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The Mesolithic/Neolithic Transformation in the Lower Rhine Basin

Leendert P. Louwe Kooijmans

INTRODUCTION

For more than 25 years, I have been involved in field research on the Neolithic in the Netherlands, trying to understand how people lived and how society evolved in this time and place. The major research problem is the transition from a purely hunting and gathering to a fully agrarian society: in what time trajectory and how and why this transition took place.

Although I have a great interest in theoretical-level explanations of this fundamental socioeconomic change, daily research practice is, however, a more basic archaeological craftsmanship. One can construct nice explanatory models for big problems in huge areas, but such models need to be tested or at least to be related to hard evidence. This requires detailed and reliable data, derived by controlled scientific investigation from sites that, in their turn, have to be discovered and selected. Thus, our research practice is a struggle with fundamental things, like site location, palaeoenvironmental reconstruction, establishment of local subsistence, raw material acquisition and procurement, site functions within settlement systems, and even more basic: the identification of house plans from post clusters, absolute and relative dating, and a critical application of middle range or archaeological formation theory. Yes, we have a corpus — for outsiders, possibly impressive — of “hard” archaeological evidence from well-documented contexts, but I experience more and more the restrictions of our primary sources for making assessments about the people that left the relics, realizing also how easily we can uncritically favor those interpretations that fit our theories. And then: how representative are our sites, restricted in number and confined to certain microregions? This chapter will deal with this quest for field evidence.

I very well realize that all efforts of the team involved should end up in a nice *explanatory* model, a sequence of positive and negative feedback, in which technological and agrarian innovation, demographic developments, and social and environmental changes all play their part. But it is not postprocessual scepticism that makes me feel

that we should be content, at least in the scope of our research program, with a *descriptive* model that follows the process of "Neolithization" in the stages through which it went. It is such a model that seems to be within reach. Explanations may be discussed then in a wider north European view. It is beyond discussion for me that such explanatory models are the ultimate goals, and that such models, as related to changes in *society*, should be firmly rooted in anthropology, or more generally in social theory about interaction and change in human society. Gradually, I am however, growing a bit uncertain, doubting the power of this field of theory for the prehistoric case.

First, prehistory is about long-term change, which is especially beyond ethnographic observation. I have the impression that this frustrates anthropologists just as much as the lack of direct observation of society frustrates the prehistorian. But it is wrong, for instance, to use typological sequences of (sub)recent societies as evolution lines to compensate for this, as is a general anthropological practice.

Second, as far as my experience allows me an opinion, anthropology fails to offer straightforward "rules" or "laws" of a general validity, of use in European prehistory. Explanation seems to me very much dependent on "schools" (paradigms or beliefs?) like structuralism, functionalism, materialism — up until Giddens' (1979, 1981) structuration — that differ (again in my opinion) mainly in the preferred factor dominating human behavior: the human psyche, economy, technology, demography, private enterprise, etc. Since it seems very hard or even impossible to test these options on the archaeological (more specifically, the prehistoric) data, I am more and more inclined to concentrate on the descriptive model, which has enough difficulties to be a challenge. But I am fully aware that the ultimate goal of all efforts must be to gain at least some understanding of the "why" of the long-term cultural transformations. For me, it is essentially only the theoretical debate of the time that I have been working on prehistory which gives this work sufficient satisfaction.

Third, the ethnographic sample on which anthropology bases its generalizations is demonstrably not representative for prehistory, certainly not for European prehistory. The total variability of human societies, throughout the millennia, is much wider than the (sub)recent sample. Types of societies that are prominent in European prehistory, like nonspecialist (semi-)sedentary hunter-gatherers and stone-technology hoe or plow cultivators, are marginal or absent in the ethnographic spectrum and exceptional in their ecological settings, as well. There is essentially a large degree of *originality*, not only in "culture", but also in cultural interaction, especially in the case of the Mesolithic-Neolithic transition in our temperate latitudes. These considerations make me feel content at the moment with the system

model of society as a descriptive device, together with formation theory, contextual considerations included, as instruments to deal with primary archaeological data as sources of information about former societies. But let us now turn to the research project.

BACKGROUND TO THE RESEARCH

Natural Conditions of the Research Area

For two major reasons, we should start with a survey of the natural conditions in the research area. First, prehistoric living conditions varied widely over the landscapes of this district. Second, research conditions in the main natural zones show extreme variation. The different living conditions in the various zones are relevant in so far as these might have been of influence on the way of life and on the exploitation systems of past communities. We are faced with the question: "How representative are our data in a wider context?". The different research conditions result in unequal data sets from the various zones, forcing investigators to use widely diverging research strategies. Moreover, answers on central questions seem beyond research in several zones, while detailed information is at hand from others.

The Netherlands are situated in the northwest corner of the European continent, facing the southern part of the North Sea (Figure 1). This is a region of very gradual subsidence, with a mean rate of about 4 cm per century during the last 2 million years, which explains why several rivers — Rhine, Meuse, Scheldt, and some minor ones — flow together there and unload their sediments at their mouths. The Quaternary sediments may reach a depth of over 500 m in this basin! The present geography of the combined delta of these rivers is relatively recent and directly related to the postglacial sea-level rise that resulted in the drowning of the North Sea Basin until it reached the present-day coastlines (Van de Plassche, 1982). About half of the territory of the Netherlands consists of these delta lowlands, the other half of predominantly Pleistocene upland.

Delta Lowland

The lowlands of the western Netherlands measure about 200 km along the delta-front coastline and extend over more than 100 km along the main rivers inland. In pre-Medieval times, this was a huge complex of wetlands, but, with the exception of the coastal dunes and the tidal flats of the Wadden Sea, hardly any relics of these natural landscapes remain. The total area has been embanked, drained, cul-

sedimentary systems and vegetation in some nature reserves as a reference, have given us detailed pictures of the genesis and of palaeogeography and living conditions in the subsequent stages of delta development (Jelgersma et al., 1979; Zagwijn, 1986).

Sand Upland

The upland zone is primarily an almost flat Late Glacial coversand landscape, under 30 m above sea level, but with occasional rows of ice-pushed sand and gravel hills up to 100 m in height and originating from a late stage of the Saalian glacial period. Our research area is, however, restricted to the region south of the main rivers, that never was glaciated. This is an almost flat cover-sand landscape, with regular drainage systems of small rivulets and brooks. The eastern part of the region is dominated by the lower course of the Meuse River. Apart from local inland dunes and the peat-bog formation of the Peel region, the watershed west of the Meuse, the country has been rather stable in postglacial times. On the poorer sands, a Brown Forest Soil developed during the earlier part of the Holocene, with a cover of relatively open deciduous woodland. The brook valleys and the Meuse Valley must have had strips of denser forest and rich grazing.

Loess Zone

The sand zone, about 90 to 100 km wide, ends in the south on the northern fringes of the European loess belt. The loess covers the zone of low hills to the north of the mountainous, uplifted Eifel and Ardennes Massives. Only a small part of Dutch territory, the southern tip of the province of Limburg, extends into this zone. This is, however, a region with very specific conditions and a core area for pre-historic occupation and present-day research. It consists of uplifted Cretaceous chinks and some Tertiary sands, dissected by the Meuse where this river leaves its narrow Ardennes Valley and its tributaries. It is a landscape of rolling hills and river terraces, all loess covered, with heights up to 300 m.

There have been extensive studies on the original vegetation of the loess, which must have been a thick woodland dominated by lime and elm and with such a dense crown space that undergrowth was restricted. It is supposed that in the moist valleys oak was more dominant, and undergrowth must have been denser and richer than on the slopes and plateaus. This country offered optimal conditions for primitive (hoe) agriculture in contrast to the sands farther north that had only restricted natural fertility and would be exhausted after a few years. The sand zone, in contrast, could be considered to have supported richer wild life, due to its more open vegetation, and so was more attractive to foragers.

Research Conditions

It is clear from the previous section that research conditions for pre-historic archaeology differ widely in the three major zones, and it is evident that these differences dominate the research strategy.

Delta Lowland

The delta gives us a restricted number of high-quality sites (Figure 2). It is a sedimentary and preservative environment which is also dynamic and thus destructive. Many sites, indeed complete regions, have been destroyed by erosion during and after occupation. Those Neolithic sites and old surfaces that escaped destruction are generally covered by some meters of later deposits, beyond reach of normal archaeological prospection. We must realize that sea level — and thus the water table and sedimentation — have risen 3 m since the end of the Neolithic, circa 3000 B.C. Neolithic sites are discovered on outcrops or in situations where the covers had been eroded and replaced by lakes that were drained in historical times, offering a modern surface several meters below present-day sea level close to the old Neolithic levels. But the Neolithic sites discovered in these localities have everything — the three major wetland qualities — an archaeologist may ask for:

- Organic material is often perfectly preserved (Figure 3).
- There is a natural macro- and microstratigraphy in synoccupational sediments (Figure 4).
- Intrasite patterns are preserved by the protection of clay and peat covers with hiatuses of restricted duration.

But field research is expensive, technically difficult, and takes a lot of time. On the other hand, it is very rewarding. Waterbolk (1981), in his review of Dutch archaeology, considered this wetland research the most specific characteristic of archaeological practice in the Netherlands (cf. Louwe Kooijmans, 1980a, 1990).

Sand Upland

The sand regions contrast in many respects with the lowlands. They might appear flat to the untrained eye — the modest microrelief is counted in meters or even decimeters — but the Neolithic living surface is still uncovered at the present ground level. Sites are surface scatters easily discovered in arable land by systematic surface prospection. Thousands of sites are known, but they are of low quality. There is no stratigraphy; material of all periods is often mixed up in one scatter and difficult to separate. The acid soil has caused the decay

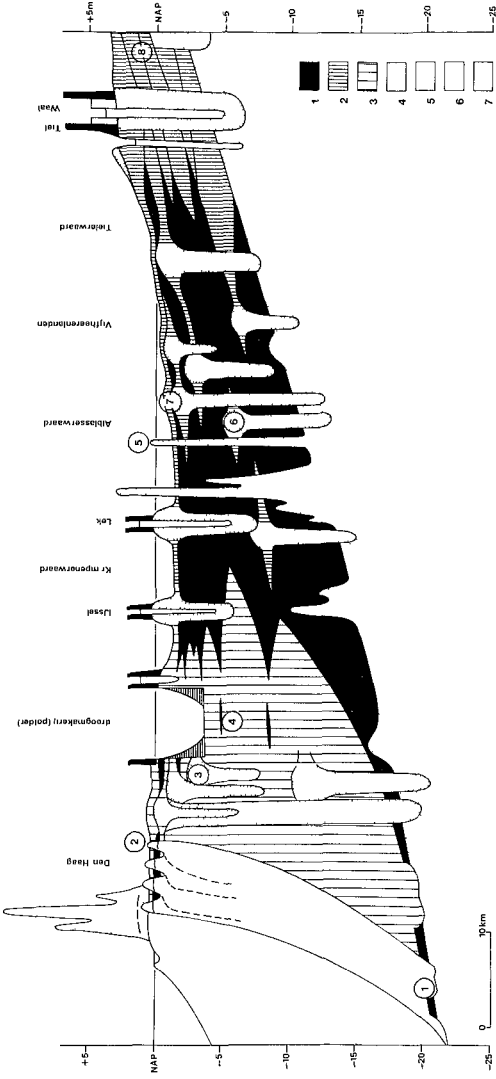


Figure 2. Schematic W-E section through the Rhine-Meuse delta showing main sedimentary environments and stratigraphical positions of several sites discussed in text. Note the extreme height exaggeration (1400×) and the depth at which most sites are embedded. Key: 1, peat; 2, river deposits; 3, marine and estuarine deposits; 4, channel fills; 5, Younger Dunes; 6, Older Dunes; 7, Pleistocene deposits. Sites indicated in figure: 1, Europoort; 2, Voorschoten; 3, Hekelingen, Vlaardingen; 4, Bergschenhoek, Schiedam; 5, Hazendonk, Brandwijk; 6, Swifterbant; 7, Molenaarsgraaf; 8, Ewijk.

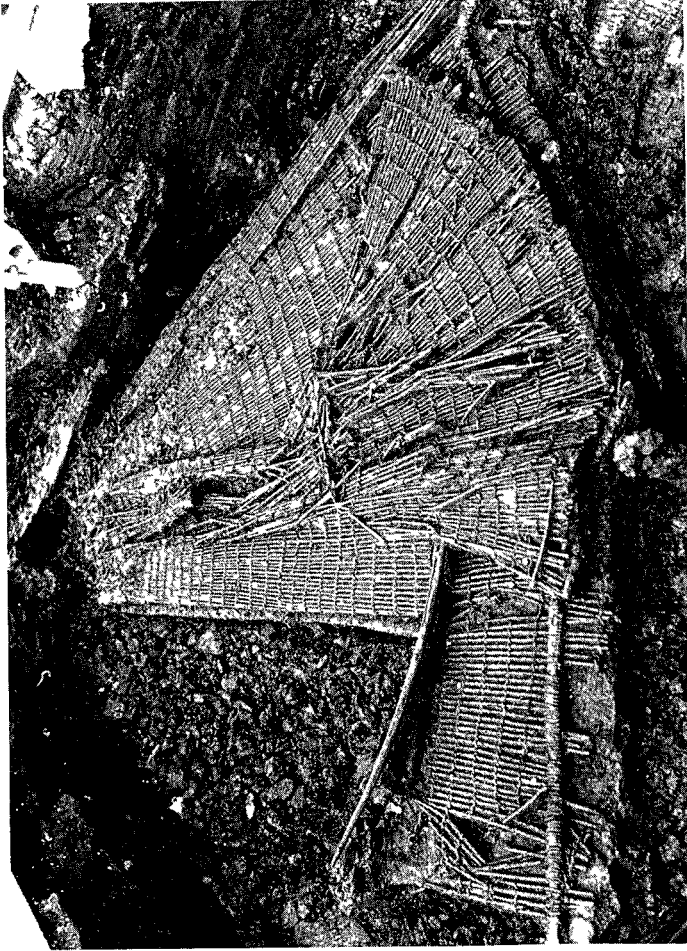


Figure 3. Good preservation conditions in the delta wetlands are illustrated by this 4300 B.C. fish trap from Bergschenhoek, made of red dogwood stakes and bound with vegetal fibers. Overall length 1.40 m. Cut-off dogwood roots in same layers indicate that the traps were made on the site, implying stays of several days. Similar traps are known from the Danish Late Mesolithic and Late Neolithic Vlaardingen and were in use in these regions until recently.

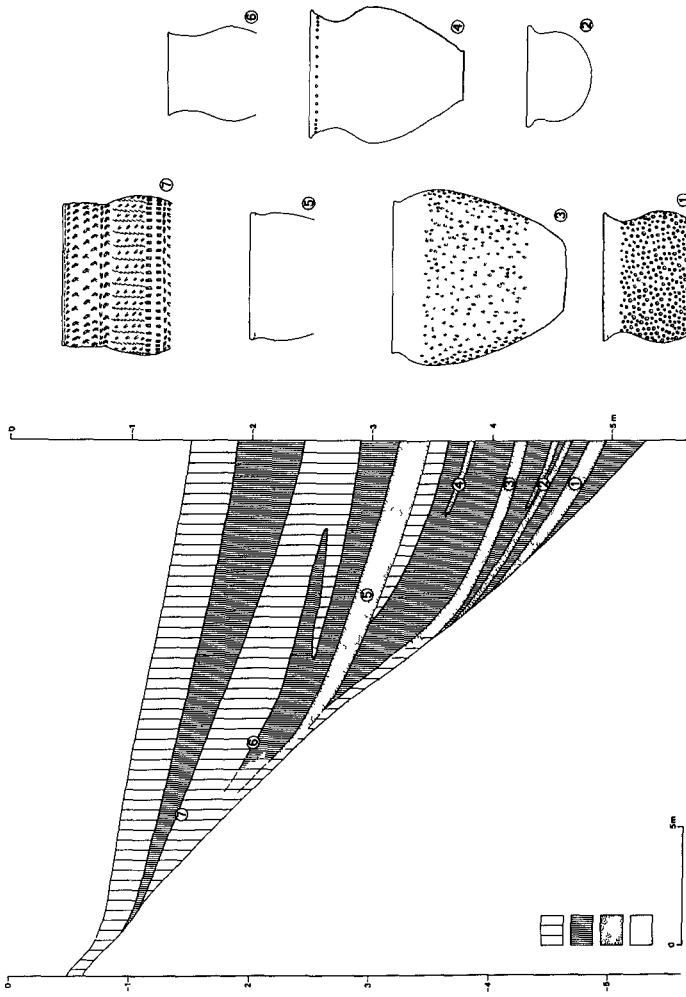


Figure 4. Hazendonk, Alblasserwaard region. Schematic section of natural Holocene stratigraphy with embedded Neolithic refuse levels, each indicated by a culture-specific pot. The dune tip was intermittently used as an extraction base for over two millennia. Vertical scale in meters below mean sea level. Key: 1, clay; 2, (clayey) peat; 3, refuse level; 4, wind-blown sand. Cultures, beginning at top: 7, Veluwe Bell Beaker, 2100 B.C.; 6, Vlaardingen group, phase 2b, 2700 B.C.; 5, Vlaardingen group, phase 1b, 3100 B.C.; 4, Vlaardingen group, phase 1a, 3400 B.C.; 3, Hazendonk 3, 3700 B.C.; 2, Hazendonk 2 (Michelsberg), 4000 B.C.; 1, Hazendonk 1, 4300 B.C.

of all organic material, bone included. Bioturbation and agriculture have disturbed site dimensions and intrasite patterns. Modern arable farming with its deep ploughing, leveling of undulations, and intensive manuring has been especially destructive. Added to these negative qualities is the absence of pit fills on Neolithic sites.

Loess Zone

The loess zone has a more distinct relief of low hills. Slope erosion, colluviation, and alluviation, especially in Roman and post-Roman times, erased upland and buried valley-floor evidence of Neolithic occupation. Only communities that preferred plateau locations and that dug artifact traps for us in the form of loam extraction pits, silos, ditch systems, — like the Linear Pottery farmers of the late sixth millennium B.C. — are archaeologically known in some detail. But their bone refuse is missing because of decalcification, and the botanical evidence is restricted to charred remains.

We should not, however, mistakingly concentrate on the more rewarding regions, but apply appropriate methods for every zone and period, since the Neolithization process covered all geography and the full Neolithic time range.

Neolithic Knowledge in the Sixties

Delta Lowland

Until after World War II, prehistoric occupation of any extent in the delta lowlands was considered improbable. The modest number of prehistoric remains, like stone and bronze implements, were interpreted by casual visitors as being lost. This opinion had, however, drastically changed by the sixties, when several true Late Neolithic settlement sites had been discovered and excavated in former wetland locations on the levees of former tidal creeks at Hekelingen (1949) and Vlaardingen (1959 to 1966). Regular occupation of at least some delta ecozones from c. 3000 by communities of full- or semi-agrarian economy was well established by that date. The sites revealed, moreover, the high potential of wetland settlement research. Earlier sites were not recognized as such (like Schiedam), and other zones were still fully blank. The Late Neolithic "Vlaardingen culture" was conceived as related to "typical delta communities", adapted to this specific (unfavorable) environment. One wondered about their origin and cultural relations, but had no good explanation (Louwe Kooijmans, 1974).

Loess Zone

In the loess zone of the German Rhineland, South Limburg, and Belgium, Neolithic occupation was well established, specifically the Early Neolithic Linear Pottery culture or Linearbandkeramik, with radiocarbon dates of 6400 to 6000 b.p. (now known to be 5300 to 4900 B.C.). Within South Limburg, these settlements appeared to cluster in a microregion known as the Graetheide, an extensive area of almost flat and low Middle Terrace, at the northern fringe of the loess zone. Town development gave rise to a series of large-scale rescue excavations at now famous sites like Geleen (1953), Sittard (1953 to 1954), Elsloo and Stein (1958 to 1966), and it was especially the work of Professor P. J. R. Modderman (1958, 1970, 1975) that made this cluster of sites in the extreme northwestern corner of the culture area the most productive region for our knowledge of the Bandkeramik at that time.

The appearance of the Bandkeramik was easily explained as a part of the general Bandkeramik colonization, but the sudden end was very puzzling. Explanations were thought to lie more in the cultural context than in archaeological formation processes: soil exhaustion, epidemic disease, conflict with "natives", and not so much in recovery deficiencies and erosion or cover of sites. The successive Rössen and Michelsberg cultures were, however, documented in the adjacent German Rhineland, albeit on a modest scale. In Belgium, a western province of Michelsberg could be identified on the basis of a restricted number of assemblages, curiously outside the Bandkeramik distribution area. There was discussion about "primary Neolithic" (colonization) and "secondary Neolithic", resulting from acculturation of native (Mesolithic) groups, parallel to the views that Piggott (1954) held for the British Neolithic. These views could be extrapolated to the Dutch loess district, or even to the whole of the southern upland, but sites and finds were absent, with the exception of two extraordinary monuments: the extensive flint mining complex of Rijckholt (Figure 5), known from 1880 onward (Bosch, 1979), and the burial vault at Stein, a chance discovery within the Bandkeramik excavation in 1953 (Modderman, 1964). Post-Bandkeramik Neolithic was, however, altogether a *tempus incognitum*. This was even more shocking when C14-dates revealed that the time lapse between the end of Linearbandkeramik and the start of Vlaardingien in the delta was not in the order of a few centuries, but measured 1600 radiocarbon years!

Sand Upland

The Neolithic in the sand district between the delta and the loess was documented mainly by a scatter of many hundreds of stone and



Figure 5. Interior of one of the thousands of interlinked flint mines of the Rijckholt mining field, dated from 4200 B.C. onward. Black flint nodules can be seen in the roof supports left by the miners. Galleries were not more than 1 m high and reached 15 m below the surface. Although Bandkeramik people were acquainted with Rijckholt flint, they only exploited eluvial slope deposits. The start of mining is linked to the production of large blades and polished axes, distributed as far north as the earliest semi-agrarian sites in the delta, ca. 100 km to the north. (Photo by Henk Brandsen, Amsterdam.)

flint axes, but no systematic study of these was made after that of Åberg in 1916! Apart from these axes, amateur archaeologists had collected large quantities of flint from surface sites, especially in the eastern Meuse Valley, but these were only superficially known by professional archaeologists, and not systematically studied. Modderman proposed a "Limburg Middle Neolithic" that embraced all material of the 15 centuries between the Rossen culture and the Beaker period, on the basis of the material assembled in his excavation at Koningsbosch (Van Haaren and Modderman, 1973). Altogether, the Meuse Valley was claimed to be rich in flint assemblages, with only occasionally some undecorated pottery that gave almost no basis for chronological or functional studies.

ORIGINS AND DEVELOPMENT OF THE PROJECT

How did the program discussed here grow to its present framework, and where are its origins? We will have to go back to my very first involvement with prehistory. It will appear that there has been

very restricted intentional planning, and that the development of the investigations depended on an interplay between (restricted) possibilities and external forces, like chance discoveries, necessity for rescue work, and funding. Looking back now for the purpose of this chapter, it seems that four stages can be identified, on the basis of changes in framework, motivation, and (perhaps) some theoretical frame.

Stage 1, Prior to 1966

As a student in physical geography, I participated in various types of field research, ranging from mapping the Holocene in the delta with hand coring, hard-rock geology in the Ardennes, geomorphological mapping of river terraces and valley forms in the same countryside, and excavation on various types of prehistoric sites. I experienced the contrast between the laborious and rather low-information content of the true geographical approach, as opposed to the work of archaeologists on sites where remains of human activity were found embedded in natural stratigraphies. Such locations where nature, so to say, had made “experimental set-ups” were the clues to many Quaternary research problems, more than were purely natural sequences or purely cultural monuments such as urnfields. So I decided to go on, preferably in Palaeolithic research, where the interplay between geology and archaeology is most prominent. It all went, however, in another direction.

Leiden University had founded a new Institute of Prehistory in 1962 under the direction of Professor Modderman. A group of amateur archaeologists in the Alblasserwaard region in the delta developed regular contact with the young institute for the identification of very modest relics — tiny shards and flints — recovered from the test pits they regularly dug on their free Saturdays. We must realize that until then their whole working area of 20 × 50 km was completely blank on prehistoric distribution maps, and that, because of the very swampy conditions of this district, no occupation until Medieval times was presumed there. The amateur archaeologists profited from a detailed soil map made several years before by the Soil Survey Institute, from the current Geological Survey, and from suggestions by Modderman for location of their pits. They had, moreover, a detailed knowledge of the subtle soil variations hidden below the meadow lands of their district. The Institute itself had only restricted opportunities to deal fully with these remarkable Neolithic sites in the middle of the Holocene peat zone, and so I got permission to do a Ph.D. study there. This type of research and the way it started seems now, looking back, typical for Dutch archaeology, not only at that time, but nowadays

as well. I finished my geography M.A., sold my stamp collection, bought a secondhand Citroën 2CV, and started a one-man field operation with hand-drilling equipment, shovel, and find bags.

Like most archaeological research in those days, the project was basically, but not purely, inductive. These were pre-“New Archaeology” times. The purpose was to gather information on prehistory and Holocene geology in the district, see what would come out, and then write a “regional cultural occupation history of the Alblasserwaard peat region”. This meant describing when, where, and how people settled and lived through time in the district and perhaps formulating some explanations for changes in the patterns found. The plan basically was regional/prospective in its layout and comprised:

- An inventory of sites, Neolithic to Medieval
- A physiographical site location map
- Detailed prospection on selected sites directed to stratigraphy, site location in relation to palaeogeography, site dimensions, and so forth
- Excavation of one or two key sites for the Neolithic period to obtain evidence on settlement structure and subsistence economy, based on botanical and zoological samples

This type of research is what later would be called functionalist, the tradition of settlement research of those days in Europe, that is, along the line set by Grahame Clark, among others. In the Netherlands, Modderman with his Hekelingen excavations were the major example (Modderman, 1953). The main goal was not so much explanation, but the description of the “way of life”, more precisely subsistence economy in close relation to palaeoenvironment, which often led to an ecologically deterministic view.

Stage 2, 1966 to 1974

I wonder how the project would have ended up if I had not been so lucky as to obtain a position as curator in the National Museum of Antiquities at Leiden, half a year later, with, as one of my special tasks, the redevelopment of the excavation department. This meant an organizational and financial basis for the enterprise, but also part-time attention to it, due to other obligations.

Thanks to the help of specialists in fields like palynology, archaeozoology, and physical anthropology, I finished my thesis in 1974. Rather ambitiously, I had extended the scope of the project to encompass the Rhine/Meuse delta as a whole for all the earlier prehistory, since my experience led me to believe that one could not fully

evaluate the results of the region of study without a wider context. Moreover, and very typical for my earth-scientist approach to pre-history, I extended the study with the calculation of a curve for the rise of the sea level based on archaeological data: these appeared to provide detailed and very hard evidence, and sea-level rise is a focus of Dutch interest!

Stage 3, 1974 to 1982

Working in the specific cultural environment of the Museum, I experienced a general shift in research focus from my first geological/geographical motivation to one based on cultural questions, that is, from Holocene-embedded archaeological sites to the Neolithic society and its evolution. But this had been more an addition than a substitution: the Holocene sediments are still a research paradise! So from a long chronological interest in a small region, attention now was directed to the Neolithic only, but in a wider area: that of the southern half of the delta and its adjacent upland, sand regions.

My main research goal became to fill the chronological blank between the Bandkeramik data in the loess zone and the earliest delta Neolithic. So I started excavations on the Hazendonk site, a small dune outcrop with a Neolithic peat stratigraphy reaching back to 4200 B.C. This appeared to be a very ambitious operation. The final publication is still far from realization, mainly because rescue work on other sites starting in 1978 overran that work. Assisted by Leo Verhart, my successor in the museum, new basic data were acquired step-by-step through rescue excavation of settlements and the study of accidentally recovered material from both the delta and its sand margins: Mesolithic barbed points of Europoort, an Early Neolithic fishing/fowling site at Bergschenhoek, Michelsberg sand margin sites of Vormer Kraaienberg, Gassel, Late Neolithic estuarine sites at Hekelingen, to name the most prominent (Louwe Kooijmans, various publications; Verhart and Louwe Kooijmans, 1989). The awareness grew that the delta Neolithic could not be understood by itself, neither culturally nor from a settlement-systems point of view. There remained, moreover, in spite of all efforts, a gap of 100 km and 700 C14-years between the end of the Linearbandkeramik and the start of the delta Neolithic. It seemed essential to have at least some idea — some data — from that period to understand the Neolithization of the Dutch part of the North European Plain.

We should realize that the project had its roots well before the major theoretical innovations of our discipline at this side of the Atlantic started, that is before David Clarke's *Analytical Archaeology*. The Netherlands have been, moreover, somewhat outside the mainstream of the methodological/ theoretical development. Some scientific work-

ers applied the new principles with varying degrees of success and appreciation, but the main lines of research remained functionalistic. Leading archaeologists like Waterbolk (1974) even denied the innovative trends. It is true that, quite different from the American situation, there was much less difference between the Old (functional) and the New Archaeology in Europe. One who reads David Clarke's *Analytical Archaeology* carefully may observe that he did not react and oppose, so much as he tried to adjust archaeological thinking. His vision and perspective can be traced back to studies like those of Grahame Clark (1939), De Laet (1954), and Eggers (1961), which critically discuss the systemic-archaeological context opposition, formation of the archaeological record, and the culture-historical principle of *Ethnische Deutung*. In essence, the "rigorous scientific approach" did not affect our research program very much.

Stage 4, 1982

My appointment as a university professor meant another important, but unplanned shift in the framework of the project. My own work could be merged with Modderman's heritage of Neolithic research on the southern sand and loess into a project with a wider scope. This heritage needed, however, to be reanimated, since he had left the region in favor of Bavaria ten years before, and no one had filled the gap. The new situation also meant teaching and the involving the students in all levels of research, such as participating in excavation and prospection and writing essays. It forced me to think and talk about basic principles and interpretation of the discipline, essentially absent in the museum. I felt that I had been lagging behind, discovering that my implicit ideas about formation processes had already been made explicit more than ten years before by Binford, Schiffer, Gifford, and others. These principles and the full set of definitions involved are now considered of basic importance for our type of research. It is a field of theory that can be applied with great profit in practical archaeology. The team now involved in the project experiences, moreover, that the "perception" approach of contextual archaeology can be applied with profit, especially in the higher levels of interpretation and explanation as, for instance, in understanding why people settled in the delta and why their way of life in the various phases was so fundamentally different. In understanding better long-term processes of techno-economical and organizational change, we overcame the ecological-deterministic explanation at last (Louwe Kooijmans, 1990).

THE PROJECT TODAY

Research Problem

The overall problem addressed by the project as a whole is the transition from hunting-fishing-gathering to food production in the westernmost part of the North European Plain. I will stick to calling this transition "Neolithization", since food production seems to be the major, if not the single criterion, for calling communities "Neolithic". This is obvious, for instance, where communities using polished axes or pottery are called Mesolithic, as in Ireland and Denmark, or others without pottery, but agrarian, are named "Aceramic Neolithic", as is done in the Near East. So, in spite of critics on its use, I will continue to make use of this term "Neolithization" for this transition to subsistence based on agriculture. The process is more interesting now, since it appears that it covers the whole of the Neolithic, and that the fully agrarian way of life — at least for some communities — was not accepted before the very end of this period, ca. 2500 B.C..

The Neolithization of the sand and Holocene sedimentation districts is of interest, not so much by itself, but as part of a much wider cultural transformation that covers the total of the North European Plain, from Holland at least to Poland. It is the Neolithization of the regions and communities to the north of the loess zone previously colonized by the Bandkeramik communities.

My aim here is to present a separate study for this region, complementary to similar studies, for instance, in southern Scandinavia (Madsen, 1982, 1988) and central Poland (Bogucki, 1982, 1988). The process does not need to be the same all over this region because of differences in communities and their cultures involved, differences in environmental and geographical conditions, and differences in demographic processes, to name some of the factors. So it is evident that the separate study of several sections of this region is of value, and that we should not *a priori* extrapolate the conclusions for one subregion over the total area, but instead combine results to see the pattern of the mosaic (Bogucki, 1988).

Specific Objectives

The main characteristic of a research problem is that it never will be solved, at least not satisfactorily. It is a standing topic of study, embodying a whole range of more specific questions that can be made the objectives of well-defined individual research projects. These offer the building stones for an explanatory structure of the main problem.

Such specific objectives, now under study, are for the delta district:

- How representative is the Hazendonk-sequence for the whole lower course district of the Rhine and the Meuse?
- Can any occupation older than Hazendonk 1 and Bergschenhoek be found in the delta?
- Can the function of the delta sites (seasonality, permanency, special purpose/full residential) be established, and how do these sites fit into settlement systems?

And for the sand upland:

- Can shifts in site locations be seen out on the sands of the southern Netherlands, and what factors are involved? Can such shifts be taken to reflect shifts in subsistence economy?
- Can flint-use patterns of assemblages in the sand zone be useful in specifying shifts in general economy?
- Which process lies behind the thin scatter of Bandkeramik artifacts — flint arrowheads, adzes, some pottery — north of the loess zone?

And for the loess zone:

- What happened on the loess in post-Bandkeramik times? Were people gone, or are only their archaeological records gone?

And, at last, more general:

- Can any Late Mesolithic be identified past 5000 B.C.?
- How fine a chronology can be made, based only on flint artifacts?
- What are the distribution patterns and mechanisms of specific raw materials between quarry sites and distant users?

I will stop here, but I could easily extend the list for pages. One can see that these are all questions, potentially to be answered by archaeology, if the right methods are applied and the right basic data are at hand. This means that sites, assemblages, and artifacts are preserved and discovered in sufficient quantities and quality.

Strategy

There is no such thing as an overall strategy for the project, which lies in the organization of scientific research and its funding. One tries to profit from various possibilities, which results in a kind of catch-as-catch-can strategy. It would be wrong to present the program

as a coherent, planned scheme. It is not; it is a collection of more or less individual projects under a common denominator. One might call the approach "multilinear" or even "holistic", because we are interested in *all* aspects of Neolithic society in the research area and do not feel bound by specific methods or material.

Research is, moreover, very dependent on chance discoveries, as might have been obvious from the preceding history. One cannot order sites of a certain age where specific conditions are fulfilled. We only can help chance a bit by keen prospection, by good cooperation with well-informed amateur archaeologists, and by optimism. The positive role of amateur archaeology in my country is already noted, but should be stressed here again as an important factor in the progress of our knowledge of prehistoric societies.

There is, however, one strategy planned with purpose and applied in several projects. That is the work on various "embedded" scales from large to fine in growing detail. My initial Alblasserwaard Project is an example, as is the Meuse Valley Project discussed below. Sites are never studied in isolation, but always in their environmental and archaeological context. Microregions are always seen as selected parts of wider geographical units. The variations in site quality and density in the various major landscape zones result, however, in considerable differences in implementation. This strategy must not be considered as specific for the project. It is common sense in Dutch archaeology and found also in Neolithic research elsewhere in Europe.

Sites and Data Available Now

My own work and that of the whole project team has not extended all over the western part of the North German Plain, but has been confined to the southern half of the delta, to the southern sand zone, and to the south Limburg loess district. There were and still are two reasons for such a restriction: (1) limited staff, funds, and time, and (2) the work of other institutes, interested in the same period and processes. These are all well-defined, separate research projects, executed fully independently, but with a good exchange of information and thoughts. Our project studies only one piece of the puzzle. The joint effort has produced a great wealth of evidence by many small and large excavations and much, although very dispersed, published information. The bibliography gives only a selection of the more accessible titles.

Loess Zone

The "Graetheide cluster" of settlements in south Limburg is no longer the most thoroughly investigated Linearbandkeramik mic-

roregion in Europe (Modderman 1985, 1988). The research center has shifted to the region of large-scale open lignite mining in adjacent German Rhineland where Jens Lüning and his team executed the Aldenhovener Platte settlement history project, centered around the Merzbach Valley settlement cluster (Lüning, 1982; Lüning and Stehli, 1989; Stehli, 1989). This has been succeeded by a similar program in the Hambacher Forst. Most prominent in Belgium has been the excavation of the Late Bandkeramik defended settlement of Darion (Cahen, 1986; Keeley and Cahen, 1989) and the discovery of settlements as far to the west as Wange, south of Leuven (Lodewijckx, 1990). Recently, large-scale research has been resumed in the Dutch cluster, with my almost full excavation of the ca. 5 ha palisaded Early Bandkeramik settlement of Geleen-Janskamperveld (Louwe Kooijmans, 1992). Thematic studies have been made on settlement systems, subsistence and environment (Bakels, 1978, 1979, 1982, 1991), on stone adze acquisition (Bakels, 1987), on flint procurement (De Grooth, 1987), and on social structure (Van de Velde, 1979, 1990).

Our detailed knowledge of the Bandkeramik culture results from the happy coincidence of heavy construction and many deep pits on plateau-edge locations that were subject to very moderate surface erosion. So information is available on site location, settlement layout, housing, raw material acquisition and technology, and on the botanical aspect of subsistence based on charred macroremains from pit fills. Bone has decayed almost completely in the decalcified loess of our region, but there is evidence from sites elsewhere that can be extrapolated. Environmental reconstruction is based on pollen diagrams from rare valley floor peat deposits and on charcoal and seed identifications from pit fills.

There is full settlement evidence for the Rössen period in the adjacent German Rhineland (Dohrn-Ihmig, 1983), but less for Michelsberg, and very little for the Late Neolithic. In the Netherlands, a first Rössen site was discovered in a Meuse Valley floor location near Maastricht. There had been surface erosion, and only the lower parts of some pit fills remained, but these were very informative: artifacts, C14, charcoal, and macrobotanical evidence. The site shows how easily evidence can be destroyed or escape our attention (Bakels, 1990). In Belgium, a counterpart of Rössen, called "Blicquy", has been identified recently (Cahen and Docquier, 1985).

Undated, but certainly post-Rössen flint scatters, are documented in the Limburg loess zone in increasing numbers, especially on higher locations like the tips of spurs overlooking valleys. There is as yet no evidence for defensive earthworks or palisades, as in Belgium and the Rhineland, but only one site has been excavated as yet with modest results. Most conspicuous are still the mining centers, dated

from 4000 B.C. onward. The well-known Rijckholt mines have been investigated by a group of professional miners over an area of 20×120 m, with spectacular results. Their true extent is difficult to establish, but there are certainly more than 600 shafts — possibly even several thousand (Bosch, 1979; De Grooth, 1991).

It is remarkable that post-Bandkeramik sites are scarce in the loess zone, and even fewer from the later Neolithic phases. What does this mean? There has been less interference with the soil (that is, fewer pits), and material remains are more difficult to identify, but this can only be a partial explanation. Settlements might have shifted to valley slopes and/or valley floors, now eroded or covered by colluvium or valley fill, or even shifted to other regions. It seems that all factors have played a rôle. It is also significant that Late Neolithic evidence is restricted to the remains of a single collective burial vault at Stein, discovered by accident during a Linearbandkeramik excavation.

Sand Upland

We can be relatively brief about the sand upland. Everything is bad here except the number of sites. Some 4000 are now in the files of the Meuse Valley Project (Wansleeben and Verhart, 1990), all surface sites, mostly from plow soils, with no intrasite patterns, and often mixed assemblages (Figure 6). Dating had to be based exclusively on flint technology, typology, and raw material used, which means working with long phases and/or large margins of error. Moreover large-scale modern agricultural land destruction frustrates systemic prospection. Some excavations of blown-over sites on the northern edge of the sand at Vormer (Louwe Kooijmans, 1980b), Kraaienberg (Louwe Kooijmans and Verhart, 1990) and Gassel (Verhart and Louwe Kooijmans, 1989), have produced single-phase pottery assemblages, but no features, not even pit fills, and no charred macroremains. Bone has fully disappeared in the acid cover sands.

In spite of intensive research, there is a remarkable absence of special sites that might have had a central function on a regional scale, like earth works or ritual centers. Nor is there any evidence for systematic burial, apart from a modest number of Final Neolithic Beaker barrows, scattered along the Meuse: a group at Swalmen and isolated barrows at Baexem, Helden, Meerlo, and Oss. We should, in my opinion, see this as a reflection of a rather simple organization throughout the Neolithic, and not so much as a result of archaeological formation processes and preservation.

The Delta

It is perhaps most remarkable that people settled in the middle of the vast delta, at least from an Early Neolithic stage onward; but they

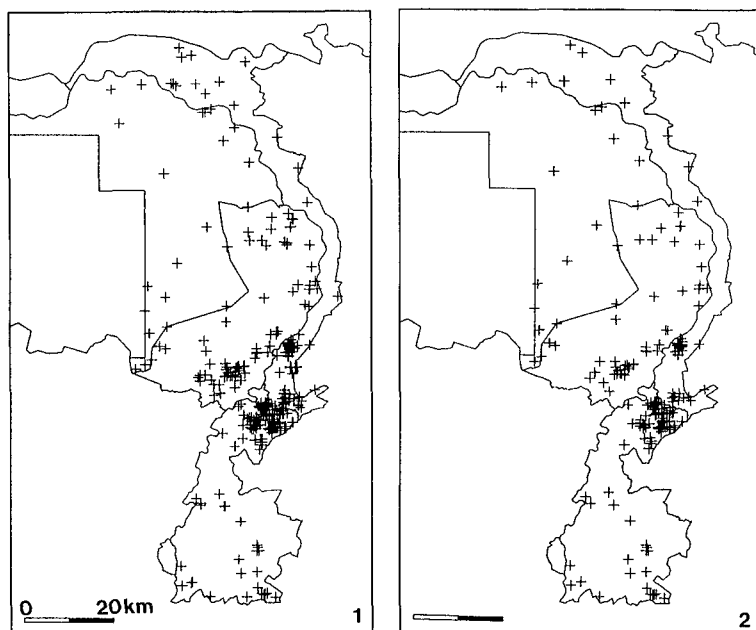


Figure 6. The Meuse Valley sand region has the challenge of extracting information on Neolithization from thousands of sites of low information content. These sites — mainly surface flint scatters, many with mixed assemblages — have to be attributed on strict criteria to the late Mesolithic and five major Neolithic states. These four maps demonstrate the dramatic influence of site definition for the Michelsberg phase as one of the problems encountered in this research. Key 1, sites with one of the five guide artifact types, 2, all sites with large muned Rijkholt flint blades and/or flakes, 3, sites with two guide artifact types, excluding two types of points, 4, sites with two guide artifact types, excluding two types of points, 4, sites with three guide artifact types (From Wansleeban, M and Verhart, L B M, in *Contributions to the Mesolithic in Europe*, Leuven University Press, Leuven, 1990, 389–402. With permission.)

did, and by lucky chance some of their sites have been discovered. These are concentrated in special microregions that escaped erosion, and where conditions for preservation, recovery, and excavation were favorable. We enter here a different world, compared to the sand upland — an archaeological paradise of high-quality sites, be it in restricted numbers.

Two clusters of early Neolithic sites, dated ca. 4200 B.C., occur in the freshwater peat zone, one in the IJsselmeer Basin, the other in the Rhine/Meuse district. The first cluster, near the village of Swifterbant, investigated by the Biological-Archaeological Institute of Groningen University, comprises sites on dune tops and on the levees of former creek systems, settlements, and some small inhumation cemeteries (van der Waals, 1976–79; Zeiler, 1991). The levee sites,

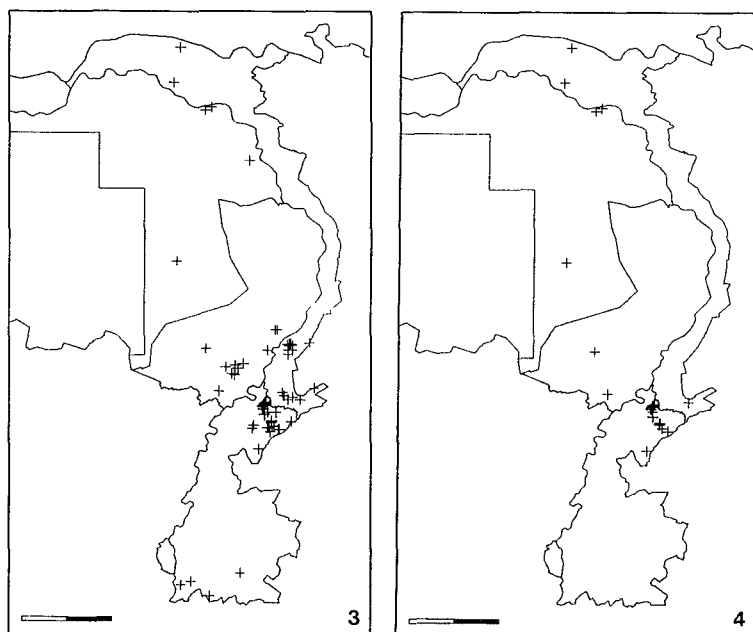


Figure 6. (continued).

especially site S3 chosen for detailed excavation, are most informative by the preservation of intrasite spatial structure, preservation of bone and botanical remains, and the absence of earlier and later contamination. The sites, 5 m below sea level, were discovered as a result of the erosion of covering peat deposits and the recent reclamation of this part of the lake. Research has now shifted to the adjacent southern part of the Northeast Polder, where the Institute for Pre- and Protohistory, Amsterdam University, investigates occupation debris on levee sites and concentrates on an outcrop margin, called P14, with rich Late Neolithic settlement traces (Hogestijn, 1990). All this research is outside the scope of the Leiden project, but relevant as a reference.

The second cluster, in the Alblasserwaard peat district, is a focus of our project from its very beginning. After the chance discovery of the Hazendonk, excavated 1974 to 1976 (Louwe Kooijmans, 1976a, b; 1987), systematic geoarchaeological prospection now reveals that most of the ca. 100 dune tops known must have been used as settlement locations in several Neolithic phases (Figure 7). We dug a deep, test trench on the newly discovered site at Brandwijk in the summer of 1991 to sample a Hazendonk 1 culture layer, ca. 4200 B.C., 5 m below sea level. No settlement structures are preserved on these dune sites, but the stratigraphies of former surfaces with Neolithic refuse on the

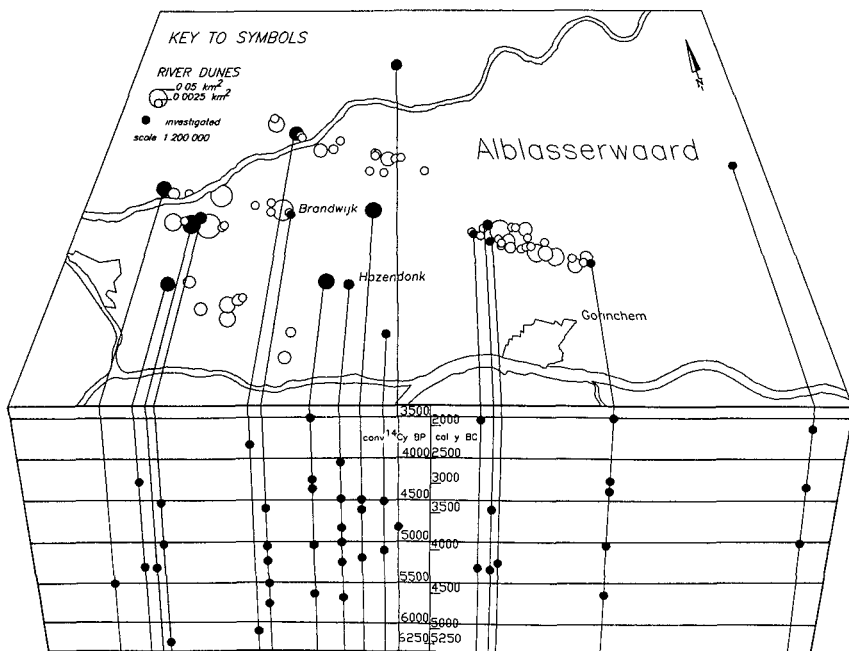


Figure 7. Schematic map and section of the Alblasserwaard region with outcrops of Late Glacial dunes (*donken*). Those in black have been surveyed in detail for the occurrence of traces of Neolithic occupation in the form of refuse levels in the surrounding peat covering their slopes. Section gives overview of C14-dated Neolithic layers, indicating use of such dry locations as extraction points from c.4300 B.C. onward. Only a few earlier levels have been attested. A major question is the explanation of the scarcity of pre-4300 B.C. sites. Research by Dr. Marten Verbruggen, in progress.

slopes below and in the peat cover are full of information: material remains — wooden artifacts included — bone, macrobotanical remains, and pollen. Levee sites are as yet unknown in this district because of the thick peat cover everywhere.

An exceptional site was discovered in 1976 and excavated two years later, north of Rotterdam near the village of Bergschenhoek at a depth of 8 m below sea level in a polder where the present surface was 5 m (Figure 8). This was a very small camp site situated in a landscape of lakes, reeds, and swamps on a formerly floating lump of peat which subsequently became embedded. Microstratigraphy led to the conclusion that the camp was used for a period of 10 to 20 years. The remains were silted over shortly after its final abandonment and preserved in very good condition: reed bundles of the living surface, wooden boards (remains of a dug-out canoe), fish remains — scales included — and some impressive fish traps. Dated by C14 and pottery typology to the early delta Neolithic, ca. 4300 B.C., it has to be con-

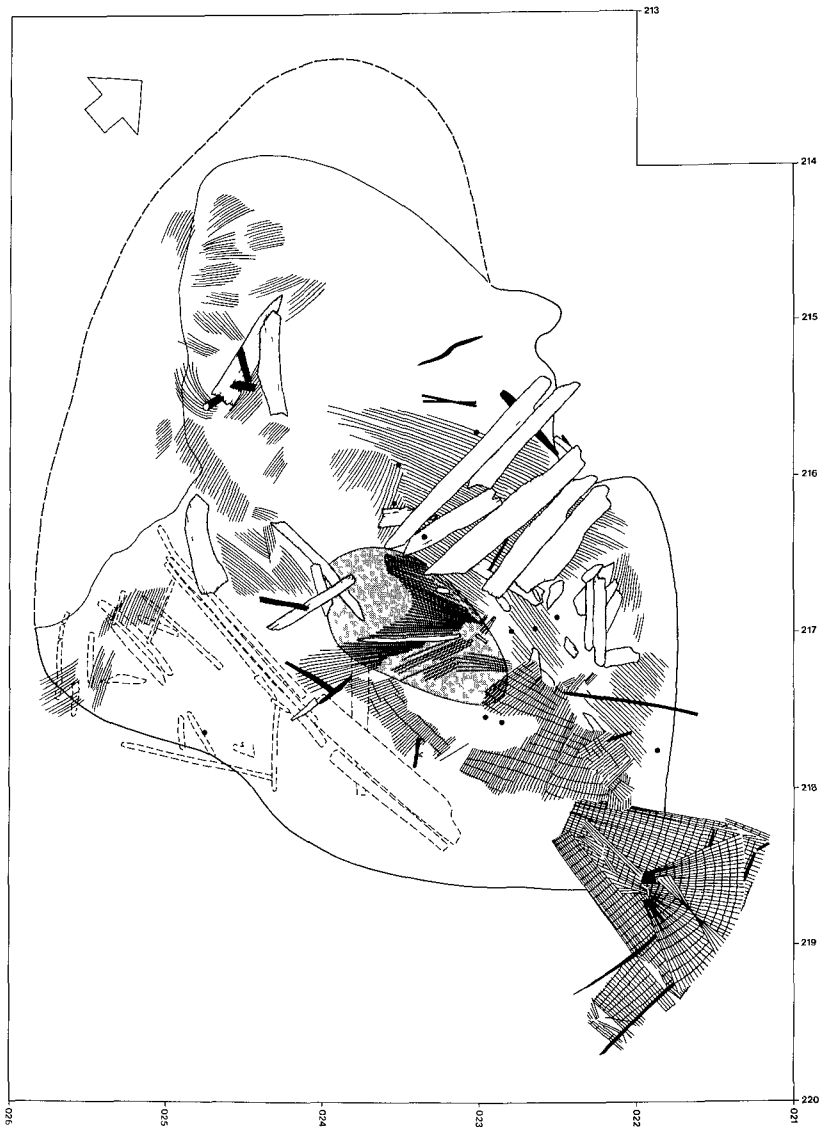


Figure 8. Bergschenhoek, phase 3 (out of 4) of a small fowling-fishing camp, dated ca. 4400 B.C.. It was originally on a floating piece of peat, ca. 4 x 4 m. When the peat island became embedded, apparently in lakeshore clay, the living surface was raised with bundles of reeds, irregular boards (probably the remains of a dugout canoe), and small trees. Microstratigraphy and bird bones indicate regular winter use over 10 to 20 years. Fish traps were left along the water edge. The "Mesolithic" style of this site contrasts with the use of pottery and domestic animals and cultivated wheat at coeval locations in the same regions, e.g., Hazendonk and Brandwijk.

sidered as a fowling-fishing station of early agricultural communities in distant regions. We must assume that many, perhaps thousands, of such sites lie hidden in the Holocene deposits (Louwe Kooijmans, 1987).

Our project has investigated settlement sites of the Vlaardingen group or the contemporaneous Beaker phase in all delta ecozones: on the coastal dunes at Voorschoten (1987), on the Meuse estuary tidal creeks at Hekelingen (1980), on the inland dune tops mentioned above (Hazendonk, 1974 to 1976), and on levees of the river clay district (Ewijk, 1978). Their preservation and information value are similar to that of the earlier sites. The wide ecological distribution is partly due to better recovery chances, but partly perhaps also to improved living conditions, especially along the coast and in the river-clay district.

In the northern half of the delta, a series of early Beaker sites, contemporaneous with the end of the Vlaardingen Group farther south, have been discovered on fossil desalinated salt marshes. They have been investigated by the institutes of the Groningen and Amsterdam Universities and by the State Service at Amersfoort.

Bell Beaker sites, of the End Neolithic, are absent from the wet environments, with the exception of some small, special activity sites. A preference for relatively high, sandy locations makes these sites less informative, but Molenaarsgraaf and similar sites near Ottoland on fluvial deposits in the center of the peat region are illustrative of many aspects of organization and economy (Louwe Kooijmans, 1974, 1990).

Methods

We apply a wide variety of methods, depending of the specific research project, its goal, and the physiographic conditions. Apart from field prospection on microregional scale, both large-scale machine-aided excavation and small-scale manual excavation with 3D-find documentation are carried out. On the analytical level, palaeobotanical identifications, identification of wood, and charcoal and pollen analysis are of crucial importance, as is zooarchaeology, including the study of fish remains, mollusks, and snails (Bakels, 1981, 1988, 1990; Prummel, 1987; Zeiler, 1991). Sectioning and mapping of Holocene deposits by means of hand coring in a dense grid for small regions in scales under 1:5000 appears important for locational analysis and palaeogeographical reconstruction (Van der Woude, 1983, 1984, 1985). A new development is that of the micromorphology of large thin sections for the study of fossil sedimentation and soil-formation processes.

Traditionally seen as a method where "better" (botanical, zoological) information fails, microwear study of flint scatters has proven of great value in combination with intrasite spatial and biological information. Microwear, especially the significant absence of sickle gloss, was decisive in a discussion on seasonality and site function at late Neolithic Hekelingen (Van Gijn, 1990)!

On the unruly sands, work is dominated by statistical analysis of the total composition of assemblages, site dimensions, and site location. The shift of site patterns is studied on various scales in relation to subsoil and other geographic variables with a Geographical Information Systems (GIS) package (Wansleben and Verhart, 1990).

More generally, increasing use is made of computer facilities, including the use of infrared theodolites with total station for electronic data storage in the field and portable computers as basic field equipment, digitizing maps in autoCAD, and the use of special software for the drawing of pollen diagrams and geological sections directly from the coded counts and field notes. Students are trained in dBase and the use of basic statistics.

Organization and Funding

Our project is part of a research program of the Institute of Prehistory, Leiden University, an institution fully financed by the state. Founded in 1575 and now with about 18,000 students, Leiden University is the oldest and one of the largest universities in the Netherlands, and by a tradition started in 1818, a center of archaeological research. The prehistoric department, founded in 1962, is a unit of 9 staff members, 5 technical and administrative members, and about 70 students. The students go for a three-year single honors M.A. study in prehistory after a first year in a wide range of fields like general archaeology, anthropology, and geography. An important part of the curriculum is field training. At least 16 weeks of excavation participation are required, as is a final 6-month study based preferably on primary sources. All this implies that education and research are intimately linked. Research has to be adjusted to educational demands, especially in its diversity, but it profits in return from students' efforts.

The four staff members each direct a field project, so I have supervision over the Neolithization program on a part-time basis, my other time being devoted to management, lecturing, and other teaching. Money and technical assistance is divided among the projects, with basic funding estimated at U.S. \$5,000 to \$10,000 for each. Additional funds are obtained from local and regional government and sometimes from private foundations exclusively on behalf of rescue excavation. These grants may range from \$1,000 to \$40,000. On this

basis, a series of excavations have been executed during the last years on Neolithic sites: a Vlaardingen settlement at Voorschoten (1986), a Rössen settlement at Maastricht-Randwijck (1988), a Bandkeramik and Michelsberg site at Maastricht-Klinkers (1989), and a Bandkeramik settlement at Geleen-Janskamperveld (1991).

The main research effort is, however, embodied in several 4-year Ph.D. research assistants, either in positions offered by the University (three for the institute as a whole) or obtained in competition with the other archaeological institutions from the Foundation for Scientific Research, which is itself financed by the same Ministry of Education as are the universities. The dependence on external funding and the uncertainties involved imply major restrictions in the planning of the program. One cannot follow one's own line, but has to adjust to others' opinions as well, but that is not considered as a real drawback. We should not complain, since at the moment four such Ph.D. studies are in progress: one in the delta, one on the sand, one in the loess, and one covering all three districts.

Marten Verbruggen, a Holocene specialist, is making an intensive prospection of the ca. 100 drowned inland dunes in the peat district in a search for Neolithic refuse levels on their slope and in the covering peat layers. Most of the dunes appear to have been occupied in several Neolithic phases, and so a database will be available to evaluate the detailed Hazendonk information in a systemic regional perspective. Questions on periodicity of exploitation of this ecozone in relation to changes in the natural environment will be answered.

The second project is a joint venture of Leo Verhart, curator of the National Museum of Antiquities, and staff member Milco Wansleben. They hope to trace the shifts in settlement variables during the Mesolithic-Neolithic transition in a wide zone along the Meuse River between the loess and the delta. The hope is that shifts in subsistence, especially a sudden or gradual transition to farming, are reflected in locational preference, site dimensions, and site functions. Since a detailed survey of the study area, measuring ca. 40 × 100 km, with 4000 sites, is beyond the possibilities, work is organized into four scales:

- Total area, archive- and literature-based site inventory
- Four core areas, detailed study of all available material in private and public collections
- Four microregions, one within each core area, with detailed field surveys
- Four excavations of one key site within each microregion

The patterns and observations of each lower level help in the interpretation of the more general picture in the next level above.

The third project is by Fred Brounen, who is studying the two flint mining centers of Valkenburg and Simpelveld in the loess zone to develop ideas about flint procurement and distribution systems. Here, too, several scales are distinguished: the mine location itself, a microregion of 10 kms in diameter and the wider distribution sphere. Major questions are: (1) Which stages of axe production were executed? (2) Where? and (3) Is it possible to differentiate between restricted access plus specialized mining and open access combined with visiting miner groups? We also wonder how exotic axes found close to the mines should be explained.

Finally, José Schreurs has started a microwear study of Michelsberg flint assemblages on the loess and on the sand combining both high- and low-power techniques, in the hope of finding specific use pattern spectra related to the materials worked and the types of movement that might be of some significance for our central question. The phase chosen seems to be crucial in the introduction of agrarian elements in the delta and in site pattern shifts in the Meuse Valley Project.

In this way, a database of site-bound excavation reports, including specialist studies and thematic studies, grows and provides the foundation on which a more general theory of the Mesolithic/Neolithic transition might be based.

RESULTS

The main results of the project, until now based on the sites and data of the preceding sections, will be dealt with in thematic order.

Chronology

The poor chronogeographical scheme from which we started has been gradually refined (Figure 9). The gap of 16 C14-centuries between the loess and delta Neolithic has been reduced with "hard" settlement evidence to about 4 centuries (4700 to 4300 B.C.), while the geographical space between both is gradually being filled with chance finds and surface sites. The present-day scheme shows a lot of detail and precise dating, which allows us to better follow processes and pattern changes. The chronological backbone for the loess is the traditional Neolithic sequence of the Rhineland to which new Neolithic finds close to the loess-sand transition can now be linked with a series of independent C-14 dates. On the delta end, a firm chronological backbone for the period 4200 to 2200 B.C. is given by the Hazendonk sequence, which gives us distinct technological and stylistic pottery assemblages in stages of about two centuries each (Louwe Kooijmans, 1976b, 1987). A significant handicap is the lack of a good chronological scheme for the sand district. It should be based on short-phase sites,

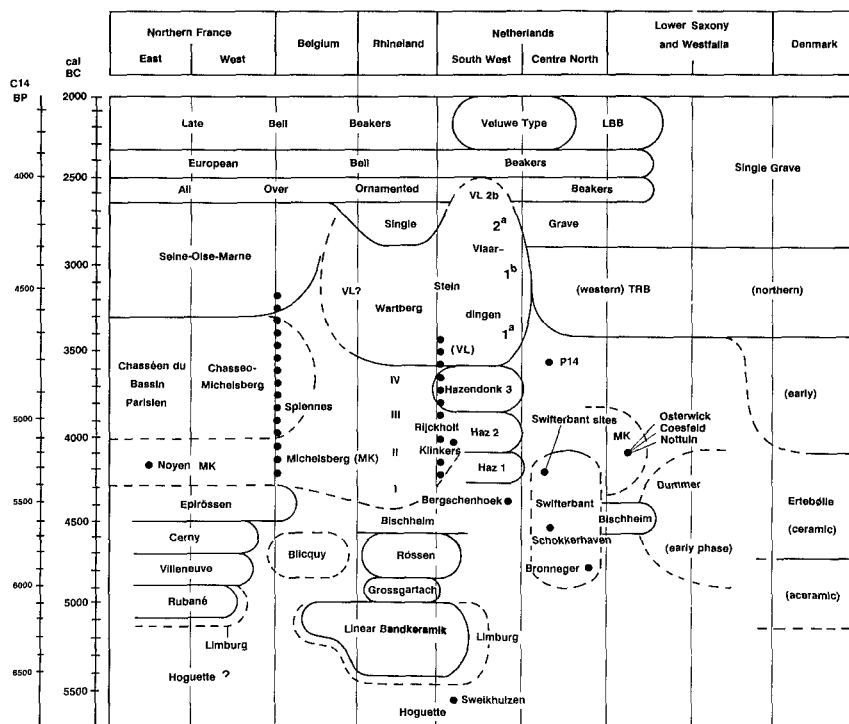


Figure 9. Chrono-stratigraphical scheme for the Neolithic period in the Lower Rhine Basin and adjacent areas. Culture names and those of selected sites are mentioned in the text. Major flint mines are indicated with black dot rows.

which are lacking, especially for the Later Neolithic. Most flint types have, moreover, restricted chronological value, and a system there should be based on flint.

Culture Geography

One can criticize the use of pottery typology as a culture marker, but I think there are enough (theoretically valid *and* pragmatic) arguments for cultural distinction on this basis. We should, however, not erroneously assume that such pottery groups differ in other aspects, such as subsistence economy and organization, as reflected by settlement systems. Nor does it seem right to assume that such pottery style units are internally homogeneous in such respects. But similarity/dissimilarity in pottery style must relate to contacts between groups of people, for instance of delta communities with their hinterlands.

"Classic" Early Neolithic Bandkeramik settlements are restricted to the loess zone, a substrate to which their agricultural system, espe-

cially crop cultivation, seems to have been intimately linked. But the culture-geographical situation here is complicated by the involvement of two other distinct pottery styles, not found farther east, named "La Hoguette" and "Limburg" (Lüning et al., 1989; Van Berg, 1990). These have in their distribution (Limburg, especially) and in decoration style (La Hoguette, especially) distinct southwestern connections that reach as far as the west Mediterranean Epicardial culture. This pottery is generally found in low percentages as an admixture in Bandkeramik pit fills. Its almost complete absence outside such contexts is seen as a result of site formation processes, especially the absence of pits, trenches, and other features at other sites. A small, pure La Hoguette site was excavated at Sweikhuizen close to the Geleen Bandkeramik sites, but without evidence of contact (Modderman, 1987). La Hoguette seems to be the earlier of the two, possibly even preceding the earliest Bandkeramik in our area of study.

Bandkeramik adzes are thinly spread all over the Meuse Valley, as far north as Nijmegen (Figure 10), fully comparable to a similar distribution of these adzes throughout the North German Plain (Brandt, 1967). In addition, over 100 characteristic Linearbandkeramik arrowheads are mapped in the same region. Pottery — never more than a few sherds on a site and restricted to the later Bandkeramik phases — is found only in the southern 20 to 30 km of the sand bordering the loess, and generally in association with a Bandkeramik flint assemblage. There is an admixture of Limburg pottery on these sites, too. Even a "pure Limburg" assemblage has been found at Kesseleyk (Modderman, 1974), and some La Hoguette sherds were found in dredging operations as far north as Gassel on the fringes of the delta.

There is a lively discussion on the implications of these modest, but seemingly important, finds (Figure 11). What do they reflect? Exchange with Late Mesolithic groups? Expeditions or wanderings from the loess to the north either for prospection, hunting, or (transhumant?) cattle herding? Or even an extension of Neolithic permanent settlement into this zone? How are La Hoguette, Limburg, and Linearbandkeramik related?

The "pure" La Hoguette and Limburg assemblages in this zone might be seen as reflecting separate, possibly (semi)agrarian, groups outside the Bandkeramik territory. The true late Bandkeramik sites with pottery might be seen, in view of their ephemeral character and location, as a growing involvement with this zone and with transhumant cattle camps as a first option. The wider spread of arrowheads and axes only tells us that the zone up to 100 km north of the loess must be considered as part of the contact or "availability zone" according to Zvelebil (1986) at that time.

The idea of a Western Neolithic "wave of advance", badly visible because of different formation processes, meeting and perhaps even

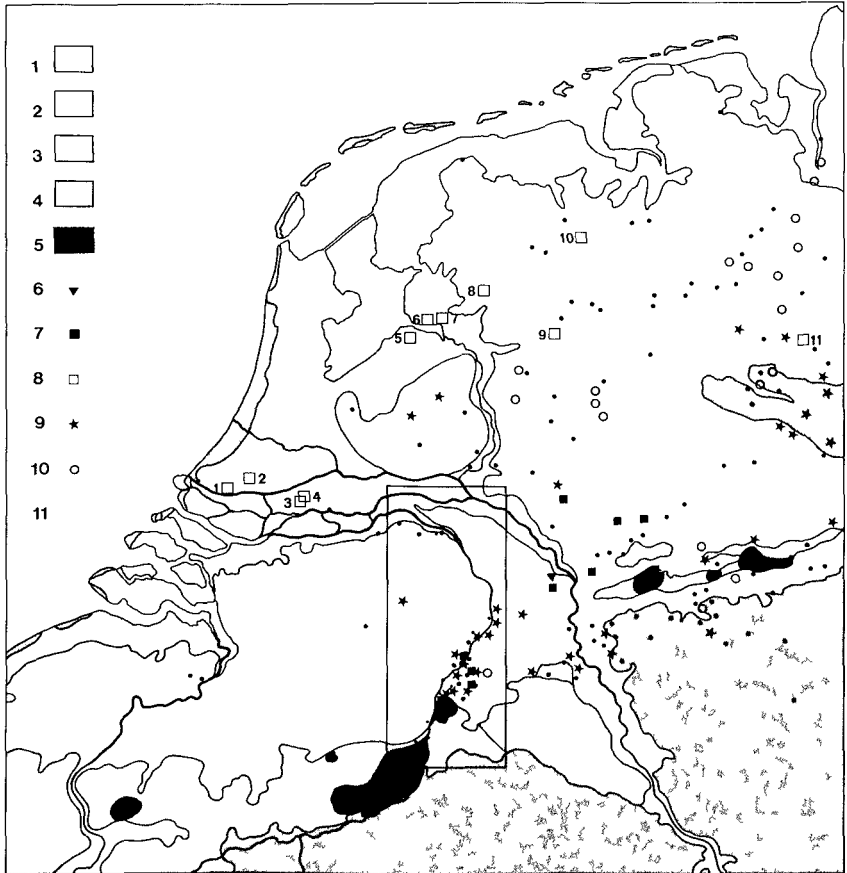
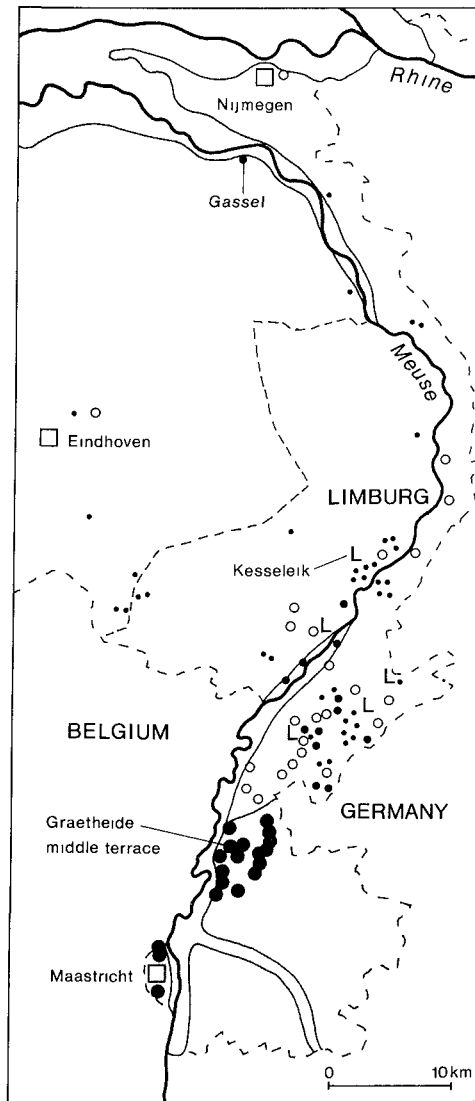


Figure 10 Earlier phases of the Neolithic in the western part of the North European Plain. Ephemeral sites and stray implements from three successive stages show a growing intensity in contacts between the fully Neolithic communities of the loess and those in the sandy plain, presumably in the form of exchange relations. The dense find pattern in the Meuse valley (Figure 11) is generalized in this map, where find density is partly related to research intensity. Compiled from Bakels 1982, Brandt 1967, Hunz 1974, Hoof 1970, Narr 1983, Schut 1987, van der Waals 1972, van der Graaf 1987. Key: 1–4, same as in Figure 1, 5, Bandkeramik/Rossen settlement of the loess, 6, ephemeral Bandkeramik sites, 7, ephemeral Grossgartach/Rossen sites, 8, ceramic sites on North European Plain, 9, Bandkeramik adzes, 10, Grossgartach perforated adzes, 11, Rossen “broad wedges”. Ceramic sites 4700–4200 BC: 1, Schiedam, 2, Bergschenhoek, 3, Hazendonk, 4, Brandwijk, 5, Swifterbant cluster, 6, Schokkerhaven, 7, P14, 8, De Gaste, 9, De Heemse, 10, Bronneger, 11, Dummer.











- | | | | |
|---|----------------|---|------------------------|
|  | delta deposits |  | bandkeramik settlement |
|  | sand |  | ephemeral site |
|  | loess |  | arrow head |
| | |  | adze |
| | |  | L Limburg pottery |

Figure 11. Bandkeramik distribution along the Meuse river in the Dutch province of Limburg, showing three zones: 1, permanent loess settlement; 2, ca. 20 km of sand zone with intensive contacts, probably in form of transhumant cattle herding; 3, wider zone of sand with sporadic contacts, probably in form of hunting or exchange. Generalized after van der Graaf 1987.

preceding the archaeologically distinct Bandkeramik, is a new and intriguing issue, especially since, already in this stage, contacts appear to have been made with the people far north, in the Rhine/Meuse delta.

The change from Bandkeramik to Early Rössen (= Grossgartach) in the loess zone around 4900 B.C. represents the transition to a pottery style which had developed along the Upper Rhine between Mainz and Strasbourg from the regional late Bandkeramik Hinkelstein group there. We can describe the transition as a disturbance horizon without understanding or explaining what happened. These changes are rather sudden and distinct in almost all aspects of culture. Defensive earthworks were constructed not around, but directly beside some Bandkeramik settlements. In culture-geographical terms there is, however, no great change: Rössen is essentially the successor of Linearbandkeramik in most of Germany. There is a similar involvement with the North German Plain, but probably wider and more intensive. There are ephemeral Rössen sand sites not too far from the loess boundary, and there is a wider and denser spread of the two leading types of heavy implements, the "high perforated shoe-last adze" and the "broad wedge" (van der Waals, 1972; Brandt, 1967). We think basically of continuity from Bandkeramik society, but with a distinct cultural transformation, not only in pottery style, but in most material and immaterial aspects of culture.

There is, as yet, hardly any evidence about the earlier recipient communities of these adzes in our regions. Recently, some modest pottery finds on sites in the Northeast Polder, IJsselmeer District, are dated to ca. 4500 B.C., and a baseless (but perhaps originally point-based) pot from Bronneger (prov. Drenthe) has accelerator dates of charred crusts at ca. 4700 B.C., earlier even than the earliest Ertebølle pottery in Denmark. These finds make us assume a western branch of Ertebølle-related communities, at least from this relatively early date onward. It should not be excluded, by lack of evidence, that this tradition started earlier and extended to the southern part of the delta, as well. Even a connection with La Hoguette should not be considered impossible! One of the goals of our project is to trace and identify material relics from this space-time unit. It is precisely the (semi)sedentary, nonagrarian Ertebølle of southern Scandinavia and the intermediate related site of Dümmer, Lower Saxony, that were the northern partners of the adze exchange farther to the east.

The third stage to be considered is the period of 4300 to 4100 B.C.. In the northern part of the delta, a "Swifterbant group" can be identified, probably rooted in the material mentioned just above (van der Waals 1976–79). Its pottery technology and style have similarities with Late Ertebølle in its pointed bases, flaring rims, some simple shoulder decoration, coiling, and organic temper. The flint industry is, how-

ever, quite different and derived from a local Late Mesolithic (micro)blade tradition. Some "broad wedges" in the assemblages demonstrate a continuity of exchange until this phase. There is, however, one major difference from Scandinavian Ertebølle: the sites are distinctly semi-agrarian, as will be described below.

Contemporaneous assemblages in the southern half of the delta (Hazendonk 1, Brandwijk, Bergschenhoek (Louwe Kooijmans, 1987)) have distinct technological and stylistic connections to the southeast, that is to the Late Rössen (= Bischheim) of the Rhineland. But there are also traits in common with Swifterbant, along with some original characteristics.

The Rhineland connections of Hazendonk 1 are the prelude to the north- and westward extension of the Michelsberg culture as far into the North German Plain as Osterwick/Coesfeld/Nottuln in the Münster Basin, Kraaienberg/Gassel/Vormer on the sand margin, and Hazendonk in the delta. The distinct Michelsberg flint tool kit of large macroblades and macroflakes produced of mined Rijckholt-type flint from southern Limburg goes together at these sites with pottery that has nothing in common with Swifterbant ware, but instead has close technological and typological affinities with that of Rhineland Michelsberg assemblages. But there are so many distinct traits specific to this new northwestern Michelsberg expansion that it can be considered as a separate group, in which carinated bowls are the most prominent elements, reflecting western connections with the British Early Neolithic. In the Hazendonk 3 phase, increased regionalization is visible in pottery style (Louwe Kooijmans, 1980b). I am inclined to use the stylistic argument in favor of acculturation/transformation, as opposed to migration/expansion as an explanation, in keeping with current ideas about the origin of the stylistically related British Early Neolithic. To the north of the Michelsberg extension, there is a hiatus over the ca. 500 years of this phase. One assemblage is dated late into this gap by C-14 and stratigraphy: Northeast Polder site P14. Its pottery is certainly different from that of the Michelsberg sites and seems to have early TRB (Funnel-Necked Beaker) affinities.

There appears to be an increasing contrast between the southern and northern sequences in the delta and its margins, implying different hinterlands for both zones. This contrast is even more distinct in the Late Neolithic, after 3400 B.C., when northern TRB (Bakker, 1979) and southern Vlaardingen "cultures" are opposed. Megalithic graves and the distinct "Tiefstich" decorated TRB pottery is found suddenly all over the North German Plain, making the invisible people of the preceding phase all at once visible. Between this area and that of Seine-Oise-Marne (SOM) in the Paris Basin, people have, in contrast, seemingly disappeared. In reality, however, we should distinguish a third, large cultural unit, comprising groups like Vlaardin-

gen in the Dutch delta and Wartberg in Hessen, that have much in common in their material remains. The scarcity of finds can be explained by archaeological formation processes (Louwe Kooijmans, 1983).

In the end of the Neolithic, a gradual but profound cultural transformation takes place, not only in the Netherlands, but over most of central and western Europe. This is the change from a variety of distinct regional groups, firmly rooted in local traditions — like Vlaardingen, Stein, and Western TRB in the Netherlands — into what is called the “Beaker Complex”. This led Van der Waals (1984) to speak of a *unification* process as the opposite of the more often observed regionalization. We now realize more than before that the discontinuity at this transition is especially marked in the archaeological record because of the introduction of a distinct new burial tradition, of which the more prestigious barrow burials and the distinct set of male grave gifts especially strike the eye. These single graves contrast sharply with the earlier collective megaliths in many regions, like the northern Netherlands. Settlement evidence of the last decades shows, however, a marked occupational continuity and a more gradual transition, either visible in stratigraphy or in the co-occurrence of material of both phases on one site, like Voorschoten (Glasbergen et al., 1967), Hazendonk (Louwe Kooijmans, 1976b) and Bornwird (Fokkens, 1982). But the adoption of a new and apparently meaningful burial tradition and set of prestige items over such a huge area asks for an explanation. We will turn, however, first to Neolithic subsistence and its evolution in our research area.

Evolution of Subsistence and Settlement Systems

It is beyond discussion that the Bandkeramik communities were fully agrarian from their very beginning. Crops, documented by charred macroremains, are emmer and einkorn wheat, linseed/flax, lentil, pea, and poppy seed, all but the last with Near Eastern origins and brought to our corner of the continent over the Balkan-Danube route. The poppy seed, in contrast, has west Mediterranean sources and is a strong argument for the second west European wave of Neolithic advance, additional to the La Hoguette-Limburg pottery argument. The poppy seed is found only in the westernmost Linearbandkeramik, from a very early stage onward, and not in central Europe. Charred weed remains point to small, shaded fields in the loess woodland. Experimental data point to good yields over long time spans without manuring (Lüning, 1980). These people must have been hoe cultivators with possible furrow sowing as a measure to safeguard a good crop (Bakels, 1978, 1979; Bakels and Rousselle, 1985).

Zoological evidence from the loess region is scarce, but points to low interest in hunting (ca. 10% of bones) and a dominance of cattle,

with pig second and sheep/goat third. Cattle herding and swine herding must be considered as separate activities, in view of the different requirements of the animals, and both are considered separate from crop farming, as well. The restricted good grazing gave rise to the hypothesis of a transhumant cattle herding, specifically in the northern zone, while pigs would have been fed closer to the settlements in the mixed deciduous forest. We can easily hypothesize a division of labor of these separate tasks according to age and sex.

We are now gradually aware that considerable economic changes took place in the Linearbandkeramik/Rössen transition, reflected by site location and botany. The crop spectrum changed to bread wheat and barley instead of dominant einkorn/emmer (Bakels, 1990). Moreover, site location seems to have been less dogmatic and extended especially to valley floors. One may, in general, speak perhaps of a better adjustment to the specific geographical qualities of our regions as opposed to the more rigid Bandkeramik traditions.

The subsistence evidence for the Michelsberg successors to Rössen is even more restricted, but there are enough arguments in favor of a "normal" agrarian Neolithic society in this area. It is a great handicap that the new Michelsberg sand sites all lack biological evidence, and so one of the major issues is to interpret the earliest delta evidence in relation to a wider geography. This means to relate this evidence to the proper site functions and their positions in the former settlement systems: were these sites permanent, seasonal, or for short-term special activity? Were the sites used by complete households or special task forces? The answer is not given by the biological data alone, but only in combination with the other site parameters, such as location, dimension, and intrasite patterns.

The few early delta sites (4300 to 4100 B.C.) are all located in agriculturally unattractive zones and on locations that offered restricted opportunities for farming and, to a lesser extent, animal husbandry. Surprisingly, all sites produced charred seeds and chaff of cereals in quantities (Bakels, 1981, 1988), and bones of domestic animals make up 10 to 50% of the total (Figure 12). In view of location and ca. 90% hunted animals (mainly beaver and otter, [Zeiler, 1991]), archaeological palimpsests dominated by specialist hunting are the most plausible interpretation for all Hazendonk levels. The Swifterbant levee sites, with evidence for complete households (milk teeth of children, cemetery evidence), are most probably summer residences, with permanent settlement as a second option. Bergschenhoek is undoubtedly a repeatedly used short-term winter fowling-fishing camp.

I propose to call this type of subsistence not only "semi-agrarian", but also "extended broad spectrum", since all classical Mesolithic subsistence activities (hunting, fowling, fishing, foraging) were extended with animal husbandry and at least the consumption, if not

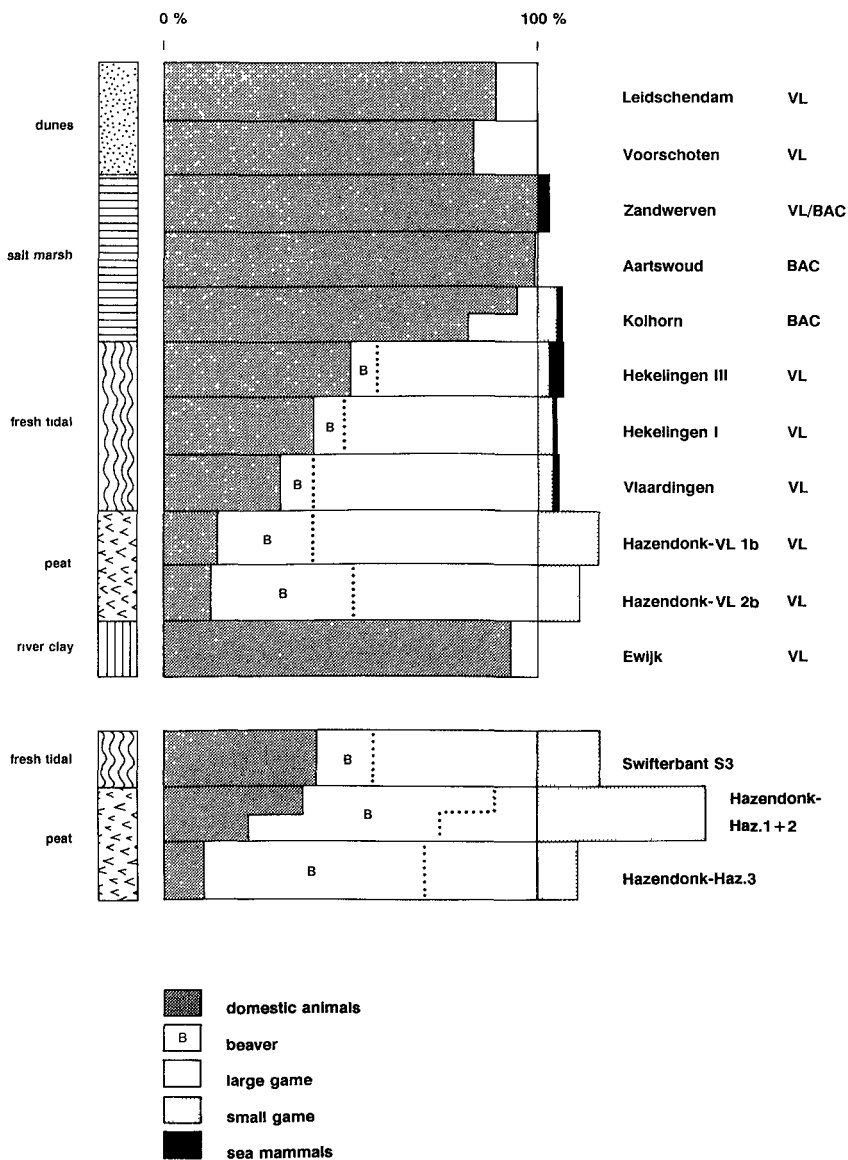


Figure 12. Identified faunal specimens from 3 Early Neolithic and 11 late Neolithic sites from the Dutch delta district, according to ecozones. Until the Late Neolithic, wild animals prevail on the fresh tidal and peat district sites. It is possible to argue that some of these sites are (summer) seasonal occupations and others are special activity/extraction locations. The high percentages of beaver at some sites is additional evidence for this. The fully agrarian salt marsh sites are viewed as summer cattle grazing sites. Sites in the coastal dune and river clay districts might have been "normal" permanent settlements.

also the growing, of cereals. But we see only the wetland elements of settlement systems, characterized probably by a restricted residential as well as some logistical mobility. The presumed upland sites of these systems are, as yet, hardly known.

We can conclude several things. First, apparently the delta wetlands were perceived as an attractive environment, and the demonstrably variable way of subsistence apparently was fully acceptable at that time (Louwe Kooijmans, 1990). Second, in view of the ecological constraints of the delta environment, communities with a similar or even fuller adoption of food production should be presumed on the upland sand, independent of the functional interpretation of the delta sites. Third, the wide occurrence of Michelsberg sites in the Meuse Valley — contrasting to the absence of upland sites farther north — might be partially caused by the use of the highly diagnostic and conspicuous large Rijckholt flint artifacts, but might also reflect a more permanent and stable settlement system.

The subsistence evidence for the Late Neolithic is similar to that of the preceding stage in the same ecozones, but for this period, sites are known from the other delta zones as well (dunes, salt marshes, river levees). These are, by contrast, predominantly agrarian. So the option that at least, in this stage, the upland was agrarian as well seems most plausible, and the fact that there are no distinct shifts in site location preferences as compared to the previous Michelsberg pattern in the Meuse Valley can be used as an argument to extend this interpretation to the preceding phase as well. The agrarian system seems to be essentially similar to that of the Bandkeramik: a wide range of seemingly independent food production activities in varying ratios. The main difference is the use of the plow, attested to by plow marks from 3000 B.C. onwards (Fokkens, 1982), but the lack of evidence does not exclude an earlier start (ca. 4100 B.C.), as elsewhere in northern Europe. I named this system for separate or only moderately interlinked agrarian activities “*quasi mixed farming*” to contrast it with the *true mixed farming* of later times (Louwe Kooijmans, 1990).

The sites in the Rhine-Meuse estuary (Vlaardingen, Hekelingen) and on the river dunes in the peat district (Hazendonk) continue the Early Neolithic tradition. Although sturgeon fishing proved their use, at least in the summer, crops were not cultivated locally, in spite of the presence of charred seeds, chaff, and even cereal pollen. There is no trace of deforestation. Cereals must have been brought to the sites, at least to Hekelingen, on the ear (Bakels, 1988). I am inclined to prefer this option for the earlier sites, where evidence is more restricted, for the sake of consistency. We have, moreover, for these Late Neolithic sites, valid arguments to see these semiagrarian sites as wetland outliers of *different* upland communities. The flint sources

of the individual sites are situated in widely different directions, reflecting different hinterlands of their occupants. For Hekelingen and Vlaardingen, these sources are mines in the chalks of southwestern Belgium and northwestern France, i.e., 150 km up the Scheldt River. For Hazendonk, we have to look to the Meuse gravels, probably 50 km to the east or southeast. At agrarian sites on the coastal dunes, small, flint pebbles dominate, either of local origin or from the Zeeland Flanders coast, 100 km along the coast to the southwest.

We can conclude that apparently the typical Mesolithic strategic concept of the exploitation of a variety of wild resources persisted as late as the end of the Neolithic, as far as such activities could be combined with the yearly agrarian cycle, including seasonal special activity sites. The Neolithization in the western part of the North European Plain was thus not a simple transition from hunting-gathering to agriculture at a given point of time. Quite the contrary, it was a long and complex process of interaction, adaptation, and cultural transformation, apparently without serious disruptions (Figure 13).

The interaction between La Hoguette, Limburg, Bandkeramik, and Rössen on the one, southern, agricultural, side and the Late Mesolithic on the other, northern, side — between societies apparently bound to their preferred habitat — had no consequences, as far as we can observe, for food procurement in the north, but might have been one of the causes of the changes observed in the agricultural system in the loess zone.

Adoption of some agriculture had begun north of the loess, at least around 4300 B.C. The process was predominantly, if not exclusively, one of addition and not a new wave of colonization. In the south, an extension of Michelsberg culture with distinct pottery forms, tool kit, and exchange links developed. In the north, a native north European tradition persisted. The transition to a formal “complete Neolithic complex” happened no earlier than a millennium later (3400 B.C.) with *Tiefstich* TRB.

As far as restricted data allow generalization, one might say that Neolithic elements were included in a basically native Mesolithic society: early pottery styles have distinct regional traits; settlement systems and subsistence strategy have firm Mesolithic roots and contrast to the “full Neolithic” of the loess zone. Even in the Late Neolithic, these traits are not lost. This seems not to be specific for our regions, but to fit patterns found elsewhere, for instance in Danish TRB with its catching sites on small islands like Hesselø and Sølager (Skaarup, 1973) and some Horgen lakeside settlements in Switzerland with semi-agrarian faunal samples.

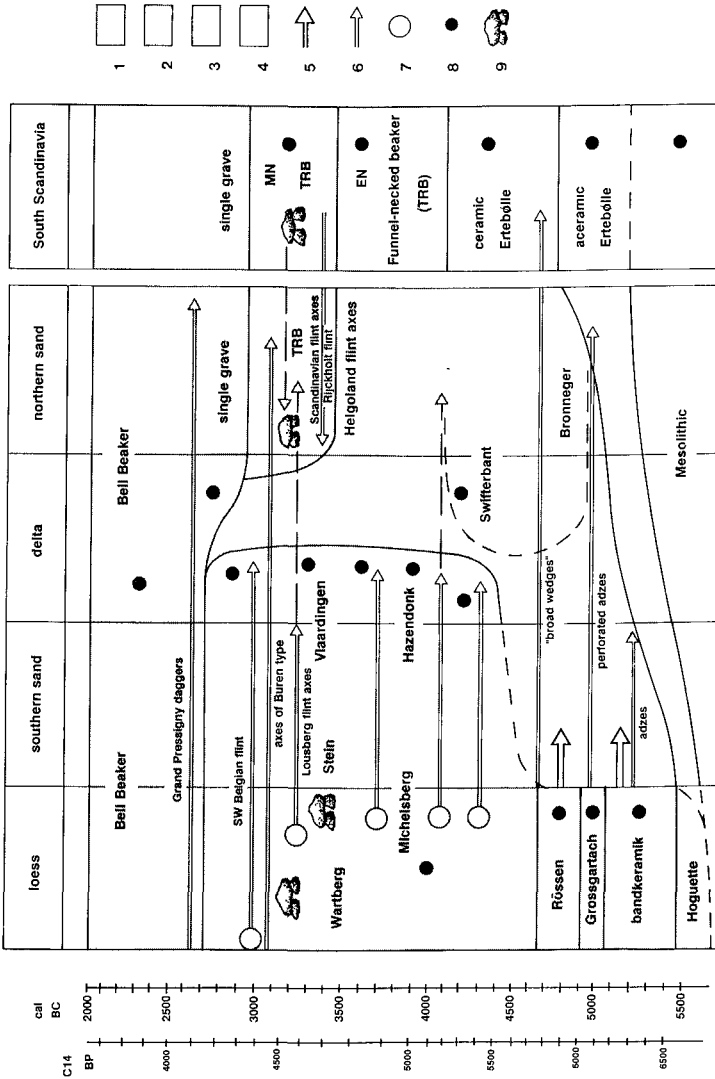


Figure 13. Chrono-geographical S-N section of the Neolithic period in the Lower Rhine Basin with evidence on palaeoeconomy and exchange relations. Zones and stages of Neolithisation according to Zvelebil's (1986) model as suggested in this paper are shaded. Key: 1, fully agrarian/consolidation; 2, substitution; 3, availability; 4, foragers; 5, extension of activities; 6, exchange relation; 7, deep flint mining; 8, botanical and/or zoological evidence; 9, megalithic burial monuments.

Explanation

Everybody working in prehistoric archaeology tries to understand why the long term changes traced by him or her took place. My opinion is that many of the "explanations" formulated reflect the theoretical viewpoint of the investigator. The changes are explained *within* a certain theoretical framework: functionalist, materialist, structuralist, etc. Which explanation is "true" depends on the investigator's theoretical belief. The present-day best explanation depends on the current favorite theory, the choice of which lies fully within the field of sociology and anthropology. We meet again the frustrations mentioned in the introduction: the lack of time depth in these disciplines and the lack of direct observation in archaeology. Do (and can!) we really understand the "why" of the Mesolithic/Neolithic transition in our area or in a wider north European context? Have we any explanation of more than local or regional validity? An impressive literature has grown on this topic, comprising considerations of the nature of the agricultural frontier or Mesolithic/Neolithic interface, on the possible factors or causes that relate to the transition, about the differences or the similarities of both types of societies involved, reviews of the scattered wealth of detailed evidence, and critical reviews of others' opinions. The reconsideration of all of this lies beyond the scope of this article, and I refer only to the major recent publications and their bibliographies: Zvelebil, 1986; Madsen, 1986; Bogucki, 1987, 1988; Thomas, 1988; Whittle, 1990. I only add some additional remarks.

Population growth and "pressure" have always been a popular cause of change in prehistory, but I am very sceptical in these cases. There is no way to calculate prehistoric population densities on more than a regional scale with any certainty, in view of the uncertainties and margins of error related to the formation processes of the archaeological record. We also know that "overpopulation" or "population pressure" are very subjective and more perceived than real. An ecological/population pressure argument has been put forward by Zvelebil and Rowley Conwy (1984), but it must be clear that there are no climatic indicators for such a crisis, nor can we expect that the highly flexible broad spectrum hunter-collector societies of northern Europe would be profoundly disturbed by the failure of one of many food sources.

We have to cope with not one but essentially with two problems: First, why did the Mesolithic people *not* turn to agriculture in Bandkeramik times? Second, why they did around 4200 B.C., all over northern Europe — not exactly in the same way everywhere; but is that really astonishing in view of the size of "northern Europe"? We have to look for processes that play a part on this scale and that are not

bound to any specific landscape or ecological condition. One might think of a technical or agrotechnical improvement that made agriculture, especially crop cultivation, at a given moment, sufficiently attractive to be adopted around 4200 B.C. The development of the *ard*, a light plow, might meet these requirements. It allows the cultivation of large fields with relatively low yields on the poor or even acid, northern soils. More speculative is the improvement of crops for cultivation in these conditions and at these latitudes, but there are no archaeological arguments in this regard.

More generally, it seems to me important, first to realize that we have here a situation that has no good modern analogy. We are studying the confrontation of stone-technology hoe cultivators, and colonist-settlers, with broad spectrum hunter-gatherers with presumably restricted mobility, all this in an unspoiled temperate environment with full opportunities for all communities involved to select optimal site locations in their perception. Both populations, the colonists and the natives, had widely different cultural roots. Those of the Bandkeramik are to be traced to southeastern Europe and ultimately to the Near East. The material expression of their ideas or beliefs includes figurines, be they rare in this western outpost. They were nonmobile and built firm, more than minimally functional, seemingly-prestigious housing (Figure 14). Most striking, however, is their attitude towards nature, their perception of the environment. Their way was to play safe — their type of low-risk strategy — which meant a very narrow range of subsistence activities, visible in their specific settlement location on the edges of loess plateaus or along brooks in loess-covered districts, and in their reliance on cattle and cereals, disregarding the natural food sources to a large extent.

The “natives”, in contrast, had their roots far back in the Late Palaeolithic of northern Europe. Their subsistence shows an appreciation of everything nature offered (Figure 15). Their perception of nature clearly was different from — yes, even in opposition to — that of the Bandkeramik people. They were, moreover, mobile, with light housing. Geometric design — if any — could express their ideas.

My point is that these differences in mentality can explain the lack of adoption of Neolithic elements in the early centuries of contact. Fundamentally different attitudes had to be bridged. This implies that both culture complexes gradually had to transform in the other's direction. I have the impression that this, indeed, is the long-term process behind the scarce archaeo-relics we have from the period 4900 to 3400 B.C. The adoption of cattle and crops at a given moment by the native communities might have something to do with the lowering of risks in the harsh season, with prestige involved, or with technological innovation that made it more attractive than before. It seems difficult or impossible to test these options.

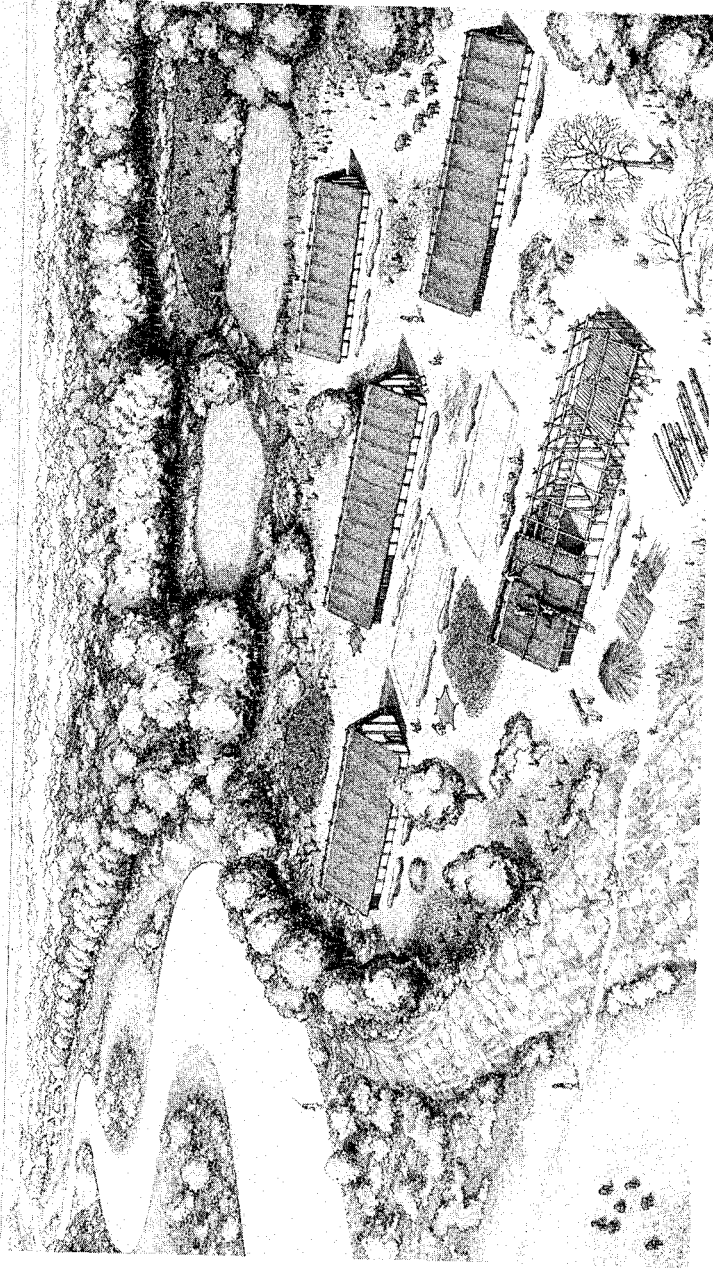


Figure 14. A Bandkeramik settlement on a Meuse river terrace like those near Eisloo or Stein in the South Limburg loess zone. Note the dense forest, small clearings close to the settlement, and the next village in this cluster in the distance. New evidence points to a wider variety of house dimensions (fewer longhouses, more shorter and higher structures), a surrounding enclosure (possibly with palisade) and narrow entrances, and small gardens among the houses. This fully Neolithic way of life contrasts with that of the native Mesolithic communities in many respects. (After color illustration by Bob Brobbel in Bloemers, J. H. F. et al., *Verliden Land*, Meulenhoff in Informatief, Amsterdam, 1981.)

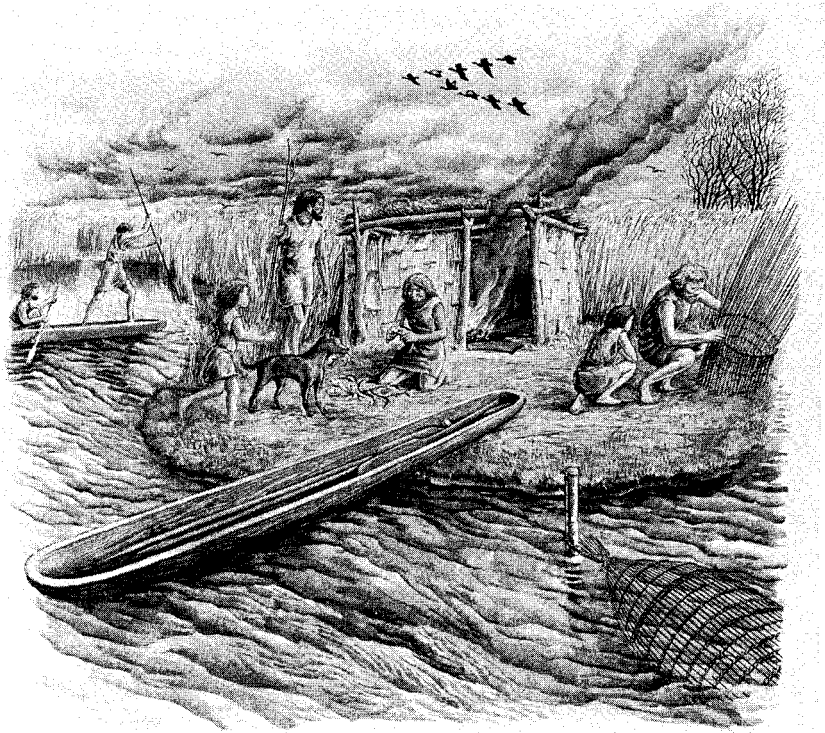


Figure 15. The small winter hunting-fowling-fishing camp of ca. 4300 B.C. at Bergschenhoek, illustrating the continuity of the Mesolithic type of settlement systems, subsistence, and perception of nature into the Early Neolithic in regions north of the loess. (After color illustration by Bob Brobbel in Louwe Kooijmans 1985.)

We observe, anyhow, that Neolithic people in the delta zone, until the very end of the Neolithic period, had a positive attitude toward the natural richness of their environment, similar to the preceding Mesolithic, and contrasting with the *Bandkeramik*. This perception of nature changed in the following centuries, the Beaker period. Evidence from this time is scarce, but we see the outcome in the well-documented Middle Bronze Age agricultural system in which large-scale plow farming is combined with cattle stalling in longhouses containing a byre, with cattle boxes under one roof. This implies the care for winter fodder, the mucking out of the stable in spring (most plausible in combination with manuring the fields), and the use of carts and draft-animals in this work. In other words, this was a *true* mixed farming system in which animal husbandry, specializing in cattle, is intimately integrated with crop cultivation. A system of short-fallow cultivation on permanent fields on the poor sand soils guaranteed a yearly crop. Hardly any attention was paid to the rich natural

resources which certainly would not have been depleted. People relied fully on their agricultural system, and their negative appreciation of nature was in sharp contrast to the preceding Neolithic communities in this delta environment. In this respect, they resemble the Bandkeramik on the loess, 3000 years earlier. Their agricultural system was, however, fundamentally different and fully adjusted to the conditions of the northern sand zone (Louwe Kooijmans, 1990).

This system developed in Beaker times, and the Beaker tradition, with its individual burial and prestige items, reflects the social changes brought about by the profound restructuring of the agricultural system (Fokkens, 1986). There is again a remarkable parallel to the Bandkeramik more than two millennia earlier, *not* in the strategy itself — that is basically different — but in the nonflexible reliance on a very specific strategy that had proven successful in the particular environmental conditions of the North European Plain. It seems to be a good argument to consider this stage as the ultimate end of the “Neolithization” process.

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