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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1. Introduction

1.1. Background

This thesis concerns the study of the neolithisation process in the Dutch wetlands by means of archaeobotanical analysis. The study forms part of the research project 'The Malta Harvest: From Hardinxveld to Noordhoorn – from forager to farmer', described as 'A new specification of Late Mesolithic and Early Neolithic culture and society of the Lower Rhine Basin, 6000-3500 cal BC, in their North European context'. The research project has been performed at the Faculty of Archaeology, Leiden University, and was financed by the Netherlands Organisation for Scientific Research (NWO). In 1992, the European Union agreed in Valletta, Malta, on a treaty that regulates the excavation of archaeological sites in the case of disturbing and destroying activities. Many locations in the Netherlands have been investigated as a result of this and are recognised as Malta sites. The goal of the research project is the analysis and synthesis of Malta sites in context of earlier excavated sites.

1.2 Problem, goal and questions

The neolithisation of Europe involved the incorporation of agriculture and changes in mobility, social practices and material culture, and possibly a change in attitude towards nature (Hodder 1990). The changes in subsistence and material culture that were part of the neolithisation process probably resulted in the long term in various changes in plant use. For example, the introduction of pottery presumably led to a decreased use of plants for basketry, the introduction of new tools such as polished stone axes resulted in changes in wood working techniques and the introduction of crop plants led to a decreased importance of other plants.

Figure 1.1 shows the distinguished cultural groups of Northwestern Europe as well as their stage of neolithisation. Figures 1.2-1.5 show the geographical extent of the main developments in the Lower Rhine Basin. The first Neolithic culture in Northwestern Europe was the Linearbandkeramik culture (LBK), whose most northwestern extension were the loess soils in the very southeastern part of the Netherlands around *c.* 5300 BC. The main subsequent cultures that are relevant for the neolithisation of the Netherlands are the Blicquy group and the Rössen culture from *c.* 4900 BC onward, and the Michelsberg culture from *c.* 4300 BC.

The neolithisation process of the sandy dryland regions in the eastern and southern parts of the Netherlands and in Belgium is hardly known due to poor preservation of organic material and the frequent occurrence of palimpsests (though see Crombé and Vanmontfort 2007; Vanmontfort 2007; Verhart 2000). The precise cultural identity of the people occupying the sandy soils is poorly understood. In contrast, the neolithisation of the wetlands is more throroughly documented due to the good preservation of organic material and stratigraphical separation of various occupation phases. The neolithisation of the wetlands was a gradual acculturation process, characterised by the introduction of pottery at *c.* 5000 BC, the introduction of domestic animals around between *c.* 4700 and 4450 BC and the introduction of crop plants afterwards. Evidence of sedentism is available from *c.* 3600 BC onwards (Louwe Kooijmans 2006b, 2007). The subsistence of the people living in the wetlands can be characterised as a broad-spectrum economy, based on a combination of hunting, fishing, fowling and gathering, extended with animal husbandry and crop cultivation over time (Louwe Kooijmans 1993b). The Late Mesolithic transformed into the Swifterbant culture, which covered the vast plain from northwestern Belgium far into northwestern Germany in the period *c.* 5000-3400 BC. It is defined on the basis of its newly developed characteristic pottery (Raemaekers 1999). It is possible to distinguish a northern group of the Swifterbant culture and a southern group, based on subtle differences in pottery and flint characteristics. The Swifterbant culture can be divided into an early, middle and late phase.

The early phase corresponds with a ceramic Late (Final) Mesolithic as distinguished in the wetlands, while the middle phase is characterised by the introduction of domestic animals and corresponds with the local Early Neolithic. At the time of the late Swifterbant phase, the Middle Neolithic Hazendonk group is distinguished in the southern part of the Dutch wetlands from *c.* 3700 BC (Louwe Kooijmans 2005; Raemaekers 1999). The local Late Neolithic in this study refers to the period following after *c.* 3400 BC and to cultural groups later than the Swifterbant culture and Hazendonk group.[1]

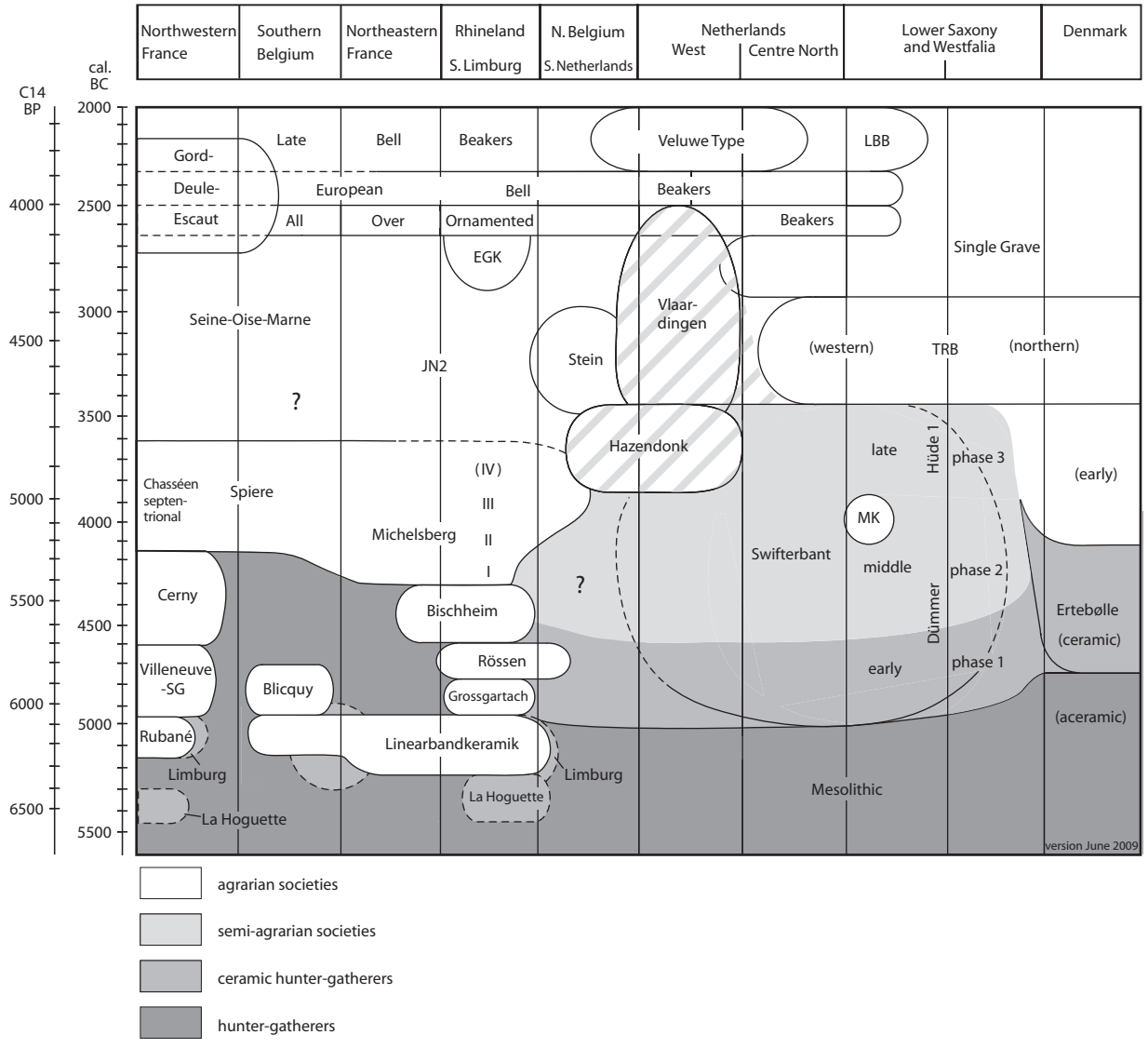
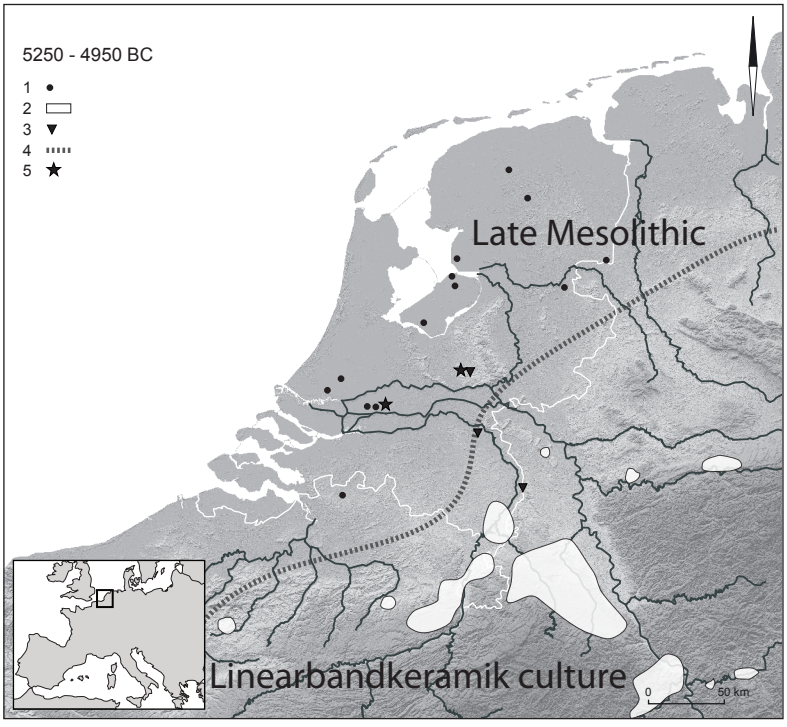


Figure 1.1 Northwestern Europe, chronologic and geographic overview of the Neolithic cultures (L.P. Louwe Kooijmans 2009).

1 The Neolithic stages (Early, Middle and Late Neolithic) of the Dutch wetlands in this text do not follow the classification by Louwe Kooijmans *et al.* (2005) in order to retain the consistency with earlier publications of the author.



1) Late Mesolithic sites with a ^{14}C range reaching up to this phase,

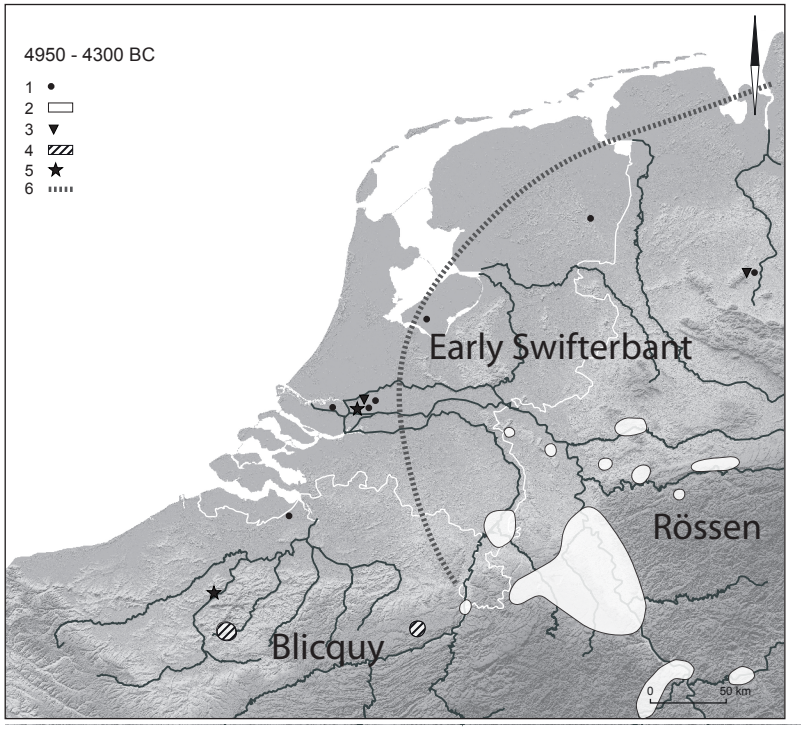
2) Linearbandkeramik settlement areas,

3) non-Swifterbant pottery (LBK, *Begleitkeramik*),

4) northern limit of isolated LBK adzes,

5) earliest Swifterbant pottery.

Figure 1.2 Lower Rhine Basin, overview of the cultures and contact finds during *c.* 5250-4950 BC.



1) Early Swifterbant sites,

2) Rössen settlement areas,

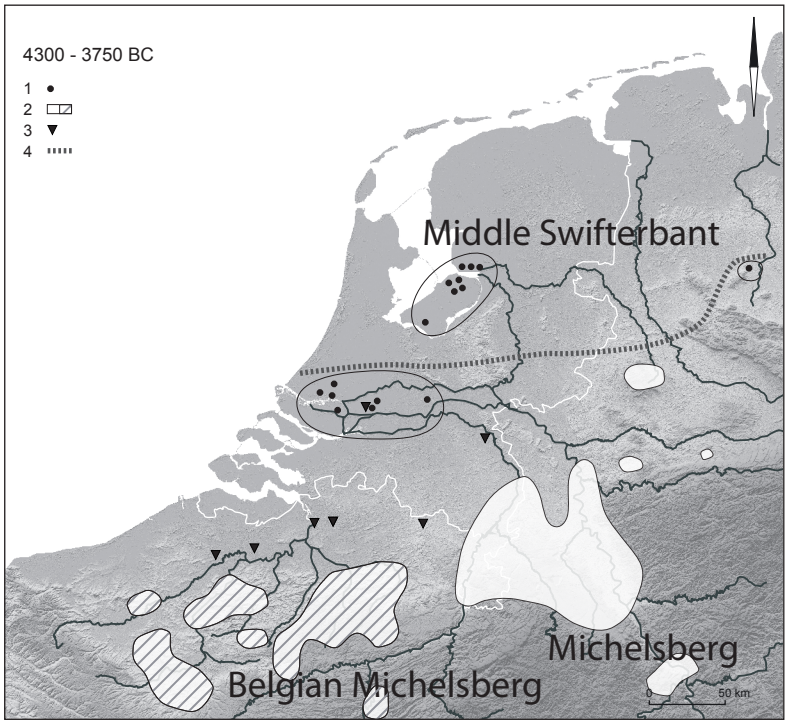
3) Rössen pottery,

4) Blicquy settement areas,

5) Blicquy pottery,

6) northwestern limit of Rössen shaft hole wedges (*Breitkeile*).

Figure 1.3 Lower Rhine Basin, overview of the cultures and contact finds during *c.* 4950-4300 BC.



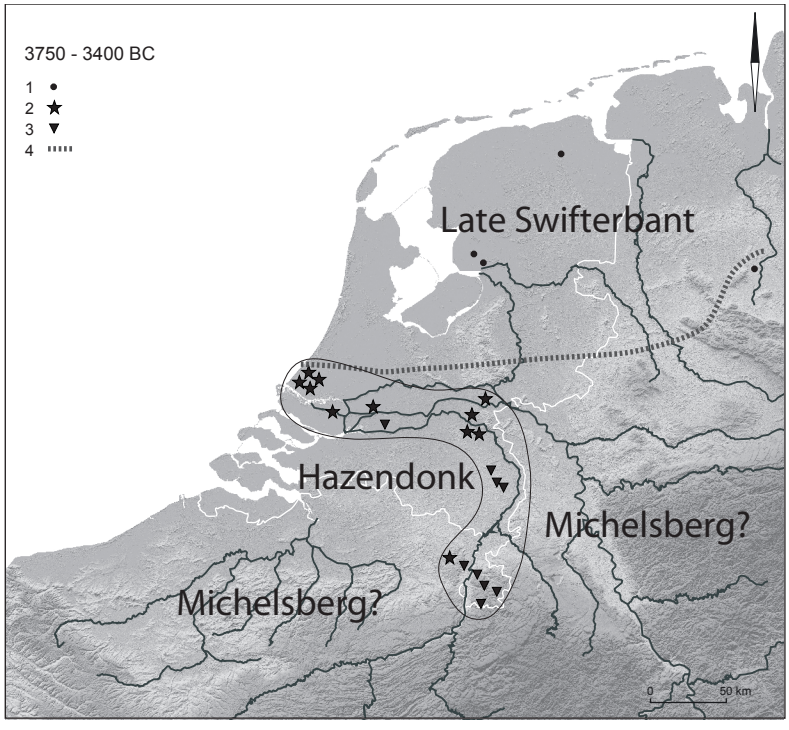
1) Middle Swifterbant sites,

2) Michelsberg and Belgian Michelsberg settlement areas,

3) Michelsberg pottery,

4) northern limit of artefacts on mined western flint.

Figure 1.4 Lower Rhine Basin, overview of the cultures and contact finds during *c.* 4300-3750 BC.



1) Late Swifterbant sites,

2) Hazendonk sites,

3) few Hazendonk pottery sherds,

4) northern limit of artefacts on mined western flint.

(figures 1.2-1.5: research project 'From Hardinxveld to Noordhoorn' based on a map by W. Laan, Archol).

Figure 1.5 Lower Rhine Basin, overview of the cultures and contact finds during *c.* 3750-3400 BC.

The neolithisation process of the wetlands can be described with the help of the model of Zvelebil (1986), that characterises the availability phase, the substitution phase and the consolidation phase, each phase being defined by the degree of intensity of use of domesticates. The availability phase of the neolithisation process is characterised by evidence of the exchange of resources and information, and the implementation of agriculture to a modest extent (less than 5%). This phase started in the Dutch wetlands with the first indications of contact with LBK farmers during the Late Mesolithic. From then onwards, agriculture could have been introduced in the wetlands by the LBK or by following cultural groups, but this did not happen, as discussed above. The substitution phase is characterised by partial incorporation of domestic animals and crop plants in the economy (domestic bone counts between 5 and 50%). This phase started with introduction of domestic animals and crop plants, after the Swifterbant culture had come into existence, and continued into the Hazendonk group. In the consolidation phase the importance of domesticates is more than 50%. This phase is presumably reached only after the studied period (Louwe Kooijmans 1993a, b, 1998; Raemaekers 2003).

Various aspects of the neolithisation of the major part of Europe by the spread of the LBK, including aspects such as human environmental impact and subsistence, are relatively well known thanks to the large geographical extent of the LBK and the large number of relevant studies (Bakels 1978; Grooth and Van de Velde 2005; Lüning 2000). Our knowledge of the neolithisation process of the remaining parts of the Netherlands is, however, more fragmented, including the knowledge of the plant-based part of the subsistence and material culture. The data from the wetland sites form the primary sources of information, although it is highly questionable whether the obtained information is representative of the dryland regions (Louwe Kooijmans 1993b).

The aim of this study is to improve the knowledge about the neolithisation process by focussing on human impact on the vegetation, plant subsistence and cultivation of crop plants. The main questions are: how should we characterise the natural vegetation, what was the influence of human impact on it, how was the woodland exploited, which plants were used, how should we characterise the introduction of crop plants, and were crops cultivated at dry patches in the wetland regions?

1.3 Approach

The study primarily focuses on Dutch Late Mesolithic and Early and Middle Neolithic wetland sites, dating to the period 5500-3400 BC (Atlantic and Sub-Boreal). Figures 1.6 and 1.7 show a palaeogeographical reconstruction of the Netherlands during the period studied. The lower boundary of this period is formed by the absence of high-quality data of Dutch sites from earlier periods. The upper boundary is related to the presence of new cultural groups in the region. Clusters of wetland sites with considerable bodies of relevant botanical data are located in four microregions: the central river area, the coastal region of Holland, the Vecht region and the Eem region (see fig. 1.8). New information on small-scale investigations obtained halfway during this study (after finishing chapter 2 that concerns the central river area) enabled the recognition of a new cluster of sites in between the coastal region and the central river area. This new cluster, the western river area, may be considered as an extension of the central river area. There are additionally some sites that are not clustered in a microregion.

The size of the microregions represents an area around the studied sites with a diameter of *c.* 5-10 km, based on the presumed action radius (exploitation area) of the occupants (Renfrew and Bahn 2005, 230-235). Various sites may, however, have been part of a mobility system that also included occupation outside the wetland regions during some parts of the year, implying that the studied regions represent only a part of the area that was exploited. The archaeological meaning of the regions is therefore restricted, and it would be relevant to include the sandy regions of the southern parts of the Netherlands in the research as well. Data on organic remains from the dryland sites are, however, limited in their availability and do not allow extensive analysis.

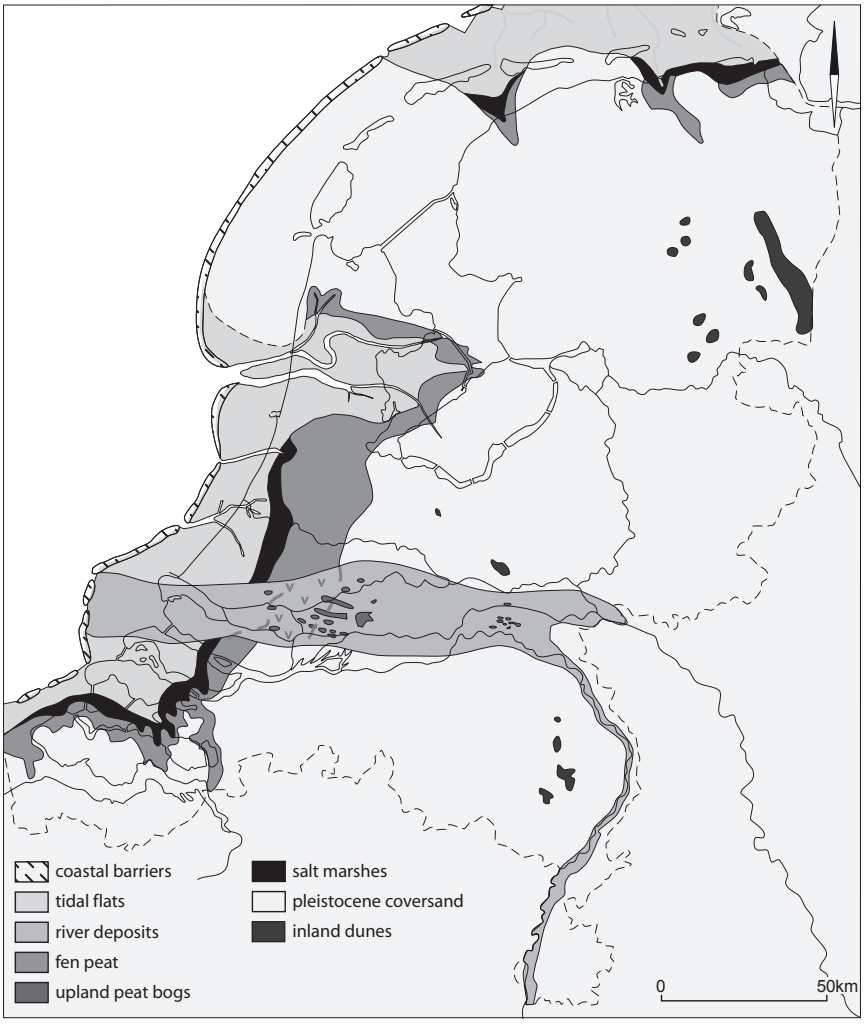


Figure 1.6 The Netherlands, palaeogeographical map, *c.* 5700 BC (NITG).

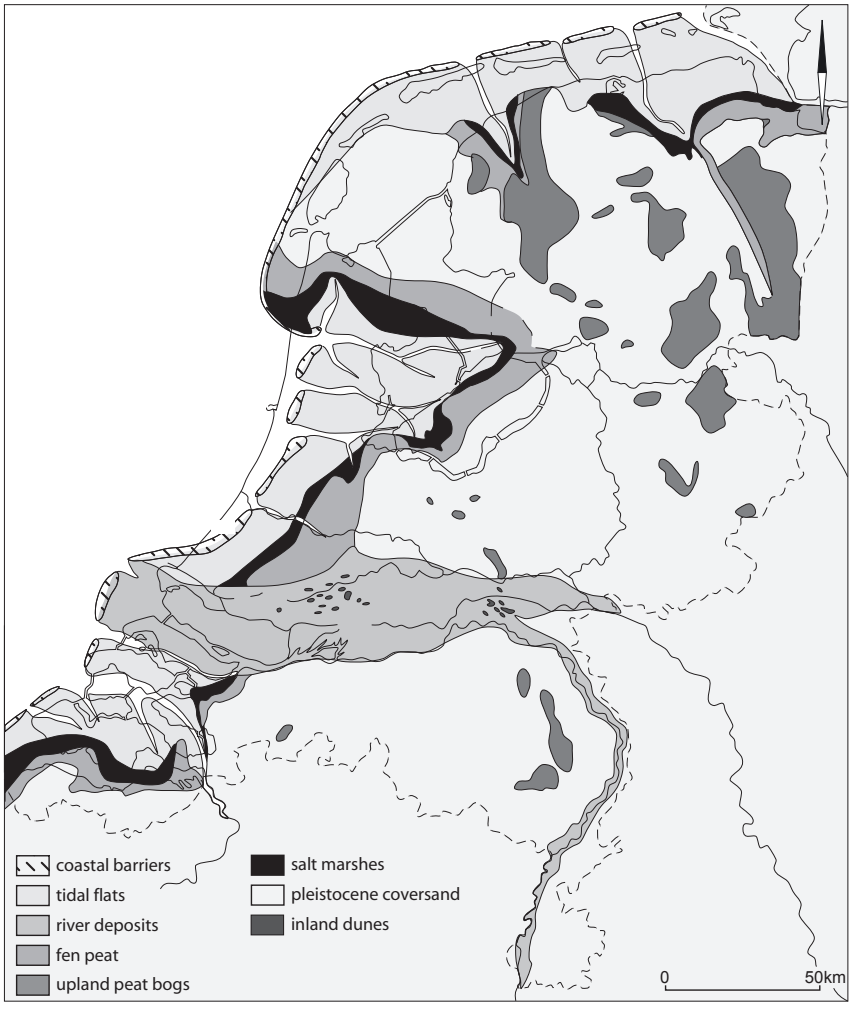


Figure 1.7 The Netherlands, palaeogeographical map, *c.* 4200 BC (NITG).

Figure 1.8 The Netherlands, the regions studied. 1 = Vecht region, 2 = Eem region, 3 = coastal region, 4 = western river area, 5 = central river area. The location of individual sites is shown on maps in chapters 2-6.

The research is primarily a literature study, based on the analysis of published information as well as databases (*e.g.* Dutch archaeobotanical database RADAR; Van Haaster and Brinkkemper 1995) and unpublished reports from a variety of institutes and companies. Botanical material from excavations has been examined or re-examined only exceptionally. Although several results have been studied and/or published earlier, it is expected that the reinterpretation and the comparative analysis of a combination of data will give new results. An additional aim is to provide better acces to various Dutch sources and to compare their value for archaeobotany.

The study is based on an integration of all available relevant archaeobotanical as well as some non-botanical data that provide information on landscape and vegetation. The natural vegetation is studied by analysis of geology, palaeogeography and archaeobotanical sources, and offers information on the environmental conditions and available resources. Human impact is primarily investigated by analysis of pollen, botanical macroremains, unworked and worked (waterlogged) wood, charcoal and additional sources, in combination with archaeological evidence.

1.4 Comments on materials and methods

Plants were probably used for consumption, fuel, construction, basketry and containers, medicinal use, colouring, oil, animal fodder, and possibly for decoration and symbolic/ritual use. However, it is hard to find evidence of each of these uses. In the first place, many applications result in the decomposition of plant remains (*e.g.* consumption, medicinal use and oil production). Secondly, some applications are based on the use of the soft parts of plants that are usually not well preserved, since even at wetland sites not all plant remains are well preserved (*e.g.* leaves, flowers, stems and fibres). Therefore, as is usually the case for plant use in the Mesolithic and Neolithic (Hather and Mason 2002; Jacomet *et al.* 1989), this study will reveal only a very small part of the range of taxa that were used and the range of activities in which plants were involved.

The pollen diagrams of this study are primarily based on an upland pollen sum, consisting of dryland trees, shrubs, herbs and spore plants including crop plants and excluding alder and other wetland taxa, an approach that is based on the method of Janssen (1959; see also Greig 1982). Some pollen diagrams have been recalculated with this new sum. The upland pollen sum has been selected to focus on changes in woodland vegetation of dry terrain, which presumably was primarily disturbed by human activity (rather than wetland vegetation). A total pollen sum was applied when the vegetation did not consist of woodland vegetation. This especially concerns the palynological studies of the coastal region.

Pollen diagrams and non-pollen palynomorph diagrams show percentages, based on the pollen sum of the relevant spectra, while macroremains diagrams show absolute numbers of seeds and fruits *etc.* A + sign in the pollen diagram indicates presence based on identification during scanning of the spectrum. The lithology of the presented diagrams is often simplified, while details are shown in tables. Peat in the lithology and discussions generally refers to fen peat except when indicated otherwise. Classification of taxa into ecological groups is based on Schaminée *et al.* (1995-1999) and on interpretation of the vegetation. The latter causes some deviations in the consistency of the classification. Names of plant taxa are generally according to Van der Meijden (1996), although exceptions occur in pollen diagrams. When possible, genus names are written completely with information on the species, but without adding more interpretation than obtained by the primary analysis (especially in case of the presentation of results). Identifications are in such cases discussed as *e.g. Corylus* sp., despite the fact that *Corylus* in this study can only represent *C. avellana*.

Taxa names are occasionally further interpreted in the discussions. When macroremains are mentioned, it primarily concerns seeds, fruitsand other diaspores, and additionally other botanical macroremains. Identifications of macroremainsof *Corylus avellana* generally refer to the shells of hazelnuts. Identifications of parenchyma of *Malus sylvestris* and *Prunus spinosa* generally refer to fragments of fleshy parts (fruits) of these species (in contrast to the seeds in the case of *M. sylvestis* and the stones in the case of *P. spinosa*).

Results of calibration of radiocarbon years are given in calibrated years BC, based on a standard deviation of 2σ, rounded off in case of general developments. The calibration programme used is Oxcal v3.10 (Bronk Ramsey 1995, 2001). The abbreviation for Dutch Ordnance Datum is NAP (Normaal Amsterdams Peil), which should not be confused with the abbreviations for arboreal and non-arboreal pollen (AP/NAP).

The discussion on cultivation distinguishes between cultivation on a large scale and a small scale. Although the difference is relatively arbitrary, cultivation on a large scale implies arable plots with an extent of at least a hectare while cultivation on a small scale implies garden-like plots with a surface varying between tens of square metres and a few hundred square meters.

1.5 Outline

In the first part of this thesis, the data are analysed on a regional scale (chapters 2-6). This part includes detailed information on individual sites and methodology. In the second part, the data are discussed in thematic order (chapters 7-11). These thematic discussions are primarily based on the regional overviews highlighted in the first part, and the reader can revert to these for more information. The thematic chapters also compare the results with data of other relevant cultures and regions in Northwestern Europe that may have played a role in the neolithisation process of the wetland sites, or that form a more or less comparable example of neolithisation. Chapter 12 incorporates the main conclusions within a general discussion.