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BETWEEN FORAGING AND FARMING

AN EXTENDED BROAD SPECTRUM OF PAPERS
PRESENTED TO LEENDERT LOUWE KOOIJMANS

EDITED BY
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JOS P. KLEIJNE, HEDWIG H. PONJEE AND CORIJANNE G. SLAPPENDEL

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2 The temporality of culture change

Harry Fokkens

2.1 Introduction

Apart from being an inspiring scholar and teacher, Leendert has the gift to summarise his data in high quality and inspiring images. We have seen a number of these in for example *Verleden land* (1981), in *Sporen in het Land* (1985) and in *The Prehistory of the Netherlands* (2005). Especially the latter book took him and Medy Oberendorff a solid year to conclude: hundreds of images were redrawn or redesigned to the right scale and in a consistent style. For *The Prehistory of the Netherlands* one of his own original drawings was redrawn as well (Van Gijn/Louwe Kooijmans 2005, 345): the image had already been published twice (Louwe Kooijmans 1993; 1998) but was due for some fine tuning again. It is this figure (fig. 2.1) that will be the starting point of my discussion of how culture change in several periods and regions has different temporalities and different trajectories.

Leendert's model shows, in a very compact form, the neolithisation process in the southern North Sea Basin. It has many layers of interpretation embedded and on first sight it is extremely complex, but with the right explanation added to it (cf. Louwe Kooijmans 1998) it is really a marvel of models. The model has in fact three dimensions: time, region and process. In vertical scale time is projected, in the horizontal scale four different regions are shown and as a function of time and region the process of Neolithisation is represented by shading, which shows the phasing of the

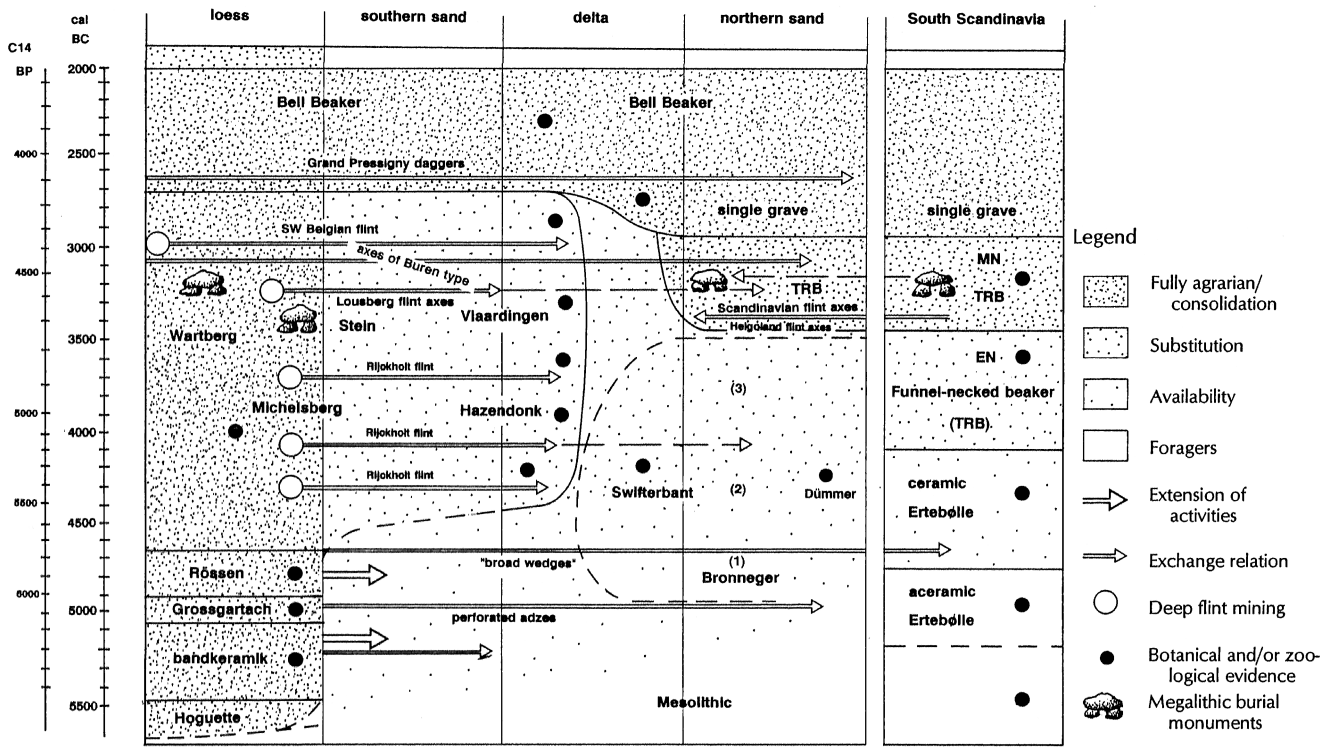

Figure 2.1 Louwe Kooijmans' dynamic model of Neolithisation (from Louwe Kooijmans 1998, 420).

process (fig. 2.1; cf. Louwe Kooijmans 1998, 420). Basically the model shows how the neolithisation in the Netherlands is the result of two important developments: in the south the LBK development on the loess around 5300 cal BC and the north the Ertebølle and subsequent TRB-cultures. It demonstrates how on the loess plateaus the process was instant, brought about by colonisation of LBK farmers around 5500 cal BC, in the lowlands however the adoption of the Neolithic elements was much more gradual. Some aspects were taken over, but basically the Mesolithic economy remained intact. The choice of settlement location, generally on the fringe of ecological zones, is typical for a hunting-gathering economy, seasonal encampments were still part of the settlement system (Louwe Kooijmans 2003). Neolithic elements seem to have been adopted only very selective and at a late stage, like the Rössener *Breitkeile*.

In the north the transition is of a different quality. Here the LBK is absent and there seems to be a gradual development from Ertebølle to TRB, where in Ertebølle context first pottery is adopted but its economy remains fully Mesolithic (Madsen 1982; 1986). In this phase, from 4700 cal BC onwards, the distribution of *Breitkeile* indicate contacts with the people of the loess, although the distribution of these wedges into southern Jutland and the areas of the Dutch coast, may be for a large part due to down the line exchange. This would to a certain extent explain why nothing seems to have been exchanged from the coast into the inland zone (Louwe Kooijmans 1998, 421).

Louwe Kooijmans interestingly weaves the 'availability – substitution – consolidation' model of Zvelebil and Rowley-Conwy (1984; Zvelebil 1986; fig. 2.2) in his image. Zvelebil's model describes how innovations become accepted within a given society according to a more or less standard pathway: first domestication is available but only a limited set of elements are adopted, subsistence remains largely based on foraging (Zvelebil 1986; fig. 2.2), then the acceptance gains momentum, the acceptance curve runs steeper when people gradually substitute up to 50% of their subsistence with domesticates, and finally there is the phase of consolidation. Farming is now the principle mode of production and more than 50% of the subsistence consists of domesticates.

Zvelebil and Rowley-Conwy apparently have developed their model independently from geographical research that deals with the spread and acceptance of innovations. In Geography especially Thorsten Hägerstrand has been influential with his simulation models for spatial distribution of innovations (cf. Haggett *et al.* 1977: 231 ff.) while the sociologist Everett Rogers developed models for the spread of concepts, the role of leaders and problems of resistance to change (Rogers 2003; cf. Haggett *et al.* 1977, 232). Both approaches have their value, but the problem with the

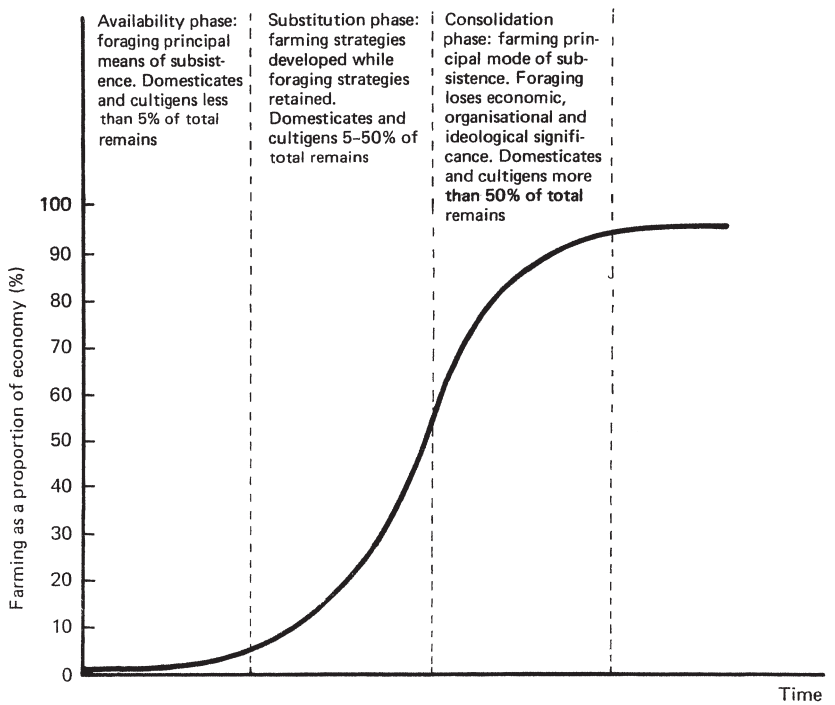

Figure 2.2 The availability – substitution – consolidation model, according to Zvelebil (from Zvelebil 1986, 12).

time-geography approach of Hägerstrand is that it sees innovation as 'automatic process': once it starts, it will carry on in a distinct (constant) rate that is dependant from distance between innovators and population density.

In the sixties of the last century, Childe's idea of a Neolithic revolution that was transmitted through diffusion and migration (Childe 1942) seemed to make such models applicable to archaeology as well. Edmondsen (1961) tried this, for instance, in an article titled *Neolithic diffusion rates* (1961). But even then one of his critics, C.J. Becker, argues that Edmondson's approach is old-fashioned: "Today we can follow, in broad lines, the development of the first Neolithic cultures in central and northern Europe. The Danubian cultures must have spread very rapidly through the whole of Central Europe, from the Ukraine to Belgium. But after that it was nearly a thousand years before food-producing cultures, with the aid of a new technique, and carried by new peoples, penetrated southern Scandinavia. And it was perhaps more than two thousand years later that a civilization based on farming could colonize northern Scandinavia (or parts of it)." (Becker 1961, 87).

And of course later research has demonstrated that the process of neolithisation is far more complex and depends on a number of aspects, among which the social-cultural may be the most important. That is also what Rogers demonstrates in his seminal *Diffusion of Innovations*, which saw five reprints between 1962 and 2003, each time modified and expanded (Rogers 2003, xv). Although Hägerstrands work is certainly relevant for archaeology as well, I will discuss here Rogers' work in more detail because I want to focus on the socio-cultural process of the acceptance of innovations.

2.2 Properties of innovation process

The logistic curve that Zvelebil (1986) sketches, is in fact an S-shaped curve of cumulative numbers (fig. 2.3). The curve results from the observation that in most cases the successful adoption of an innovation follows a normal bell-shaped distribution pattern (Rogers 2003, 275). Rogers divides the 'innovativeness' of adopters into categories by using the standard deviations. When taking the average time at which an innovation spreads, at 1 sigma on either side of the average we find the early and late majority, at 2 sigma the early adopters and the laggards. The first 2.5% of the early adopters are called the innovators (Rogers 2003, 282 ff.; fig. 2.4). In any given population, the steepness of the S-curve, or the length of the standard distribution, is

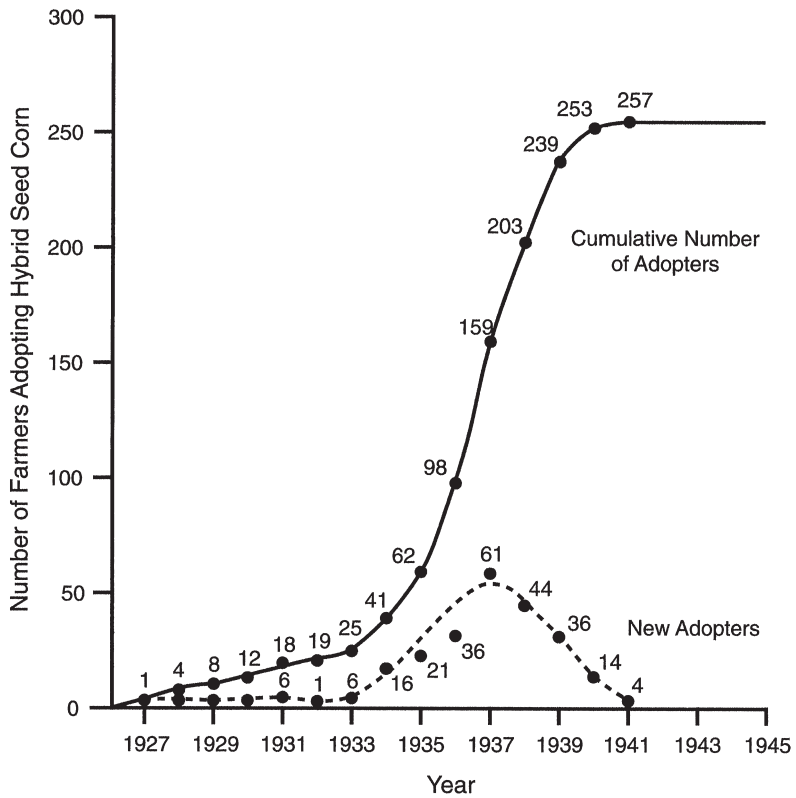

Figure 2.3 The cumulative adopters of hybrid seed corn (from Rogers 2003, 273).

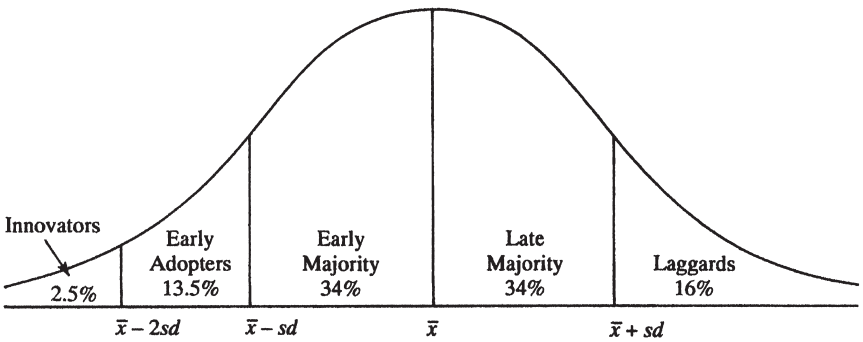

Figure 2.4 Adopter categorisation on the basis of innovativness (from Rogers 2003, 281).

determined by the time period in which an innovation is adopted. The aspects that play a role in this diffusion process are the subject of Rogers' study. Innovation is defined as "an idea, practice or object that is perceived as new by an individual or other unit of adoption. It matters little, so far as human behavior is concerned, whether or not an idea is 'objectively' new. […] The perceived newness of the idea for the individual determines his or her reaction to it. If an idea is new to the individual, it is an innovation" (Rogers 2003, 12).

Diffusion is defined as the process by which "(1) an innovation is (2) communicated through certain channels (3) over time (4) among the members of a social system" (Rogers 2003, 11). Rogers distinguishes a number of variables that determine the rate of adoption of innovations (fig. 5; cf. fig. 6.1). He states that about 50% of the adoption rate is determined by the perceived attributes, about the contribution of the four other classes of variables little research is done (2003, 222). It is unnecessary to discuss all of these variables in great detail since not all of them are relevant for the period we are discussing. I will focus in particular on one variable: compatibility. The concept of compatibility is defined as "the degree to which an innovation is persistent with existing values, past experiences and needs" (Rogers 2003, 240). Does the innovation fit in the local culture? Rogers cites a number of examples that demonstrate how obvious health or technological improvements were not at all, or only very slowly, adopted because they did not fit in the local or regional culture, a problem that has to be faced by many of the development workers for instance. Incompatibility is one of the main reasons that even superior technological innovations do not necessarily diffuse themselves (Rogers 2003, 10).

Compatibility is probably of great relevance for the process of neolithisation (cf. below). Closely connected to this factor is the nature of the social system. The rate of innovation is influenced by how the community is structured, how the chains of command are organised and how the communication networks function. Important is also the type of the decision. Is it optional, is it a collective decision to adopt or is adoption prompted by authority.

Compatibility is important, but for the rate of introduction also the concept of critical mass needs to be discussed. Critical mass is "the point after which further diffusion becomes self-sustaining" (Rogers 2003, 343; fig. 2.5). Especially in interactive innovations, for instance where new communication technology is involved, the idea of a critical mass is relevant. It predicts that at a certain point in time individuals cannot communicate with each other any longer if they have not yet adopted the innovation. This is for instance the case with cellular telephones or beamers. Not adopting such innovations means that one places oneself outside the mainstream of social interaction. Although this concept has been developed for the information age, it may well be relevant for the adoption of some innovations in the past. Especially when these had an ideological aspect, it may have been – socially speaking – impossible not to follow the innovation. People who were raised in small village communities know how this works: in order to be part of the community, one follows its mainstream and rules, even if authority or leadership may not be part of the process. Collective decisions are just as 'coercive'. The introduction of the Bronze Age three-aisled farm, for instance, may be an example. Its introduction took a few hundred years. But the last part of that development, after 1500 cal BC took place in probably a few generations (Arnoldussen 2008; see par. 2.3.3). It appears that in this point in time a critical mass was reached and any social constraints on adoption that previously may have slowed down the introduction, were now 'absent'.

2.3 The implication of diffusion models for archaeology

The question we may rightfully ask is whether these models are useful at all for describing processes of change in the

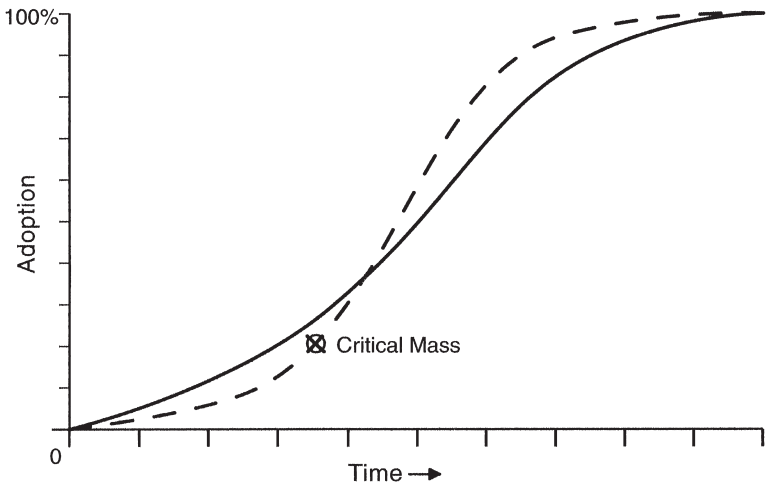

Figure 2.5 The concept of critical mass, showing how the rate of adoption changes when critical amss is reached (from Rogers 2003, 344).

Neolithic or in other periods of Prehistory. In my opinion they are useful indeed. Archaeologists study culture change through means of objects and other visible manifestations of culture, like burial ritual, settlements, etc. But generally they, implicitly, consider all changes as being more or less of similar magnitude and as part of one coherent process. Yet, it hardly needs discussion that for instance a pottery style may change under different conditions and in a different trajectory than, say, burial ritual. These are different culture processes that may have different temporalities and conditions.

This realisation has important implications for the study of culture change. It implies, for instance that major change does not occur automatically with the first occurrence of an innovative product. It also implies that we always have to discuss the trajectory of change of a given phenomenon and that we cannot assume a standard process. I will discuss both issues in more detail.

2.3.1 The visibility phase of the innovation curve

As discussed in paragraph 2.2 the acceptance of innovation follows an S-shaped curve. Generally archaeologists, however, visualise innovation as a linear process of appearance and disappearance. Dating the beginning and the end of certain phenomena is therefore an important aspect of archaeological reasoning. However, the curve of figure 2.6 shows that the number of adopters is very low in the first phase, this is probably a phase in which not much changes. Next to that, post-depositional processes, influencing the visibility of the archaeological record, can decrease the chance of us archaeologists finding these trendsetters. After reaching the critical point, or just before, when the adoption curve becomes steeper, the innovation settles in and causes culture change to occur. Generally this is the phase in which archaeologists see 'quick' developments, which in the past was interpreted as the result of migration or 'revolution'. We could call this *the visibility phase*, defined as the phase that innovations gain cultural impact and visibly become an integral part of culture processes.

To give an example, in earlier publications I have argued that the start of the Single Grave Culture in our regions is associated with the introduction of the *ard* (Fokkens 1986, 1998). Nevertheless it is clear that we have dating evidence

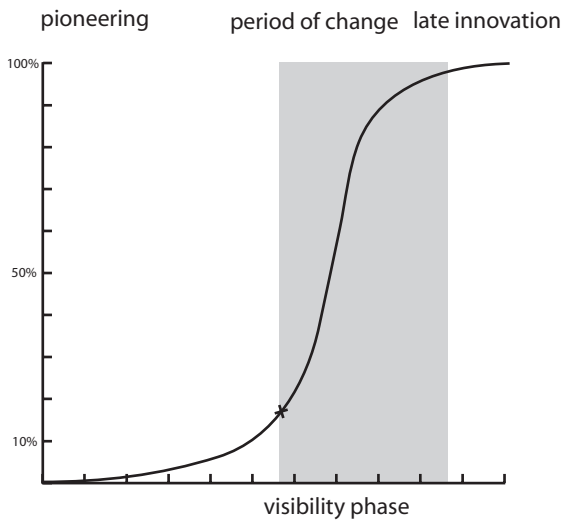

Figure 2.6 The period of change occurs when the critical mass is reached and an innovation is accepted in a fast rate. This is the period in which most innovations become visible archaeologically.

of older *ard* marks associated with the Funnelbeaker Culture (TRB) in, for instance, Groningen around 3000 cal BC (Kortekaas 1987; Lanting/Van der Plicht 2000, 67).[1] Although this is undoubtedly correct, it does not undermine my main argument in any way, as is demonstrated by figure 2.6. People may have experimented with the *ard* much earlier, it may have been available, but was probably not an integral part of TRB culture. It became accepted on a much larger scale after 3000 cal BC and was only adopted in all of the Netherlands after 2500 cal BC (see below). In 1998 I argued that the use of the *ard* can be seen as a technological innovation that becomes only possible when the forest has been cleared, tree trunks were removed and larger open areas existed (Fokkens 1998). In such open spaces, especially after fallow periods, dense root systems develop that are difficult to work with a hoe (Boserup 1965). In such landscapes the *ard* is a helpful, possibly even an indispensable tool. But still, it does not mean that it necessarily was adopted everywhere.

2.3.2 The trajectory of the process

The *ard* is an example of an innovation that could 'turn the world around' in the sense that its adoption implied more then just using an instrument. Oxen, for example, needed to be trained and guided on the field. We have absolutely no evidence for the work division between men and women, but if women were doing most work in hoe agriculture and men in plough agriculture, which is the case in parts of Africa for instance (*e.g.* McCann 1995), the introduction of the plough potentially meant a change in labour division. This means that such an introduction process may meet many social constraints, much more than for instance the introduction of a new pottery style. We therefore cannot assume a standard trajectory, but have to take regional situations and constraints into account.

In fact, even within the borders of the Netherlands, we can see two different developments in this respect. Louwe Kooijmans' models (fig. 2.1 and 2.7) shows that the Vlaardingen culture in the south and west did not adopt a fully agrarian lifestyle until *c.* 2500 cal BC. There is no evidence of *ard* marks from earlier periods in that region. In the centre, the north and the east of the country, however, the *ard* was already introduced in the TRB culture and became an integral part of the economic system during the Late Neolithic, from *c.* 2850 cal BC onwards. One can only understand this properly by looking at the palaeo-geographical maps of the period (fig 2.8). They demonstrate that around 2750 cal BC the lower Rhine-Meuse basin formed a wide zone of riverbeds, levees and marshes. This is the area inhabited by the Vlaardingen people and they seem to have resisted the Single Grave tradition. There are no Single Grave finds *sensu stricto* in this area, the oldest Beaker finds belong to All Over Ornamented (AOO) and All Over Corded (AOC) Beakers.[2]

After 2500 cal BC it appears that in the whole of the Netherlands the Bell Beaker tradition takes over and a fully agrarian economy is established also in the lower Rhine-Meuse basin (fig. 2.7). It is quite clear that the *ard* is part of the Bell Beaker economy, for instance demonstrated by the plough marks underneath the Bell Beaker barrows at Oostwoud (Lanting/Van der Plicht 2000, 87 ff.), but several sites in the delta or river valleys show that for instance fishing remained important (cf. Molenaarsgraaf: Louwe Kooijmans 1974; Oldeboorn: Fokkens 1998).

In conclusion, it is clear that even within the Netherlands different trajectories exist for the introduction of the plough. These trajectories may have been influenced by the physical landscape of these regions, which do, or do not, favour the use of a plough. But on the other hand, cultural restraints may have played a role as well. Where on the sandy uplands the TRB culture had paved the path for the introduction of the plough as an integral element of the economy short after 3000 cal BC, in the river valleys this happened only after 2500 cal BC. Here the previous Vlaardingen groups may have had little use for a plough and possibly its social consequences may have been incompatible with the mixed Mesolithic/Neolithic life style and the 'extended broad spectrum economy'.

2.3.3 Interference

Another interesting phenomenon that may be explained by innovation trajectories is that of 'periods without data'. For instance in the period between 3100 and 2900 cal BC megalithic graves are no longer built (although they are still used) but barrows are not yet erected. Another period without data is the period 1800-1500 cal BC with regards to settlement data (house plans). All of the three-aisled Bronze Age houses that we know date to the period 1500-1200 cal BC (Arnoldussen 2008). Yet, the youngest two-aisled house from the Netherlands dates to *c.* 1850 cal BC (Noordwijk: Van der Velde 2008). From the period in between we know virtually nothing. A few settlement pits are known, but no house plans.

These periods 'without data' seem to coincide exactly with the interference of two major traditions. Since the three-aisled house plans appear fully developed and as a stable system after 1500 BC, what we look at is probably the point that the critical mass is reached: the innovation settles in, change becomes visible (par. 2.3.1). But that does not mean that there was nothing before that period. Between 1800 and 1500 BC the two-aisled farm and the ideology that adheres to it has slowly disappeared and was replaced by the three-aisled farm and its ideological significance (Fokkens 2005).

The conflict of both ideologies apparently made house structures invisible. I do not understand exactly why, but it is interesting that the same phenomenon becomes visible again

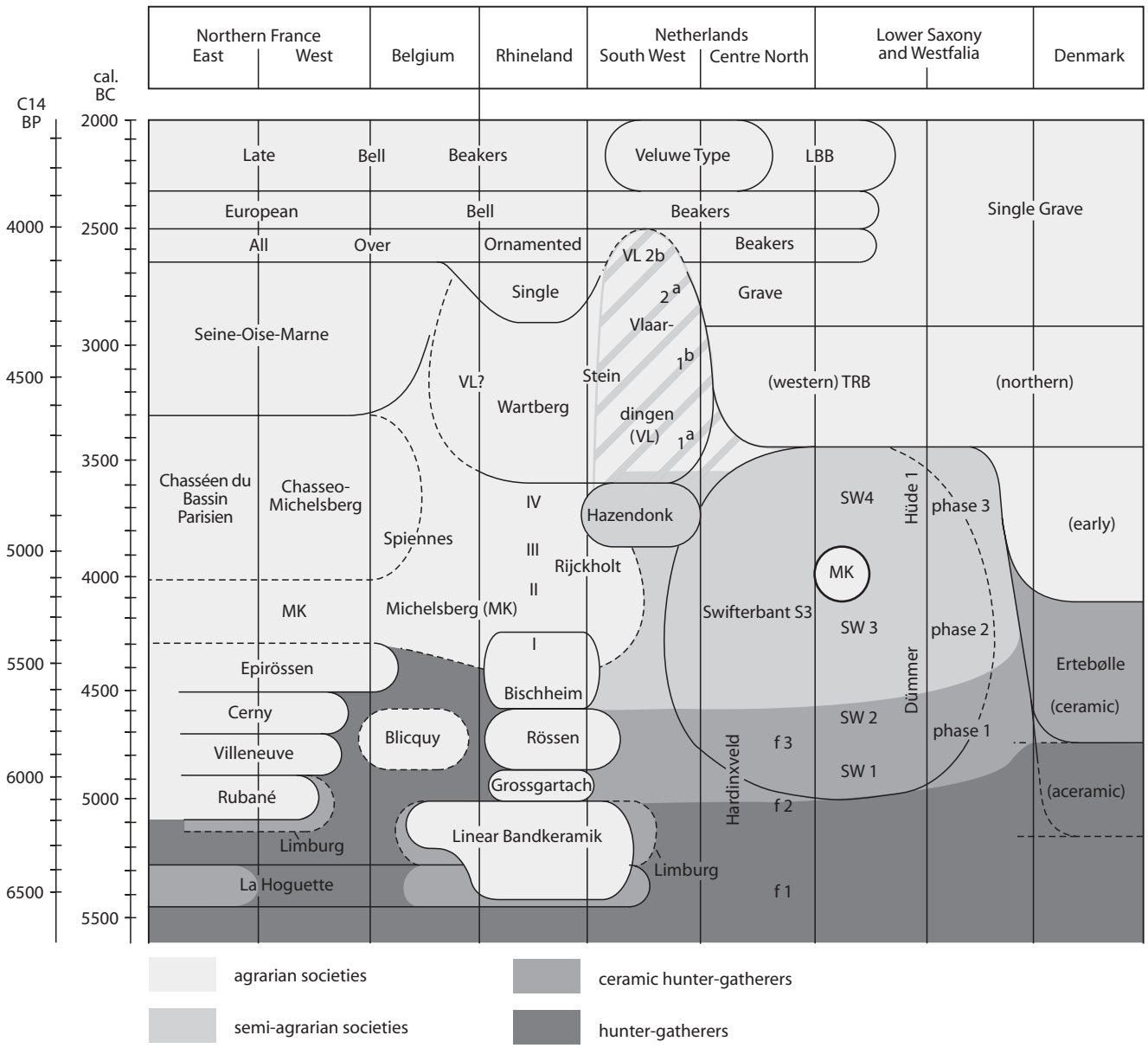

Figure 2.7 Louwe Kooijmans' most recent chrono-geographical diagram of the Lower Rhine Basin and adjacent areas. The colours indicate the stages of neolithisation (after Louwe Kooijmans 2006, 512).

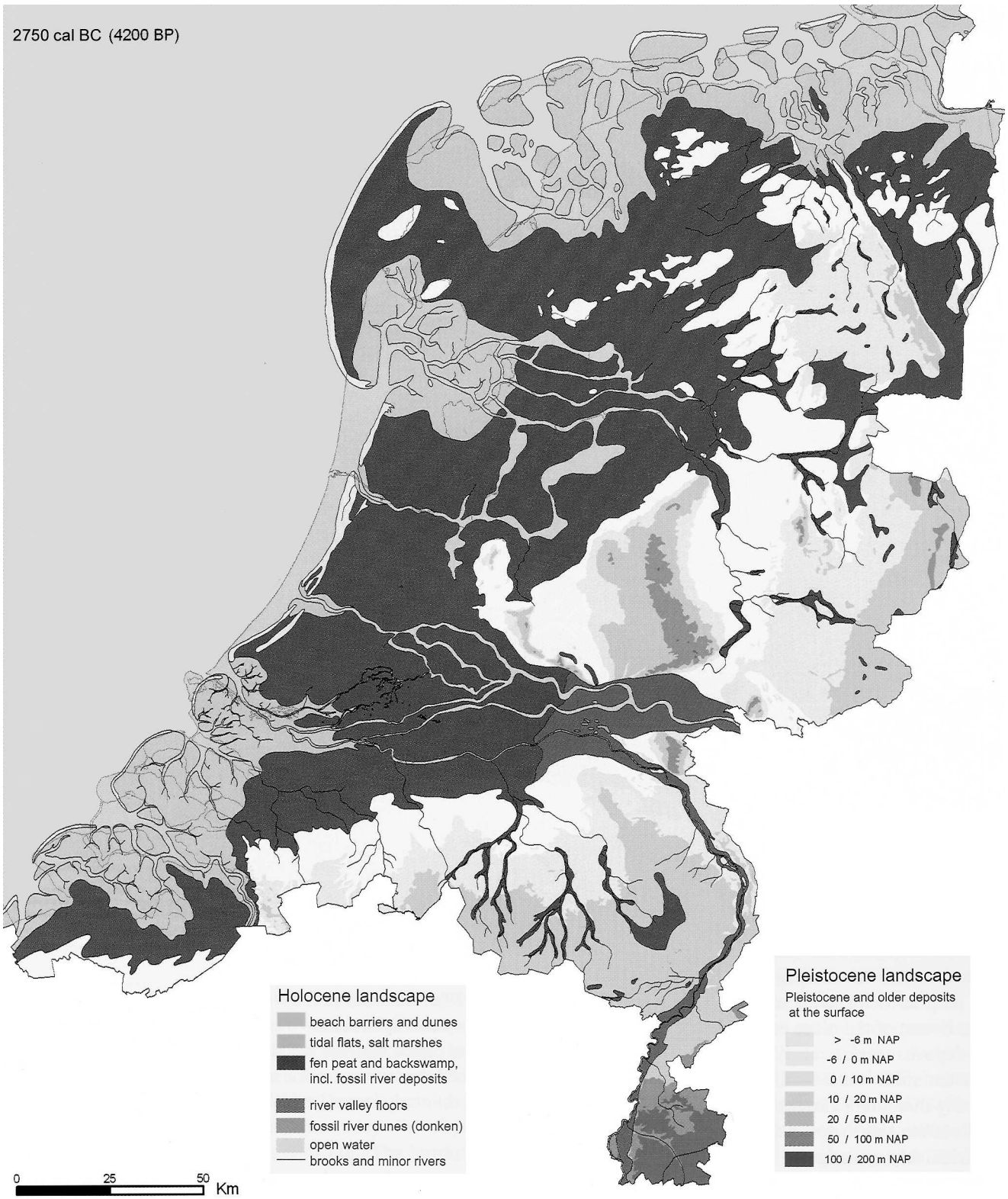

Figure 2.8 The palaeogeographical map of the Netherlands *c.* 2750 BC (from Vos/Kiden 2005, 22).

in the eleventh to tenth century BC when the three-aisled farm is replaced by the short Late Bronze Age/Early Iron Age farm. What these developments do demonstrate is that these were not 'just' technical innovations. Apparently these influenced culture processes to such an extent that they had an interference effect, making a clear pattern invisible for a while. In itself the presence of that effect may be used to support the idea that – following the house example – the three-aisled farm represented a fundamental concept in society.

2.4 Concluding remarks

I hope to have made clear that when studying cultural change, we should be aware of the many variables that influence the adoption of innovations. I have tried to make clear that even if a technological innovation can be considered to be superior, incompatibility with the existing social structure may prevent its acceptance. Of course it is almost impossible to find evidence for suppositions that are made on the basis of this approach, but in fact neither is there any evidence for the suggestion that pottery style comparisons are reliable evidence for cultural contacts or process. What I wanted to make clear is that one cannot just 'assume' culture change to be a standardised and uniform process. We should at least try to bring the complexity of it into the analysis. Leendert's model of neolithisation in the Low Countries was a good start in the right direction and probably will continue to inspire students in the future.

Acknowledgements

I would like to thank Karsten Wentink and Quentin Bourgeois for the critical editing of the text.

Notes

1 The Groningen arable is dated by two dates a *t.p.q.* is given by the date of charcoal in a vague pit underlying the arable: 4515 ± 30 BP (3360-3090 cal BC at 2 sigma; Lanting/Van der Plicht 2000, 67). The base of the arable itself is dated as well, but this date is less secure: GrN 13441 4565 ± 35 BP or 3500-3460/3380-3260/3240-3100 cal BC (Lanting/Van der Plicht 2000, 67). The date is on charcoal in the base of the arable layer and could belong to older (ploughed-up) material. Nevertheless the Groningen arable probably dates between 3100 and 3000 cal BC.

2 The Dutch typological tradition places AOO at the end of the Single Grave tradition (Lanting/Van der Waals 1976; Lanting/Van der Plicht 2000, 80). With Single Grave *sensu stricto*, the typical Protuding Foot Beaker phase is indicated here. Elsewhere AOO (and AOC) are considered the oldest Bell Beakers (*e.g.* Needham 2005), especially in areas without an earlier Corded ware tradition. Also in the southern and western Netherlands, where the Corded tradition is absent, AOO and AOC pottery marks the transition to the Bell Beakers proper.

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