RESEARCH INTO THE BANDKERAMIK SETTLEMENT OF THE ALDENHOVENER PLATTE IN THE RHINELAND

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The research project "Aldenhovener Platte" (Rhineland) lasted for 15 years (1965-1970). After describing the present day geology and geography of the landscape, a reconstruction of soils and vegetation in bandkeramik times is given. Then different levels of the settlement system are discussed: Houses and farmsteads, the distribution of finds within these units and the function of different types of houses; the settlements, their internal structure and history; the Merzbach valley settlement cell and its history and the differences in function and importance of the settlements; and, at last, the distribution of the settlements within the region of the Aldenhovener Platte. At the end there follow some calculations on population density.

The State of Research

Research into the settlement history of the Aldenhovener Platte during the Neolithic began in 1965 when, encouraged by H. Schwabedissen, R. Kuper was looking for a suitable Rössen settlement to excavate. His attention was drawn by the first finds made by H. Löhr on the perimeter of "Tagebau Inden", a brown coal opencast mine about 50 km west of Cologne in the middle of the fertile Jülicher Loessbörde. During an 18 month excavation from 1965-1967, R. Kuper uncovered a total area of 6 hectares of the first and as yet only fully excavated Rössen settlement (Inden 1; fig. 1).[1]
During the excavation, the exceptional technical and organisational potential for settlement archaeology research on the edge of the opencast mines was realised. The perimeters of these mines, several kilometres long, are in effect "free trial trenches" which can present a complete picture of all surviving prehistoric settlement remains. In addition, and of especial importance, is the opportunity afforded to establish areas completely devoid of settlement with considerable certainty.[2]

The recent research in the Aldenhovener Platte which started with this excavation can be divided into three sections (fig. 2):

1. The excavation of individual settlements (1965-1968). This type of research began with Inden 1 and continued with the Rössen settlements of Inden 2, Inden 3 and Aldenhoven 3.[3] The discovery of settlements of the same culture so surprisingly close to Inden 1 led to questions about the basic structure of Rössen settlement, and from this arose the need to define and divide the site better in the landscape. An early rescue excavation in the neighbouring Bandkeramik settlement Lamersdorf 2[4] was the motivation for extending this to the whole of the Neolithic period.

2. The discovery of the settlement landscape of the Merzbach valley (1969-70) When "Tagebau Inden" was closed down in 1968, archaeological interest shifted to the neighbouring mine, "Tagebau Zukunft-West". At this time, the 3 km long perimeter of the mine was moving down the Merzbach valley, revealing considerable Neolithic settlements on both banks. A working group was set up at the *Institute für Ur- und Frühgeschichte* at Cologne University, consisting of people working on doctoral theses on the Neolithic, under the direction of R. Kuper and J. Lüning. They established the aim of systematically observing the perimeter of "Tagebau Zukunft-West" and immediately excavating all the material, in order at least to be able to

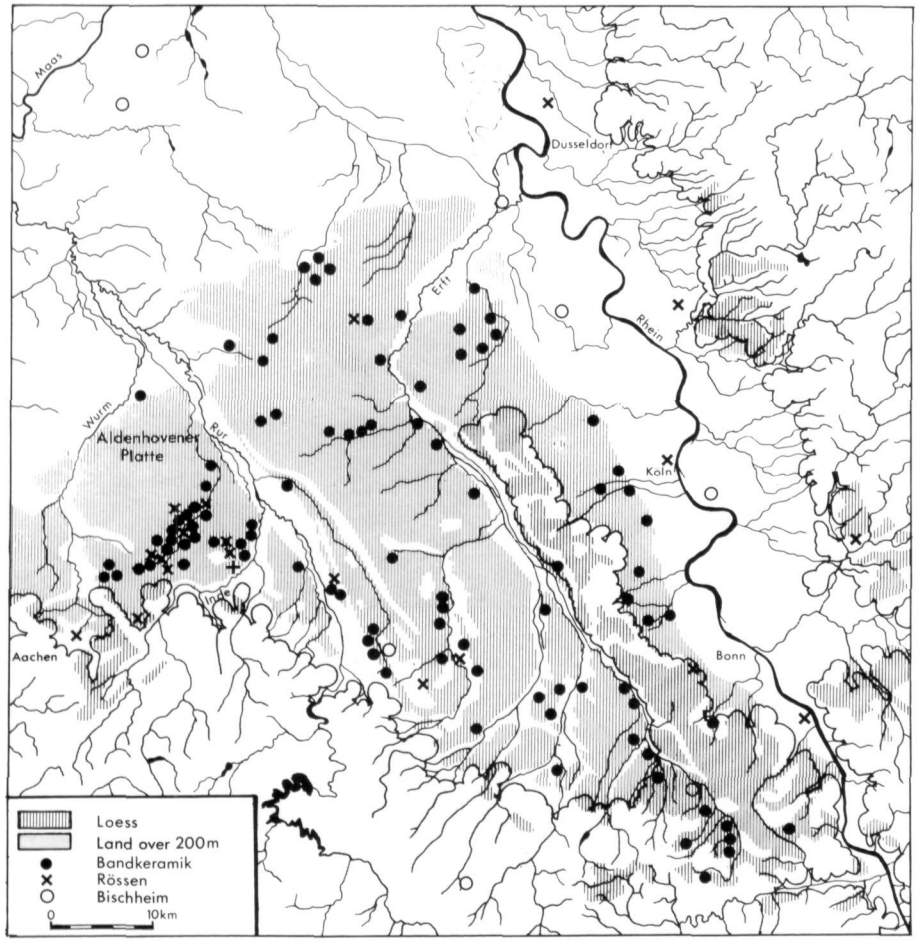

Fig. 1. The Lower Rhine Bay. Distribution of the Bandkeramik (after Dohrn-Ihmig with additions) and the Rössen and Bischheim Culture (after I. Eckert-Schröter). Vertical cross - Inden 1. Scale 1:750 000

date it.[5] In this way in two years a 0.8 km long section of the Merzbach valley (plus a 1.2 km long section of the Langweiler Fliess) was investigated, revealing finds from almost all periods of the Neolithic.[6]

Observations and finds from almost all prehistoric and early historic periods were made, so that it became clear that the Merzbach valley was a representative settlement cell for the archaeological history of the Lower Rhine Bay. However, demands on the time of the members of the working group were considerable, and at the same time it appeared to be unjustifiable to continue the rescue excavations longer than necessary, and as a result accept the unobserved destruction of the greater part of the archaeological material.

3. The Project "Settlement History of the Neolithic of the Aldenhovener Platte" (1971-81). The numerous discoveries of the preceding years and the excellent opportunity afforded for the total excavation of a small landscape unit prompted the proposal to apply to the *Deutsche Forschungsgemeinschaft* to set up a long and comprehensive project in settlement archaeology.[7]

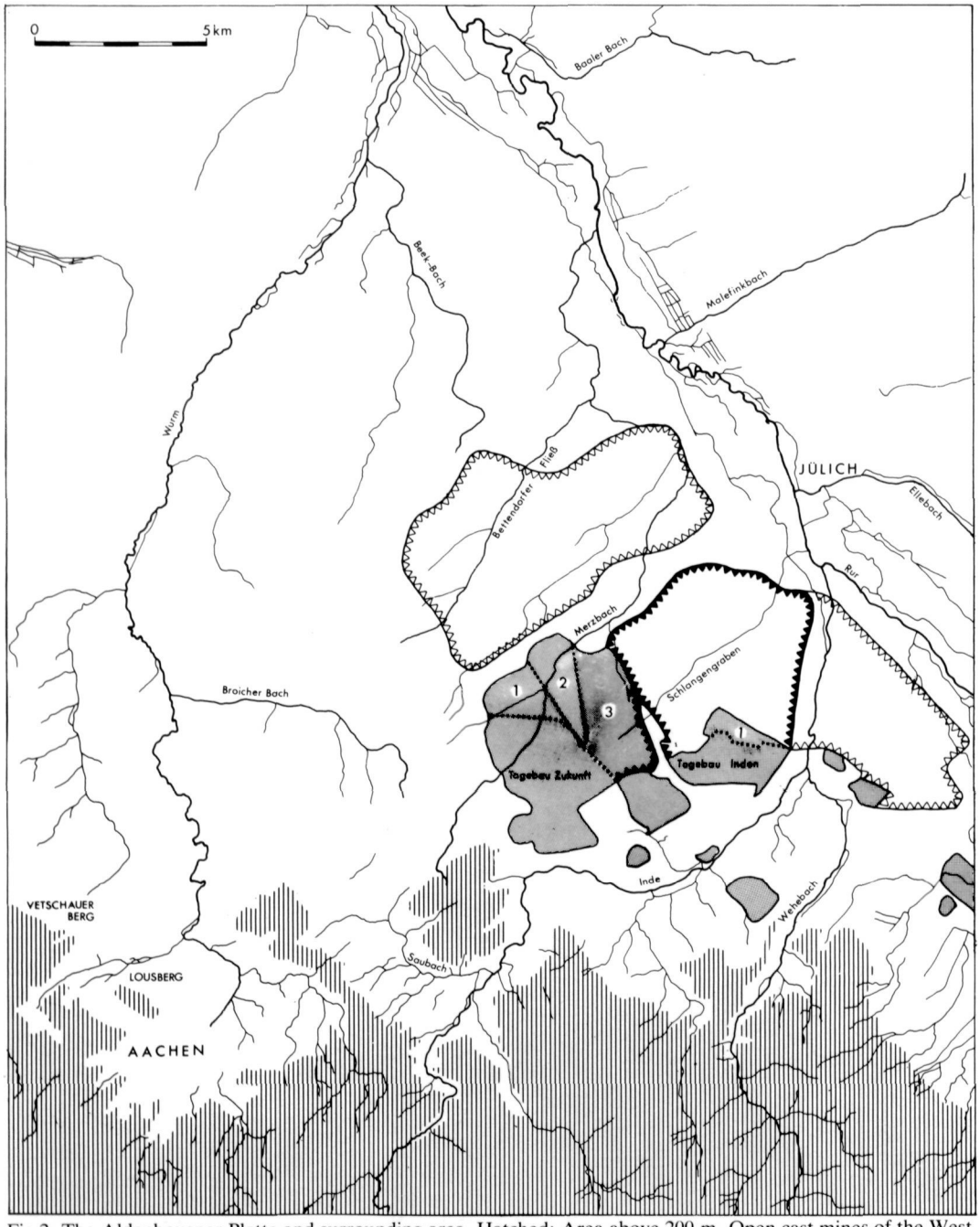

Fig 2. The Aldenhovener Platte and surrounding area. Hatched: Area above 200 m. Open cast mines of the West Group of the Rheinische Braunkohlenwerke AG. Stippled: Excavated and Dumping Area. Lines with filled and open triangles: Planned and projected Mining Areas (Bonner Jahrb. 177, 1977, 549). 1. Areas mined during the first phase of the Research Project (1968-1971). 2. Areas mined during the excavations in the Merzbach valley (1.10.1971-1.10.1973). 3. Areas mined from 1.10.1973-1981. Scale 1: 200 000

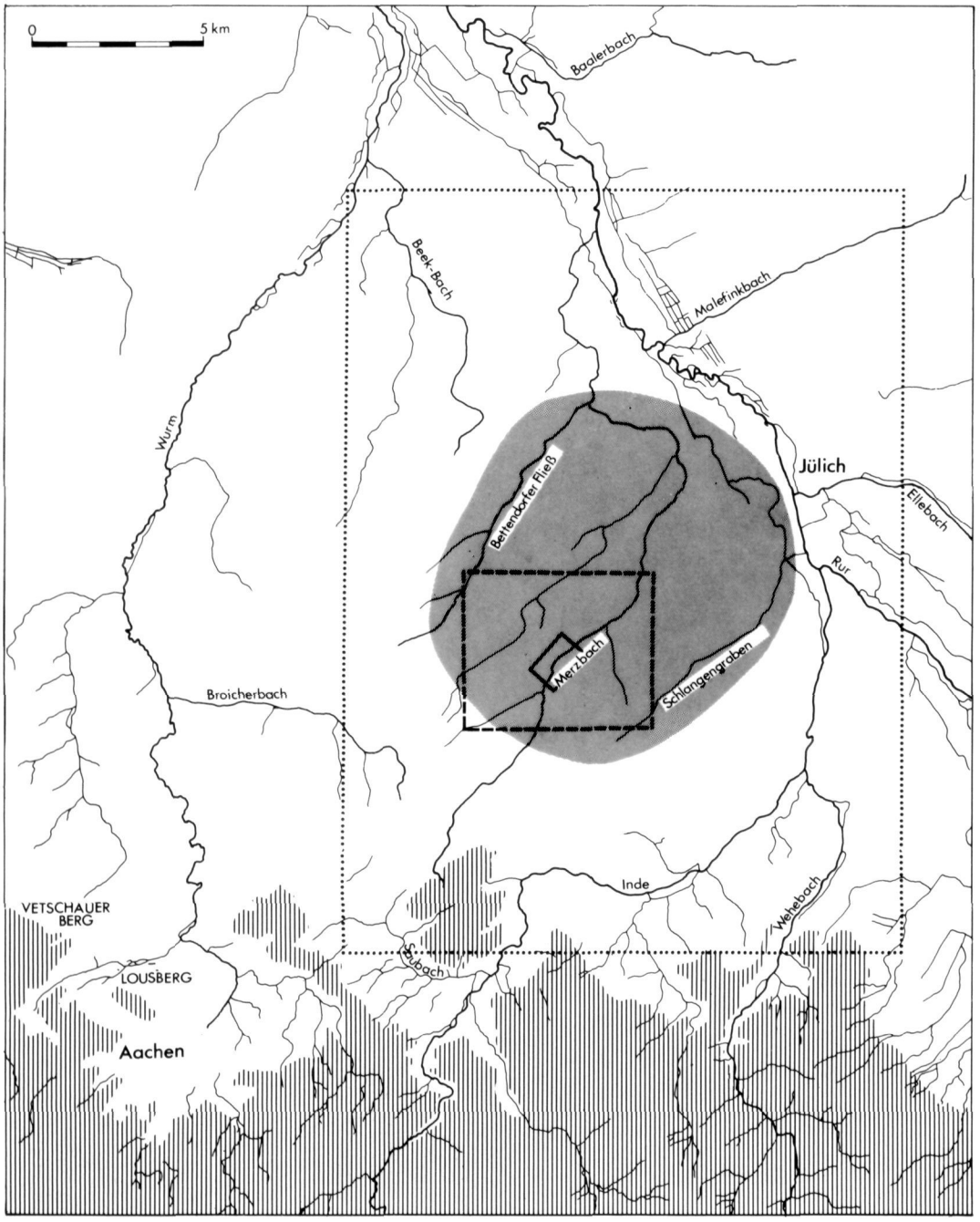

Fig. 3. The Aldenhovener Platte and surrounding area. Area of research (980 km^2). Hatched: Area above 200 m. Dotted line: Limits of extensive survey area (350 km^2). Stippled: Intensive survey area (85 km^2). Dashed line: Map published in Bonner Jahrb. 174, 1974, Beilage 1 with excavated area of Merzbach valley indicated (Bonner Jahrb. 179, 1979, 553). Scale 1: 200 000

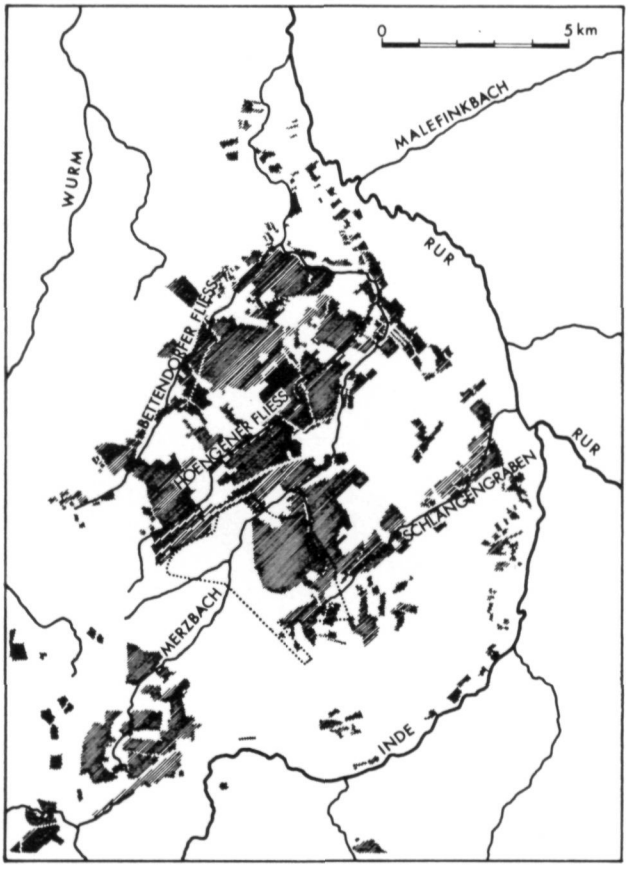

Fig. 4. The Aldenhovener Platte. Hatched: areas surveyed up to end of 1979. Dotted line: Open-cast mine "Zukunft-West" (controlled data collection since 1968) (Bonner Jahrb. 180, 1980, 300). Scale 1: 200 000

The object of this project was to excavate totally the sections of the Merzbach valley which would be destroyed by mining in forthcoming years and, combined with research in the surrounding area, to build up a settlement history of the Aldenhovener Platte.

During the first two years of the project (1971-73) an area of 24 hectares of the Neolithic settlement in the Merzbach valley was excavated.[8] Surprisingly this consisted exclusively of Bandkeramik settlements and a contemporary gravefield, so that during the next few years it was necessary to extend the picture by added excavation outside the area of mining, increasing the area to 39 hectares. Large settlement areas of the Grossgartach and Michelsberg cultures were discovered and excavated, while only minimal traces of the Late Neolithic Wartberg, Seine-Oise-Marne and Beaker groups were found.

Of importance was a survey programme which ran from 1973 to 1981 (fig. 3). An area of 85 km^2 adjacent to the main area of excavation in the Merzbach valley was systematically and intensively surveyed (fig. 4). As most Neolithic sites are rich in flint material, it is probable that at least the largest settlements were more or less completely recovered.[9]

In parallel to the fieldwork the material was analysed and published. The aim was to publish the excavated settlements in monographs. This, as always, was far more expensive in time, personnel and money than the excavations themselves. So far two monographs have been publish-

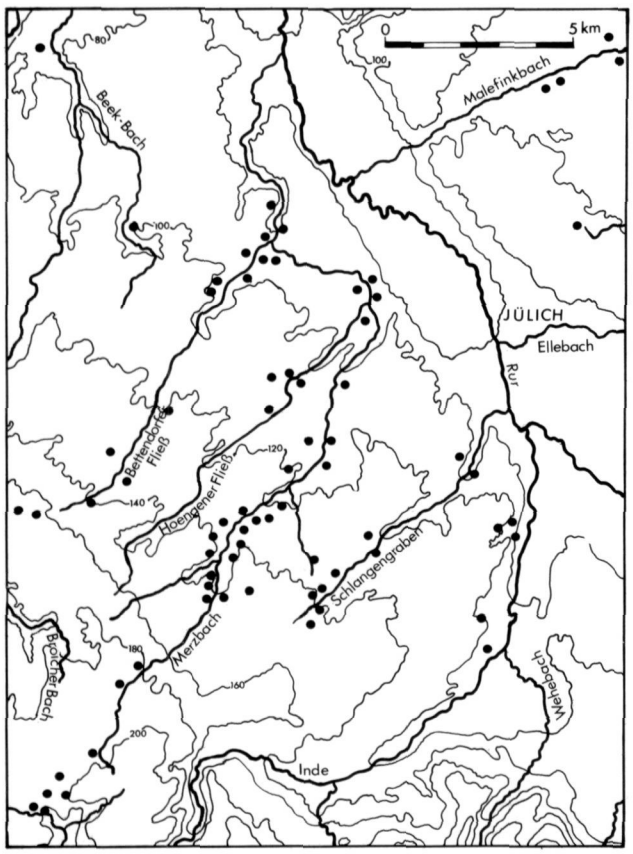

Fig. 5. The Aldenhovener Platte. Hydrographic network, relief and Bandkeramik distribution. Scale 1:200 000.

ed,[10] and more are in preparation. Several smaller sites have been published in the annual reports. The following account is based on the excavation results alone, as the results of the survey have as yet to be written up.

The Geology and Soils of the Aldenhovener Platte

The Aldenhovener Platte is situated in the south-west of the Lower Rhine Bay in the triangle between the rivers Rur, Inde and Wurm and the north foot of the Eifel, an area of 370 km^2. The landscape[11] consists of a plateau dissected by dry water courses which falls gently to the northeast (fig. 5).[12] The lowest strata are the brown coal levels, which are overlain by thin strata of early Pleistocene sands and gravels. The sands and gravels are covered by a layer of loess up to 5 m thick. The loess is the parent material for post-Pleistocene soil development, and is now usually 1.5 to 2 m deep, weathered and decalcified to clay loes or *Loesslehm*. The deposits in the Merzbach valley are up to 6 m thick. In the lower part they consist of water deposited loess and alluvial clay, in which occasionally gravels or organic deposits (*Niedermoor* in places under the water table, *Anmoor* in places with fluctuating water table) are laid down. These deposits are overlain by a 3-5 m thick colluvium of redeposited clay loess. Most of these deposits were washed down from the higher areas into the valleys in post-Roman times.

The loess landscape of this area has been con-

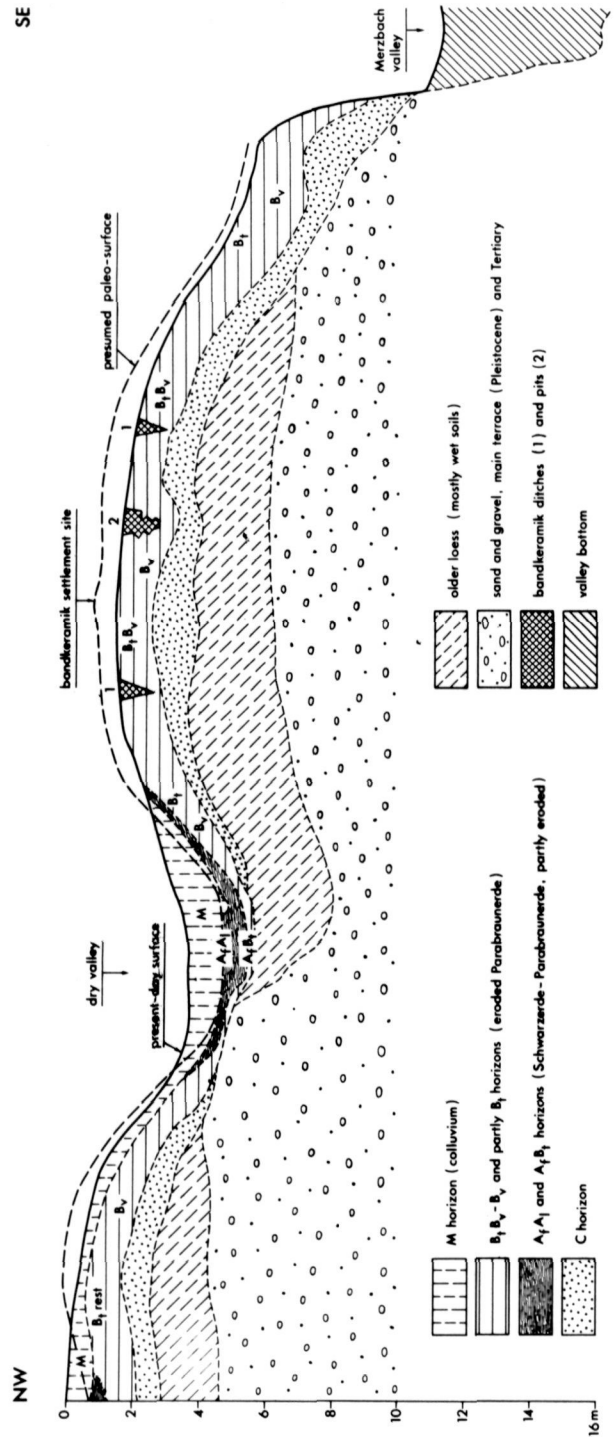

Fig. 6. Langweiler 9. Semi-schematic profile of the loess landscape in the settlement area of Langweiler 9 (after J. Schalich, Langweiler 9).

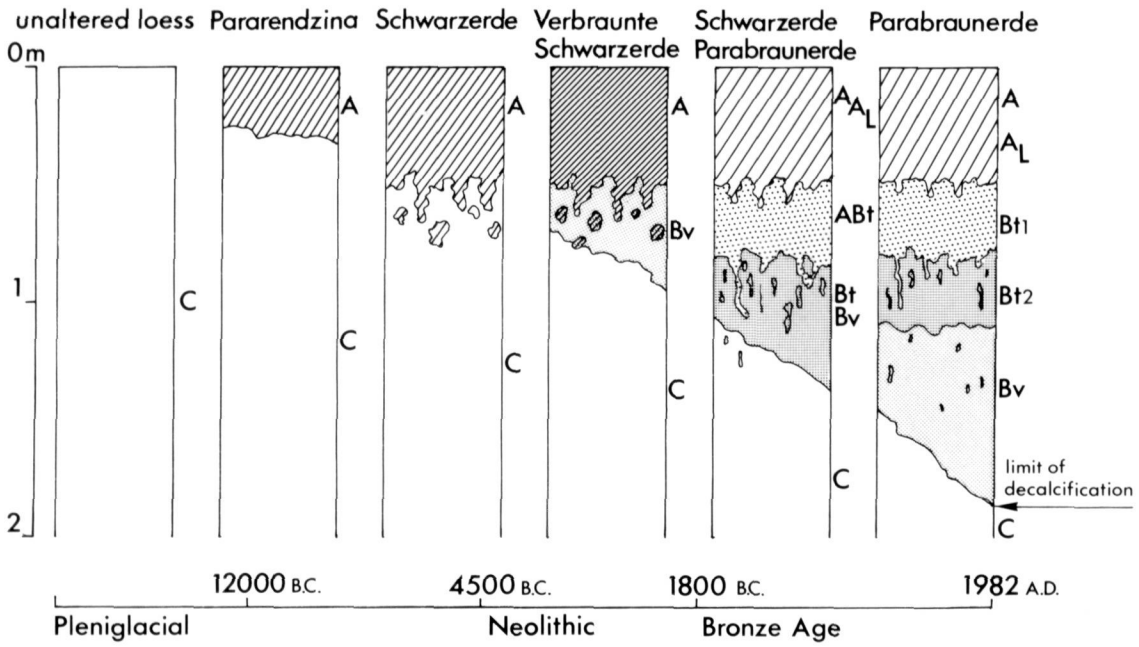

Fig. 7. The Aldenhovener Platte. Soil development from the Weichsel Ice Age to present (after J. Schalich, Langweiler 8).

siderably smoothed by environmental and anthropogenic factors (erosion and deposition). As a result the characteristic soils of the plateau are eroded *Parabraunerden*.

The eroded soil material has to a large extent been redeposited in the valleys, water courses and other depressions in the loess area as colluvium, partially covering Neolithic fossil soils (fig. 6). Continuous observation of the morphology of the settlements themselves showed that in the post-Neolithic period soil erosion of 0.60 to 0.85 m had occurred, which removed the old land surface and the upper part of the ditches, pits and postholes. In level areas, the erosion was minimal, so that the present land surface is practically identical with that of the Neolithic. In such areas the traces of the houses were preserved to a depth of up to 1.40 m. In sites on knolls or slopes the erosion could be as much as 1-2 m, as in the area of the earthwork Langweiler 8.

On the aeolian loess deposits laid down in the Weichsel Ice Age the first black earths developed in the late glacial and early Holocene climate under steppe and forest vegetation. These black earths had a humus rich horizon directly on the calcareous loess (C-horizon) (fig. 7). During the later Atlantic, and thus essentially the post-Bandkeramik period, the black earth degraded to a depth of 0.8-1.0 m (by the end of the Neolithic).

During the Bronze Age this process of degradation continued (black earth – parabraunerde), forming the present parabraunerden which have been in existence since at least the Hallstatt period.

These erosion processes which were so important in the morphological and soil development of the area have their basis in the system of valleys and water courses of the loess landscape. Erosion started immediately from these and, with increasing afforestation, continued in a form of retrogressive erosion to the plateaus, where levelling processes had already started to a limited extent. The eroded material was redeposited as colluvium in the valleys, channels

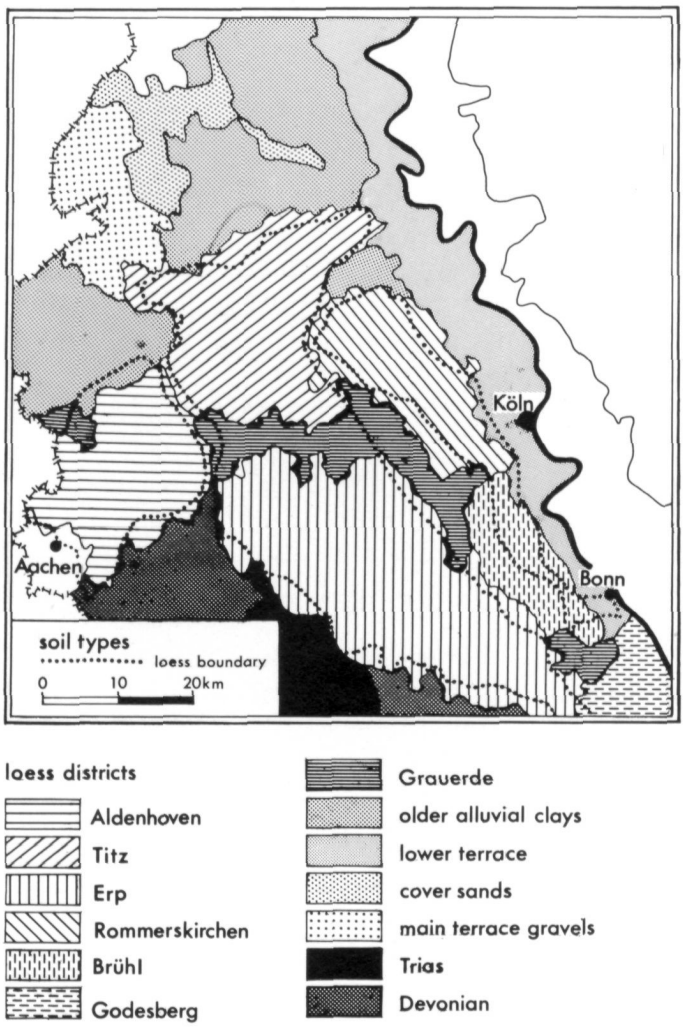

Fig. 8. The Lower Rhine Bay. Soil types compiled from the dominant soil type per parish with the loess areas of the Rhineland indicated by a dotted line (after P. Imhoff). Scale 1: 1 000 000

and depressions. Already by the Bandkaramik there were small colluvial deposits. In the Merzbach valley since the Roman period 3.0-4.5 m colluvium of redeposited loess had been laid down, with up to 2.0 m in the tributary water courses. This means that in the Neolithic the morphology of the loess landscape of the Aldenhovener Platte was considerably more pronounced than today.

The Present Day Geography of the Aldenhovener Platte

The loess area of the Lower Rhine Bay[13] of the Rhine is divided into several smaller areas by rivers and streams flowing from the Eifel, and by the Vorgebirge, which is covered only by a thin layer of completely degraded loess. These areas are to some extent clearly divided from each other both morphologically and economically. In this way five loess areas can be distinguished; the Aldenhovener Platte is the wes-

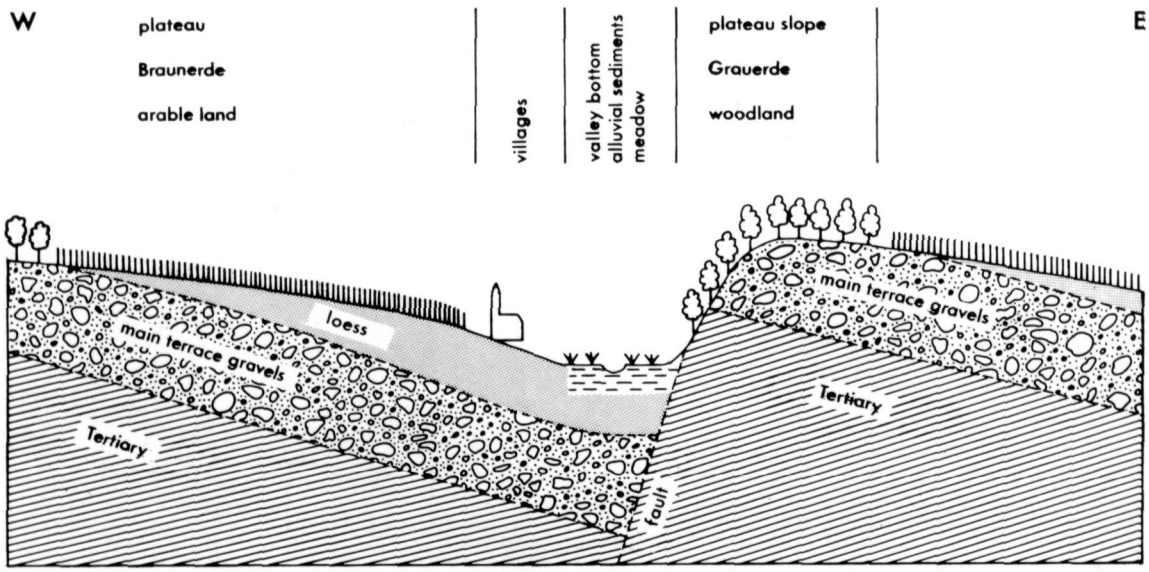

Fig. 9. The Lower Rhine Bay. Schematic profile of the modern landscape (after H. Becker).

ternmost of these (fig. 8). It is distinguished by a gently rolling surface. Gentle elevations alternate with broad, mostly dry valley basins. The few, mostly dry streams, have usually cut deep channels with vertical sides.

As in the whole of the Lower Rhine Bay, asymmetric valley forms are characteristic. Valleys running north-south have steeper eastern banks, while those running east-west have steeper northern banks. These steep east and north slopes are usually free of loess, while the flat west and south slopes are often covered by deep loess (fig. 9).

The climate of the Lower Rhine Bay is determined by its western location in the continental land mass. The Hohe Venn in the Eifel is of great importance in determining the amount of rainfall. Oceanic air currents can flow mostly unhindered over the greater part of the area. Occasionally, in short periods of usually only a few days, continental climatic influences are important (fig. 10).

This is clearly observable in the distribution of prevailing winds per month. In all months the prevailing winds are south-west and west, especially south-west (fig. 11). In spring the north-east wind and in autumn the south-east wind increases. April and May are the months with the most east wind.

The west winds bring warmth in winter and cool air in summer. Their dominance during the whole year ensures the moderate temperature curve in the Lower Rhine area. The Hohe Venn keeps back the oceanic winds. The temperature curve therefore becomes more continental towards the south.

For agriculture the late occurrence of autumn frost is of great importance. The first day of frost occurs on average on the 1st November. Winter wheat can be planted until late in the autumn; there is therefore little summer wheat. Cold phases occur not infrequently in May, but they are of little importance as because of the earlier warm weather the grain is usually too far advanced to be affected by frost. Despite the relatively high rainfall, its distribution is relatively unsuited for agriculture; instead of high spring rainfall until June (for growing crops) and low summer rainfall in June and July (for ripening crops), the situation is reversed

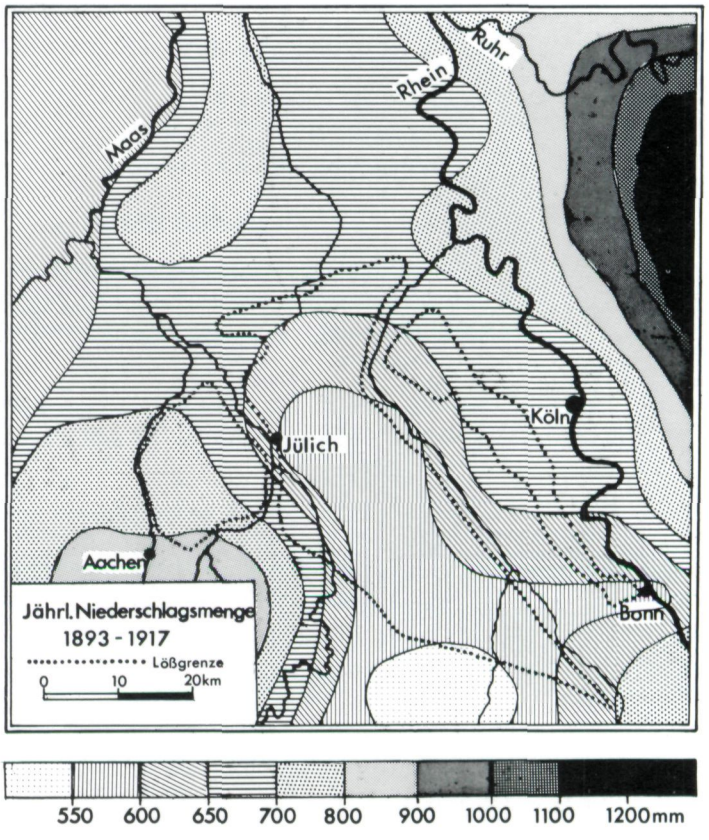

Fig. 10. The Lower Rhine Bay. Annual Rainfall 1893-1917 with border of loess indicated by a dotted line (after P. Imhoff). Scale 1:1 000 000

(fig. 12) and there are often problems with a too dry spring and wet summer.

The Aldenhovener Platte in the west shows some exceptions to this picture. Here there is the highest rainfall of the loess zone (fig. 10). The effect of this can be seen at the present day in the Aldenhoven loess zone, which has 30% grazing land, while there is only 17% grazing land further east. There is accordingly more cattle farming in the west than in the east.

The climate of the Aldenhovener Platte is monitored by measurements taken in Jülich.[14]. The mean annual temperature is 9.4°C. The mean January temperature is 1.6°C and the mean July temperature is 17°C (fig. 12). The mean annual rainfall is 700 mm, and the mean humidity 79%.

Bandkeramik Settlement in Relation to Geology, Soils, Geography and Topography

In the Bandkeramik period the Aldenhovener Platte was in a unique position in terms of network geography (fig. 13). The loess area of the Lower Rhine Bay, which is almost identical with the Bandkeramik settlement area, narrows immediately west of the Aldenhovener Platte to a strip of loess only 15 km from north to south. Through this "bottleneck" ran all the networks between the Rhineland-Westphalian and the Dutch-Belgian Bandkeramik, so that cultural differences of all sorts should occur representatively in the area. This can be clearly seen in the influence on ceramic styles; links from far to the west (Limburg pottery)[15] and far to the south-east (Grossgartach pottery)[16] can be

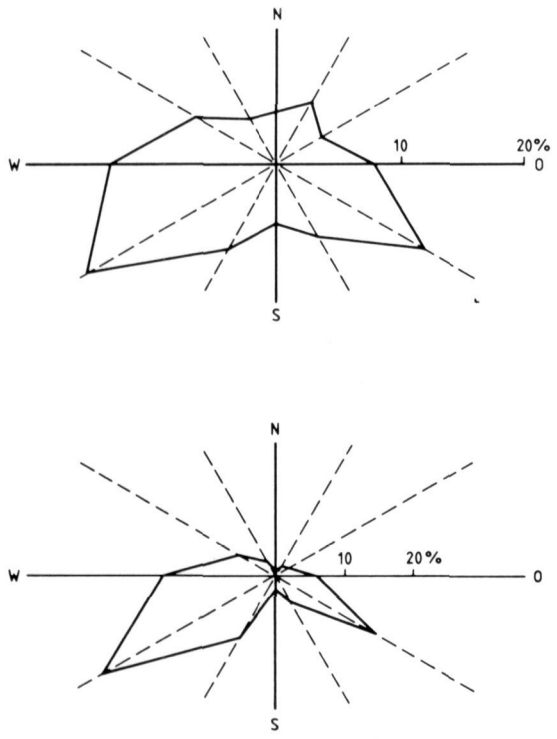

Fig. 11. The Aldenhovener Platte. Jülich meteorological station: frequency distribution of wind direction 1967-1973. Above: All wind speeds. Below: Wind speeds >6m/s (after Geiss, Horbert and Polster).

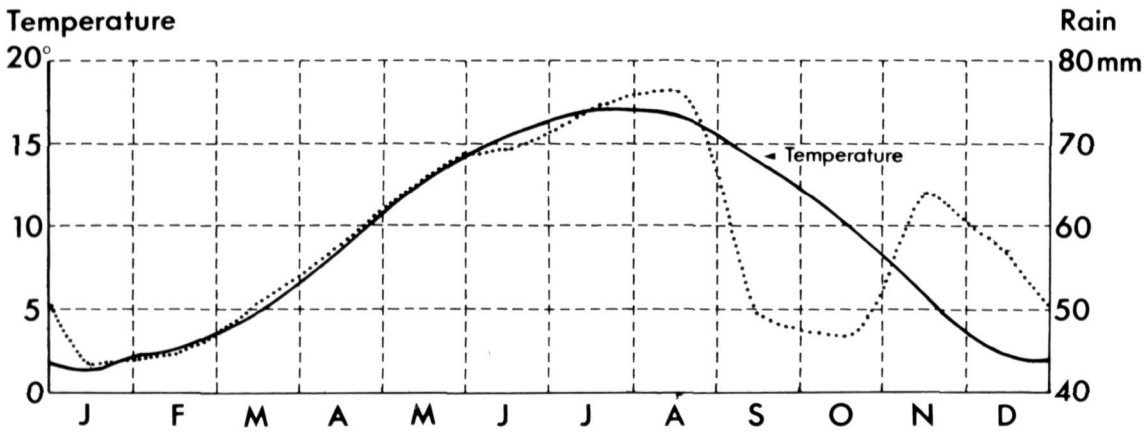

Fig. 12. The Aldenhovener Platte. Jülich meteorological station 1961-1973: Average annual temperature and rainfall distribution (after Geiss, Horbert and Polster)

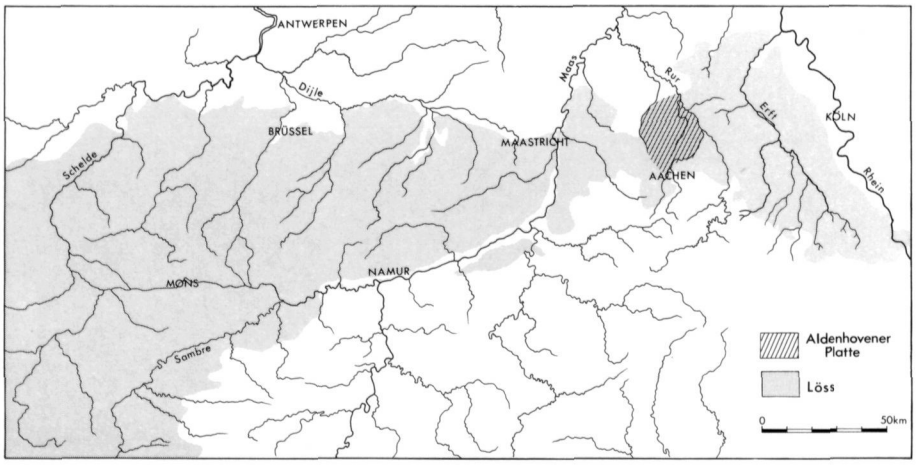

Fig. 13. The Rhenish and Dutch-Belgian loess areas and the location of the Aldenhovener Platte: network geography. Scale 1:3 000 000

recognised. In particular the continually changing methods of raw material exploitation for stone tools enables the types and extent of exchange to be reliably recognised.[17] In all 98 Bandkeramik settlements in the Lower Rhine Bay, as studied by M. Dohrn-Ihmig in 1979[18], are located on loess, including very poor loess soils.[19] On the Aldenhovener Platte the Bandkeramik settlements occur on two different types of location; on the gently sloping west and north-west slopes of the valleys with deep soils, or on the east and south-east steeper slopes on thin loess, often mixed with gravels (fig. 9).[20]

J. Schalich has prepared an exact soil map of the excavated area of settlement,[21] showing that Bandkeramik settlements occur almost exclusively on parabraunerden; both on the deep soils (L 3_1) and shallower soils (L 3_2). In the early Neolithic these parabraunerden were still black earths, which have since degraded (fig. 7). The present day parabraunerden show the extent of this degradation and the erosion from the valleys and water courses. The current extent of settlement features is therefore certainly smaller than in the Neolithic; it is therefore important to take this into consideration when reconstructing the exact settlement extent.

The argument that the present day spread of settlement is smaller than in the Neolithic is based on both soil science and archaeology. For example on the settlement Langweiler 9 (fig. 14) it can be seen that almost all the house remains lie on parabraunerden types L 3_1 and L3_2, and are therefore well preserved. Only two houses in the south were found under a thin layer of colluvium of type K 3_2. It is therefore necessary to recognise that in such areas strongly eroded but still present parabraunerden were covered by later and shallow colluvium. During excavations it is important in certain cases to consider carefully these border areas.

Fig. 14 shows that in most places the perimeter of the settlement has been securely defined. If the settlement had been larger, the good preservational qualities of the soil would have ensured that features would have been found; therefore in this case the present day distribution of settlement features coincides to a large extent with the original settlement spread.[22]

The Aldenhovener Platte is dissected internally only by the south-west to north-east running system of small water courses and channels described above (fig. 5). It therefore formed a relatively homogenous and neutral background for the system of Bandkeramik settlement. The

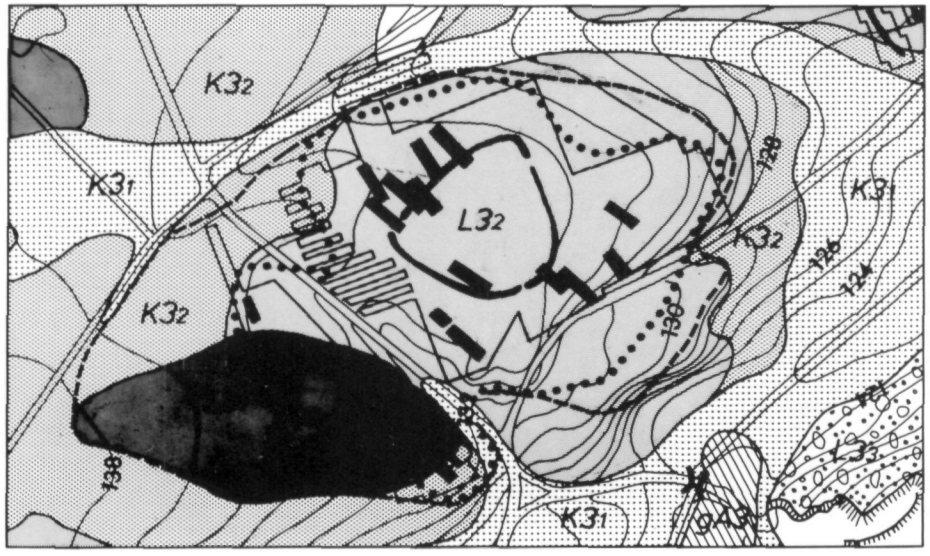

Fig. 14. Langweiler 9. Section from the soil map by J. Schalich with house plans and limits of excavation. Dashed line: Largest possible extension of the settlement based on soil types (after J. Schalich). Dotted line: Limit of archaeological features. Scale 1:5 000
L 3_1: Parabraunerde. Silty loess-loam, 17->20 dm.
L 3_2: Parabraunerde, often to a greater or lesser extent eroded. Silty loess-loam, 12-17 dm.
L 3_3: Parabraunerde, mostly considerably eroded. Silty loess-loam with some gravel, 3-10 dm.
K 3_1: Colluvium of displaced loess and clay-loess, often above alluvial clay or water deposited loess. Silty loess-loam to loamy loess-silt, 15->20 dm.
K 3_2: Colluvium of displaced loess over eroded Parabraunerde. Much silty loess-loam, 6->10 dm.
gA 3: Brown alluvial soil, gley or gleyed colluvium of alluvial clay or clay loess. Loamy loess-silt to silty loess-loam, 5->20 dm.

settlements are not found on the edges of the large alluvial rivers, the Wurm and Rur, which surround the Aldenhovener Platte, but only on the smaller streams within the plateau; the Inde is the largest water course with settlement. Certainly there would also probably originally have been small tributary water courses here suitable for settlement, as altogether a good source of drinking water must have been of primary importance; the small streams would have ensured this.

Botanical studies have shown that the vegetation of the valley bottoms of the Rur, Inde and Wurm consisted of hard wood ash/elm with alder in the wetter areas and a diverse undergrowth. Flooding occurred once or twice a year on these rivers flowing from the Eifel. The smaller water courses, originating in the loess plateau itself, had predominately oak forest, reflecting their drier location.[23] A pollen profile from the Rur valley shows that the large river valley bottoms were exploited, certainly for elm leaf fodder.[24]

The topographical location of the settlements (fig. 15) is either on a spur in the triangle formed by confluent streams (Langweiler 3, 2, 16, 9), or, as with Langweiler 8, on the plateau and slope, with the houses in the upper and middle area, and the earthwork ring on the lower slope. Settlements such as Laurenzberg 7 and Niedermerz 4 are located differently on the edge of the plateau above the steeper bank of the Merzbach. The houses are at the most 500 m away from water. This provisional sketch of settle-

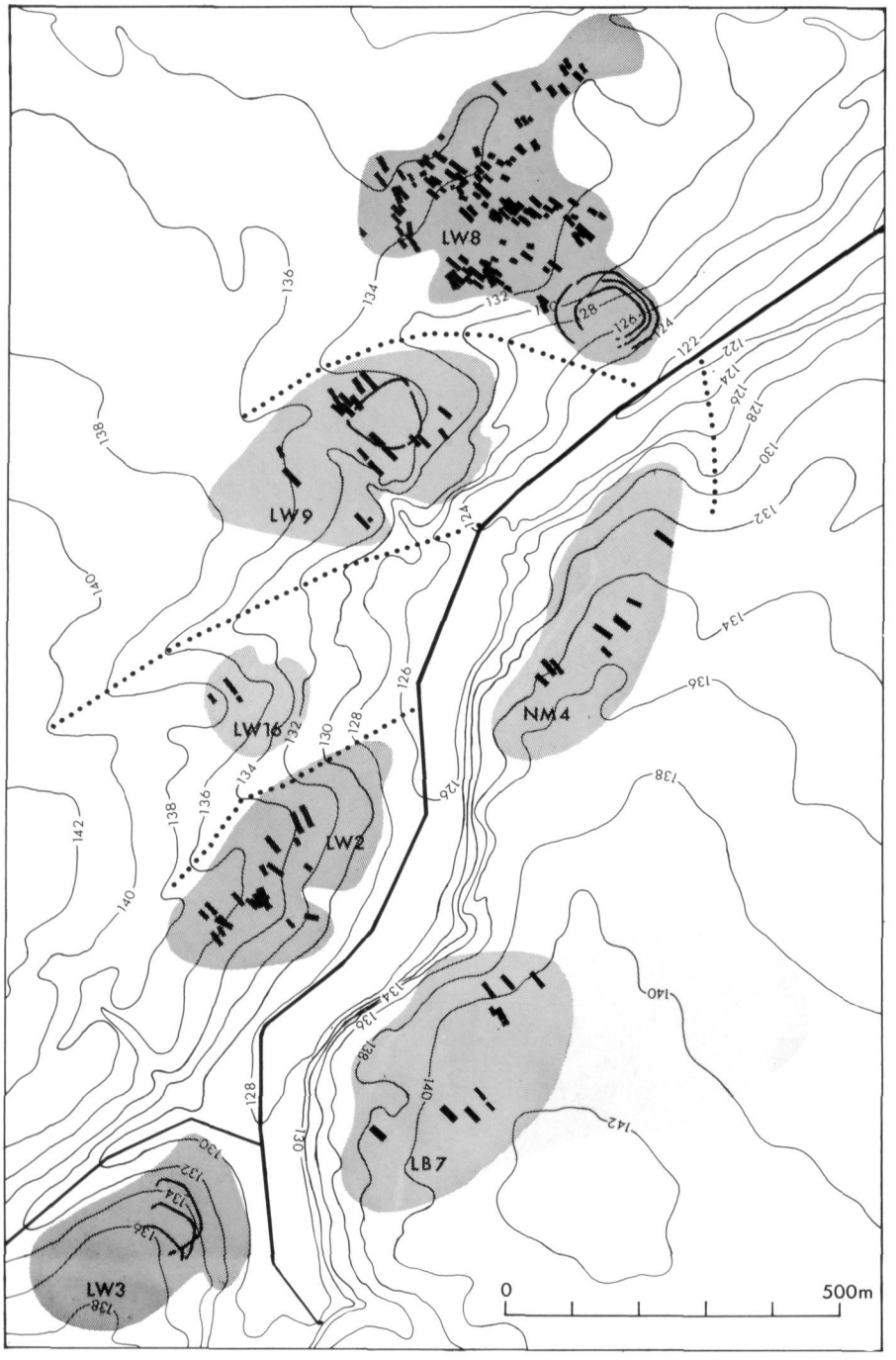

Fig. 15. The Merzbach Valley. Topographical location of Bandkeramik settlements and houses.

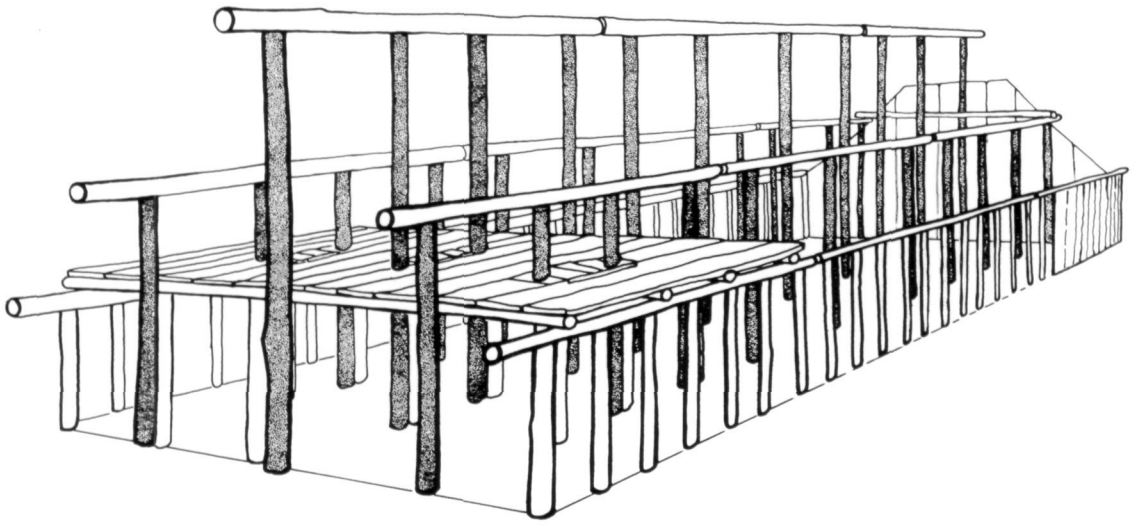

Fig. 16. Reconstructed internal structure of a Bandkeramik longhouse (Type 1) with storage floor in the south-east section

ment location must suffice here; a complete study of the whole survey area is in preparation.[25]

House and Farmstead

P.J.R. Modderman's threefold classification of the Bandkeramik houses in the Dutch Limburg (small, medium and long houses) is also valid for the Rhineland. In the Merzbach valley the three types are found in the approximate ratio 83:12:5. There are thus considerably fewer medium and small sized houses than in the neighbouring Netherlands, where they occur in percentages of 25.5% and 15% in the earlier Bandkeramik and 35.5% and 23,5% in the later Bandkeramik.[26] The temporal development of the house forms will be fully published elsewhere. It appears that the few medium sized houses (type 2) in some settlements (e.g. Langweiler 2) occur more frequently than in others, and that altogether they are found only in the middle and later Bandkeramik phases. The situation appears to be the same for the small houses (type 3) while the longhouses (type 1) occur in all periods. 19% of all the houses are longhouses of type 1a; it is not the case that there was only one longhouse in each settlement at any one time.[27] In the extensive settlement Langweiler 8 in several phases there are no longhouses of type 1a, and in some phases two.

P.J.R. Modderman has also divided the houses internally, in the longhouses observing a division into three sections; north-west, central and south-east sections. The medium sized houses consist of the north-west and central section, and the small houses of the central section only.[28] This interpretation is directly applicable to the Rhineland. There is no direct evidence as to the reason for this threefold division, but it must be certain that each section had a different function and that they were not therefore purely domestic habitations with numerous people in each house. The south-east section has probably correctly been interpreted as a storage area (fig. 16), so that the longhouses can be seen as domestic/storage buildings. From the evidence of the foundations it is less probable that there were cattle stalls in the houses. Since there are no special buildings serving as stalls, including all types of neighbouring buil-

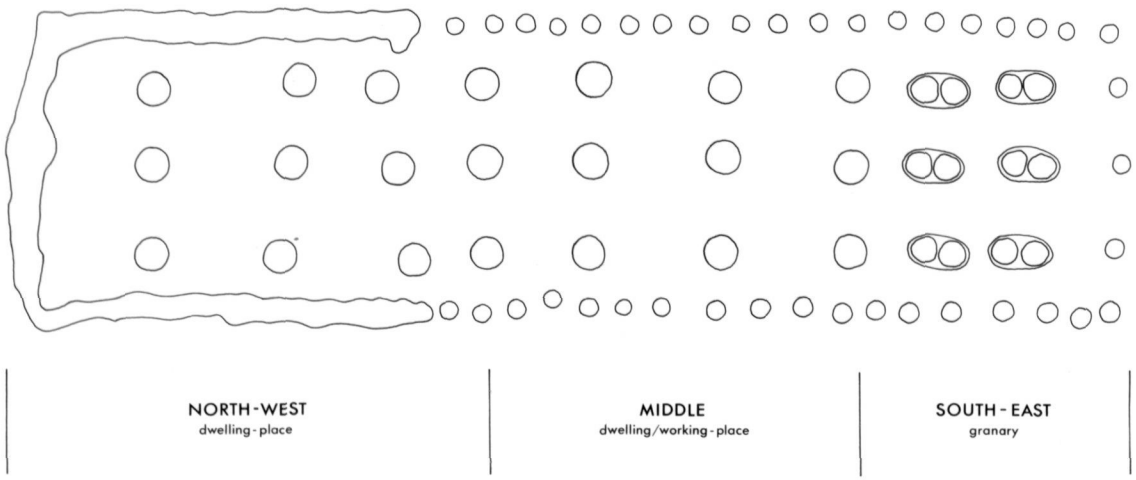

Fig. 17. Plan and probable functional division of a Bandkeramik longhouse (Type 1b).,

dings, there cannot have been any stalling of cattle in the Bandkeramik.

The north-west section was especially "expensively" built; that is, as the walls were built of split logs much building wood was expended (fig. 17). These walls must have been covered with clay daub, so that from outside they looked no different from the adjoining wattle and daub walls, and were probably no more weatherproof. It is probable that this section was built massively for traditional reasons, surrounding the "most distinguished" part of the house. It is therefore probable that this section can be interpreted as the living/sleeping area, in which perhaps also goods of particular value were kept.

The central section of the building, the only one which occurs in all three types of house and was therefore essential, is probably best interpreted as the living/working area. It can only be postulated that there was a fireplace here, but there is much evidence for hearths in the numerous remains of untempered loess with a smooth and heavily burnt surface found in the rubbish pits around the houses.

If the interpretation of the south-east section of the longhouses as a storage area is correct, then the houses without this section must have had a different economic function. It is clear that these and other functional questions must be answered by the finds and their spatial distribution within the settlement. Langweiler 8 has shown remarkable differences between buildings with and without storage areas.[29] The longhouses have on average more pits than the medium sized and smaller houses, and they are richer in material. The houses without a south-east section have a considerably smaller proportion of decorated pottery, and there are differences in the proportion of plant remains, as the longhouses have clearly more weeds and wheat chaff (fig. 18).[30] Against this the number of wheat grains is about the same, as is the number of quern stones. It must be concluded that the cleaning and production of the grain was carried out mostly by the occupants of the longhouses, but that it was consumed in both types of house. It is still unclear as to what economic function the occupants of the houses without the south-east section had.

It has been known for a long time that the long pits are associated with specific Bandkera-

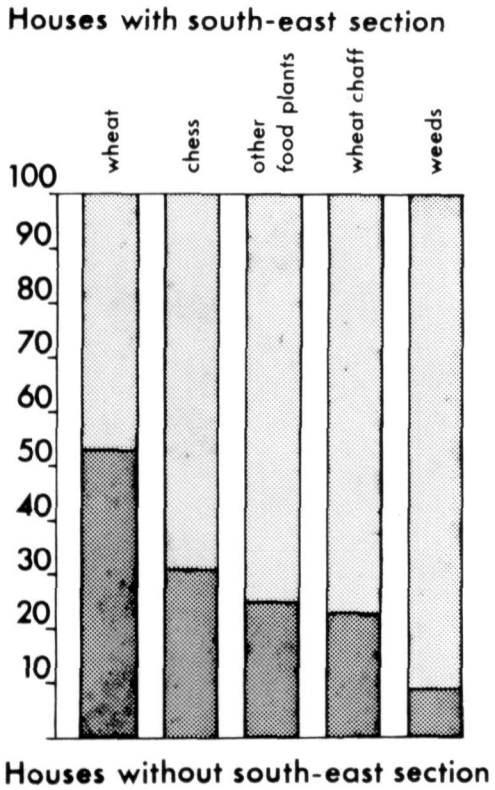

Fig. 18. Langweiler 8. Frequency of plant remains in pits of houses with and without south-east sections (after K.-H. Knörzer).

mik houses. The "north-east pit" has also been recognised recently as a characteristic type.[31] In Langweiler 8, U. Boelicke has identified an activity zone, which consists of an oval of radius 25 m from the houses (fig. 19). In this farmstead area there is at least one pit in a consistent location to west, north and east. Further pits ("others") are more randomly located, but they are often found to the south of the houses.

A careful study by U. Boelicke has shown that specific categories of finds are divided in unequal proportions among the pits, and, extrapolating from this, in the different sections of the houses. An example of this is illustrated in fig. 20, showing the pottery, and especially the undecorated pottery, dominating to the south of the houses, whereas to the north flint tools and artefacts are found in above average quantities. These two zones cut across each other in the areas of pits to the west and east. North and west of the houses there is a preponderance of stone rubble. This sort of difference in the spatial location of finds must reflect a difference of activity areas in the houses themselves, because at least a proportion of the finds must come from these. Thus the functional division apparent in the house foundations is reflected in the finds. It is to be hoped that an exact analysis of their material and their functional interpretation as shown in fig. 17 will be fruitful.

Settlements

As of the excavated settlements in the middle Merzbach valley, two have already been published[10] and the rest have been fully analysed, most of the results have come from this area. In principle it has been possible to build chronologies for the individual farmsteads; *i.e.* finding adjacent to each house an immediate predecessor or successor. Such chronological series can incorporate up to 12 buildings, and the area encompassing this can be 60 - 120 m across. Some settlements (*e.g.* Langweiler 16) consist of only one such farmstead, while others have more; Langweiler 8 for example has 11 contemporary houses.

As the Bandkeramik in the Rhineland lasted for *ca.* 450 years, and 14 house generations have been identified at Langweiler 8, which lasted for the whole of this period, each house stood on average for 30 years.[32] Merely the fact that the farmsteads can be identified indicates this continuous settlement, and thus a site like Langweiler 8 with four and a half centuries of continuous occupation demonstrates a settlement continuity which in prehistoric and early historic terms is frankly astonishing. Under these cirumstances shifting cultivation or cultivation with shifting fields can be completely excluded.[33] The basic settlement continuity does not of course exclude mobility and population dynamics or occasional abandonment. An example of the

history of one settlement is that of Langweiler 9, which is already published.[34]

The settlement of Langweiler 9 begins in Phase 5 of the 15-Phase Merzbach chronology[35] with three houses, which are 130-150 m away from each other (fig. 21). The successors in Phase 6 are the buildings 2, 3 and 16. There is then a break in Phase 7 of at least one house generation, *i.e.* at least 30 years, whose cause is unclear. On the neighbouring sites of Langweiler 2, 16 and 8 there was settlement during this phase.

The resettlement of the site began with house 10 in Phase 8. This house is however also contemporary with house 12 in Phase 9, as shown in fig. 21. In Phase 10 there follow houses 7 and 17; *i.e.* both the Phase 9 houses had immediate successors. In Phases 11 and 12 there are three houses in each, with house 14 probably standing alone at the end.

From this succession of houses it is possible to construct informally several farmstead traditions. The clearest is shown by the concentrated grouping of Farmstead 1 in the north. Here, in spite of the discontinuity of two phases there must have been an especial reason for continuity in this particular place which was probably related to rights of land; it may be that a "Family Tradition" can be recognised in the find material.

Farmstead 2 consists of houses 1 and 2, Farmstead 3 of houses 5 and 3/4; both of them ending with the gap in Phases 7 and 8. The resettlement begins in the east with house 10 on previously unused terrain, and shortly afterwards also on Farmstead 1. From house 10 in Phase 9 there appears to be a tradition leading to house 7 in Phase 10, so that for a short period the whole south-east area can be seen as one large farmstead. In Phase 11, with the contemporary houses 6 and 9 the area is once again divided, and this continued in Phase 12. Houses 10 and 7 therefore formed the nucleus of the two later Farmsteads 4 and 5.

The history of the settlement can be seen therefore to be very complex. Next to farmsteads with a life of only two generations (Farmsteads 2 and 3) and three generations (Farmstead 4) there is the six generation long Farmstead 1, which however has a break of 60 years, and Farmstead 5 with three houses which was also abandoned for 30 years. In both cases of local discontinuity there appears therefore to have been a continuous "claim" on the part of the settlement abandoned. Farmstead 1 with its close grouping of houses supports this contention, while Farmsteads 4 and 5 appear to merge into a large unit in Phases 9 and 10. It would be of considerable importance to link this relatively formal picture of houses and farmsteads with kinship, social and economic relations by linking the associated material.

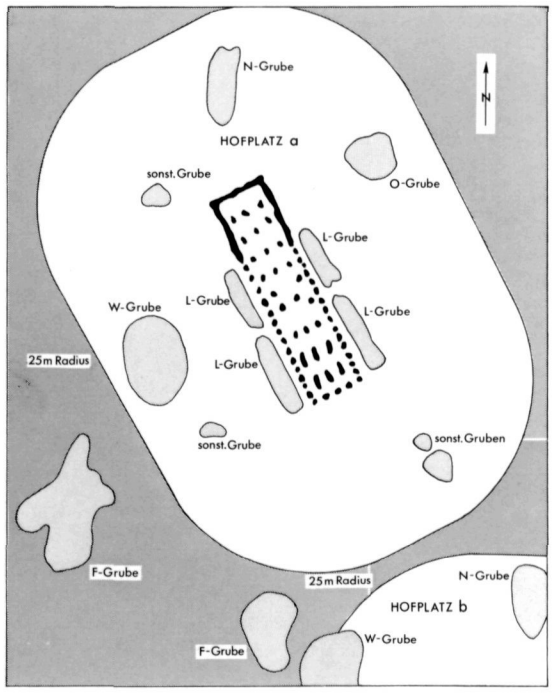

Fig. 19. Langweiler 8. Model of a Bandkeramik farmstead with associated pits (after U. Boelicke).

The Merzbach Valley Settlement Cell

The Merzbach valley is the central water course in the south-east part of the Aldenhovener Plat-

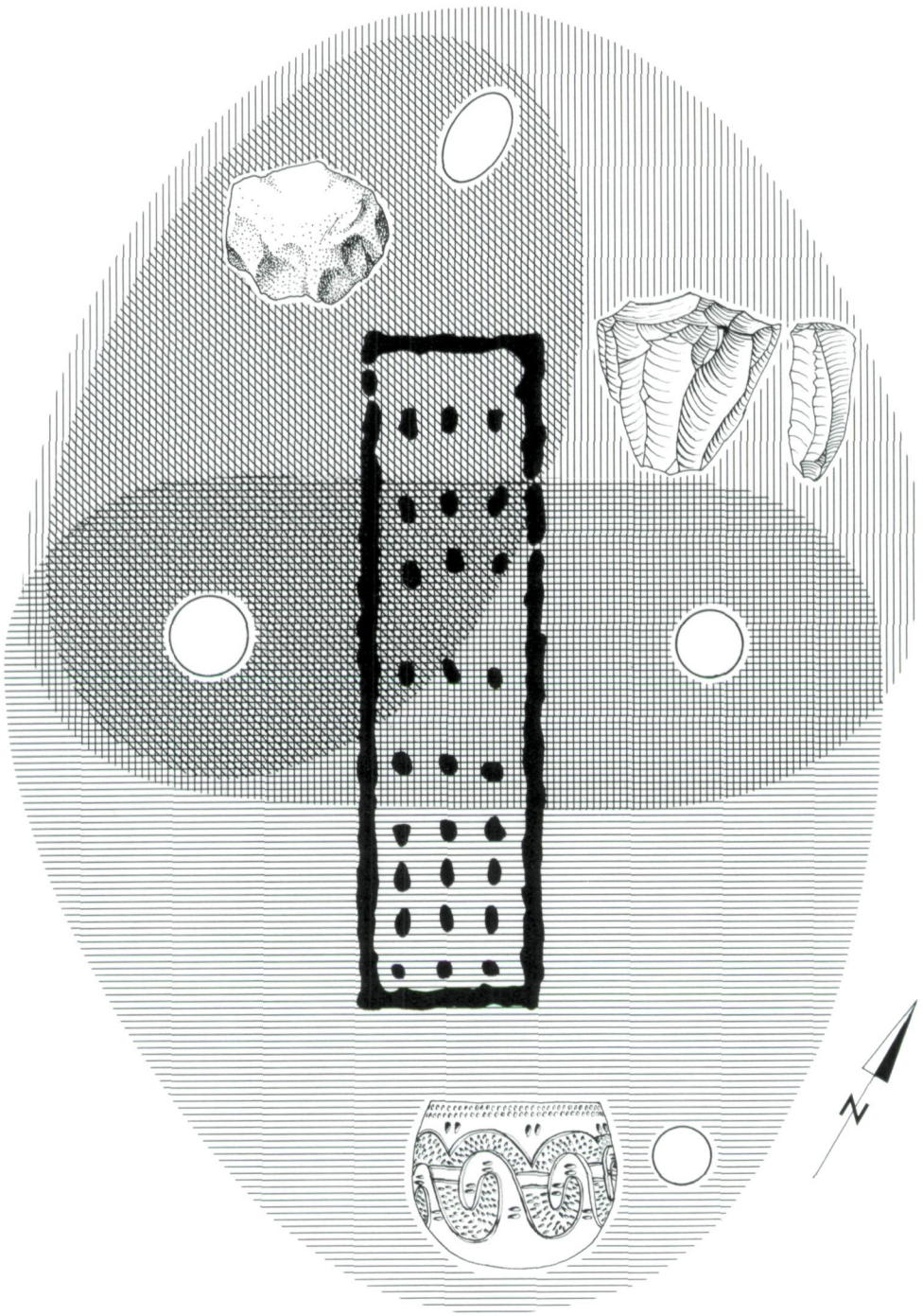

Fig. 20. Langweiler 8. Model of some of the activity zones round a Bandkeramik house (after U. Boelicke).

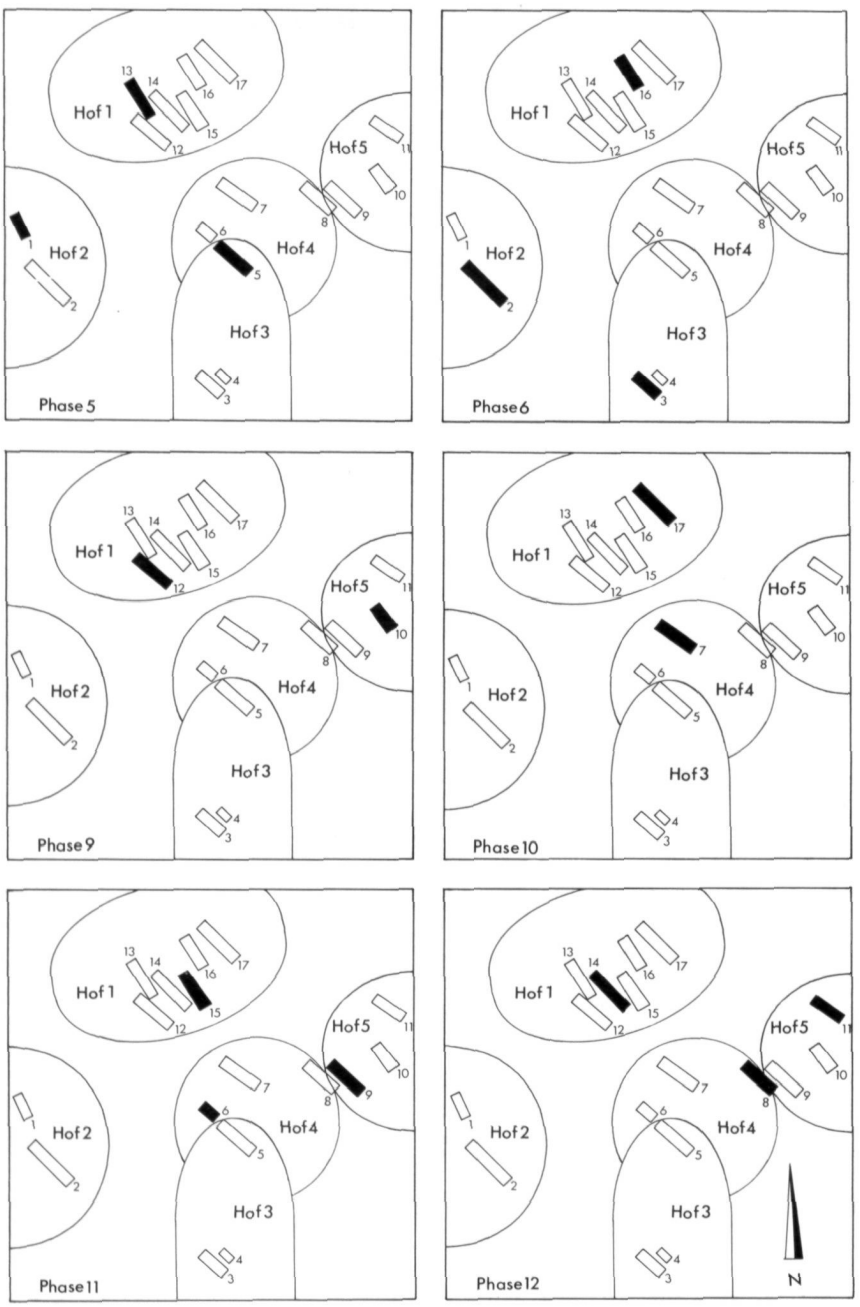

Fig. 21. Langweiler 9. Settlement development during Phases 5-12 of the Merzbach chronology. Scale 1: 5 000

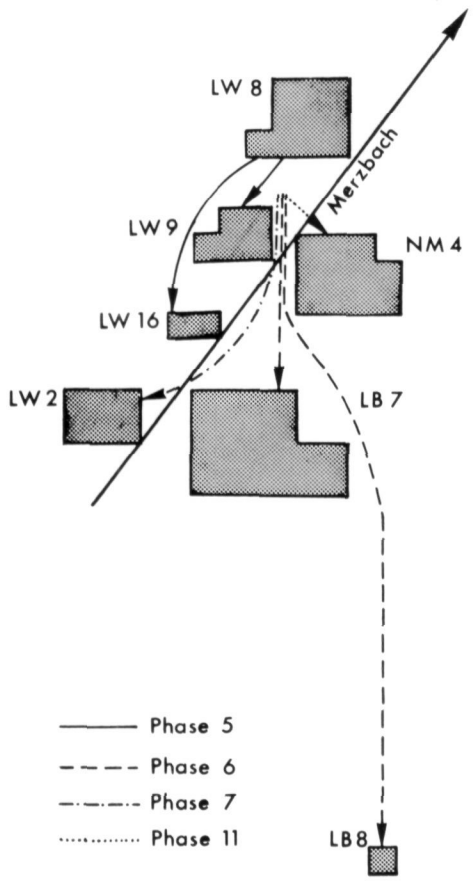

Fig. 22. Merzbach Valley. Spread of settlement upstream from Langweiler 8 to the other settlements.

te. The excavated area is on the interface between the upper and middle course of the *ca.* 23 km long valley. It must be emphasised that this area is only 1.3 km long, and thus comprises only 5.7% of the whole valley (fig. 3). Apart from this, a 12 km long stretch (51%) has been covered by survey and rescue excavations. As noted above, as the survey material is as yet unavailable, the following picture is based only on the excavated material.

Of the seven excavated settlements, four are on the left bank and two on the right bank of the Merzbach, while the seventh (Laurenzberg 8) was found about 1 km away on the loess plateau (figs. 5, 15).[36] Apart from this no house lies further than 500 m away from the Merzbach. On the left bank, all the spur locations have settlement remains, divided from one another by small tributary streams. On the higher right bank there is no topographical division between Laurenzberg 7 and Niedermerz 4, so that the sites could have been linked. There is a similar "random" division between settlements further downstream on the right bank, where the survey results indicate that between Niedermerz 6 and Aldenhoven 3 there is a 1.8 km long stretch apparently without Bandkeramik settlement.[37] It is therefore not possible to assume a continuous settlement of both banks, and there were certainly discontinuities, especially on the right bank.

On the excavated area of the Merzbach (fig. 15) there are two single farmsteads (Langweiler 16 and Laurenzberg 8), several small grouped settlements with 2-3 farmsteads (Langweiler 2 and 9, Laurenzberg 7) and the largest site, Langweiler 8, with 11 contemporary farmsteads at its peak.

P. Stehli's research has shown that the settlement of this section of the Merzbach valley began with Langweiler 8 with 3 houses, and grew during the first four house generations (120 years) to 7 houses. In Phase 5 settlement extended for the first time to the neighbouring Langweiler 9 and 16 (fig. 22) and in Phase 6 it spread over the stream to Laurenzberg 7 and 8. Langweiler 2 was first occupied in Phase 7, and after a period of four house generations Niedermerz 4. Only Langweiler 8 was occupied for the whole Bandkeramik; the other settlements either began later or ended earlier.

This development is fully described elsewhere. Here fig. 23 simply shows how the number of houses in the seven sites has changed through time. The frequency distribution shows two peaks. After a continuous growth from 3 to 17 houses in 210 years (Phase 7) there was a reduction for 120 years to 12-13 houses; then in Phases 11 and 12 there was a further sudden increase to 16 houses, and finally a gradual

reduction to 7 houses in Phase 14. In this last phase the first earthwork appeared (Langweiler 8) with Langweiler 15 following in Phase 15; the dating of the Langweiler 9 enclosure is not so precise, but it is certainly late.

The reasons for this form of development are as yet unclear. Perhaps the depression between the two peaks is linked with the Bandkeramik expansion to the west as far as the Paris Basin; however it is not possible at present to synchronize the two areas. The late Bandkeramik development and its links with the Grossgartach Culture are also not clear. It is important to note that Langweiler 8 was not only founded as the first settlement, but alone lasted for the whole period and grew to become the largest.

Langweiler 8 therefore probably had a particular central importance. A. Zimmerman's research has shown that on this site a higher proportion of unworked flint was imported, so that it can be seen as a distribution centre.[38] Contemporary houses here have an average distance of 66 m from each other, with successive houses in the farmstead area an average of 34 m away. In Langweiler 9 the respective figures are 131 m and 42 m, so that the settlement density is significantly lower. A larger and more concentrated population in Langweiler 8 afforded from the start a better basis for social and economic differentiation, so that from this point of view it is also possible to see this particular settlement as having had a central function.

An exact comparison of all the Merzbach settlements has yet to be completed, so that the latter problem can only be touched on. For example on Langweiler 2 there is evidence for distinct local specialisation, with a relatively higher number of long narrow pits *(Schlitzgruben)* and of houses of Type 2. On Laurenzberg 7 there is much more flint than on other sites. Because of the topographical location on the higher bank and on thinner loess of some sites on the right river bank it can probably be expected that there was a different economic emphasis between sites on either side of the valley.

In the excavated 1.3 km section of the Merzbach there was a maximum of 17 contemporary houses, with up to 15 on the left bank; the distribution between the two banks is therefore different. This is however locally variable. Just 3 km downstream is the large settlement Aldenhoven 3 on the right bank (fig. 5).[39] Because of the dispersed nature of the houses and settlements, the question naturally arises as to how they can be divided into separate sites. Topographical features such as the small tributary streams dissecting the left bank have little importance in the "administrative" or social ordering of single farmsteads like Langweiler 16 or "hamlets" like Langweiler 2 and 9. An exact analysis of the finds may be of use here. The late Bandkeramik earthworks would appear to be evidence of co-operative labour, as that of Langweiler 8 appears to have been used by the inhabitants of Langweiler 2 and 8 and Niedermerz 4.

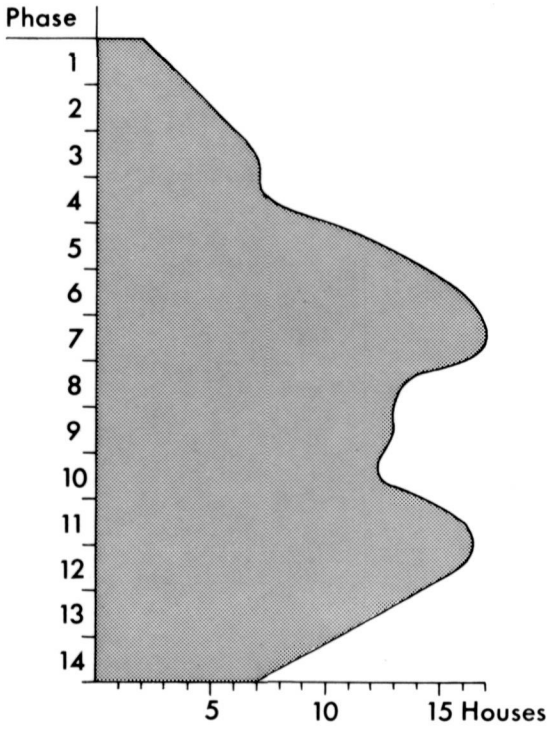

Fig. 23. Variation in the number of houses in the 7 settlements in the excavated section of the Merzbach valley.

The Aldenhovener Platte

Only the south-east part of the Aldenhovener Platte has been systematically surveyed; of 370 km² only 85 km² (23%) has been covered. The following conclusions relate only to this smaller area. The Bandkeramik distribution on Fig. 24 is based on sites with pottery; more sites may be added to this when the stone material has been analysed.

In the survey area 48 Bandkeramik settlements have been identified, located along the valleys of the Merzbach, the Schlangengraben and the Bettendorfer Fliess; it is certain that these valleys can be construed as separate settlement cells. These narrow settlement "corridors" were not continuously occupied along their length; as the excavated section of the Merzbach shows, there were discontinuities. Which of the discontinuities shown in fig. 24 show the real situation and which are caused by lack of fieldwork wil be fully discussed in forthcoming publications. Meanwhile here only a rough generalization can be made, pointing out that along the streams named above there was a 500 m broad strip of potential land suitable for the building of houses and farmsteads.

The three settlement corridors are 3 km from each other. That this is no chance occurrence and not dictated by the hydrographic network is shown by the Hoengener Fliess which flows between the Merzbach and the Bettendorfer Fliess. On its upper reaches there is no Bandkeramik settlement, although in the Middle Neolithic there was a Rössen settlement, indicating that it offered suitable site locations. This picture probably only means that the economic exploitation area of the Merzbach and Bettendorfer Fliess reached to here, and that there was therefore no available agricultural land to support settlement.

The economic exploitation behind the settlements must therefore have extended to 1.5 km; this is shown in Fig. 24 with corresponding "boundaries" indicated. This boundary line shows another remarkable situation in the lack of finds on the lower Merzbach before the confluence with the Bettendorfer Fliess (fig. 24, point A). Here, as with the corresponding find gap on the bank of the Rur (fig. 24, point B), it is clear that the area was taken up by the neighbouring valleys and thus allowed no concentrated settlement. The situation in the middle Merzbach (fig. 24, point C) is also interesting, as although good environmental conditions are found on the left bank there are no settlements. Clearly this area was used by the four settlements which lie immediately to the west on the lower Hoengener Fliess.

In the excavated section of the Merzbach on a 1 km length of the left bank there were 10-15 contemporary houses during the Middle Bandkeramik. Allowing for a depth of exploitation behind the settlements of 1.5 km there was an area of 150 hectares available; *i.e.* 10-15 hectares per house. Of this about a third consisted of the valley bottom, slopes and settlement area, thus leaving 7-10 hectares behind each house for agriculture and stockbreeding. The valley bottom of the Merzbach was several metres deeper during the Bandkeramik, and was at its maximum 100 m wide. On each bank therefore in a length of 1 km there was an exploitation area of 5 hectares; *i.e.* 0.3-0.5 hectares per farmstead.

It must therefore be asked as to how the land behind each settlement was used. If a minimum number of occupants for each house is reckoned as a nuclear family of 5-7 people, and 0.5 hectares were needed *per capita* for grain,[40] then the land requirement for agriculture for 10-15 farmsteads was in the order of 30-45 hectares. These fields must have been on the plateau and not the valley bottom, which means that there was a further 50 hectares of woodland left over (3-5 hectares per farmstead).

This area of woodland could have been used in the summer for cattle grazing. There is not a great deal known as to how much grazing a wood can take. If figures from East Prussia in the 18th century are used,[41] then for each head of horned cattle and oxen 0.28 hectares of deciduous forest and 0.58 hectares of coniferous forest with alder clearings and glades were nee-

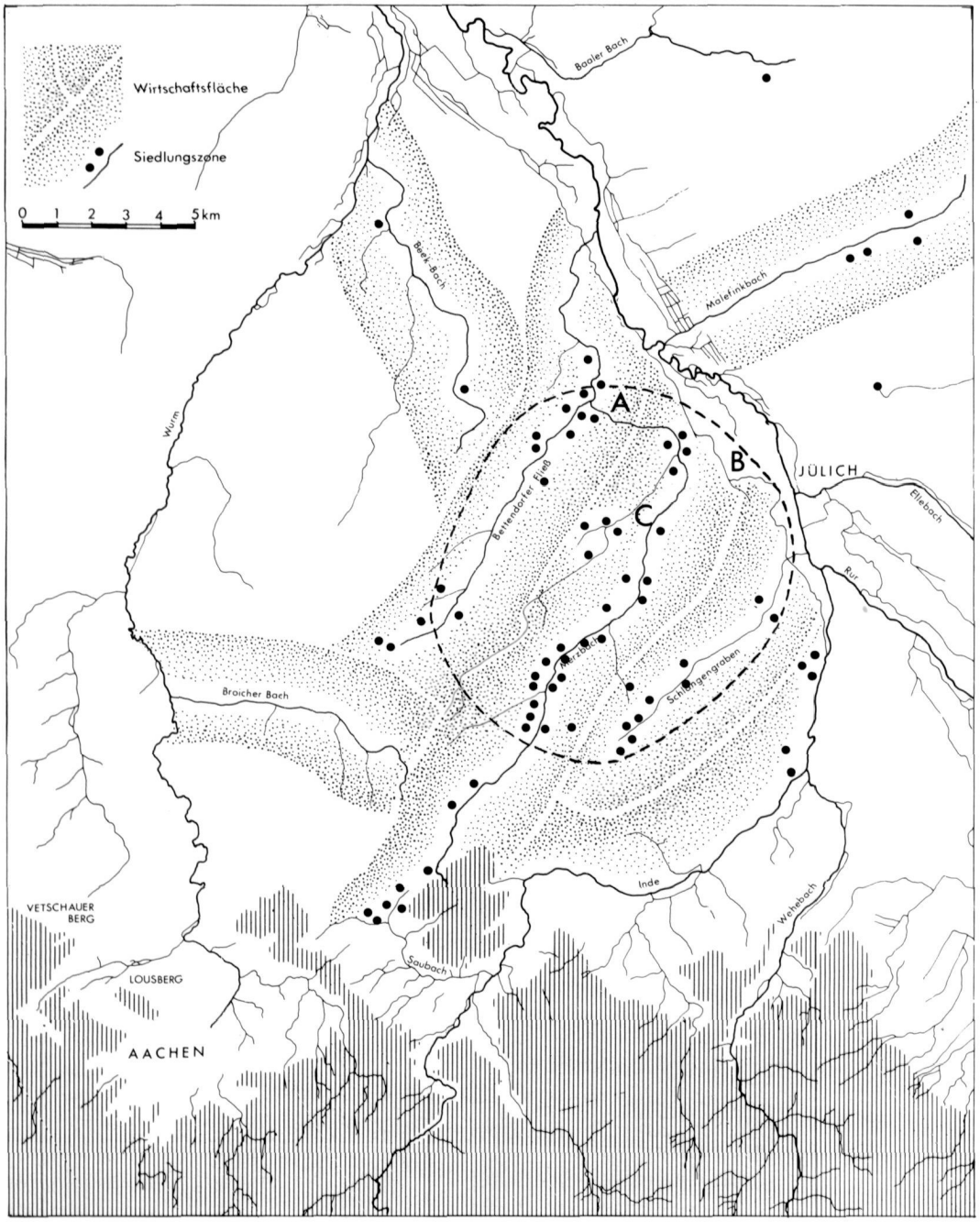

Fig. 24. Aldenhovener Platte. Distribution of the Bandkeramik with settlement zones and zones of exploitation. Dashed line: Limit of the survey area. Scale 1: 100 000

ded. The Atlantic lime forest was probably more similar to the latter, although there were increasingly more clearings during the course of the Bandkeramik. On 50 hectares of woodland therefore 100-150 head of cattle could have been grazed in summer. If fallowed fields are added to this, of which in East Prussia 1.16 hectares were necessary for one head of horned cattle, and the empty areas within the settlement cell are considered, then it must be reckoned that the Aldenhovener loess area was sufficient for a very large number of cattle. From the same East Prussian sources, one head of horned cattle used the same grazing as two young cattle or ten sheep, so that it is possible here to consider the amount of sheep and goat in the Bandkeramik. A limiting factor for the size of the herd was undoubtedly the provision of winter fodder, which had to be obtained by cutting leaves to make leaf hay, and was therefore dependent on human work capacity. If the winter requirement for a cow of 150 kg is estimated at 1000 bundles of leaves and twigs each weighing 1 kg[42], then it is clear that the size of the herd indicated required considerable work to bring it through the winter.

It is clear that these theories must be tested more rigourously, especially in conjunction with palaeobotanical studies. Theoretically the adjacent Eifel could also have served for summer pasture. From the archaeological evidence however it was not occupied until the late Middle Neolithic[43] and only intensively in the Late Neolithic;[44] no Bandkeramik material has as yet been found.

The Bandkeramik cultural landscape on the Aldenhovener Platte can be described as a linear system of settlement corridors, orientated on water courses which are 3 km apart from each other. The necessary fields must be reconstructed as having been immediately adjacent to the settlements, so that behind the fields there was a strip of woodland about 1 km wide which divided the settlement cells but must have been intensively exploited.

Such a landscape type was still in existence in the first half of the 19th century in the Lower Rhine Loessboerde (fig. 25). The woodland known as the "Friesheimer Busch" between Rothbach and Erft divided the field boundaries of the settlements which were located on the streams. Because of pasturage and wood cutting it was already at this time fully degenerated. Already by the middle of the 18th century there was no oak suitable for house building, almost no beech, and the copses (for firewood) were in poor condition.[45] The map shows a typical "Bandkeramik" settlement location on the edge of the valley bottoms, which in this case were used as pasture. There are some "twin" settlements; villages opposite each other on either side of the valley, such as Lommersum and Derkum and Klein- and Gross-Vernich. At Lommersum there is also a cluster of smaller and larger sites. However, such analogies with a different political and economic system must not be taken too far. The general structure is comparable though, as the basic requirements of an agricultural economy are similar.

As a conclusion to this short survey of some of the results of settlement archaeology research on the Aldenhovener Platte there follows an estimation of population density. If the period of greatest settlement extent in the Merzbach valley is taken, and a population estimate based on 6 inhabitants per house is made, then in the Lower Rhine Bay there was a population of 26 800. Extended to the whole of the Federal Republic of Germany the total figure is 360 000 inhabitants in 60 000 houses and about 15 000–20 000 settlements, if 3–4 houses are estimated per settlement.[46] This means a population density of 1.45 per square kilometre; the modern figure is 247. If only loess areas are included, which appears more valid as these formed the basis for settlement and economy, then the figure is 16.7 people per square kilometre. This figure is highly significant when compared with estimates for the later Medieval period (pre 1500 AD).[47] At this time the population was 30 per square kilometre of arable land.

This seems to support the contention that during the florescence of the Bandkeramik the loess areas and their resources were intensively

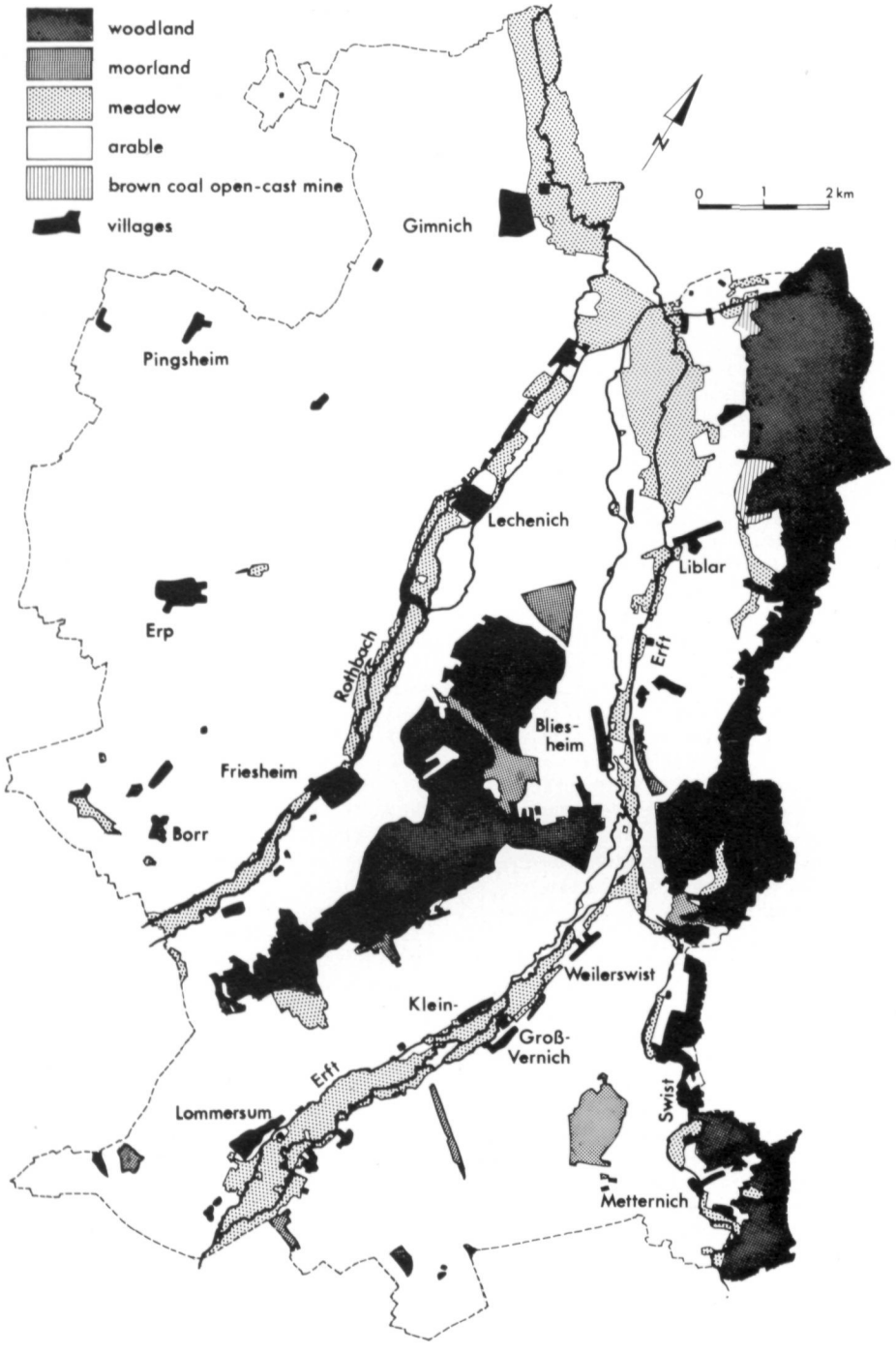

Fig. 25. The South-East Lower Rhine Bay. Land use in the first half of the 19th century (after H. Becker).

exploited, and that possibly already the limits of their carrying capacity at that time were reached.

(Translated by N.J. Starling)

NOTES

1. R. Kuper, Der Rössener Siedlungsplatz Inden 1. Dissertation, University of Cologne (1975). Limited printed edition (1979).
2. For sampling problems see F.W. Hamond, The Interpretation of Archaeological Distribution Maps: Biases Inherent in Archaeological Fieldwork. *Archaeo-Physika* 7 (1980) 193-216.
3. In previous years, spectacular finds had been made in excavations carried out by the *Rheinisches Landesmuseum*,4. Bonn, which showed from other mines the possibilities afforded to archaeologists by opencast mining for brown coal; cf. A. Herrnbrodt, Der Husterknupp. *Beihefte der Bonner Jahrbücher* 6 (1958); H. Hinz, Die Ausgrabungen auf dem Kirchberg in Morken, Kr. Bergheim (Erft). *Rheinische Ausgrabungen* 7 (1969); W. Piepers, Ausgrabungen an der Alten Burg Lürken. *Rheinische Ausgrabungen* 21 (1981).
4. *Bonner Jahrb.* 171, 1971, 612-616.
5. The *Arbeitsgemeinschaft* was energetically supported by F. Schmidt of Aldenhoven, who at that time was a private collector. In 1968 he had begun to make observations at the mine "Zukunft-West". The *Rheinisches Landesmuseum* reimbursed travelling costs.
6. The results were published in a summary report (*Bonner Jahrb.* 171, 1971, 558-644), the first of 12 annual reports by the Aldenhovener Platte Project. cf. Report 12 in *Bonner Jahrb.* 182, 1982, 307-324.
7. The application was in the hands of J. Lüning; it was supported by the directors of the *Rheinisches Landesmuseum* Bonn and the *Institut für Ur- und Frühgeschichte* of the University of Cologne. The Project was directed from 1971-75 by R. Kuper and J. Lüning, and from 1976-1981 by J. Lüning. It was financed by the *Deutsche Forschungsgemeinschaft,* with considerable financial help also by the *Rheinische Braunkohlenwerke AG;* this contribution was at times as much as 30%. The *Rheinisches Landesmuseum* Bonn also supported the Project as far as possible in every respect.
8. The excavation techniques, using much mechanical help, and the special recording system, are detailed in *Bonner Jahrb.* 173, 1973, 226-256.
9. cf. the description of the survey method by W. Schwellnus in *Bonner Jahrb.* 177, 1977, 546-558.
10. J.P. Farrugia, R. Kuper, J. Lüning, P. Stehli, Der bandkeramische Siedlungsplatz Langweiler 2. *Rhein. Ausgrabungen* 13 (1973); R. Kuper, H. Löhr, J. Lüning, P. Stehli, A. Zimmermann, Der bandkeramische Siedlungsplatz Langweiler 9. *Rhein. Ausgrabungen* 18 (1977). A comprehensive bibliography is published in *Bonner Jahrb.* 182, 1982, 308-312.
11. The following is taken partly direct from J. Schalich, Boden- und Landschaftsgeschichte. In: Langweiler 9, (Note 10) 9-14. The unpublished contribution by J. Schalich in the monograph Langweiler 8 was also used.
12. The Merzbach from source to mouth falls 140 m in a direct line of 20 km, *i.e.* 0.7%.
13. This section follows, partially word for word, the publication by P. Imhoff, *Das niederrheinische Lössgebiet.* Dessau (1932). cf. also K. Gatzen, *Die Ackerbaulandschaft der nördlichen Rur-Erft-Platte* (1957); K. Gatzen, *Die Aldenhovener Platte; Ackerbörde und Kohlenrevier. Wirtschafts- und sozialgeographische Themen zur Landeskunde Deutschlands.* Festschr. für Th. Kraus (1959) 225 ff.; H. Becker, Die Agrarlandschaften des Kreises Euskirchen in der ersten Hälfte des 19. Jahrhunderts. *Veröffentl. des Vereins der Geschichts- und Heimatfreunde des Kreises Euskirchen e.V.* (1970).
14. H. Geiss, M. Horbert, G. Polster, Geländeklima und Lufthygiene. Ökologisches Gutachten über die Auswirkungen eines Tagebaues Hambach auf die Umwelt. *KFA-Jülich* (1975).
15. cf. contributions by P.J.R. Modderman et al. in *Helinium* 21, 1981, 136-175.
16. P. Stehli, Grossgartacher Scherben vom bandkeramischen Siedlungsplatz Langweiler 8, Kr. Düren. *Arch. Korrespondenzblatt* 4, 1974, 117 ff..
17. H. Löhr et al., Die Rohstoffversorgung von Langweiler 9 im Vergleich mit anderen bandkeramischen Fundplätzen. In: Langweiler 9 (Note 10) 165 ff..
10) 165 ff..
18. M. Dohrn-Ihmig, Bandkeramik an Mittel- und Niederrhein. *Rheinische Ausgrabungen* 19 (1979) 191-362, Fig. 2 (Soil map).
19. For example the shallow and gleyed "grey earths" in the Hambacher Forst (Fig. 8).
20. An extreme example of this type of location is the settlement Barmen 1A on the gravel plateau of the Barmer Heide. cf. *Bonner Jahrb.* 179, 1979, 304 ff..
21. This will be published in the monograph of Langweiler 8. The map, Fig. 14, is an excerpt of this.
22. For the exact determination of this settlement boundary see J. Lüning, J. Schalich and P. Stehli, Ausdehnung des Siedlungsplatzes. In: Langweiler 9 (Note 10) 17f.
23. Information from A.J. Kalis, Utrecht.
24. Information from A.J. Kalis, Utrecht and L. Castelletti, Como.
25. W. Schwellnus, A. Zimmerman (in preparation).
26. P.J.R. Modderman, *Linearbandkeramik aus Elsloo und Stein* (1970), 101 ff. and table p. 112.
27. Op. cit. p. 110.
28. Op. cit. 100 ff. and table, fig. 12.
29. This is presented fully by U. Boelicke in the monograph Langweiler 8 (in press). cf. also U. Boelicke, Gruben und Häuser: Untersuchungen zur Struktur bandkeramischer Hofplätze. In: *Siedlungen der Kultur mit Linearbandkera-*

mik in Europa. Kolloquium Nové Vozokany (Nitra) 1981 (1982), 17-28. Hereafter the following details and fig. 18-20.

30. K.H. Knörzer in Langweiler 8 (in press).

31. J. Lüning in Langweiler 9 (Note 10) 41 ff..

32. J. Lüning, Siedlung und Siedlungslandschaft in bandkeramischer und Rössener Zeit. *Offa* 39, 1982, 9-33.

33. On this subject and also soil exhaustion cf. P.J.R. Modderman, Bandkeramik und Wanderbauerntum. *Arch. Korrespondenzblatt* 1, 1971, 7-9; J. Lüning, Getreideanbau ohne Düngung. *Arch. Korrespondenzblatt 10, 1980, 117-122;* J. Lüning and J. Meurers-Balke, *Experimenteller Getreideanbau im Hambacher Forst, Gemeinde Elsdorf, Kr. Bergheim/Rheinland. Bonner Jahrb.* 180, 1980, 305-344.

34. cf. note 10 above. In the light of the new complete chronology of the Merzbach valley the local chronology published in 1977 has had to be somewhat changed; in particular a gap in settlement of one house generation had become apparent. Also more pits have been assigned to specific houses than before, so that some can be dated differently. An exact description of the new Langweiler 9 chronology is in preparation.

35. The chronology of the Merzbach valley has been worked out by P. Stehli, and will be published separately. cf. P. Stehli, Zur Methode der chronologischen Gliederung des bandkeramischen Siedlungsplatzes Langweiler 8. In: *Siedlungen der Kultur mit Linearbandkeramik in Europa* (note 29), 271-277.

36. For the location of Laurenzberg 8 cf. *Bonner Jahrb.* 174, 1974, Beilage 1.

37. *Bonner Jahrb.* 174, 1974, Beilage 1.

38. A. Zimmermann, Zur Organisation der Herstellung von Feuersteinartefakten in bandkeramischen Siedlungen. In: *Siedlungen mit Kultur der Linearbandkeramik in Europa* (note 29), 319-323.

39. *Bonner Jahrb.* 174, 1974, Beilage 1.

40. This is presented fully in J. Lüning, Bandkeramische Pflüge? *Fundberichte aus Hessen* 19/20, 1979/80, 55-68.

41. F.W. Henning, Bauernwirtschaft und Bauerneinkommen in Ostpreussen im 18. Jahrhundert. *Beihefte zum Jahrbuch der Albertus – Universität Königsberg* / Pr. 30 (1969) 46.

42. J.G.D. Clark, *Prehistoric Europe: The Economic Basis* (1952) 124 f.

43. Bischheimer Funde aus der Kartsteinhöhle bei Weyer, Kr. Schleiden. *Bonner Jahrb.* 155-156, 1955-1956, 437 f., Fig. 8.

44. Finds in the school collection at Kleinhau, Kr. Düren.

45. This is presented fully in H. Becker, *Die Agrarlandschaften des Kreises Euskirchen in der ersten Hälfte des 19. Jahrhunderts* (1970) 124 ff..

46. Using a similar method of calculation the Central German loess area had a population of 210 000 *i.e.* ten times as many as has been recently estimated for the area. *cf.* H. Behrens, *Die Jungsteinzeit im Mittelelbe-Saale-Gebiet* (1973), 213 (10 000-25 000 inhabitants).

47. F.W. Henning, Phasen der landwirtschaftlichen Entwicklung unter besonderer Berücksichtigung der Ertragverhältnisse. *Zeitschr. für Agrargeschichte und Agrarsoziologie* 30, 1982, 2-27, especially p. 4.