24; its function remains unclear.

region	Central river				Western river	Coastal	
site	Polderweg	De Bruin	Brandwijk-Kerkhof	Hazendonk	Randstadrail CS	Schipluiden	Wateringen 4
number of samples taxon	65	77	16	17	31	60	74
Cerealia indet.	-	-	-	-	-	****	**
Hordeum vulgare var. nudum	-	-	-	***	-	***	**
Hordeum vulgare var. nudum, rachis internodia	-	-	-	-	-	***	-
Triticum dicoccon	-	-	**	****	-	****	**
Triticum dicoccon, glume bases	-	-	-	-	-	****	-
Triticum dicoccon, spikelet forks	-	-	-	***	-	****	-
Bromus secalinus-type	-	-	-	***	-	-	-
Chenopodium album	-	-	-	-	**	-	-
Cornus sanguinea	-	+	-	***	-	-	-
Corylus avellana	+	++	***	****	**	-	-
Crataegus monogyna	-	+	-	-	-	-	-
Fallopia convolvulus	-	-	-	***	-	-	-
Galium aparine	-	-	-	-	-	-	-
Hedera helix	-	-	-	-	-	-	-
Malus sylvestris, seeds	-	-	-	***	-	-	-
Mentha aquatica/arvensis	-	-	-	-	-	-	-
Moehringia trinervia	-	-	-	-	-	-	-
Nuphar lutea	-	-	-	-	-	-	-
Nymphaea alba	-	-	-	-	-	-	-
Persicaria lapathifolia	-	-	-	-	-	-	**
Poa sp.	-	-	-	-	-	***	-
Poaceae, stem fragments	-	-	-	-	-	***	-
Prunus spinosa	-	-	-	-	-	***	**
Quercus sp.	-	+	-	-	-	-	-
Rubus caesius	-	-	-	-	-	-	**
Schoenoplectus lacustris	-	-	-	-	-	-	-
Stellaria neglecta	-	-	-	-	**	-	-
Trapa natans	-	++	-	-	***	-	-

Table 9.2 part 1.

region	Eem	Vecht		Other
site	Hoge Vaart-A27	Urk-E4	Swifterbant-S3	Doel Deurganckdok-sector B
number of samples taxon	187	> 22	> 46	42
Cerealia indet.	-	-	-	-
Hordeum vulgare var. nudum	-	-	++	-
Hordeum vulgare var. nudum, rachis internodia	-	-	-	-
Triticum dicoccon	-	-	-	-
Triticum dicoccon, glume bases	-	-	-	-
Triticum dicoccon, spikelet forks	-	-	-	-
Bromus secalinus-type	-	-	-	-
Chenopodium album	-	-	-	-
Cornus sanguinea	-	-	-	-
Corylus avellana	+	++	++	****
Crataegus monogyna	-	-	+	-
Fallopia convolvulus	-	-	-	-
Galium aparine	+	-	-	-
Hedera helix	-	-	-	***
Malus sylvestris, seeds	-	-	-	-
Mentha aquatica/arvensis	+	-	-	-
Moehringia trinervia	+	-	-	-
Nuphar lutea	+	-	-	-
Nymphaea alba	+	-	-	-
Persicaria lapathifolia	-	-	-	-
Poa sp.	-	-	-	-
Poaceae, stem fragments	-	-	-	-
Prunus spinosa	-	-	-	-
Quercus sp.	-	-	-	-
Rubus caesius	-	-	-	-
Schoenoplectus lacustris	+	-	-	-
Stellaria neglecta	+	-	-	-
Trapa natans	-	-	-	-

Frequency classes based
on the analysis of original data:
** = 5-25%
*** = 26-50%
**** = 51-75%

Frequency analysis based on literature study:
+ = present in a moderate high frequency
++ = present at a relative high frequency (higher than other taxa from the same site found in moderate high frequency)
- = not found in a high frequency

Table 9.2 The sites studied, taxa found in a carbonised state that were most frequently present (frequency analysis). The Vlaardingen material from the Hazendonk is excluded. The number of samples of Urk-E4 and Swifterbant-S3 is underrepresented in this table as sieve residue samples of these sites are not included, part 2.

category taxon	1	2	3
Malus sylvestris	+	-	a
Nuphar lutea	+	-	a
Nymphaea alba	+	-	a
Quercus sp.	+	-	a
Rubus caesius	+	-	a
Bromus secalinus-type	+	-	b
Chenopodium album	+	-	b
Fallopia convolvulus	+	-	b
Mentha aquatica/ arvensis	+	-	b
Moehringia trinervia	+	-	b
Persicaria lapathifolia	+	-	b
Poa sp.	+	-	b
Poaceae, stem fragments	+	-	c
Schoenoplectus lacustris	+	-	c
Galium aparine	+	-	d
Hedera helix	+	-	d
Malus sylvestris, parenchyma	-	+	a
Atriplex patula/prostrata	-	+	b
Chenopodiaceae	-	+	b
Galium sp.	-	+	b
Malva sp.	-	+	b
Persicaria lapathifolia	-	+	b
Polygonum aviculare	-	+	b
Rumex sp.	-	+	b
Solanum nigrum	-	+	b
cf. Phragmites australis	-	+	c
Phragmites australis, stem fragments	-	+	c
Althaea officinalis	-	+	d
Ruppia maritima	-	+	d
Ruppia maritima	-	+	d

1 = taxa found in a high frequency at single sites only
2 = taxa found in frequencies higher than 10%
3 = interpretation of the function of the species:
a = potential food plants
b = indicators of disturbed and eutrophic conditions representing arable weeds and/or possibly food plants
c = reeds/grasses/sedges/rushes that can be used for various domestic purposes but are generally well represented in the natural vegetation, too
d = plants with another function (see text)

+ = taxon belongs to category 1 or 2
- = taxon does not belong to category 1 or 2

Table 9.3 The sites studied, interpretation of plants that were found in a high frequency at single sites (see also table 9.2) and taxa found in frequencies higher than 10%.

9.2.3 Concentrations

An anthropogenic concentration of (plant) macroremains can be defined as an unusual large quantity when considering the natural production, biotope and dispersal of macroremains in combination with the number of macroremains and macroremains distribution at a given site. It is a subjective concept not always defined in publications. The anthropogenic context of a concentration is supported if it concerns a pure, unmixed concentration without indications of collection by animals, if the concentration is present in a feature or anthropogenic context, in case of a concentration at a location where the taxon is not expected to grow and in case of storage in a container. Unfortunately, no concentrations from storage containers are known from the studied sites.

Good examples of concentrations of macroremains of a single taxon are very scarce at the relevant sites. At Schipluiden, a concentration of *Prunus spinosa* was found. A concentration of *Corylus avellana* was found at Schokkerhaven-E170 (Luijten 1987) and a concentration of *Hedera helix* at Doel (Bastiaens *et al.* 2005).

In certain cases, it is unclear whether a certain number of macroremains represents an anthropogenic concentration. This is true for instance for finds of *Cornus sanguinea* (Hazendonk), *Rubus fruticosus* (Ypenburg), *Brassica rapa* (Wateringen 4) and furthermore for the combined find of a large number of remains of *Quercus* sp., *Acer campestre and Alnus glutinosa* in a Vlaardingen pit at the Hazendonk. In these cases, there are indications of an anthropogenic context (a feature or refuse layer), but the number of macroremains is not high enough to ensure an anthropogenic concentration, especially since the volume of the sample is not always known.

Another interesting example is a possible concentration of moss found at Bergschenhoek. This is documented in a few words in a document on the identification of mosses (pers. comm. During 1980, see appendix V). The document indicates that a concentration of *Hylocomium brevirostre* syn. *Loeskeobryum brevirostre* was present, as well as possible concentrations of *Neckera* sp. and *Anomodon* sp. The information further suggests that there are indications that people used these mosses, but details are not given. *Hylocomium brevirostre* is not known from other Dutch Mesolithic or Neolithic sites (Mulder 2003). The possible functions of this moss, as known from archaeology and ethnography, include use as a handle (covering) of a flint artefact, as a fill for beds and cushions and as caulk material (Mulder 2003; Dickson 1970, 192 in Mulder 2003).

In this study, there are examples of finds that are not considered as concentrations despite comprising considerable numbers of macroremains in single samples, which concerns for example finds of Chenopodiaceae, *Alnus glutinosa*, *Urtica dioica*, *Lythrum salicaria*, *Typha angustifolia/latifolia*, *Schoenoplectus* sp., *Ranunculus sceleratus* and *Salvinia natans*. Macroremains of these taxa are regularly found in high densities since they are produced in considerable numbers, they remain well preserved and/or their identification is relatively easy. It is therefore likely that the taxa represent the vegetation of the site, rather than anthropogenic concentrations. For taxa such as these, however, it remains difficult to distinguish between natural and anthropogenic concentrations.

9.2.4 Features: hearths

Taxa found in archaeological features may be considered to be handled by people (*cf.* Dietsch 1996). This chapter only takes into consideration taxa found in a carbonised state in hearths, since for these features the relationship of the botanical material with human activity is strongest. Other features, the function of which is not always understood, are excluded from the study since the uncertain relationship between the feature and the plant remains does not ensure a sufficient indication that people handled the plant remains inside the feature. Table 9.4 shows the taxa of which macroremains have been found in hearths. The species that is most frequently found at sites in a carbonised state, *Corylus avellana*, is found in hearths at only four sites. Furthermore, only few of the remaining taxa, namely *Quercus* sp., *Galium aparine* and *Cladium mariscus*, are found in a carbonised state in hearths at more than two sites. *Cladium mariscus* may have ended up in hearths because it is very common

region	Central river		Coastal		Eem	Vecht	Other
site	De Bruin	Bergschenhoek	Ypenburg	Schipluiden	Hoge Vaart-A27	Urk-E4	Doel Deurganckdok -sector B
samples from hearths analysed	9	5	2	4	40	11	58
samples from hearths with identifiable carbonised remains	4	5	2	4	38	3	44
taxon							
Agrostis sp./Poa sp.	-	-	-	-	+	-	-
Ajuga reptans	-	-	-	-	+	-	-
Alisma sp.	-	-	-	-	+	-	-
Alnus glutinosa	-	-	-	-	+	-	-
Alnus glutinosa, male catkins	-	-	-	+	-	-	-
Althaea officinalis	-	-	-	+	-	-	-
Anagallis sp./Glaux sp.	-	-	-	-	+	-	-
Apiaceae	-	-	-	-	+	-	-
Apium graveolens	-	-	-	+	-	-	-
Arenaria serpyllifolia ssp. serpyllifolia	-	-	-	-	+	-	-
Asteraceae	-	-	-	-	+	-	-
Atriplex littoralis/prostrata	-	-	-	-	+	-	-
Atriplex patula/prostrata	-	-	-	+	+	-	-
Atriplex sp.	-	+	-	-	-	-	-
Bolboschoenus sp./ Schoenoplectus sp./Scirpus sp.	-	+	-	-	-	-	-
Calystegia sepium	-	+	-	-	-	-	-
Carex sp.	-	-	-	-	+	-	-
Carex acuta	-	-	-	-	+	-	-
Carex acutiformis/rostrata	-	-	-	-	+	-	-
Carex flacca/panicea	-	-	-	-	+	-	-
Carex paniculata	-	-	-	-	+	-	-
Carex pseudocyperus	-	-	-	-	+	-	-
Carex riparia	-	-	-	-	+	-	-
Caryophyllaceae	-	-	-	-	+	-	-
Cerastium sp.	-	-	-	-	+	-	-
Ceratophyllum demersum	-	-	-	+	-	-	-
Cerealia indet./Phragmites sp., stem fragments	-	-	+	-	-	-	-
Chelidonium majus	-	-	-	-	+	-	-

Table 9.4 part 1.

region	Central river		Coastal		Eem	Vecht	Other
site	De Bruin	Bergschenhoek	Ypenburg	Schipluiden	Hoge Vaart-A27	Urk-E4	Doel Deurganckdok -sector B
samples from hearths analysed	9	5	2	4	40	11	58
samples from hearths with identifiable carbonised remains	4	5	2	4	38	3	44
taxon							
Chenopodiaceae	-	-	-	+	+	-	-
Chenopodium sp.	-	-	-	-	+	-	-
Chenopodium album	-	-	+	-	-	-	-
Chenopodium glaucum/rubrum	-	-	-	-	+	-	-
Cladium mariscus	-	+	-	-	+	-	+
Cornus sanguinea	-	-	-	-	-	-	+
Corylus avellana	+	-	-	+	-	+	+
Crataegus monogyna	-	-	-	-	-	-	+
Erica tetralix	-	-	-	-	+	-	-
Eupatorium cannabinum	-	-	-	-	+	-	-
Fabaceae	-	-	-	-	+	-	-
Fallopia dumetorum	-	-	-	-	+	-	-
Galium aparine	+	-	-	+	+	-	+
Hedera helix	-	-	-	-	-	-	+
Hippuris vulgaris	-	-	-	-	+	-	-
Hordeum marinum	-	-	-	+	-	-	-
Iris pseudacorus	-	+	-	-	-	-	-
Lamiaceae	-	-	-	-	-	-	+
Lapsana communis	-	-	-	-	+	-	-
Lathyrus sp./Vicia sp.	-	-	-	-	-	-	+
Lychnis flos-cuculi	-	-	-	-	+	-	-
Lycopus europaeus	-	-	-	-	+	-	-
Lysimachia vulgaris	-	-	-	-	+	-	-
Lythrum salicaria	-	-	-	-	+	-	-
Malus sylvestris	-	-	-	+	-	-	+
Malva sp.	-	-	-	+	-	-	-
Malva neglecta	-	-	+	-	-	-	-
Medicago lupulina	-	-	-	+	-	-	-
Mentha sp.	-	-	-	-	+	-	-
Mentha aquatica/arvensis	-	-	-	-	+	-	-
Menyanthes trifoliata	-	-	-	-	+	-	-

Table 9.4 part 2.

region	Central river		Coastal		Eem	Vecht	Other
site	De Bruin	Bergschenhoek	Ypenburg	Schipluiden	Hoge Vaart-A27	Urk-E4	Doel Deurganckdok -sector B
samples from hearths analysed	9	5	2	4	40	11	58
samples from hearths with identifiable carbonised remains	4	5	2	4	38	3	44
taxon							
Moehringia trinervia	-	-	-	+	+	-	-
Myosotis sp.	-	-	-	-	+	-	-
Najas marina	-	-	-	-	+	-	-
Oenanthe aquatica	-	-	-	-	+	-	-
Persicaria maculosa	-	-	-	+	-	-	-
Persicaria minor	-	-	-	-	+	-	-
Phragmites australis	-	+	-	-	-	-	-
Phragmites australis, stem fragments	-	+	-	-	-	-	-
Poa sp.	-	-	-	+	-	-	-
Poaceae	-	-	-	-	+	-	-
Poaceae, stem fragments	-	-	-	+	-	-	-
Polygonaceae	-	-	-	-	+	-	-
Polygonum sp.	-	-	-	-	+	-	-
Potamogeton cf. natans	-	-	-	+	-	-	-
Potamogeton sp.	-	-	-	-	+	-	-
Potentilla reptans	-	-	-	-	-	-	-
Potentilla sp.	-	-	-	-	+	-	-
Prunus spinosa	-	-	-	+	-	-	+
Quercus sp.	+	-	-	-	+	-	+
Quercus sp., cupulae	-	-	-	-	-	+	-
Rhamnus cathartica	-	-	-	-	+	-	-
Rosaceae	-	-	-	-	-	-	+
Rubus idaeus	-	-	-	-	+	-	-
Rumex sp.	-	-	-	+	+	-	-
Rumex obtusifolius	-	-	-	-	+	-	-
Ruppia maritima	-	-	-	+	+	-	-
Schoenoplectus lacustris	+	-	-	-	+	-	-
Schoenoplectus tabernaemontani	-	-	-	+	-	-	-
Schoenoplectus sp. / Scirpus sp. s.l.	-	-	-	-	+	-	-

Table 9.4 part 3.

region	Central		Coastal		Eem	Vecht	Other
site	De Bruin	Bergschenhoek	Ypenburg	Schipluiden	Hoge Vaart-A27	Urk-E4	Doel Deurganckdok -sector B
samples from hearths analysed	9	5	2	4	40	11	58
samples from hearths with identifiable carbonised remains	4	5	2	4	38	3	44
taxon							
Scrophularia sp.	-	-	-	-	+	-	-
Silene dioica	-	-	-	-	+	-	-
Sisymbrium officinale	-	-	-	+	-	-	-
Solanum nigrum	-	-	-	+	-	-	-
Sparganium erectum	-	-	-	-	+	-	-
Sparganium sp.	-	-	-	-	-	-	+
Stellaria aquatica/media	-	-	-	+	-	-	-
Stellaria media	-	-	-	+	-	-	-
Stellaria neglecta	-	-	-	-	+	-	-
Stellaria palustris	-	-	-	-	+	-	-
Tilia platyphyllos	+	-	-	-	-	-	-
Trapa natans	+	-	-	-	-	-	-
Trifolium sp.	-	-	-	-	+	-	-
Typha sp.	-	-	-	-	+	-	-
Urtica dioica	-	-	-	+	+	-	-
Veronica sp.	-	-	-	-	+	-	-
Veronica officinalis	-	-	-	-	+	-	-
Vicia sp.	-	-	-	-	+	cf. +	-
Vicia hirsuta	-	-	-	+	-	-	-
Vicia sepium	-	-	-	-	+	-	-

Table 9.4 The sites studied, carbonised macroremains found in hearths, part 4.

in wetland marsh vegetation, but also because it may have been used for thatching and basketry, *etc.* on a large scale. The scarcity of finds in hearths of even shells of *C. avellana*, which are generally the most common find in hearths and which are generally overrepresented in the archaeobotanical record since the shells represent waste instead of plant food and since they are relatively robust, indicates that the chance that other carbonised macroremains can be retrieved from hearths is very small. The chance to retrieve these other macroremains may relate to the chance that they were present (deposited) in hearths, that they became carbonised and their chances of preservation (presumably being less robust than hazelnut shells). As the result of the small chance for many taxa of being recovered regularly from a hearth in a carbonised state, many use plants will not be recognised as such using this criterion of evidence.

The diversity of macroremains in hearths is maximal at Hoge Vaart and Schipluiden. At Hoge Vaart, many samples were collected from surface hearths. At Schipluiden, the number of hearths is however small, while in contrast, at Doel, the number of samples from hearths is high but the number of taxa moderate. This pattern demonstrates that the number of hearth samples alone does not explain the variation of taxa. Site function, the function and temperature of the fire and taphonomy probably play a role as well.

9.2.5 Spatial distribution

The analysis of the spatial distribution of plant remains is concerned with the question whether the spatial distribution of macroremains deviates from its expected natural distribution and from the distribution pattern of macroremains at the site. The spatial distribution of plant remains, including food plant remains, has not always been systematically investigated at Dutch wetland sites, although its' mentioning may have been omitted from publications.

The spatial distribution of macroremains of all taxa of the natural and synanthropic vegetation at most of the sites studied is influenced by at least two factors other than human impact. Firstly, spatial distribution at many sites is strongly influenced by the variation in preservation conditions in relation to the ground water level. Preservation was less optimal in the higher parts of the landscape, and more optimal in the lower waterlogged parts. An additional factor is the fact that the location of the border between wetland and dryland changed through time. The preservation of the higher parts of sites may furthermore have been threatened by later disturbance of the sediment (ploughing, construction activities). Spatial distribution of waterlogged macroremains therefore partly represents preservation conditions. The spatial distribution of carbonised remains is expected to be less influenced by the ground water level since carbonised remains remain preserved also under non-waterlogged conditions. However, the knowledge about preservation of carbonised remains is restricted (Braadbaart 2004, 15).

Secondly, spatial distribution is influenced by non-anthropogenic causes of seed and fruit dispersal. On the one hand gravity, slump and erosion lead to rolling of macroremains downwards along the slope, while on the other hand water activity (flooding) leads to transport of macroremains in upwards direction. Other processes of seed dispersal may play a role as well.

A third factor influencing spatial distribution of macroremains is human handling of plants. The scarcity of information on this subject available from the studied sites indicates that it is rather difficult to systematically recognise human handling as the major factor influencing spatial distribution of plant remains. Comparison with a representative number of comparable non-archaeological locations in the same regions, investigated especially for this purpose, may be useful in the future.

In the first place, it can be argued that the spatial distribution of macroremains indicates human handling of taxa if the distribution pattern of the macroremains largely corresponds with the distribution of a specific group of archaeological remains. There are several examples from the sites studied that support this argument. At Hoge Vaart, the distribution of carbonised remains of acorns (*Quercus* sp.) and hazelnuts (*Corylus avellana*) corresponded with the distribution of hearths, the remains of flint, burned bone, pottery and charcoal, supporting a relationship with human activities (Visser *et al.* 2001). At Schipluiden, handling of *Prunus spinosa* is supported by the spatial distribution corresponding with the observed pattern of households and with the spatial distribution of cereal remains (Kubiak-Martens 2006a). At Wateringen 4, certain shrub macroremains representing food plants and the fruits of *Suaeda maritima* are argued to have been dispersed by people and/or domestic animals since these taxa could not have been part of the local vegetation. Finds of *S. maritima* and the remains of shrubs in general are furthermore concentrated around the house (Raemaekers *et al.* 1997). The presence of fruits of *S. maritima* can be exlained by collection of clay near the coast (where *S. maritima* was present) to make pottery near the house (see also paragraph 3.7.4), implying that *S. maritima* was not necessarily used intentionally. These examples of taxa for which use is supported by their spatial distribution are convincing, although one must be careful of non-causal relationships with this kind of evidence (influence of taphonomy?). At Swifterbant-S3, for example, the distribution of concentrations of flint and pottery correlates with the frequency and quantity of certain taxa (Van Zeist and Palfenier-Vegter 1981). The interpretation of this pattern is however unclear; the authors suggest that differential preservation played a role. (At the time of the archaeobotanical research at Swifterbant-S3, the location of the houses was not known and the distribution of plant remains in relation to the houses could not be investigated, see chapter 4).

Secondly, it can be argued that the spatial distribution of plant remains alone, independently of the distribution of archaeological remains, can sometimes demonstrate human handling. A clear example of indications that people handled macroremains supported by the spatial distribution pattern is found at Polderweg. At this site, carbonised and waterlogged fruits of *Trapa natans* were mostly found on the higher slopes of the dune. It is unlikely that this spatial distribution would be expected on the basis of natural dispersion mechanisms since, in that case, one would expect remains of *Trapa natans* on the lower parts of the slope as well (Bakels and Van Beurden 2001, 344). Similarly, it has been argued that the carbonised finds of harpoon-shaped bristles of fruits of *T. natans* in samples from a refuse layer at the Mesolithic site of Randstadrail CS must indicate collection by people, since these bristles would scarcely remain preserved in a carbonised state after natural dispersal processes (Guiran and Brinkkemper 2007).

A specific example of interpretation of the spatial distribution comes from an explorative site investigation at the Eendragtspolder, and is based on the analysis of core samples. For this site, it has been argued that the presence of plant remains of a relatively high number of various different biotopes indicates human handling of plant matter (Van Haaster 2005). The underlying assumption is that such a large environmental variety of taxa cannot be the result of natural seed dispersal processes. However, the above discussion shows that natural processes at locations on sloped terrain or at water edges can also result in mixed assemblages. While promising for prospective research, this argument therefore requires further investigation by comparison with control studies.

9.2.6 Coprolites

There is only one published coprolite from the sites studied that is probably a human coprolite. It concerns a coprolite found at Schipluiden the shape of which suggests that it belongs to a large dog or a human. It differs from the other coprolites in containing pollen of *Hippophae (rhamnoides)*, *Solanum dulcamara* and *Sambucus* (*nigra*) (Bakels 2006). This coprolite may represent a human coprolite and the taxa mentioned above (all edible since berries of *Solanum dulcamara* are not poisonous when ripe; Bakels 2006) may thus represent human plant food. Macroremains have hardly ever been retrieved from coprolites at the sites studied.

9.2.7 Use-wear analysis

The analysis of the use-wear of flint and stone artefacts provides information on the importance of plant use. Indications of working of plants containing silica, the light working of wood, and the working of plants which probably consisted of the debarking of branches are reported for the Hazendonk, Brandwijk-Kerkhof, Polderweg, De Bruin, Schipluiden, Wateringen 4, Hoge Vaart and Swifterbant (*i.e.* all sites for which it has been investigated) (Bienenfeld 1986; Van Gijn, Beugnier and Lammers-Keijsers 2001; Van Gijn *et al.* 2006; Van Gijn, Lammers-Keijsers and Houkes 2001; Peeters, Schreurs and Verneau 2001; Raemaekers *et al.* 1997). The use-wear analysis shows that plant working was a substantial activity at the sites studied. The number of indications of plant working is especially high at the Mesolithic site of Polderweg, also in comparison with other Mesolithic sites such as De Bruin and Hoge Vaart (Van Gijn, Beugnier and Lammers-Keijsers 2001). At many of the sites studied, the use-wear analysis demonstrates the use of tools in a transverse direction, indicating not so much harvesting as the working of plant material ("maintenance activities"; Van Gijn, Lammers-Keijsers and Houkes 2001). In contrast to the Late Mesolithic sites, a relatively small number of transversely used silicious plant processing tools were found at the Middle Neolithic site of Schipluiden, indicating a shift in technology or subsistence through time. The "large number of silicious plant cutting tools [nevertheless] indicates that wild plants were still important" at this Middle Neolithic agricultural site (Van Gijn *et al.* 2006, 163).

At Polderweg, there are indications of the grinding of plant macroremains that were rich in oil (Van Gijn, Louwe Kooijmans and Zandstra 2001, 177). Generally, use-wear analysis does not result in identification of the precise plant species worked. In some cases, groups of plants can be indicated (*e.g.* wood, bark, grasses, reed). For the grinding of macroremains rich in oil at Polderweg, the investigators suggested we might be dealing with the grinding of seeds of *Linum usitatissimum* or *Brassica rapa*, but these taxa were not found at Polderweg. Therefore, it may be that stones of *Cornus sanguinea* or nuts (*Corylus avellana* and *Trapa natans*) were ground instead. At Schipluiden, phytolith analysis of stone artefacts suggests the grinding of wild grasses (Panicoideae; Van Gijn and Houkes 2006, 180), which may represent *Digitaria* sp., *Echinochloa* sp. and/or *Setaria* sp. Only *Echinochloa crus-galli* is known from the sites studied. It is unclear whether we are dealing with the intentional or unintentional grinding of wild grasses.

9.3 RESULTS AND DISCUSSION

9.3.1 DISCUSSION OF PROBABLE USE PLANTS OTHER THAN FOOD PLANTS

There are very strong indications that people used *Galium aparine*; the function of the species is however unclear. The indications of its use are its frequent presence in a carbonised state (at many sites as well as in a large number of samples) and its presence in a carbonised state in hearths at four sites. The data suggest continued use of *G. aparine* throughout the neolithisation process, since the species has been found in a carbonised state at sites without crop plants as well as at sites with crop plants. *G. aparine* must therefore have had another function than a weed initially, and may have developed into an arable weed at a later point in time. The leaves were perhaps eaten (as suggested by *e.g.* Carruthers 2000; Mears and Hillman 2007; Parker Pearson 2003), but this does not explain the presence of carbonised fruits. In the publication of the Dutch site Hoge Vaart, it is suggested that fruits of *Galium aparine* were used to prepare a drink comparable to modern-day coffee (Visser *et al.* 2001). Bieniek (2002) suggested a medicinal use, a cultural use (offering *etc.*) and a use related to the presence of coumarin ($C_9H_6O_2$) in these fruits for finds at Early Neolithic sites in Poland. Coumarin is often found in plants, it has a sweet scent and has been used in tobacco products and vanilla substitutes during the recent past, although it is mildly toxic. The use of *G. aparine* because of the coumarin fits with the hypothesis of the species' use for 'coffee'. Van Wijngaarden and Pals (1981) furthermore suggested that *G. aparine* is known for its good blood-staunching qualities and that an extract of the fruits may have been used to temper bleeding. Roots of several *Galium* species (*Galium verum* and *Galium mollugo*) are additionally known as a source of dye (Mertens 2000, 42). *G. aparine* may alternatively have been used in the same way as mosses, *e.g.* to fill beds and cushions. As an alternative to explanations involving the intentional use of *G. aparine*, it must be stressed that stems and fruits of *G. aparine* easily become attached to other objects due to the presence of small bristles on the fruits, and that these fruits may have been burned unintentionally as a result of being attached to something that was used intentionally. In certain cases, *G. aparine* may have ended up in the fire while attached to wood branches used as fuel. The strong indications of human handling however still support the idea that the taxon itself was used in some way. Comparison with other regions provides only limited evidence on the function of *G. aparine*. The species is not generally present at Northwestern European Mesolithic sites or at Neolithic sites other than LBK sites, although indications of use are available from some other sites. At the Late Mesolithic Ertebølle site of Halsskov, Denmark, some fruits were found together in a hearth in a carbonised state (Robinson and Harild 2002). At the site of Stoasnaig, Scotland, carbonised fruits of this species were most commonly found together with hazelnut shells, which suggests deliberate gathering (Carruthers 2000). Other finds of *G. aparine* are known from Funnel Beaker sites in northern Germany and southern Scandinavia (Kroll 2001; Price *et al.* 1995) and from the Mesolithic site Roc del Migdia in Spain (Holden *et al.* 1995).

Other taxa qualifying as use plants are *Hedera helix* (concentration of carbonised remains found at Doel), *Cladium mariscus* (found in a carbonised state in hearths at three sites, as well as in a grave at Urk-E4) and *Stellaria neglecta* (found relatively frequently in a carbonised state at Hoge Vaart). Analysis of the data with special attention to herb taxa results in some indications of use of *Chenopodium album* and *Moehringia trinervia*, although this result may be related to the relative good preservation of macroremains of these taxa.[2] Indications of human handling of these five taxa are somewhat restricted. The possible function of the first two taxa is discussed in this paragraph below, while the possible function of *Stellaria neglecta*, *Chenopodium album* and *Moehringia trinervia* is discussed in paragraph 9.3.2.3. As for the berries of *Hedera helix* found at Doel, it is suggested that they were ripped off twigs that were used as animal fodder (Bastiaens *et al.* 2005). There is evidence of such leaf and twig foddering for example from a Swiss Neolithic site (Rasmussen 1989). The pollen diagrams of the Dutch wetlands sites sometimes show an increase in *Hedera helix* during occupation (*e.g.* the Hazendonk and Brandwijk-Kerkhof), but this cannot be directly linked to intentional collection or production of animal fodder. Many other taxa may have been used as animal fodder as well but the macroremains of the Dutch wetland sites do not support this either. *Cladium mariscus* is a taxon that can be used for plaiting, thatching, *etc.* (*cf.* Regnell *et al.* 1995; see the discussion below).

The number of taxa indicated as plants used for other purposes than consumption at the studied Dutch wetland sites is limited. A comparison of evidence of such use of plants between the Mesolithic and Neolithic is therefore not considered. In the introduction (paragraph 1.3), some factors are discussed that may lead to underrepresentation of the evidence of the use of plants. The limited evidence of the use of specific taxa nevertheless remains remarkable when considering that plants were of major importance in life during the Mesolithic and the Neolithic, as indicated by use-wear analysis and as suggested by anthropological analogues.

A first group of taxa that must be underrepresented consists of taxa used as raw material for *e.g.* containers, thatching, rope and clothing. The analysis of taxa found in a carbonised state suggests the possible use of many taxa for plaiting. The frequency analysis classifies some taxa as taxa that were found in a high frequency at single sites (*Scirpus lacustris* ssp. *lacustris* and stem fragments of Poaceae), suggesting use as well. Interestingly, detailed analysis of the data of the sites studied has resulted in further indications of the use of taxa for plaiting and similar functions. These indications are provided in particular by the analysis of the number of sites where taxa were found in a carbonised state in features. This analysis includes many features

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[2] The evidence of the use of herbs is expected to be underrepresented since consumption of the green parts of herbs does not necessarily result in the presence of macroremains (carbonised or not) in the macroremains assemblages. Indications of the use of taxa have therefore been investigated with special focus on herb taxa, resulting in indications of the use of *C. album* and *M. trinervia*. Indications of the use of *C. album* are as follows: it was found in a carbonised state at five different sites (*i.e.* at relatively many sites), it was found in a moderately high frequency at a single site (Randstadrail CS) and it was found in a frequency higher than 10%. Indications of use of *Moehringia trinervia* are that it was found in a moderately high frequency at a single site (Hoge Vaart), that it was found in a frequency higher than 10%, and that it was found in a carbonised state in hearths at two sites.

other than refuse layers: pits, postholes, hearths, graves, wells, water wells, watering places and concentrations of archaeological remains. The analysis indicates that *Galium aparine*, *Cladium mariscus*, *Schoenoplectus lacustris*, *Bolboschoenus* sp./*Schoenoplectus* sp./*Scirpus* sp., *Schoenoplectus* sp./*Scirpus* sp. s.l., *Schoenoplectus tabernaemontani*, *Urtica dioica*, *Carex* sp., Poaceae and stem fragments of *Phragmites australis* were found at three to six sites in a carbonised state, while other taxa were not found at more than two sites. All these taxa can be used for plaiting or as rope (*Galium aparine* being an exception). Although the precise relation between the features and human activities remains unclear, finds from postholes, pits and concentrations may represent burned material, possibly waste, while finds from features with a waterlogged content may represent pits where plants were deposited for retting (Hurcombe 2000). Other plants that may also have been used for plaiting, fibres, *etc.* include *Juncus* sp. (including *Juncus effusus*, *Juncus acutus*, and *Juncus maritimus*), *Typha* sp., Cyperaceae and *Clematis vitalba*. The bark of *Quercus* sp., *Tilia* sp., *Ulmus* sp., *Salix* sp., *Acer campestre* and *Populus tremula* is also particularly suitable for this function (Hurcombe 2000; Jacomet *et al.* 1989; Körber-Grohne 1991, 98). *Linum usitatissimum* and *Cannabis sativa* are also commonly used for comparable goals in prehistory, but there have been no finds of these taxa at the sites studied.

A second group of taxa that is probably underrepresented are medicinal plants. Many taxa are known for their medicinal function, for instance *Conium maculatum* and *Hyoscyamus niger*. The analysis of use plants does not, however, distinguish any plants that we consider to be primarily medicinal plants, except for *Althaea officinalis*. Some of the plants that are classified below as food plants may in fact have been medicinal plants since some of these plants will have been ingested.

A third group that is strongly underrepresented in the data set are fungi. Fungi were presumably used for lighting fires and as food, while toxic fungi may have been used for medicinal/ritual/stimulant purposes. A fungus species that is relatively regularly found at comparable prehistoric European sites is *Fomes fomentarius*. This species was used for lighting fires (Clark 1954; Grøn and Skaarup 1991; Peitner and Pöder 2000). Finds of fungi are known from the studied sites but there is no evidence at all for the use or consumption of fungi. Most of the taxa found at the sites studied are moreover not edible (Bakels *et al.* 2001), since the ones that remained preserved are rather woody and nasty tasting. Fungi are best documented in the central river area (see table 2.7), but these are not carbonised. A single carbonised find of *Ganoderma cf. lucidum* is known from Hoge Vaart, but this species has no known function and is therefore assumed to have been carbonised together with wood used for fuel (Visser *et al.* 2001).

9.3.2.1 Discussion of probable food plants – introduction

Proving that gathered plants functioned as food plants in Northwestern Europe during the Mesolithic and Neolithic remains problematic since explicit evidence to show that non-cultivated taxa really functioned as food plants is scarce. The find of a potential food plant does not prove the species was consumed, although this problem is often ignored in publications relating to Northwestern European Mesolithic and Neolithic sites. The best evidence of a plant's status as a food plant is provided when plant remains are found in the intestines of people, in cooking or storage pots, or in human coprolites. Such examples are rarely available from the Late Mesolithic and Early and Middle Neolithic Dutch wetlands. There are, however, three notable exceptions: a single pollen study of coprolites (Bakels 2006; taxa presented above), indications of the cooking of vegetative fats (oil) of unidentified species, as indicated by the analysis of food crusts at Schipluiden and Ypenburg (Kubiak-Martens 2006b, 351, 2008), and indications of the cooking of vegetables together with cereals, as indicated by the analysis of food crusts at Ypenburg (Kubiak-Martens 2008).

In the absence of optimal evidence of consumption from intestines and pottery, this study uses several other criteria in order to detect consumption. Consumption is considered to be most likely when there are considerable indications of human handling, when the macroremains/roots are edible, when they can be stored and/or when they have a high energetic value. The possibility to store plant food is highly relevant since storage increases the variation of the diet during winter and early spring when plant food is naturally scarce.[3] The strength of the evidence of use and consumption depends on the number of positive indications. Comparable evidence from other Mesolithic and Neolithic sites in temperate and Northwestern Europe is used to support the available evidence. Below a discussion is given on the evidence of consumption of seeds and fruits from three categories: trees and shrubs, herbs and grasses, and roots. A summary of the results of the Dutch wetland sites has been presented in Out (2008e).

9.3.2.2 Potential plant food from trees and shrubs

Tables 9.5 and 9.6 present a selection of the taxa of potential edible seeds and fruits from trees and shrubs found in carbonised and waterlogged states at each of the sites studied (the tables include the data from the Late Neolithic phases at the Hazendonk). Taxa that are included in these tables are selected for their expected edible seeds/fruits/nuts/berries. Macroremains of the water plant *Trapa natans* are included in the table as well since the function of the fruits of this species as food may have been comparable to that of seeds and fruits from trees and shrubs. Fruits of Rosaceae are included in tables 9.5 and 9.6 for completeness' sake but are not discussed further since they may represent a variety of edible taxa. The paragraphs below discuss the indications of consumption for each taxon included in the table, and for some others in addition.

Quercus sp.

Acorns are found at wetland sites where finds of pollen, wood and charcoal of *Quercus* sp. are very abundant (central river area), but they are generally found only in a low frequency (*cf.* Pals 1984, 319). Carbonised finds are found at several sites, but in considerable quantities only at De Bruin and Hoge Vaart. At these sites, as well as at Doel, acorns were also found in hearths. At Hoge Vaart, the distribution of *Quercus* sp. within the site correlates with archaeological refuse. The relatively little evidence of use indicates that acorns may have been consumed occasionally but they probably did not function as a staple food at the sites studied, and especially not at Early and Middle Neolithic sites. The apparent marginal role of acorns is unexpected since they are edible after roasting, they can be stored, they have considerable nutritional value (Jørgensen 1977), which makes them a potential staple food, and they were commonly consumed from at least the Late Bronze Age onwards in the Netherlands and other parts of Europe (see below). It is unclear how to interpret finds of cupules or finds of juvenile acorns; indications of the use of these are restricted (*e.g.* carbonised cupules in a hearth at Urk-E4). Cupules may represent waste from food processing, remains of fuel or waste from construction wood.

One possibility is that acorns did function as food plants but that their use did not result in the production of waste that remained preserved through time. Firstly, acorns were possibly not always roasted for preparation at the studied wetland sites, since they might alternatively have been prepared for consumption by leaching (De Hingh 2000, 200; Madsen 1982, 223).[4] Another option is that acorns functioned in the first place as animal fodder. Animals, and especially pigs, would have eaten acorns in large quantities. Acorns must have been important for the animal diet especially at marsh sites where the availability of food sources for domestic animals during the winter and spring was restricted.

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[3] Clarke (1976) suggested that nuts and roots can be stored for up to six months, although this would depend on the precise species and storage conditions. The preparation of seeds, fruits and roots prior to storage, for example by roasting, drying and fermentation, may prevent affection of plant material by fungi, resulting in better storage possibilities.

[4] The author is aware of the extensive evidence of carbonised acorns that supports roasting of acorns in Northwestern Europe during the Late Bronze Age and Iron Age (see *e.g.* references in De Hingh 2000).

region	Central river				Westeren river		Coastal				Eem	Vecht				Other
taxon / site	Polderweg	De Bruin	Brandwijk-Kerkhof	Hazendonk	Randstadrail CS	Bergschenhoek	Ypenburg	Schipluiden	Wateringen 4	Rijswijk-A4	Hoge Vaart-A27	Urk-E4	Schokland-P14	Swifterbant-S3	Schokkerhaven-E170	Doel Deurganckdok -sector B
Cornus sanguinea	-	+	+	+	+	-	-	+	-	-	-	-	-	-	-	+
Corylus avellana, nut shells	+	+	+	+	+	-	-	+	+	+	+	+	+	+	+	+
Crataegus monogyna	-	+	-	+	-	-	-	+	-	-	-	+	-	+	-	+
Malus sylvestris	-	+	-	+	-	-	-	+	+	-	+	+	-	+	-	+
Malus sylvestris, parenchyma	+	-	-	+	-	+	-	+	-	-	+	-	-	+	-	-
Prunus spinosa	-	-	-	+	-	-	+	+	+	-	-	-	-	-	-	+
Quercus sp.	-	+	-	+	+	-	-	-	-	-	+	-	-	-	-	+
Quercus sp., cupulae	-	-	+	-	-	-	-	-	-	-	-	+	+	-	-	-
Rosa sp.	-	-	-	-	-	-	-	+	+	-	-	-	-	-	-	-
Rosaceae	-	+	-	+	-	-	-	-	-	-	+	-	-	-	-	+
Rubus fruticosus	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-
Rubus idaeus	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-
Rubus sp.	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-
Trapa natans	+	+	+	+	+	-	-	-	-	-	-	-	+	-	-	-
Viburnum opulus	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	+

+ = present - = not present

Table 9.5 The sites studied, carbonised macroremains of food plants, mainly from trees and shrubs.

region	Central river				Westeren river		Coastal				Eem	Vecht					Other
site taxon	Polderweg	De Bruin	Brandwijk-Kerkhof	Hazendonk	Randstadrail CS	Bergschenhoek	Ypenburg	Schipluiden	Wateringen 4	Rijswijk-A4	Hoge Vaart-A27	Urk-E4	Schokland-P14	Swifterbant-S3	Schokkerhaven-E170		Doel Deurganckdok -sector B
Cornus sanguinea	+	-	+	+	+	-	-	+	+	+	-	-	-	-	-	-	+
Corylus avellana, nut shells	-	-	+	+	+	+	+	+	-	-	-	+	+	-	+	?	-
Crataegus monogyna	+	-	+	+	-	-	-	+	-	-	-	-	-	-	-	-	-
Malus sylvestris	cf. +	-	+	+	cf. +	+	+	+	+	+	+	-	-	+	-	-	-
Malus sylvestris, parenchyma	-	-	+	+	-	-	-	-	-	+	-	-	-	-	-	-	-
Prunus padus	-	+	-	+	-	-	+	-	-	-	-	-	-	-	-	-	-
Prunus spinosa	+	-	+	+	-	+	+	+	+	+	-	-	-	-	-	-	-
Pyrus communis ssp. pyraster	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-
Quercus sp.	+	-	+	+	-	-	-	-	-	-	-	-	+	-	-	-	-
Quercus sp., cupulae	-	-	+	+	-	-	-	-	-	-	-	+	-	-	-	-	-
Rosa sp.	+	-	-	-	-	-	-	+	-	+	-	-	-	+	-	-	-
Rubus caesius	+	+	-	+	+	-	-	+	+	+	-	-	-	-	-	-	-
Rubus fruticosus	-	-	+	+	-	-	+	+	-	+	-	+	+	+	-	-	-
Rubus idaeus	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-
Rubus sp.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-
Sambucus nigra	+	-	-	+	-	-	+	+	+	+	-	-	-	-	-	-	-
Trapa natans	-	-	+	+	+	-	-	-	-	-	-	-	+	-	-	-	-
Viburnum opulus	+	+	+	+	-	-	-	-	-	-	-	-	-	-	-	-	-

+ = present

- = not present

? = preservation state unknown

Table 9.6 The sites studied, waterlogged macroremains of food plants, mainly from trees and shrubs.

There is only limited evidence of the use and especially the consumption of acorns from other Mesolithic and Early and Middle Neolithic sites in temperate Europe. A marginal role for acorns has also been deduced for Mesolithic southern Scandinavia (Larsson 1990). On the other hand, Robinson (2007, 363) reported the common presence of acorns in Denmark during the Mesolithic and Neolithic. At the Danish Mesolithic site Møllegabet II the absence of the edible remains of acorns and the presence of empty cups and small unripe fruits is furthermore interpreted as being indicative of the conscious handling of food items, similar to hazelnuts of which only shells and bad nuts were found (Grøn and Skaarup 1991, 45).

The indications of consumption of acorns at the Dutch wetland sites are mainly derived from sites where crop plants were absent, and appear to decrease in the Early Neolithic when crop plants were introduced but not yet fully incorporated into the Dutch wetlands subsistence. There is a remarkably larger body of evidence of the consumption of acorns from Late Neolithic and particularly Bronze Age and Iron Age sites in Northwestern Europe. For example, a concentration of 70 carbonised halves of acorns was found at the Dutch Late Neolithic coastal site Aartswoud (Single Grave Culture; Pals 1984). The absence of cupules strongly supports that this concentration was gathered for consumption (*cf.* De Hingh 2000; Pals 1984). A Funnel beaker found at Skævinge Mose, Denmark, contained an animal bone, chaff remains and mast-husks (remains of acorns) (Koch 1998, 151), and this was interpreted to be the remains of food prepared in the vessel. In the Rhineland, acorns are mentioned as gathered nuts from the Bronze Age onwards (Knörzer *et al.* 1999). The increased importance of acorns may be related to the incorporation of agriculture and possibly the methods for preparing cereals. It has been suggested that the storage of acorns functioned as a risk buffering mechanism in the Bronze Age and Iron Age farming communities (De Hingh 2000, 202). This may have been particularly important from the time when the production of flour and bread was well incorporated in the society. In times of scarcity, cereals might have been replaced by acorns ground into flour. One hypothesis, to be confirmed by further research, is that the consumption of acorns may have increased in the Dutch wetlands following the complete incorporation of agriculture, *i.e.* only from the Late Neolithic onwards.

Corylus avellana

The macroremains that are found at most sites are hazelnut shells. These are frequently found because they are robust, large, and easily recognisable in the field, but also because they represent the waste of a seed rather than the edible part (Jones and Rowley-Conwy 2007). At Dutch wetland sites, hazelnuts are found in both carbonised and waterlogged states. Indications to support human handling are the fact that they are found in a carbonised state, at many sites, in a high frequency, in small concentrations, and in hearths at four sites. For at least one site (Hoge Vaart), it has been demonstrated that their distribution within the site corresponds with the distribution of archaeological finds. This may have been the case at more sites although this has not been documented. Nuts of *Corylus avellana* can be stored when dried or roasted. The energetic value is furthermore probably the highest of all potential food plants that are not cultivated (Jacomet *et al.* 1989). It is altogether very likely that hazelnuts indeed functioned as a staple food.

Cornus sanguinea

Stones of *Cornus sanguinea* are found at many sites in the central river area and the coastal region, but appear to be absent in the north (see also Out 2008b). The stones are found in carbonised and waterlogged states, and in a carbonised state in a hearth at a single site (Doel). The fruits may have been consumed, but the function and importance of the fruits at the studied sites is not entirely clear. The fruits may have been stored after drying.

There are finds from several Mesolithic sites in Denmark and Neolithic sites in Europe. A find that supports collection by people is the find from the floor of a hut at Ulkestrup, Denmark (Andersen *et al.* 1982 cited in Grøn and Skaarup 1991). The Neolithic site of Bercy, France also provides indications of gathering (Dietsch 1996). The edibility is subject to debate (Bastiaens *et al.* 2005; Dietsch 1996); the edibility and palatability probably increase after preparation (*e.g.* Wiltshire 1995). Several authors suggest that the fruits were collected for consumption but convincing food contexts are not known (Bakels, Van Beurden and Vernimmen 2001; Grøn and Skaarup 1991; Kubiak-Martens 2006a; Regnell *et al.* 1995; Robinson and Harild 2002). Other suggested functions of the stones are oil and soap based on oil (the edibility of the oil is a subject of debate; Karg and Märkle 2002, 172; Mason 2004, 129; Regnell *et al.* 1995), while the plant is also mentioned as a dye plant (Hegi 1965; Karg and Märkle 2002).

Viburnum opulus

Macroremains of *Viburnum opulus* have been found in a waterlogged state at five sites, mainly in the central river area. Carbonised macroremains have been found at the Hazendonk and Doel only (see appendix III; Bastiaens *et al.* 2007). Macroremains of *V. opulus* were neither found as concentrations, nor in hearths at the sites studied, while there is no information available on spatial distribution. There is therefore little evidence from the sites studied for human handling and use as a food plant. The edibility of *V. opulus* is unclear, although most sources suggest edibility (Bos *et al.* 2005; Kroll and Willerding 2004, 148-149; Kubiak-Martens 1999; Robinson 2007 *contra* Bakels *et al.* 2001). Evidence of consumption is however very scarce. Few indications are known of the use of *V. opulus* from parts of Europe other than Northwestern Europe (Kroll 2001; Kroll and Willerding 2004, 148-149 and references there). In conclusion, despite the edibility, it is unlikely that the fruits of *V. opulus* were collected for consumption at the sites studied.

Crataegus monogyna

Crataegus monogyna is found in various regions, but not at many sites, and usually in low numbers. Everywhere, except in the central river area, the seeds are mostly found in a carbonised state. The seeds were found in a hearth at a single site (Doel), but concentrations are not known. The fruits are edible, and the taste improves with cooking and after the first frost (Price *et al.* 2001). Roasted seeds may have functioned to prepare a drink comparable to modern-day coffee. The fruits might have been stored by drying and may represent a moderate source of energy in dried form (15% of the fruit consists of carbohydrates, see Renfrew 1973, 195). The evidence from the studied sites suggests that the fruits may have been consumed, but the species certainly did not form a staple food.

Seeds of *Crataegus monogyna* are found at many other European prehistoric sites, and archaeobotanical sources from Northwestern Europe suggest consumption (Bakels *et al.* 2001; Bastiaens *et al.* 2005; Dietsch 1996; Kubiak-Martens 1999; Price *et al.* 2001 and references cited there; Van Zeist and Palfenier-Vegter 1981). At Danish sites, considerable numbers of these seeds have been reported (Møllegabet II, Grøn and Skaarup 1991; Ringkloster, Robinson and Harild 2002). These indications tend to support that the fruits functioned as use plants and/or food plants.

Malus sylvestris

Fruit fragments and seeds of *Malus sylvestris* were found at many sites and in all the regions studied, both in carbonised and waterlogged states. The remains are usually not found in a high frequency. The taxon was found in hearths at two sites, and not in concentrations. There is no detailed information available on the spatial distribution of apples at the sites. The fruit can be stored, and there is indeed evidence of drying of crab apples from the sites studied, indicating storage (the Hazendonk, Bakels and Zeiler 2005; Schipluiden, Kubiak-Martens 2006a). The energetic value of dried apples is considerable (62% of the fruit consists of carbohydrates, Renfrew 1973, 195), although crab apples probably contained fewer carbohydrates than modern apples. It is very probable that the crab apple functioned as a food source at the sites studied. Although it is unclear whether they functioned as staple crops, these apples were probably relatively important fruits.

Crab apples are regularly reported to have been found at other Mesolithic and Neolithic sites in temperate Europe. Helbæk (1952) reported a concentration of 220 c.c. carbonised apples at the site Sandegaard, together with macroremains of crop plants, hazelnuts and weeds. An unquantified concentration of carbonised fruits is known from Neolithic Ireland (Thankardstown, Ireland, Monk 1998 cited in Jones 2000). Concentrations and dried halves of apples have also been found in Neolithic sites in Switzerland and Austria (Jacomet *et al.* 1989; Kohler-Schneider 2007, 212).

Pyrus communis ssp. *pyraster*

A single seed of *Pyrus communis* ssp. *pyraster* has been found only in a waterlogged state at Ypenburg (Koot and Van der Have 2001; chapter 3). It is unclear whether the species was part of the natural vegetation in this region since it is not possible to distinguish the pollen and wood of *Malus* sp. and *Pyrus* sp. from each other (while other taxa of the Rosaceae cannot always be excluded either). Some seeds from the sites studied that have been classified as *Malus* sp. might in fact turn out to be *Pyrus* sp. The find at Ypenburg is unique for this period in the Netherlands and therefore the identification must still be supported by future finds of *Pyrus communis* ssp. *pyraster* from the same period and region. It can be concluded that *P. communis* ssp. *pyraster* certainly was not a common use plant or food plant at the sites studied.

Mesolithic and Neolithic finds of *P. communis* ssp. *pyraster* in other European countries are very scarce; *Pyrus* sp. is generally present only from the Iron Age and Roman Period onwards. Zvelebil (1994) reports three Mesolithic finds of pear in Northwestern Europe (Téviec, France, carbonised, Clark 1954; Mount Sandel, Ireland, Woodman 1985; Carn Southern, Scotland, Searight 1990[5]). However, a table in the same paper shows that the find at Mount Sandel concerns wild apple/pear. Concerning the finds of Téviec (*Pyrus cordata*), it was suggested that "these may require re-examination" (Bakels 1991, 280). Macroremains of pears are nevertheless also known from the Cerny culture and the Villeneuve-Saint-Germain group in northern France (pers. comm. Bakels 2007). These finds confirm the finds of Téviec. Marinval (1988) reported Late Neolithic finds of *Pyrus* sp. at Lac de Chalain, Jura, France. Further research on archaeobotanical finds and the distribution of *P. communis* ssp. *pyraster* is necessary to understand the scarce finds in Europe and the economical value of *Pyrus* sp. during the Neolithic.

Prunus spinosa

Prunus spinosa is found in a carbonised state in features and as a concentration. At Schipluiden, its spatial distribution corresponds with the distribution of cereal remains and the identified house yards (Kubiak-Martens 2006a). The evidence of human handling is strongest at the Neolithic sites in the coastal region, which is related to the distribution of *P. spinosa* in the natural vegetation.[6] The fruits are edible and the taste improves after freezing or natural fermentation (Kroll and Willerding 2004, 147; Regnell *et al.* 1995). The energy value is considerable (*cf.* Renfrew 1973, 195). *P. spinosa* was probably an important food source in the coastal region, and functioned as an additional food source in other regions where the species was present in the natural vegetation.

The use of *P. spinosa* interpreted as consumption is supported by the fact that this species is generally found at other sites in Northwestern Europe dating to the Late Mesolithic and Neolithic and from later periods (all the way until historical times). It has, for instance, been found at the location were the ice mummy Ötzi was found, presumably in a decomposed receptacle (Oeggl and Schoch 1995).

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[5] See Zvelebil (1994) for complete references.

[6] It can be assumed that finds of *Prunus* sp. at Vlaardingen, a Late Neolithic site nearby the coast, represent *Prunus spinosa* as well, similar to the finds of the comparable site of Hekelingen III.

Prunus padus

Macroremains of *Prunus padus* have been found at two sites. One find dates to the Late Mesolithic (Hardinxveld) and one find dates to the Middle Neolithic (Ypenburg). There is one additional Late Neolithic find (the Hazendonk). Other finds of stones are not known from the Netherlands from any period (RADAR 2005). In addition to the scarcity of finds, the species has not been found in a carbonised state and is not found in concentrations at the sites studied. As a result, the available evidence from the sites studied does not support that *P. padus* functioned as a food plant. The species is not known as a gathered plant from other Mesolithic and Neolithic sites in Northwestern Europe either (*e.g.* Knörzer *et al.* 1999), although it was present in Northwestern Europe during the Middle Holocene (*e.g.* Belgium: Kuijper 2007; Denmark: Jensen 1987; France: Dietsch 1997, 65; Germany: Bos and Urz 2003).

Rosa sp.

Fruits of *Rosa* sp. have occasionally been found in a waterlogged state in all regions, but only in the coastal region in a carbonised state. Identifications from the site studied include *Rosa* sp., *Rosa canina* and *Rosa canina/ rubiginosa*. It is not excluded that other species are represented by Rosa sp., since 19 native *Rosa* species are distinguished in the Netherlands and Flanders nowadays, of which *Rosa canina* is most common (Maes 2006). Apart from finds of carbonised fruits, there are no indications of human handling of the fruits of *Rosa* sp. The fruits are edible and dried fruits have a considerable energetic value (21% of the fruit consists of carbohydrates). In conclusion, people may have consumed the fruits but they probably did not function as a staple food.

Rosa sp. is regularly found in Swiss Neolithic lakeshore settlements, where concentrations are known and where it is considered as a food plant (Jacomet *et al.* 1989; Jacomet 2006; Karg and Märkle 2002). There are only scarce examples of finds from more northwestern regions in Europe. A Mesolithic find considered as a potential food source is known from the Danish site of Tybrind Vig (Kubiak-Martens 1999). The species was also found at the Neolithic site Bercy in France, but it did not meet the criteria to be considered as a gathered taxon (Dietsch 1996). It was furthermore found at the Funnel Beaker site of Wangels in northern Germany, and for this site it is considered as a potential use plant (Kroll 2001). The evidence of consumption at comparable Northwestern European sites thus appears to correspond with the evidence at the sites studied.

Rubus fruticosus, *Rubus idaeus* and *Rubus caesius*

Fruits of *Rubus fruticosus* are generally found in a waterlogged state and have only been found in a carbonised state at the Hazendonk. The fruits are not found in a high frequency, not in concentrations and not in hearths. Fruits of *Rubus idaeus* are generally found in a waterlogged state and have only been found in a carbonised state in a surface hearth at Hoge Vaart. The fruits are not found in a high frequency and not in concentrations. Fruits of *Rubus caesius* have only been found in a waterlogged state. The fruits are not found in a high frequency, not in concentrations and not in hearths. At Wateringen 4, fruits of *R. caesius* were found relatively often compared with other taxa, but their frequency did not exceed 10%. The overall indications of human handling of these taxa at the sites studied are scarce. Their energy content is restricted (8.5% of the fruits consists of carbohydrates) and the fruits are not very well suited for storage. It is therefore unlikely that *Rubus* sp. functioned as a major food source or as a staple food. It is nevertheless often suggested that the fruits of *Rubus* sp. were collected for consumption. Evidence of consumption may be underrepresented since the fruits can be consumed directly without preparation.

Finds of *Rubus* taxa at Mesolithic sites in temperate Europe are scarce. *R. idaeus* and *R. caesius* have been found at Danish sites and are assumed to have been eaten (Kubiak-Martens 1999; Paludan-Müller 2002; Robinson and Harild 2002). A carbonised fruit of *R. idaeus* has also been found at the Mesolithic site Rottenburg in Germany (Rösch 2000). Neolithic finds of *Rubus* taxa are more common. *R. caesius* has been found at several sites in Germany and Switzerland. *R. idaeus* ad *R. fruticosus* are commonly found in various countries, also in a carbonised state (Kroll 2001, 2007; Soltvedt 2000). There are also indications of intentional gathering of *Rubus fruticosus* and, in limited quantities, of *Rubus caesius* (Dietsch 1997). At the Early Neolithic site of Muldbjerg in Denmark, fruits of *R. idaeus* were found in what was probably a human coprolite (Troels-Smith 1960 cited in Dennell 1976). The difference between the Mesolithic and Neolithic finds remains to be explained.

Trapa natans

Fruits, spines and bristles of *Trapa natans* have been found mainly in the central river area, but also at some more northern sites. Remains of *T. natans* have been found in a carbonised state, have probably been found as a concentration at Zijdeweg (see paragraph 2.4), and human handling is also supported by the spatial distribution of the finds at Randstadrail CS (see paragraph 6.2) and Polderweg. It is remarkable that the remains were never found in hearths. *Trapa* fruits are rich in starch (50%), contain proteins (10%) and fats (Kalkman 2003; Karg 2006), and can be eaten raw, roasted or boiled (Renfrew 1973, 151). It has been suggested that they were possibly also ground into flour (Rimantiené 1992, 372). The fruits can be stored for several weeks after roasting. As in the case of *Corylus avellana*, it is very likely that water chestnuts functioned as a staple food, at least in the central river area where they appear to have been plentiful. Use-wear and phytolith analysis of stone, and the analysis of wood remains might allow to test whether the pounding of *Trapa* nuts was practised at the sites studied.

Fruits of *Trapa natans* have been found at many Mesolithic and Neolithic Northwestern European archaeological sites in a carbonised state (Karg 2006; Larsson 1990; Vuorela and Aalto 1982; Zvelebil 1994), and they were a prehistoric food source in the Alpine region (Renfrew 1973). At several non-agrarian Neolithic sites in Lithuania, wooden mallets were found that were used to split or break fruits (*Corylus avellana* and/or *Trapa natans*) (Rimantiené 1992). *T. natans* is additionally known as a food source from historical times (Karg 2006) and is cultivated nowadays in Asia and Africa (Kalkman 2003). Together, these indications strongly support consumption of *T. natans* at Dutch Mesolithic and Neolithic wetland sites.

Other trees and shrubs

The taxa discussed in this paragraph are not shown in tables 9.5 and 9.6 since there are no convincing indications that these taxa were consumed. Seeds of *Juniperus communis* have been found in a waterlogged state at a single site in the coastal region (Schipluiden). The species was part of the natural vegetation. The seeds are known for their flavour and are nowadays used for food preparation, but are not consumed on a large scale due to their mildly toxic nature. The data of the investigated sites offer no indications that the seeds were consumed.

Seeds of *Rhamnus cathartica* have been found in a carbonised state at Hoge Vaart, and in a waterlogged state at all sites in the central river area where the species was probably common in the natural vegetation. There are no other indications of the human handling of seeds. The seeds of *R. cathartica* are poisonous (Maes 2006), which would explain the scarce indications of them having been handled by people.

Remarkably, no macroremains of *Sorbus aucuparia* were found at the sites studied, despite some indications of the presence of this species in the natural vegetation of the Dutch wetlands (see chapter 7). This is all the more remarkable since the berries are edible and can be dried or ground into flour (Aura *et al.* 2005). The evidence of consumption from comparable sites in Northwestern Europe is similar to the evidence from the sites studied. Seeds were found at the Late Mesolithic site Tybrind Vig (Kubiak-Martens 1999), and at the Swedish site Bökeberg III, for which it was concluded that "the possibility that rowan [*S. aucuparia*] berries were collected for consumption cannot be excluded" (Regnell *et al.* 1995).

Fruits of *Sambucus nigra* have been found in some of the regions but only in a waterlogged state. The fruits are mostly found at those sites where the species was presumably common in the natural vegetation. They are not found in hearths, not in concentrations, not in a high frequency and they do not have a high energetic value. This makes the deliberate gathering of the fruits of *S. nigra* at the sites studied unlikely. At

Schipluiden, however, pollen of *Sambucus* sp. was found in a coprolite that is probably of human origin, which can be interpreted as an indication of consumption. It may remain very hard to detect consumption of *S. nigra* since roasting and preparation in hearths is not necessary before consumption, and as a result carbonised finds and finds in hearths remain scarce. Indications of gathering during the Neolithic in other European countries are also scarce (Dietsch 1997). At the Swiss lakeshore settlements, carbonised finds are rare and concentrations are absent, but gathering has nevertheless been suggested (Jacomet *et al.* 1989, 204).

Scarce waterlogged remains of the berries of *cf. Ribes* sp. have only been found at De Bruin. The scarcity of the seeds and berries indicates that this taxon was not regularly gathered for consumption or other use.

There is scarce evidence of the presence of *Hippophae rhamnoides* in pollen diagrams from the coastal region and the central river area (Schipluiden: Bakels 2006; Hartman 1968; Ypenburg: Van Beurden 2008b; Bergambacht and Goudriaan: chapter 2; and scarcely in unpublished diagrams of Van der Woude). These berries are edible and may have been consumed (*cf.* Hörnberg *et al.* 2006), which is indeed suggested by the analysis of coprolites (Bakels 2006). Evidence of consumption from finds of macroremains is however not available since there are no finds of macroremains.

The new results of the excavation from Ypenburg indicated the presence of waterlogged macroremains of the edible species *Asparagus officinalis*, *Berberis vulgaris* and *Physalis alkekengi* (Van Beurden 2008a, see also paragraph 3.5.5), which all represent the oldest finds of the Netherlands (similar to the find of *Pyrus communis* ssp. *pyraster* at Ypenburg). The context of the finds does not support consumption. The only other known Dutch Neolithic find is from *Physalis alkekengi* at Beuningen-Ewijkse Veld, located in the eastern river area (Janssen 1989).

9.3.2.3 Herbs, wild grasses and sedges

There is a considerable group of herbs that are part of the natural vegetation of the sites studied for which consumption of seeds and fruits and/or leaves has been suggested in the archaeobotanical literature: *Chenopodium album*, *Urtica dioica*, *Stellaria media*, *Persicaria maculosa*, *Persicaria lapathifolia*, *Polygonum aviculare*, *Atriplex patula*, *Atriplex* sp., *Brassica rapa*, *Fallopia convolvulus*, *Rumex* sp., *Rumex crispus*, *Galeopsis tetrahit*, *Lapsana communis*, *Vicia* sp., *Potentilla anserina*, *Plantago maritima*, *Arenaria serpyllifolia*, *Hypericum perforatum*, *Stellaria aquatica*, *Plantago major*, *Pteridium aquilinum*, *Oxalis acetosella*, *Prunella vulgaris*, *Ranunculus repens*, *Solanum nigrum*, *Sonchus asper*, *Valerianella dentata*, *Glyceria fluitans*, *etc.* (Harlan 1992, 22; Jacomet *et al.* 1989; Karsten and Knarrström 2003; Kubiak-Martens 2002; Paludan-Müller 2002; Pitts 1979; Price 1990; Renfrew 1973; Rösch 2000; Van der Woude 1983, 91; Van Zeist and Palfenier-Vegter 1981). This list of taxa certainly fails to represent the complete list of edible taxa; there are also many other edible taxa (*e.g. Alliaria petiolata*, found in the central river area). For many of these taxa, it is difficult to distinguish whether taxa functioned as food plants, as weeds or in another way. This problem is not always explicitly recognised in archaeobotanical sources on Late Mesolithic and Neolithic sites from Northwestern Europe and the relevant taxa are regularly dismissed as weeds without further discussion. The difference between food plants and weeds may moreover have been minimal in certain cases since weeds may have been tolerated and may have functioned as food sources (*cf.* Behre 2008).

Generally, consumption of various herb taxa in Northwestern Europe including Dutch wetlands during the Late Mesolithic and Neolithic is supported by 1) analysis of bog bodies found in Northwestern Europe and 2) data on consumption of wild plants from historical temperate Europe. Comparable anthropological studies on hunter-gatherers from temperate Europe would be useful as well but these are not available from temperate Europe or other regions.

1) The contents of the intestines of bog bodies from Northwestern Europe give precise information on these people's last meal. Apart from crop plants, taxa found to be the last meal from bog bodies are *Malus*

sylvestris, *Corylus avellana*, *Rubus fruticosus*, *Persicaria lapathifolia*, *Chenopodium album*, *Spergula arvensis*, Apiaceae, *Brassica* sp., *Bromus* sp., *Capsella bursa-pastoris*, *Echinochloa crus-galli*, *Fallopia convolvulus*, *Galeopsis tetrahit*, *Lapsana communis*, *Plantago major*, *Plantago lanceolata*, *Polygonum aviculare*, *Rumex* sp., *Stellaria media*, *Rumex acetosella* and *Viola arvensis*[7] (Behre 2008; Holden 1995; Pieper 2003; Van der Sanden 1995, 1996). Apart from crop plants, *Persicaria lapathifolia*, *Chenopodium album*, and *Spergula arvensis* have been found particularly often (Behre 2008; Pieper 2003). However, the bog bodies discussed above date to the late prehistory and first centuries AD and not to the Mesolithic or Neolithic, a fact which may decrease the validity of the argument that the finds support consumption of these taxa during the Mesolithic and Neolithic. Another problem is ascertaining how representative the people's last meal is, since human sacrifice, which was the cause of death in the case of some of the bog bodies, may have been preceded by a special meal. Behre (2008) discusses combined evidence from bog bodies and finds of concentrations of herb seeds and fruits, based on data from prehistoric and historical periods, and concludes that there is considerable evidence of consumption for the following six species: *Polygonum lapathifolia*, *Chenopodium album*, *Spergula arvensis*, *Fallopia convolvulus*, *Bromus secalinus* and *Glyceria fluitans*.

2) A study on plant food in Poland during the Early Middle Ages (Dembińska 1976) shows that Chenopodiaceae and Polygonaceae were used for flour and groats, especially *Chenopodium album*, *Persicaria lapathifolia*, *Polygonum aviculare* and *Fallopia convolvulus*. Interestingly, the return rate of *Chenopodium album* is "probably similar to that of cultivated cereals, which may produce more seeds per unit area but require much more processing" (Stokes and Rowley-Conwy 2002).

As argued in the first part of this chapter, the analysis of use plants at the sites studied does indicate the use of *Galium aparine* and *Stellaria neglecta*, and there are additional indications of the use of *Chenopodium album* and *Moehringia trinervia*. The function of these taxa remains unclear. They may represent food plants, but may also represent arable weeds (see chapter 10). Pollen analysis of coprolites at Schipluiden does additionally suggest the consumption of *Solanum dulcamara* (Bakels 2006). Some very explicit evidence of the consumption of herbs has come from food crusts found on pottery. Food crusts found on pottery at the Middle Neolithic site of Schipluiden contained fruits of *Atriplex* sp./*Suaeda* sp. (Kubiak-Martens 2006b). At Ypenburg, the food crusts also contained other plants than crop plants, but these could not be identified (Kubiak-Martens 2008). There are no explicit indications in this study of gathering of wild grasses.

The available evidence of the gathering and consumption of herbs at the studied sites is very restricted in view of the number of herbs present in the natural vegetation at the sites studied and the many ways in which herbs may have been used. The available evidence is moreover very restricted in view of all the indications of the consumption of herbs from bog bodies and the historical parallels presented above. Many food plants are therefore probably underrepresented due to the poor preservation of the weak parts of plants, as well as consumption and preparation habits that do not result in recognisable food waste. Therefore, the consumption of herb taxa in particular deserves further attention during future research.

One herb species found at the Dutch wetlands is discussed here in detail, as an example, to show that the available data do not clearly indicate the use of plants and that various interpretations are possible. Seeds of *Brassica rapa* have been found at Brandwijk-Kerkhof, the Hazendonk, Wateringen 4 and Schipluiden. Only at the Hazendonk and Schipluiden were they found in a carbonised state, but in very few samples and in low numbers. At Wateringen 4, a sample of 2 litres from a pit contained 115 waterlogged seeds. It is unclear whether this quantity represents an anthropogenic concentration since this number of seeds might have been produced by a single *Brassica* plant and since the sample also contained considerable numbers of other taxa. The species may well have been used as food, as shown by seed finds in the stomach of the Tollund man

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[7] Taxa that are not part of the natural vegetation at the sites studied are not included in this list, and neither are taxa that were probably part of the natural vegetation at the find spots of the bog bodies.

(a bog body; Renfrew 1973). In the Dutch wetland sites, *B. rapa* is only known from Neolithic sites and layers. This suggests that it was introduced intentionally or unintentionally as a weed or as a food plant. In Germany, a single seed of *B. rapa* is, however, known from the Mesolithic site Rottenburg (Rösch 2000). The species is also known from Swiss Neolithic sites, and gathering has tentatively been suggested in these cases (Brombacher 1997), although "the exact role of gathering as human food resource is not known" (Jacomet 2006; see also Kohler-Schneider 2007). In the Netherlands, *Brassica rapa* was probably cultivated from the Iron Age onwards (Brinkkemper 2006, 29).

9.3.2.4 Roots

Roots, tubers and rhizomes are argued to represent an important food source in temperate Europe, possibly representing staple foods (Clarke 1976; Hather and Mason 2002). Roots are the storage organs of plants and therefore contain valuable nutrients (carbohydrates and sugars), at least before the period of seasonal growth and flowering. It has been argued that roots can easily be collected and stored (Clarke 1976). The seasons generally suggested as the period for the gathering of roots are winter and spring (Clarke 1976, Parker Pearson 2003), while it has been suggested that the rhizomes of *Pteridium aquilinum* can be collected during the entire year.

Generally speaking, the idea that people consumed certain roots is supported by the edibility of these roots, the presence of fleshy root tissue solely (Mason *et al.* 1994), the carbonised state and, in certain cases, the presence of the roots in features (hearths). The indications of use and consumption are usually not overwhelming because identified finds are scarce and the absence of other non-fleshy root material is not always investigated or discussed. Human handling would furthermore be better supported if there was evidence of the absence of the species in the local vegetation.

Table 9.7 displays the identification of roots, tubers and rhizomes found in a carbonised state at the sites studied.[8] No roots in a waterlogged state were found. Six taxa are represented: *Ranunculus ficaria*, *Allium* sp., *Bolboschoenus maritimus*, *Beta vulgaris* ssp. *maritimus,* Pteridophyta and *Typha* sp. Only *Ranunculus ficaria* is found regularly and in hearths (at Hardinxveld-Giessendam De Bruin and Hoge Vaart), and the evidence that roots functioned as food plants at the sites studied is therefore most convincing for this species. *R. ficaria* may however have grown at all the sites as part of the local vegetation, and it is difficult to completely exclude the unintentional carbonisation of the tubers. Carbonised tubers of *R. ficaria* have also been found at the Dutch Neolithic sites of Barendrecht 20.58 (Vlaardingen group; Bakels and Kuijper unpublished data, see also Moree *et al.* 2002, 90-93), Hekelingen III (Vlaardingen group; Bakels 1988) and Schokland-P14 (Single Grave culture; Gehasse 1995). The regular identification of tubers of *R. ficaria* can be related to the possibility of identifying the tubers without using a SEM microscope.

Mason and Hather (2000) offer an overview of finds of tubers of *Ranunculus ficaria* in prehistoric Northwestern Europe. A remarkable quantity has been found at the Late Mesolithic site Staosnaig, Scotland (Mithen *et al.* 2001). To this overview we can add a find in a hearth at the Bronze Age site Ajvide, Gotland (Viklund 2002). The function of *Ranunculus ficaria* as a food plant is supported by ethnographic sources, but its medicinal use has also been suggested (see references in Mithen *et al.* 2001). Both the tubers and the leaves are edible after drying, heating or cooking; consumption without preparation can however result in poisoning (Mason and Hather 2000).

All taxa other than *R. ficaria* are only found at Schipluiden and Ypenburg, were not found in hearths, and may have grown near the site as part of the local vegetation. Tubers are particularly known from these sites due to the fact that suitable research skills and methods have been applied there. Precise parallels for carbonised roots from *Bolboschoenus maritimus* are not known from Northwestern Europe, but see in this respect the

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[8] Unidentified carbonised tissue has additionally been found at the Randstadrail CS (Guiran and Brinkkemper 2007), the Hazendonk, Alblasserdam-Nieuw Kinderdijk (Van Haaster 2006a) and Sion.

region	Central river			Western river			Coastal		Eem
taxon / site	Polderweg	De Bruin	Hazendonk	Randstadrail CS	Barendrecht 20.126	Barendrecht 20.125	Ypenburg	Schipluiden	Hoge Vaart-A27
Allium sp.	-	-	-	-	-	-	+	+	-
Beta vulgaris ssp. maritima	-	-	-	-	-	-	-	+	-
Bolboschoenus maritima	-	-	-	-	-	-	-	+	-
Pteridophyta	-	-	-	-	-	-	+	-	-
Ranunculus ficaria	+	+	+	+	+	+	-	-	+
Typha sp.	-	-	-	-	-	-	+	-	-

+ = present - = not present

Table 9.7 The sites studied, carbonised roots (*s.l.*).

work of Perry discussed below. For *Beta vulgaris* ssp. *maritima,* several parallels are known from a Dutch Mesolithic dryland site (Veenkoloniën, discussed below) and an Ertebølle site in Denmark (Kubiak-Martens 1999). Macroremains of *Beta* sp. (exocarp) have furthermore been found at the Ertebølle site Møllegabet II in Denmark (Mason 2004, 130). The roots of *Typha latifolia* are mentioned in archaeobotanical sources as a potential food plant (*e.g.* Karsten and Knarrström 2003) although there has been only one comparable find (see paragraph 9.4.1).

Bulbs of *Allium* sp. have been found both at Schipluiden and Ypenburg, and a comparison between the materials of these sites indicates that various *Allium* species may have been consumed (Kubiak-Martens 2008). Dutch finds of *Allium* sp. may include *Allium ursinum*, *Allium scorodoprasum*, *A. vineale* and/or *A. oleraceum*. In the literature discussing finds from other countries, authors emphasize the consumption of *Allium ursinum* (Kubiak-Martens 2002; Paludan-Müller 2002). The carbonised bulbs of *Allium* sp. are not commonly known from other sites in Europe (only from an Ertebølle site in Denmark, Kubiak-Martens 2002), but pollen analysis from organic layers and from a pot from a Neolithic site in Europe offers additional evidence that *Allium* sp. functioned as a food source (see references in Kubiak-Martens 2006b). In this study, *Allium* pollen was found at two sites. At Brandwijk-Kerkhof, a single grain was found at a level dating from after occupation, and the relationship with human activity is weak. At the Hazendonk, a pollen diagram shows a true peak of *Allium* sp. during several occupation phases, which appears to be related to human activity (see appendix III). A similar example comes from an unpublished pollen diagram of the Late Neolithic site Hekelingen III (Bakels 1988). The presence of *Allium* pollen does not however directly prove use or consumption at these sites.

There are many other edible roots, but there is no evidence of their consumption at the sites studied. First of all, for two species, carbonised roots have been found at sites comparable with the Dutch wetland sites, namely *Sagittaria sagittifolia* and *Polygonum* sp./Polygonaceae *cf. Polygonum* sp. (Holden *et al.* 1995; Kubiak-Martens 1996). Secondly, a number of roots have repeatedly been suggested to represent potential food plants in archaeobotanical literature, namely *Phragmites australis*, *Epilobium* sp., *Menyanthes trifoliata*, *Schoenoplectus lacustris*, *Pteridium aquilinum*, *Butomus umbellatus*, *Althaea officinalis* and *Humulus* sp.

(Bos *et al.* 2005; Clark 1954; Clarke 1976; Dennell 1976; Jacquat 1989; Holden *et al.* 1995; Kubiak-Martens 1996, 1999; Karsten and Knarrström 2003; Mears and Hillmand 2007; Price 1990). The data show that *Polygonum* sp., *Phragmites australis*, *Typha angustifolia/latifolia* and *Schoenoplectus lacustris* were particularly common at the sites studied. Thirdly, some edible roots have been known as Dutch food plant from historical times: *Chaerophyllum bulbosum*, *Persicaria bistorta*, *Daucus carota* and *Apium graveolens* (Kubiak-Martens 2000). Mesolithic and Neolithic finds of the first two species are not common. Remains of *Daucus* sp. have been found at Hoge Vaart, Ypenburg, Schipluiden and Hekelingen III (Bakels 1988; Kubiak-Martens 2006a; Spek *et al.* 2001b). Fruits of *Apium graveolens* have been found at Ypenburg, Schipluiden, Rijswijk-A4 and the Late Neolithic site Aartswoud (Gehasse 1985; Kubiak-Martens 2006a; Van Beurden 2008a).

In the case of two taxa, it has been suggested that both the roots and the seeds may have been consumed; namely *Nuphar lutea* and *Nymphaea alba*. The taxa are very common in the natural vegetation of many of the studied sites (especially in the central river area) and they have often been mentioned in the relevant literature as a potential food source (Bakels and Van Beurden 2001; Bos *et al.* 2005; Dark 2004; Mears and Hillman 2007; Paludan-Müller 2002; Pitts 1979; Price 1990; Van Zeist and Palfenier-Vegter 1981). Both the seeds and the roots of *Nuphar lutea* are edible. At the sites studied, waterlogged seeds of *N. lutea* are most common, especially in the central river area. Carbonised seeds were only found at Hoge Vaart, but interestingly in a relatively high frequency (see frequency analysis). It has been hypothesised that the carbonised seeds represent the by-product of the gathering and consumption of roots (Visser *et al.* 2001). However, the overall evidence of the consumption of seeds in the Dutch wetlands is limited due to the absence of further indications of human handling. Human handling of the seeds of *N. lutea* is nevertheless supported by the find of a concentration of seeds of *Nuphar* sp. (250 cm^3) below a cultural layer at the Maglemosian site Holmegaard, Denmark, a context argued to be most certainly anthropogenic (Bronholm 1931 in Clark 1954). Storage underneath the soil surface has indeed been reported as a way of preparing the seeds for consumption (see references in Kubiak-Martens 2002).

For *Nymphaea alba*, there are also suggestions for the consumption of both seeds and roots (see references listed above), although the author is not aware of roots that have been found at European Mesolithic or Neolithic sites. The distribution of waterlogged seeds at the sites studied is comparable with that of the seeds of *N. lutea*. Carbonised seeds have been found at Hoge Vaart, Brandwijk-Kerkhof and the Hazendonk, as well as at the Late Neolithic site Barendrecht 20.58 (unpublished data Bakels and Kuijper), and they are therefore more common than the carbonised seeds of *N. lutea*. The seeds have frequently been found at Hoge Vaart (see frequency analysis) and in a moderately high frequency at the Hazendonk. There are, however, no other indications of handling. It must therefore be concluded that the consumption of both *Nuphar lutea* and *Nymphaea alba* requires further investigation.

9.3.2.5 Conclusions on the evidence of consumption

The taxa that most likely functioned as a staple food at the sites studied are *Corylus avellana* and *Trapa natans*. Taxa that also functioned as an important food source are *Prunus spinosa*, *Malus sylvestris*, *Crataegus monogyna* and *Ranunculus ficaria*. Additional plant food sources probably included *Quercus* sp., *Cornus sanguinea*, *Rosa* sp., *Rubus* species, the roots found at the sites studied (*Allium* sp., *Bolboschoenus maritimus* and *Beta vulgaris* ssp. *maritima*, Pteridophyta and *Typha* sp.), and possibly *Nymphaea alba* and *Nuphar lutea*. Most of the taxa may have been stored (all but *Rubus* sp.). Roots may theoretically have functioned as a staple food but this is not as yet supported by sufficient evidence. It is furthermore quite possible that people consumed *Galium aparine*, *Chenopodium album*, *Persicaria* species, *Moehringia trinervia*, *Stellaria neglecta* and *Atriplex* sp./*Suaeda maritima,* while the consumption of other herbs cannot be excluded. The evidence gathered here probably represents only part of the plant food sources, and many more taxa may also have been consumed. Many of the consumed taxa probably did not function as a staple food but were nevertheless valuable for their vitamins and because of the variation in food they offered.

9.3.3 Food plants: regional differences

The spectrum of potential and probable food plants is relatively large in the central river area and in the coastal region, and small in Flevoland (the Eem and Vecht regions). There are no macroremains of *Cornus sanguinea*, *Prunus* sp., *Rubus caesius* and *Sambucus nigra* in the north, remains of *Trapa* sp. and *Quercus* sp. are very scarce and the remains of *Malus sylvestris* and *Crataegus monogyna* are moderately scarce in this region. Two notable exceptions are the finds of a number of stones of *Prunus* sp. at Bergumermeer (Friesland, Odell 1978) and a find of a single stone of *C. sanguinea* at Swifterbant-S3 (Van Zeist and Palfenier-Vegter 1981). This scarcity of taxa in the macroremains assemblages in the Vecht region corresponds with the data obtained on wood taxa and weeds (see chapters 8 and 10) and may indicate that the natural vegetation in the Vecht region differed from the southern regions. However, the amount of data from several of the sites in the north, except for Swifterbant-S3, seems to be smaller than in the other regions. As a result, the validity of the reconstruction of the food plant assemblages must be questioned. It is therefore unclear whether the absence of taxa that may have functioned as food plants is a true result (indicating the absence of consumption of taxa in the north) or whether it results from an unrepresentative data set. This remains to be tested in future excavations. Interestingly, new excavations at Swifterbant seem to support the validity of the results on the assemblage of food plants obtained at S3 (pers. comm. Cappers 2007, Groningen Institute of Archaeology).

In addition to the specific assemblage in the Vecht region, there are also differences in the assemblage of food plants between the central river area and the coastal region, which are probably related to differences in the natural vegetation (see chapter 7 and the discussion below). In the coastal region, macroremains of *Prunus spinosa*, *Malus sylvestris* and *Sambucus nigra* are more common and their consumption is likely, while finds of *Quercus* sp. and *Corylus avellana* are scarce. In the central river area, *Prunus* sp. and *Sambucus nigra* are less common, while *Quercus* sp., *Corylus avellana* and *Trapa natans* are more common, and there is clear evidence of the consumption of these last taxa.

The differences in the evidence of consumption of taxa between regions can in the first place be related to differences in the natural vegetation (see chapter 7) and differences in research methods and taphonomy. Interestingly, it might also be that the differences relate to cultural preferences, since the characteristics of flint and pottery assemblages indicate minor cultural differences during the Neolithic between, on the one hand, the northern and southern regions (Raemaekers 1999) and, on the other hand, the central river area and the coastal region (Louwe Kooijmans in press). However, the influence of cultural preferences is difficult to demonstrate and to separate from differences in the natural vegetation. The avoidance of consumption of a given food plant in a region where it is optimally available might possibly offer a stronger indication of cultural preferences concerning food.

9.3.4 Food plants: the economic importance of plants through time

One aspect of the neolithisation process is the addition of crop plants to the food spectrum. The introduction of crop plants may have influenced the importance of gathered food plants in the diet, and it may have influenced the diet's composition. The first aspect, the importance of gathered *versus* cultivated plants in the diet, can hardly be analysed since a quantitative analysis of plant remains is limited by differential site function, occupation length and intensity, gathering methods, processing methods, taphonomy, preservation and sampling, all of which influence the quantity of plant remains that remain preserved (*cf.* Rowley-Conwy 2004). Importantly, the use of plants often results in the destruction and/or disappearance of the plant remains (Bakels 2005; Jacomet *et al.* 1989, 217; Zvelebil 1994). The second aspect, the composition of the diet, is easier to reconstruct, and this is one of the aims of the following paragraphs.

The data set, based on data from sites representing a continuum from Late Mesolithic to Middle Neolithic, allows an analysis through time of changes in wild plant use at the sites studied. A general comparison of the number of carbonised taxa (including roots) found at Mesolithic *versus* Neolithic Dutch wetland sites in all regions supports the idea that there are no major differences between the two types of sites and that the neolithisation process did not directly result in a decrease in the number of carbonised taxa or a decrease in the number of food plants. At the Mesolithic sites (without crop plants), the number of carbonised food plants (as shown in tables 9.5. and 9.6) varies between 0 and 8, while at the Neolithic sites (with crop plants), the number varies between 0 and 7, except for the Hazendonk, where 12 food plants were found in a carbonised state. The number of waterlogged food plants is also comparable at the Mesolithic and Neolithic sites. Furthermore, potential food plants found in a high frequency in a carbonised state are generally found both at Mesolithic and Neolithic sites.

The comparison of the probable food plants additionally shows some minor differences at species level between Mesolithic and Neolithic sites. Firstly, some taxa are only found at Mesolithic sites (*cf. Ribes* sp.) while others are only found at Neolithic sites (*Juniperus communis*, *Prunus spinosa*, *Pyrus communis* ssp. *pyraster*, *Physalis alkekengi* and *Berberis vulgaris*). The absence of *Ribes* sp. at Neolithic sites is probably related to the scarcity and scarce use of the species since only a find of one possible berry is known. The absence of Mesolithic finds of the latter species may be related to the absence of Mesolithic sites in the coastal region or to the introduction of the taxa during the Neolithic (see also paragraph 3.5.5). Secondly, there are some indications of the changing importance of *Quercus* sp. and *Trapa natans* from the Late Mesolithic to the Late Neolithic. The changing role of acorns is discussed above (see paragraph 9.3.2.1). The changing role of *T. natans* is possibly related to the decrease in the mean summer temperature in the Netherlands after the Atlantic, and its decreased presence in the natural vegetation from the Sub-Boreal onwards. The available evidence of the consumption of other probable food plants does not display changes contemporaneous with or related to the neolithisation process.

There are few possibilities for a detailed comparison between sites with and without crop plants for separate regions. For the coastal region, it is impossible to compare sites with and without crop plants since crop plants have been found at all the sites in that region. In the Vecht region, there is a limited amount of data dating with certainty to early occupation phases without crop plants. Such data are available for Hoge Vaart in the Eem region, but this site cannot be compared with a site with crop plants in the same region. Only the central river area offers representative data of sites without and with crop plants. It is however important to note that the difference between the absence and presence of crop plants is only one aspect of the difference between sites and one of the many aspects of neolithisation.

A comparison of the number of food plants found in a carbonised state at the sites in the central river area support the general trend of continuity in the use of gathered food plants from the Late Mesolithic until the Late Neolithic (see fig. 9.1 and paragraph 2.8.3). The highest number of carbonised food plants was found at the Hazendonk, but the difference with De Bruin is small. The low number of carbonised food plants at Brandwijk-Kerkhof makes it different from the other sites, but this might be related to the relatively small scale of the excavation at Brandwijk-Kerkhof. The continuity in the assemblage of gathered plants strongly supports the idea that the introduction of crop plants did not result in a decrease in the use of non-cultivated food plants, although it is not possible to take into consideration the quantities of either wild or cultivated plants consumed.

The data of the Late Neolithic sites Hekelingen III, Vlaardingen and Aartswoud indicate that the gathering of plant food also continued in the Late Neolithic (see table 9.8, based on Bakels 1988; Gehasse 1985; Pals 1984; Van Beek 1990; appendix VI based on unpublished data of Van Zeist). Hekelingen in particular is relatively similar to the Early and Middle Neolithic sites in terms of subsistence and site function, and this may explain the continuous gathering of seeds and fruits, although their relative importance is unknown. The number of taxa found at Vlaardingen is small but this is related to the limited number of samples.

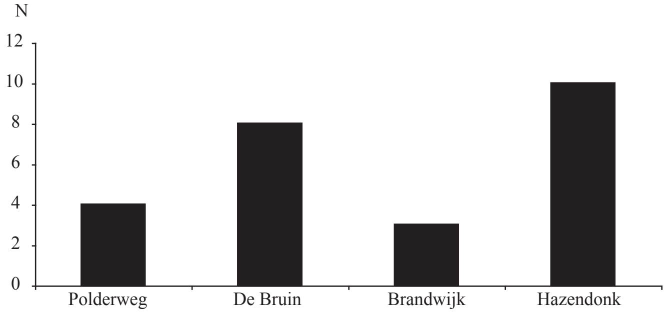

Figure 9.1 Sites in the central river area, the number of carbonised macroremains of food plants. The selection of taxa corresponds with the selection as used for tables 9.5 and 9.7 (cupulae of *Quercus* sp. are not included, and fruits and parenchyma of *Malus sylvsetris* count as one species). The Vlaardingen material from the Hazendonk is excluded.

site	Aartswoud		Hekelingen III		Vlaardingen	
category taxon	C	W	C	W	C	W
Cornus sanguinea	-	-	-	+	-	-
Corylus avellana, nut shells	+	-	+	+	-	+
Malus sylvestris	+	-	+	-	-	-
Malus sylvestris, parenchyma	+	-	-	-	-	-
Prunus sp.	-	-	-	-	-	+
Prunus spinosa	-	-	+	+	-	-
Quercus sp.	+	-	+	-	-	-
Rosa canina	-	-	-	-	-	+
Rubus fruticosus	-	+	-	+	-	-
Rubus idaeus	-	+	-	-	-	-
Rubus sp.	+	+	-	-	-	-
Sambucus nigra	-	-	-	+	-	-
Trapa natans	-	-	+	-	-	-

C = carbonised
W = waterlogged

+ = present
- = not present

Table 9.8 The Late Neolithic wetland sites Aartswoud, Hekelingen and Vlaardingen, carbonised and waterlogged macroremains of food plants (see paragraph 9.3.4 for sources).

The Late Neolithic sites presented in table 9.8 provided no data from occupation during the Early and/or Middle Neolithic, and it can therefore not be investigated whether these sites support a decrease in the gathering of food plants during the Late Neolithic. Interestingly, analysis of the separate phases of the Hazendonk (see fig. III.25) shows that the number of carbonised food plants of the Late Neolithic (Vlaardingen group) is slightly lower than the number of the Early and Middle Neolithic (Swifterbant culture and Hazendonk group). This may be related to the decreased surface of the dune, a possible shift in seasonality, or to diet changes related to the neolithisation process. This may thus indicate that there is a decrease in the consumption of gathered plants through the Neolithic after all, especially during the Late Neolithic. However, this result is based on a single site only, and needs further investigation. In contrast to the indications of continuity during the first stages of the neolithisation process and the lack of clear information from the transition to the Late Neolithic, gathered plants are less important during the Bronze Age than during the Neolithic (Brinkkemper 2006, 29).

In conclusion, the indications of plant use and consumption of plants at Mesolithic and Neolithic sites show a strong similarity in the assemblage of wild food plants before and after the introduction of crop plants. There are only moderate indications of a changing role of *Quercus* sp. in the Early and Middle and Late Neolithic (which needs further investigation) and *Trapa natans* in the Late Neolithic. The changing role of *T. natans* is however not necessarily related to the introduction of crop plants but might instead relate to changes in its distribution in the natural vegetation. The continued gathering of food plants during the Neolithic is also known from other Northwestern European Neolithic cultures (*e.g.* Dietsch 1996; Robinson 2000, 89, 2007, 369; Stevens 2007, 384, and discussion below). It must however be noted that the importance of gathered food plants *versus* crop plants remains unknown (see chapter 11), and that the importance of gathered plants may have decreased through time during the period studied.

The absence of major changes in the assemblage of food plants corresponds with the assumed stage of the neolithisation process at the Dutch wetlands, since the studied sites are thought to represent the availability phase and the substitution phase of the neolithisation process, but not the consolidation phase. Before the introduction of domestic animals and crop plants, the subsistence of the Swifterbant culture and the Hazendonk group was based on a large variety of resources and it seems that this subsistence continued afterwards, resulting in a semi-agrarian economy. The continuity of the assemblage of food plants found at the studied sites thus indicates that the neolithisation process was a gradual process.

9.3.5 Food plants: preparation and consumption

As suggested above, the taxa found at the sites studied that can be considered as food plants could probably all have been collected from the vegetation in the sites' exploitation area, and in many cases even in the local or extra-local vegetation of the sites themselves. This implies that there is no evidence of the long-distance transport of plant food. For some taxa, it is unclear whether they were present in the natural vegetation.[9] The common presence of food plants in the natural vegetation may have resulted in intentional conservation of the vegetation around the sites, resulting in the avoidance of large-scale disturbance (see also chapter 8 for information on the scale of human impact).

Many of the food plants may have been eaten raw; this is the case for most nuts except for *Quercus* sp., various fruits, and herbs and roots. There is, however, evidence of several forms of preparation of plant food: steeping, cooking, drying, roasting, production of oil and grinding, indicated by finds of a concentration of waterlogged fruits of *Prunus spinosa* (Kubiak-Martens 2006a, 332), identifications of plant remains from food crusts on pottery, finds of dried crab apples, carbonised macroremains, cooking stones (*e.g.* Van Gijn and Houkes 2006, 183; Peeters 2001) and grinding stones with traces of plant working. The edibility and

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[9] This is true, for instance, of *Pyrus communis* ssp. *pyraster* at Ypenburg, *Trapa natans* at Bergumermeer, and *Ranunculus ficaria* at all sites.

palatability of certain food plants indeed probably increased after some form of preparation, such as drying, heating, roasting, cooking, freezing or restricted fermentation (Wiltshire 1995). It should however be noted that palatability is cultural, and that our current ideas on palatability cannot be directly applied to prehistory (Parker Pearson 2003).

The most common context from which macroremains have been collected are refuse layers, and additional contexts are pits, hearths, unlined wells, watering places for animals and postholes. Due to the regular collection of samples from refuse layers, almost all data available reflect domestic waste that accumulated during one hundred if not one thousand years of occupation, and represent the food preparation and/or consumption activities performed at the site. There is however scarcely any information on food preparation and consumption activities performed in off-site areas. Taxa that were mainly prepared or consumed at off-site locations can therefore not easily be recognised as food plants. This might apply especially in the case of *Rubus* species, *Sambucus nigra* and possibly *Hippophae rhamnoides*. These taxa are edible and considered as prehistoric food plants but the evidence of their use and consumption is rather scarce.

Information on spatial aspects of preparation and consumption of plant food at any given site is very scarce. In general, the distribution of relatively large remains of plant food (*e.g.* remains of *Corylus avellana*) tends to correlate with the distribution of archaeological finds (discussed above). Clusters of plant food preparation are however not frequently recognised. Only at Schipluiden were clusters of cereal remains recognised, corresponding to clusters of remains of *Prunus spinosa*. The distribution of these food plants corresponds with the distribution of yards and was therefore interpreted as the waste of separate households (Kubiak-Martens 2006a). The clusters of food remains indicate at least that preparation of the plant food occurred at the household level. The scale of consumption however remains unclear (having a meal alone, together with the members of the household or together with the members of all households). At Wateringen 4, the distribution of macroremains from trees and shrubs could also tentatively be related to the location of the house, *i.e.* with consumption in and around the house, although the distribution may alternatively reflect the natural vegetation of the higher part of the site.

Information on the cultural context of plant food at the sites studied is difficult to grasp. As explained above, there is a relatively good level of information available on the domestic use of plants and common consumption. However, there are no contextual indications of specific uses of plant food for decoration, symbolic use, rituals or feasting. Depositions or offerings of plant food are not known either. Potential cultural aspects of food that may have affected preparation and consumption, such as taboos, gender differences, age differences and the symbolic value of taxa therefore remain unknown. The analysis of flint and isotopes may provide supplementary information here (Van Gijn in press; Smits *et al.* in prep.). Interestingly, it cannot be excluded that the variation in the evidence of food consumption between regions might be related to cultural preferences, although this might also be explained by differences in the natural vegetation (discussed above).

9.4 COMPARISON WITH OTHER MACROREGIONS

The evidence of the consumption of food plants is compared with information from similar regions dating to the same period, including the dryland soils in the Netherlands and Belgium, parts of France and Germany (with special attention to the Rhineland), Denmark and Great Britain.

9.4.1 THE NETHERLANDS AND BELGIUM

Table 9.9 shows the identifications of carbonised macroremains from various Dutch and Belgian Mesolithic dryland sites (sites without crop plants), based on Arts (1994), Baak *et al.* (2003), Bastiaens *et al.* (2005), Bos *et al.* (2005), Buurman (1978 in RADAR version 2005), Crombé (1998), Crombé *et al.* (2005), De Man (1996),

site taxon	Bergumermeer	Boxmeer-Maasbroeksche Blokken	Grootegast-Tolberter Petten	Hardenberg-Marienberg	Helmond	Jardinga	Kruishoutem Kerkakkers	Oostwinkel Mostmolen	Remouchamps Station Le Duc	Veenkoloniën	Verrebroek I	Weelde-Paardsdrank	Zutphen-Ooijerhoek
Ajuga reptans	-	-	+	-	-	-	-	-	-	-	-	-	-
Chenopodium album	-	-	-	-	-	-	-	-	-	-	+	-	-
Corylus avellana	+	+	+	+	+	+	+	+	+	+	+	+	+
Prunus sp.	+	-	-	-	-	-	-	-	-	-	-	-	-
Quercus sp.	+	-	-	-	-	-	-	-	-	-	-	-	-
Trapa natans	+	-	-	-	-	-	-	-	-	-	-	-	-

+ = present - = not present

Table 9.9 Mesolithic sites located on Dutch and Belgian dryland sites, carbonised macroremains (see paragraph 9.4.1 for sources).

Odell (1978), Perry (1996, 1999, 2002) and Van Beurden (1999).[10] The table also includes sites earlier than the Late Mesolithic. At most sites, only the shells of *Corylus avellana* were found (in a carbonised state), sometimes as a concentration or near hearths and flint concentrations. Finds other than hazelnuts are carbonised remains of *Ajuga reptans*, *Chenopodium album*, *Quercus* sp., *Prunus* sp. and *Trapa natans*.

At Mesolithic and Neolithic dryland sites, shells of *C. avellana* are often the only identified botanical macroremains or only known food plants, except when roots are identified. A summary of plant food of prehistoric temperate Europe with the emphasis on the Late Mesolithic and Neolithic indicates that *C. avellana* is most frequently found (Zvelebil 1994), but this is of course related to the use and refuse, taphonomy and research strategies (*cf.* Jones and Rowley-Conwy 2007).

At Mesolithic dryland sites, finds of seeds and fruits other than hazelnuts are reported only exceptionally. The reports hardly if not at all discuss the indications of the use and consumption of these exceptional finds (except for the indications of use of finds of *C. album*, see Bastiaens *et al.* 2005, 264). The scarcity of macroremains at dryland sites is probably to a large extent related to the poor preservation of organic material in the sandy soils. However, the lack of finds of macroremains at Mesolithic dryland sites is probably also related to excavations methods, since it is strange that hardly any carbonised remains were found other than hazelnut shells. The small chances of retrieving plant macroremains make it clearly expensive and unattractive to perform a detailed macroremains analysis. It is however very probable that the excavation of new sites will result in identification of new taxa that have not previously been found at dryland sites. The identification of roots and parenchyma is also a good additional research method for dryland sites (see discussion below).

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[10] The table is not meant to be complete. Only sites dating to the period 5500-3400 BC are meant to be included, although some sites are older. At the site Verrebroek 1, carbonised remains of other taxa were found as well, but these date to the period before 5500 BC.

Table 9.10 shows the finds of carbonised macroremains from Dutch and Belgian Neolithic dryland sites (sites with crop plants; LKB excluded)[11], based on Bakels (2003), Bakels and Rouselle (1985), Heim and Hauzeur (2002), Out in Ball and Van den Broeke (2007), Vanmontfoort (2004), Vanmontfoort *et al.* (2004) and Verhart and Louwe Kooijmans (1989). *C. avellana* is again most commonly found. There is marked variation between sites in the number of (other) taxa found in a carbonised state. The finds from Neolithic sites do not correspond with the finds of Mesolithic sites at all. The variation indicates that the plant remains from both Mesolithic and Neolithic dryland sites are strongly underrepresented.

site	Irchonwelz La bonne fortune	Vaux-et-Borset Gibour	Maastricht-Randwijk	Maastricht-Vogelzang	Maastricht-Klinkers	Heerlen-Schelsberg	Spiere-De Hel	Kemmelberg (Loker)	Ittre	Heverlee	Assent	Nijmegen-Oosterhout	Gassel	Melsele Hof te Damme
cultural group	Bqy	Bqy	R	Mi	Mi	Mi	BM	BM	BM	BM	BM	Haz	?	?
taxon														
Astereaceae	-	-	-	-	-	-	+	-	-	-	-	-	-	-
Atriplex prostrata	-	-	-	-	+	-	-	-	-	-	-	-	-	-
Chenopodium album	+	-	-	-	+	-	-	-	-	-	+	+	-	-
Corylus avellana	-	+	+	+	+	+	+	-	+	+	+	+	+	+
Fallopia convolvulus	-	-	-	-	+	-	-	-	-	-	-	-	-	-
Galium aparine	-	-	-	-	-	-	+	-	-	-	-	-	-	-
Lapsana communis	-	-	-	-	-	-	+	-	-	-	-	-	-	-
Malus sylvestris	-	-	-	-	-	+	+	-	-	-	-	-	-	-
Prunus spinosa	-	-	+	+	-	-	-	-	-	-	-	cf. +	-	-
Rosa sp.	-	-	+	-	-	-	-	-	-	-	-	-	-	-
Rubus fruticosus	-	-	-	+	-	-	-	-	-	-	-	-	-	-
Sambucus nigra/racemosa	-	-	-	-	-	-	+	-	-	-	-	-	-	-
Silene sp.	-	-	-	-	+	-	-	-	-	-	-	-	-	-
Trifolium pratense	-	-	-	-	-	-	+	-	-	-	-	-	-	-
Vicia hirsuta/tetrasperma	-	-	-	-	-	-	+	-	-	-	-	-	-	-

+ = present
- = not present
Bqy = Blicquy group
R = Rössen culture

Mi = Michelsberg culture
BM = Belgian Michelsberg
Haz = Hazendonk group
? = botanical finds are not assigned to a (single) cultural group

Table 9.10 Neolithic sites located on Dutch and Belgian dryland sites (LBK excluded), carbonised macroremains (see paragraph 9.4.1 for sources).

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[11] See the previous footnote.

At some Dutch and Belgian sites, located in the middle of the Pleistocene sand soils, waterlogged sediment has been investigated, amongst others at the sites Jardinga and Oudenaarde Donk. Jardinga is located in Friesland, the Netherlands (see chapter 6). An analysis of sample boxes sampled in a section resulted in the construction of a macroremains diagram. This diagram represents the development of the vegetation from the Late Glacial until the Atlantic, and primarily provides finds of *Alnus glutinosa*, *Betula* sp., *Carex* sp. (various species), *Potamogeton* sp. (various species), *Menyanthes trifoliata* and *Empetrum nigrum*. No carbonised remains are reported. Finds of *Tilia* sp. and *Corylus avellana* have been found in the refuse layer (Baak *et al.* 2003). The diagram shows the presence of various potential use plants, but does not give any evidence of human handling of plants. This is probably related to the aim of the macroremains diagram (reconstruction of the vegetation) and the sample location in a channel at several metres distance from the bank where human activity was concentrated. The site function and occupation intensity may have played a role as well.

The Mesolithic/Neolithic site Oudenaarde Donk is located on the levee of a fossil streambed of the river Scheldt in Belgium. The analysis of macroremains included a single sample (volume unknown) of an archaeological layer dated between 3950 and 3650 BC, *i.e.* dated to the Neolithic (De Ceunynck *et al.* 1985). There is little information concerning the site function. Moreover, there is no further information on the relationship between the sample location and the location of human activity (distance to concentrations of archaeological remains, distance to the top of the dune, distance to attachment point of the peat during occupation). The assemblage contained mainly taxa of natural wetland vegetation and some ruderals, all in a waterlogged state. The only taxon found in a carbonised state was *Alnus* sp. The investigation of the archaeological remains also resulted in finds of (waterlogged?) shells of *Corylus avellana*. Other dryland trees and shrubs were not identified except for *Sambucus nigra* (De Ceunynck *et al.* 1985). The assemblage of macroremains shows that the wetland vegetation was considerably similar to that of the wetland sites studied. Only *Alnus* sp. and *Corylus avellana* show indications of human handling, although many of the other taxa may have been used as well.

site taxon	Grootegast-Tolberter Petten	Veenkoloniën
Asteraceae	-	+
Beta vulgaris ssp. maritima	-	+
Bolboschoenus sp./ Schoenoplectus sp./Scirpus sp.	-	+
Calluna vulgaris	+	-
Dryopteris filix-mas	-	+
Equisetum sp.	-	+
Typha sp.	-	+

+ = present - = not present

Table 9.11 Sites located on the Dutch and Belgian Pleistocene sand soils, carbonised roots (*s.l.*) found in hearths (see paragraph 9.4.1 for sources).

Table 9.11 displays the identifications of the carbonised remains of roots, tubers and rhizomes found in hearths at Dutch sites other than the studied wetland sites (De Man 1996; Perry 1996, 1999, 2002). In the sandy dryland regions, the analysis of carbonised tissue from hearths is a very important source of archaeobotanical information since other botanical remains are generally absent, except for hazelnut shells. This scarcity of plant identification unfortunately prevents us from analysing whether the root taxa were present in the sites' local vegetation. The range of taxa represented in the list of tubers from dryland sites is wider than that of the Dutch wetlands and includes *Bolboschoenus* sp./*Schoenoplectus* sp./*Scirpus* sp. (*Scirpus* sp.), *Beta vulgaris* ssp. *maritima*, *Typha* sp., *Equisetum* sp., *Dryopteris filix-mas*, Asteraceae and *Calluna vulgaris*. Remains of *Equisetum* sp. ("wood and stem or rhizome") have also been found at Smakkerup Huse, a Danish Mesolithic site (Price *et al.* 2001). It is not sure whether it functioned as a food plant since ethnographic sources that would support such a status are very scarce (Perry 1996). It must be questioned whether the roots of *Calluna vulgaris* represent hearth fill deposited by humans or roots present in the soil at the moment of the use of the hearth.

9.4.2 France

At the Middle Neolithic wetland site Bercy, France (Chasséen, contemporaneous with the Swifterbant culture), the assemblage of macroremains has been investigated intensively for evidence of the use and consumption of taxa (Dietsch 1996). The criteria used were the presence of taxa in a carbonised state, the presence of taxa in archaeological features, the quantitative analysis and spatial distribution. In total, 63 samples were collected at various locations at and around the archaeological site. The material was very rich in macroremains of both dryland and wetland taxa. The assemblage of carbonised remains included *Cornus sanguinea*, *Corylus avellana*, *Quercus* sp., *Prunus spinosa*, *Crataegus monogyna* and *Vitis sylvestris* (all edible). The overall analysis indicated that the taxa found in a carbonised state all represent gathered plants, as well as *Rubus caesius* and *Rubus fruticosus*. The indications of the gathering (use) of these taxa show that the collection of wild food plants continued after the introduction of crop plants in France (at least at this site), which is similar to the data obtained from the Dutch wetland sites studied. However, the absence of wetland taxa in a carbonised state contrasts with the results of the Dutch wetland sites.

Another Neolithic French wetland site investigated in the same way is La Croix-Saint-Ouen (Seine-Oise-Marne, contemporaneous with the Vlaardingen group and Funnel Beaker culture) (Dietsch 1997). The analysis of La Croix-Saint-Ouen indicated that people deliberately gathered *Corylus avellana*, *Rubus fruticosus*, *Physalis alkekengi*, *Nuphar lutea*, *Vitis sylvestris* and *Prunus spinosa*. Again, these results correspond with and support the evidence of the gathering of food plants at the Dutch wetland sites, except for the gathering of *V. sylvestris*, which is not known from contemporaneous sites in the Netherlands.

9.4.3 Germany

Knörzer *et al.* (1999) have summarised the evidence of the gathering of food plants for the German Rhineland. There is little information available on the gathering of food plants during the Mesolithic apart from indications of the gathering of *Corylus avellana* and *Chenopodium album* (Knörzer *et al.* 1999, 71, 75). There is more evidence of the gathering of food plants during the Neolithic, although the specific evidence that supports gathering is not discussed in detail. People of the LBK gathered *Corylus avellana*, *Malus sylvestris*, *Prunus spinosa*, *Rosa* sp., *Rubus caesius*, *R. idaeus*, *Sambucus nigra* and *Sorbus aria* (the number of analysed sites is 37). People of the Großgartach culture, Rössen culture and Bischheim group gathered *Corylus avellana*, *Malus sylvestris* and *Rosa* sp. (the number of analysed sites is 2, 9 and 2 respectively). New research adds finds of *Sambucus nigra* (Arora and Zerl 2004). For the Michelsberg culture, there are indications that people gathered *Corylus avellana*, *Malus sylvestris* and *Rubus fruticosus* (the number of analysed sites is 7). A comparison of the number of sites analysed indicates that the differences between the number of food plants for each cultural group/period is probably related to the number of sites investigated for each culture/period, although it cannot be entirely excluded that the decreasing number of taxa during the Neolithic is related to changes in the role of wild food plants.

A comparison with the site Hüde I (Niedersachsen) is relevant since the Neolithic occupation at this side was partly contemporaneous with and related to the Swifterbant culture (see chapter 6). Information on the analysis of macroremains, based on two sections and some additional samples (Kampffmeyer 1983, 309 and further), is however not assigned to a single cultural period (Kampffmeyer 1983, 122, 358; Raemaekers 1999, 87). The analysis indicated the predominance of alder carr vegetation and the common presence of water plants. Potential food plants are *Corylus avellana*, *Quercus* sp., *Rubus idaeus*, *Nymphaea alba*, *Nuphar lutea* and herbs. There is, however, no information on carbonised taxa and or other indications of use of non-cultivated plants.

Other relevant sites are the sites of Wangels (Schleswig-Holstein) and Dannau (Ostholstein), both dating to the Middle Neolithic Funnel Beaker culture (Kroll 1981, 2001, 2007). The Funnel Beaker culture is not contemporaneous with the culture of the Dutch wetland sites studied but the data are still relevant because of the considerable similarity with the studied sites. At Wangels, the assemblage of waterlogged macroremains represented a combination of taxa that is comparable with the Dutch wetland sites: dryland and wetland taxa, food plants and potential arable weeds, and indicators of fresh water and brackish water. The carbonised macroremains from Wangels included *Corylus avellana*, *Rubus fruticosus*, *Chenopodium album*, *Persicaria maculosa*-type, *Phleum* sp., *Bromus arvensis/secalinus*, *Descurainia sophia*, *Vicia*-type, *Alnus glutinosa*, *Schoenoplectus lacustris*, *Potamogeton* sp., *Iris pseudacorus*, *Ruppia maritima*, *Bolboschoenus maritimus* and Poaceae. The carbonised macroremains assemblage from Dannau included *Corylus avellana*, *Rubus idaeus*, Poaceae, *Bromus secalinus*, *Fallopia convolvulus*, *Persicaria maculosa*-type, *Rumex sanguineus*-type, *Solanum dulcamara* and *Schoenoplecus lacustris*. Most of these taxa have been found in a carbonised state at least at one of the Dutch wetland sites. Contextual indications of the use of plants other than the carbonised state are not discussed for the sites.

9.4.4 DENMARK

There are many Danish Mesolithic and Neolithic sites that are comparable with the Dutch Mesolithic and Neolithic wetland sites. The assemblages of potential use plants and food plants found in a carbonised state of both macroregions are moreover very similar (see Robinson 2007; Robinson and Harild 2002 and references in these sources, see also other relevant references discussed earlier in this chapter). A major exception to the similarity is the presence of *Fragaria vesca* (Robinson and Harild 2002; Troels-Smith 1960 in Dennell 1976), a species that was probably not present in the natural vegetation in the Netherlands during the period studied. The finds of carbonised macroremains, carbonised roots, and concentrations of macroremains, the finds in hearths, and finds of macroremains in vessels at Danish sites as included in the discussion on Dutch food plants, all support the use of plants.

9.4.5 GREAT BRITAIN

Zvelebil (1994) has provided an overview of finds of potential food plants in Great Britain, but many more results may have been obtained since then. Richmond (1999, 6) argues that the indications of the use of vegetation in Mesolithic Britain are restricted but archaeobotanists may have developed a different view on this subject. Robinson (2000) and Jones and Rowley-Conwy (2007) offer a detailed overview of the finds of carbonised macroremains of potential food plants at Neolithic sites in Great Britain, including *Corylus avellana*, *Crataegus monogyna*, *Malus sylvestris/Pyrus communis* ssp. *pyraster*, *Prunus spinosa*, *Rubus* sp., *Sambucus* sp. and *Vitis* sp. These taxa probably represent only the taxa for which the best indications of consumption are available. The question is which other taxa might be identified as potential or probable food plants when contextual evidence is analysed in further detail.

region	Central river				Western river		Coastal			
site taxon	Polderweg	De Bruin	Brandwijk-Kerkhof	Hazendonk	Randstadrail CS	Bergschenhoek	Ypenburg	Schipluiden	Wateringen 4	Rijswijk-A4
Acer campestre	-	+	-	-	-	-	-	-	-	-
Agrostis sp./Poa sp.	-	-	-	-	-	-	-	+	-	-
Ajuga reptans	-	-	-	+	-	-	-	-	-	-
Alisma sp.	-	-	-	-	+	-	-	-	-	-
Alnus glutinosa	+	-	+	+	-	-	-	-	-	-
Alnus glutinosa, cones	-	-	+	+	-	-	-	-	+	-
Alnus sp., male catkins	-	-	-	-	-	-	-	+	-	-
Althaea officinalis	-	-	-	-	-	-	-	+	-	-
Althaea sp./Malva sp.	-	-	-	-	-	-	-	+	-	-
Anagallis sp./Glaux sp.	-	-	-	-	-	-	-	-	-	-
Apiaceae	-	-	-	-	-	-	-	-	-	-
Apium graveolens	-	-	-	-	-	-	-	+	cf. +	-
Arenaria serpyllifolia ssp. serpyllifolia	-	-	-	-	-	-	-	-	-	-
Asteraceae	-	-	-	-	-	-	-	-	-	-
Atriplex littoralis-type	-	-	-	-	-	-	-	+	-	-
Atriplex littoralis/prostrata	-	-	-	-	-	-	-	-	-	-
Atriplex patula/prostrata	-	-	-	-	-	-	-	+	-	-
Atriplex sp.	-	-	-	-	-	+	-	-	-	-
Atriplex sp./Chenopodium sp.	-	-	-	-	-	-	-	+	-	-
Berula erecta	-	-	-	+	-	-	-	-	-	-
Bolboschoenus maritimus	-	-	-	-	-	-	-	-	+	-
Bolboschoenus maritimus, stem fragm.	-	-	-	-	-	-	-	+	-	-
Bolboschoenus sp./ Schoenoplectus sp./Scirpus sp.	-	-	-	-	-	+	-	-	-	-
Brassica rapa	-	-	-	-	-	-	-	+	-	-
Brassica sp./Sinapis sp.	-	-	-	+	-	-	-	-	-	-
Bromus secalinus-type	-	-	-	+	-	-	-	-	-	-
Calystegia sepium	-	-	-	-	-	+	-	-	-	-
Capsella bursa-pastoris	-	-	-	+	+	-	-	cf. +	-	-
Carex sp.	-	-	-	-	-	-	-	+	-	-
Carex acuta	-	-	-	-	-	-	-	-	-	-
Carex acutiformis/rostrata	-	-	-	-	-	-	-	-	-	-
Carex distans	-	-	-	-	-	-	-	+	-	-
Carex flacca/panicea	-	-	-	-	-	-	-	-	-	-
Carex otrubae	-	-	-	-	-	-	-	+	-	-
Carex paniculata	-	-	-	-	-	-	-	-	-	-
Carex pseudocyperus	-	-	-	-	-	-	-	-	-	-

Table 9.1 part 1a.

region	Central river				Western river		Coastal			
site taxon	Polderweg	De Bruin	Brandwijk-Kerkhof	Hazendonk	Randstadrail CS	Bergschenhoek	Ypenburg	Schipluiden	Wateringen 4	Rijswijk-A4
Carex riparia	-	-	-	-	-	-	-	-	-	-
Carex sp., bicarpellate	-	-	-	-	-	-	-	-	+	-
Carex sp., tricarpellate	-	-	-	-	-	-	-	-	+	-
Caryophyllaceae	-	-	-	-	-	-	-	+	-	-
Caryophyllaceae/Chenopodiaceae	-	-	-	-	-	-	-	-	-	-
Cerastium sp.	-	-	-	-	-	-	-	+	-	-
Ceratophyllum demersum	-	-	-	-	-	-	-	+	+	-
Ceratophyllum submersum	-	-	-	-	-	-	-	-	-	+
Cerealia indet./ Phragmites sp., stem fragments	-	-	-	-	-	-	+	-	-	-
Chaerophyllum temulum	-	-	-	+	-	-	-	-	-	-
Chelidonium majus	-	-	-	-	-	-	-	-	-	-
Chenopodiaceae	-	-	-	-	-	-	-	+	-	-
Chenopodium sp.	-	-	-	-	-	-	-	-	-	-
Chenopodium album	-	-	+	+	+	-	+	-	+	-
Chenopodium cf. ficifolium	-	-	-	-	-	-	-	-	+	-
Chenopodium glaucum/rubrum	-	-	-	-	-	-	-	-	-	-
Chenopodium sp./Stellaria sp.	-	-	-	-	-	-	-	-	+	-
Cladium mariscus	-	-	-	-	-	+	-	+	-	-
Claviceps purpurea	-	-	-	-	-	-	-	-	-	-
Cornus sanguinea	-	+	+	+	+	-	-	+	-	-
Corylus avellana	+	+	+	+	+	-	-	+	+	+
Crataegus monogyna	-	+	-	+	-	-	-	+	-	-
Echinochloa crus-galli	-	-	-	-	+	-	-	-	-	-
Eleocharis palustris/uniglumis	-	-	-	-	-	-	-	+	-	-
Elytrigia repens	-	-	-	+	-	-	-	-	-	-
Erica tetralix	-	-	-	-	-	-	-	-	-	-
Eupatorium cannabinum	-	-	-	-	-	-	-	-	+	-
cf. Euphorbia palustris	-	-	-	+	-	-	-	-	-	-
Fabaceae	-	-	-	-	-	-	-	-	-	-
Fallopia convolvulus	-	-	-	+	-	-	-	-	+	-
Fallopia dumetorum	-	-	-	-	-	-	-	-	-	-
Fallopia sp./Persicaria sp./ Polygonum sp./Rumex sp.	-	-	-	-	-	-	-	-	+	-
Galium sp.	-	-	-	-	-	-	cf. +	+	+	-
Galium aparine	-	+	+	+	+	-	-	+	+	+

Table 9.1 part 1b.

region	Central river				Western river		Coastal			
taxon / site	Polderweg	De Bruin	Brandwijk-Kerkhof	Hazendonk	Randstadrail CS	Bergschenhoek	Ypenburg	Schipluiden	Wateringen 4	Rijswijk-A4
Galium cf. mollugo	-	-	-	-	-	-	-	-	+	-
Galium odoratum	-	-	-	+	-	-	-	-	-	-
Galium palustre	-	-	+	-	-	-	-	-	-	-
Galium spurium	-	-	-	+	-	-	-	-	-	-
Galium tricornutum	-	-	-	-	-	-	-	+	-	-
Hedera helix	+	-	-	-	-	-	-	-	-	-
Hippuris vulgaris	-	-	-	-	-	-	-	-	-	-
Hordeum marinum	-	-	-	-	-	-	-	+	-	-
Iris pseudacorus	+	-	-	+	-	+	-	-	-	-
Lamiaceae	-	-	-	-	-	-	-	-	-	-
Lapsana communis	-	-	-	-	-	-	-	-	-	-
Lathyrus sp./Vicia sp.	-	-	-	+	-	-	-	+	-	-
Luzula sp.	-	-	-	-	-	-	-	+	-	-
Lychnis flos-cuculi	-	-	-	-	-	-	-	-	-	-
Lycopus europaeus	+	-	+	-	-	-	-	-	-	-
Lysimachia vulgaris	-	-	-	-	-	-	-	-	-	-
Lythrum salicaria	-	-	-	-	-	-	-	-	-	-
Malus sylvestris	+	+	-	+	-	-	-	+	cf. +	-
Malva sp.	-	-	-	-	-	-	-	+	-	-
Malva neglecta	-	-	-	-	-	-	+	-	-	-
Medicago lupulina	-	-	-	-	-	-	-	+	-	-
Mentha sp.	-	-	-	-	-	-	-	-	-	-
Mentha aquatica/arvensis	-	-	-	-	-	-	-	+	-	-
Menyanthes trifoliata	-	-	-	+	-	-	-	-	-	-
Moehringia trinervia	-	-	-	-	-	-	-	+	-	-
Myosotis sp.	-	-	-	-	-	-	-	-	-	-
Najas marina	-	-	-	-	-	-	-	-	-	-
Nuphar lutea	-	-	-	-	-	-	-	-	-	-
Nymphaea alba	-	-	+	+	-	-	-	-	-	-
Oenanthe aquatica	-	-	-	+	-	-	-	-	-	-
Persicaria lapathifolia	-	-	-	+	+	-	-	-	+	-
Persicaria maculosa	-	-	-	+	-	-	-	+	-	-
Persicaria maculosa/minor	-	-	-	-	-	-	-	-	+	-
Persicaria minor	-	-	-	-	-	-	-	-	-	-
Persicaria mitis	-	-	-	-	-	-	-	+	-	-
cf. Persicaria sp.	-	-	-	-	-	-	-	+	-	-

Table 9.1 part 1c.

region	Central river				Western river		Coastal			
taxon / site	Polderweg	De Bruin	Brandwijk-Kerkhof	Hazendonk	Randstadrail CS	Bergschenhoek	Ypenburg	Schipluiden	Wateringen 4	Rijswijk-A4
Phleum sp./Poa annua	-	-	-	+	-	-	-	-	-	-
Phragmites australis	-	-	+	-	cf. +	+	-	-	-	-
Phragmites australis, stem fragm.	-	-	+	cf. +	+	+	-	+	+	-
Phragmites sp./Poa sp.	-	-	-	-	-	-	-	-	+	-
Plantago major	-	-	-	-	-	-	-	+	-	-
Poa sp.	-	-	+	-	-	-	-	+	+	-
Poaceae	-	+	-	-	-	-	-	-	+	+
Poaceae, lemma bases	-	-	-	-	-	-	-	+	-	-
Poaceae, stem fragments	-	-	-	-	-	-	+	+	-	-
Polygonaceae	-	-	-	-	-	-	-	-	-	-
Polygonum sp.	-	-	-	-	-	-	-	-	-	-
Polygonum aviculare	-	-	-	-	-	-	-	+	cf. +	-
Potamogeton sp.	-	-	-	-	-	-	-	+	-	-
Potamogeton cf. acutifolius	-	-	-	-	-	-	-	-	-	-
Potamogeton cf. natans	-	-	-	-	-	-	-	+	-	-
Potentilla sp.	-	-	-	-	-	-	-	-	-	-
Potentilla reptans	-	-	-	-	-	-	-	-	-	-
Prunus spinosa	-	-	-	+	-	-	+	+	+	-
Quercus sp.	-	+	-	+	cf. +	-	-	-	-	-
Quercus sp., cupulae	-	-	+	-	-	-	-	-	-	-
Ranunculus ficaria, tubers	+	+	-	+	+	-	-	-	-	-
Rhamnus cathartica	-	-	-	-	-	-	-	-	-	-
Rosa sp.	-	-	-	-	-	-	-	+	+	-
Rosaceae	-	+	-	+	-	-	-	-	-	-
Rubus sp.	-	-	-	-	-	-	-	-	-	-
Rubus fruticosus	-	-	-	+	-	-	-	-	-	-
Rubus idaeus	-	-	-	-	-	-	-	-	-	-
Rumex sp.	-	-	-	-	-	-	-	+	-	-
Rumex cf. crispus	-	-	-	+	-	-	-	-	-	-
Rumex crispus-type	-	-	-	-	-	-	-	+	-	-
Rumex obtusifolius	-	-	-	-	-	-	-	-	-	-
Rumex sp.	-	-	+	+	-	-	-	-	+	-
Ruppia maritima	-	-	-	-	-	-	-	+	-	-
Schoenoplectus lacustris	-	+	-	+	+	-	-	+	+	-
Schoenoplectus lacustris/ tabernaemontani	-	+	+	-	-	-	-	+	-	-
Schoenoplectus tabernaemontani	-	-	+	-	-	-	-	+	+	-
Scirpus sp.	-	-	-	-	-	-	-	-	+	-

Table 9.1 part 1d.

region	Central river				Western river		Coastal			
taxon / site	Polderweg	De Bruin	Brandwijk-Kerkhof	Hazendonk	Randstadrail CS	Bergschenhoek	Ypenburg	Schipluiden	Wateringen 4	Rijswijk-A4
Scrophularia sp.	-	-	-	-	-	-	-	-	-	-
Silene dioica	-	-	-	-	-	-	-	-	-	-
Sisymbrium officinale	-	-	-	-	-	-	-	+	-	-
Sium latifolium	+	-	-	-	-	-	-	-	-	-
Solanum nigrum	-	-	+	+	-	-	-	+	+	-
Sparganium erectum	-	-	+	+	-	-	-	-	-	-
Sparganium emersum/natans	-	-	-	-	-	-	-	+	-	-
Sparganium sp.	-	-	-	-	-	-	-	-	-	-
Stachys palustris	+	-	-	-	-	-	-	-	-	-
Stellaria sp.	-	-	-	-	-	-	-	+	-	-
Stellaria aquatica/media	-	-	-	-	-	-	-	+	-	-
Stellaria media	-	-	-	-	-	-	-	+	-	-
Stellaria neglecta	-	-	-	-	+	-	-	-	-	-
Stellaria palustris	-	-	-	-	-	-	-	-	-	-
Suaeda maritima	-	-	-	-	-	-	-	+	-	-
Tilia platyphyllos	-	+	-	+	-	-	-	-	-	-
Tilia sp.	-	-	-	+	-	-	-	-	-	-
Torilis japonica	-	-	-	-	-	-	-	+	-	-
Trapa natans	+	+	+	+	+	-	-	-	-	-
Trifolium sp.	-	-	-	-	-	-	-	-	-	-
Trifolium arvense/campestre/dubium	-	-	-	-	-	-	-	-	-	-
Trifolium campestre	-	-	-	-	-	-	-	+	-	-
Trifolium repens	-	-	-	-	-	-	-	+	-	-
Typha sp.	-	-	-	-	cf. +	-	-	-	-	-
Urtica dioica	-	-	-	+	-	-	-	+	-	-
Veronica sp.	-	-	-	-	-	-	-	-	-	-
Veronica arvensis	-	-	-	-	-	-	-	+	-	-
Veronica austriaca/chamaedrys	-	-	-	+	-	-	-	-	-	-
Veronica hederifolia	-	-	-	+	-	-	-	-	-	-
Veronica officinalis	-	-	-	-	-	-	-	-	-	-
Viburnum opulus	-	-	-	+	-	-	-	-	-	-
Vicia hirsuta	-	-	-	-	-	-	-	+	+	-
Vicia hirsuta/tetrasperma	-	-	-	-	-	-	-	-	+	-
Vicia sepium	-	-	-	-	-	-	-	-	-	-
Vicia sp.	-	-	-	-	-	-	-	-	+	-

+ = present
- = not present

Table 9.1 part 1e.

region	Eem	Vecht					other
site taxon	Hoge Vaart-A27	Urk-E4	Schokland-P14	Swifterbant-S3	Schokkerhaven-E170	Emmeloord-J97	Doel Deurganckdok -sector B
Acer campestre	-	-	-	-	-	-	-
Agrostis sp./Poa sp.	+	-	-	-	-	-	-
Ajuga reptans	+	-	-	-	-	-	-
Alisma sp.	+	-	-	-	-	-	-
Alnus glutinosa	+	-	-	-	-	-	-
Alnus glutinosa, cones	-	-	-	-	-	-	-
Alnus sp., male catkins	-	-	-	-	-	-	-
Althaea officinalis	-	-	-	-	-	-	-
Althaea sp./Malva sp.	-	-	-	-	-	-	-
Anagallis sp./Glaux sp.	+	-	-	-	-	-	-
Apiaceae	+	-	-	-	-	-	-
Apium graveolens	-	-	-	-	-	-	-
Arenaria serpyllifolia ssp. serpyllifolia	+	-	-	-	-	-	-
Asteraceae	+	-	-	-	-	-	-
Atriplex littoralis-type	-	-	-	-	-	-	-
Atriplex littoralis/prostrata	+	-	-	-	-	-	-
Atriplex patula/prostrata	+	-	-	-	-	+	-
Atriplex sp.	-	-	-	-	-	-	-
Atriplex sp./Chenopodium sp.	-	-	-	-	-	-	-
Berula erecta	-	-	-	-	-	-	-
Bolboschoenus maritimus	-	-	-	-	-	-	-
Bolboschoenus maritimus, stem fragm.	-	-	-	-	-	-	-
Bolboschoenus sp./ Schoenoplectus sp./Scirpus sp.	+	-	-	-	-	-	-
Brassica rapa	-	-	-	-	-	-	-
Brassica sp./Sinapis sp.	-	-	-	-	-	-	-
Bromus secalinus-type	-	-	-	-	-	-	-
Calystegia sepium	-	-	-	-	-	-	-
Capsella bursa-pastoris	-	-	-	-	-	-	-
Carex sp.	+	-	-	-	-	-	-
Carex acuta	+	-	-	-	-	-	-
Carex acutiformis/rostrata	+	-	-	-	-	-	-
Carex distans	-	-	-	-	-	-	-
Carex flacca/panicea	+	-	-	-	-	-	-
Carex otrubae	-	-	-	-	-	-	-
Carex paniculata	+	-	-	-	-	-	-
Carex pseudocyperus	+	-	-	-	-	-	-

Table 9.1 part 2a.

region	Eem	Vecht					other
site taxon	Hoge Vaart-A27	Urk-E4	Schokland-P14	Swifterbant-S3	Schokkerhaven-E170	Emmeloord-J97	Doel Deurganckdok -sector B
Carex riparia	+	-	-	-	-	-	-
Carex sp., bicarpellate	-	-	-	-	-	-	-
Carex sp., tricarpellate	-	-	-	-	-	-	-
Caryophyllaceae	+	-	-	-	-	-	-
Caryophyllaceae/Chenopodiaceae	+	-	-	-	-	-	-
Cerastium sp.	+	-	-	-	-	-	-
Ceratophyllum demersum	-	-	-	-	-	-	-
Ceratophyllum submersum	-	-	-	+	-	-	-
Cerealia indet./ Phragmites sp., stem fragments	-	-	-	-	-	-	-
Chaerophyllum temulum	-	-	-	-	-	-	-
Chelidonium majus	+	-	-	-	-	-	-
Chenopodiaceae	+	-	-	-	-	-	-
Chenopodium sp.	+	-	-	-	-	-	-
Chenopodium album	-	-	-	-	-	-	-
Chenopodium cf. ficifolium	-	-	-	-	-	-	-
Chenopodium glaucum/rubrum	+	-	+	-	-	-	-
Chenopodium sp./Stellaria sp.	-	-	-	-	-	-	-
Cladium mariscus	+	+	-	-	-	-	+
Claviceps purpurea	-	-	-	+	-	-	-
Cornus sanguinea	-	-	-	-	-	-	+
Corylus avellana	+	+	+	+	-	-	+
Crataegus monogyna	-	+	-	+	-	-	+
Echinochloa crus-galli	-	-	-	-	-	-	-
Eleocharis palustris/uniglumis	-	-	-	-	-	-	-
Elytrigia repens	-	-	-	-	-	-	-
Erica tetralix	+	-	-	-	-	-	-
Eupatorium cannabinum	+	-	-	-	-	-	-
cf. Euphorbia palustris	-	-	-	-	-	-	-
Fabaceae	+	-	-	-	-	-	-
Fallopia convolvulus	-	-	-	-	-	-	-
Fallopia dumetorum	+	-	-	-	-	-	-
Fallopia sp./Persicaria sp./ Polygonum sp./Rumex sp.	-	-	-	-	-	-	-
Galium sp.	-	-	-	-	-	-	-
Galium aparine	+	+	-	+	-	-	+

Table 9.1 part 2b.

region	Eem	Vecht					other
taxon / site	Hoge Vaart-A27	Urk-E4	Schokland-P14	Swifterbant-S3	Schokkerhaven-E170	Emmeloord-J97	Doel Deurganckdok -sector B
Galium cf. mollugo	-	-	-	-	-	-	-
Galium odoratum	-	-	-	-	-	-	-
Galium palustre	-	-	-	-	-	-	-
Galium spurium	-	-	-	-	-	-	-
Galium tricornutum	-	-	-	-	-	-	-
Hedera helix	-	-	-	-	-	-	+
Hippuris vulgaris	+	-	-	-	-	-	-
Hordeum marinum	-	-	-	-	-	-	-
Iris pseudacorus	-	-	-	-	-	-	-
Lamiaceae	-	-	-	-	-	-	+
Lapsana communis	+	-	-	-	-	-	-
Lathyrus sp./Vicia sp.	-	-	-	-	-	-	+
Luzula sp.	-	-	-	-	-	-	-
Lychnis flos-cuculi	+	-	-	-	-	-	-
Lycopus europaeus	+	-	-	-	-	-	-
Lysimachia vulgaris	+	-	-	-	-	-	-
Lythrum salicaria	+	-	-	-	-	-	-
Malus sylvestris	+	+	-	+	-	-	+
Malva sp.	-	-	-	-	-	-	-
Malva neglecta	-	-	-	-	-	-	-
Medicago lupulina	-	-	-	-	-	-	-
Mentha sp.	+	-	-	-	-	-	-
Mentha aquatica/arvensis	+	-	-	-	-	-	-
Menyanthes trifoliata	+	-	-	-	-	-	-
Moehringia trinervia	+	-	-	-	-	-	-
Myosotis sp.	+	-	-	-	-	-	-
Najas marina	+	-	-	-	-	-	-
Nuphar lutea	+	-	-	-	-	-	-
Nymphaea alba	+	-	-	-	-	-	-
Oenanthe aquatica	+	-	-	+	-	-	-
Persicaria lapathifolia	-	-	-	-	-	-	-
Persicaria maculosa	-	-	-	-	-	-	-
Persicaria maculosa/minor	-	-	-	-	-	-	-
Persicaria minor	+	-	-	-	-	-	-
Persicaria mitis	-	-	-	-	-	-	-
cf. Persicaria sp.	-	-	-	-	-	-	-

Table 9.1 part 2c.

region	Eem	Vecht					other
taxon / site	Hoge Vaart-A27	Urk-E4	Schokland-P14	Swifterbant-S3	Schokkerhaven-E170	Emmeloord-J97	Doel Deurganckdok -sector B
Phleum sp./Poa annua	-	-	-	-	-	-	-
Phragmites australis	-	-	-	-	-	-	-
Phragmites australis, stem fragm.	-	-	-	+	-	-	-
Phragmites sp./Poa sp.	-	-	-	-	-	-	-
Plantago major	-	-	-	-	-	-	-
Poa sp.	-	-	-	-	-	-	-
Poaceae	+	-	-	-	+	-	-
Poaceae, lemma bases	-	-	-	-	-	-	-
Poaceae, stem fragments	-	+	-	-	-	-	-
Polygonaceae	+	-	-	-	-	-	-
Polygonum sp.	+	-	-	-	+	-	-
Polygonum aviculare	-	-	-	-	-	-	-
Potamogeton sp.	+	-	-	-	-	-	-
Potamogeton cf. acutifolius	+	-	-	-	-	-	-
Potamogeton cf. natans	-	-	-	-	-	-	-
Potentilla sp.	+	-	-	-	-	-	-
Potentilla reptans	+	-	-	-	-	-	-
Prunus spinosa	-	-	-	-	-	-	+
Quercus sp.	+	-	+	-	-	-	+
Quercus sp., cupulae	-	+	-	-	-	-	-
Ranunculus ficaria, tubers	+	-	-	-	-	-	-
Rhamnus cathartica	+	-	-	-	-	-	-
Rosa sp.	-	-	-	-	-	-	-
Rosaceae	+	-	-	-	-	-	+
Rubus sp.	-	-	+	-	-	-	-
Rubus fruticosus	-	-	-	-	-	-	-
Rubus idaeus	+	-	-	-	-	-	-
Rumex sp.	+	-	-	-	-	-	-
Rumex cf. crispus	-	-	-	-	-	-	-
Rumex crispus-type	-	-	-	-	-	-	-
Rumex obtusifolius	+	-	-	-	-	-	-
Rumex sp.	-	-	-	-	-	-	-
Ruppia maritima	+	-	-	-	-	-	-
Schoenoplectus lacustris	+	-	-	-	-	-	-
Schoenoplectus lacustris/ tabernaemontani	-	-	-	-	-	-	-
Schoenoplectus tabernaemontani	-	-	-	-	-	-	-
Scirpus sp.	-	-	-	-	-	-	-

Table 9.1 part 2d.

region	Eem	Vecht					other
taxon / site	Hoge Vaart-A27	Urk-E4	Schokland-P14	Swifterbant-S3	Schokkerhaven-E170	Emmeloord-J97	Doel Deurganckdok -sector B
Scrophularia sp.	+	-	-	-	-	-	-
Silene dioica	+	-	-	-	-	-	-
Sisymbrium officinale	-	-	-	-	-	-	-
Sium latifolium	-	-	-	-	-	-	-
Solanum nigrum	-	-	-	-	-	-	-
Sparganium erectum	+	-	-	-	+	-	-
Sparganium emersum/natans	-	-	-	-	-	-	-
Sparganium sp.	-	-	-	-	-	-	+
Stachys palustris	-	-	-	-	-	-	-
Stellaria sp.	-	-	-	-	-	-	-
Stellaria aquatica/media	-	-	-	-	-	-	-
Stellaria media	-	-	-	-	-	-	-
Stellaria neglecta	+	-	-	-	-	-	-
Stellaria palustris	+	-	-	-	-	-	-
Suaeda maritima	-	-	-	-	-	-	-
Tilia platyphyllos	-	-	-	-	-	-	-
Tilia sp.	-	-	-	-	-	-	-
Torilis japonica	-	-	-	-	-	-	-
Trapa natans	-	-	+	-	-	-	-
Trifolium sp.	+	-	-	-	-	-	-
Trifolium arvense/campestre/dubium	+	-	-	-	-	-	-
Trifolium campestre	-	-	-	-	-	-	-
Trifolium repens	-	-	-	-	-	-	-
Typha sp.	+	-	-	-	-	-	-
Urtica dioica	+	-	-	-	-	-	-
Veronica sp.	+	-	-	-	-	-	-
Veronica arvensis	-	-	-	-	-	-	-
Veronica austriaca/chamaedrys	-	-	-	-	-	-	-
Veronica hederifolia	-	-	-	-	-	-	-
Veronica officinalis	+	-	-	-	-	-	-
Viburnum opulus	-	-	-	-	-	-	-
Vicia hirsuta	-	-	-	-	-	-	-
Vicia hirsuta/tetrasperma	-	+	-	-	-	-	-
Vicia sepium	+	-	-	-	-	-	-
Vicia sp.	+	cf. +	-	-	-	-	-

+ = present - = not present

Table 9.1 The sites studied, macroremains found in a carbonised state, part 2e.