

The nature of early farming in Central and South-east Europe

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ABSTRACT – *This paper summarises models of crop and animal husbandry in Neolithic Europe and reviews the relevant evidence from three regions: the western loess belt and Alpine Foreland; the Great Hungarian Plain; and the southern Balkans and Greece. Intensive mixed farming (small-scale, labour-intensive cultivation integrated with small-scale herding) emerges as the most plausible model across these regions. Such continuity is in some ways counter-intuitive given climatic variability across Europe and archaeological diversity in settlement and house forms etc. It is argued that variability in the form of Neolithic settlements (nucleated versus dispersed, ‘tell’ versus ‘flat’ sites) should be understood not as a reflection of radically different farming practices but rather as different social permutations of the same basic farming and herding pattern.*

IZVLEČEK – *V članku povzemamo modele za poljedelstvo in živinorejo v neolitski Evropi in pregledamo ustrezne podatke s treh področij: zahodni aluvialni pas v alpskem predgorju; Panonska nižina; južni Balkan in Grčija. Intenzivno mešano kmetovanje (v malem obsegu, obdelovanje zemlje z intenzivnim ročnim delom, manjše črede) se kaže kot najverjetnejši model po vseh treh območjih. Takšna enotnost je na nek način nenavadna glede na različne klimatske razmere po Evropi, arheološko različnost naselbin in oblik hiš itd. Menimo, da raznolikost oblik neolitskih naselbin (jedrne proti razpršenim, ‘tell’ proti ‘ravnim’ najdiščem) ne kaže na zelo različne načine kmetovanja, ampak bi jo morali razumeti kot različne družbene permutacije istega temeljnega vzorca kmetovanja.*

KEY WORDS – *Central Europe; South-east Europe; crop husbandry; animal husbandry*

INTRODUCTION

“Students of civilization have often credited the development of intensive agriculture to revolutionary inventions such as metal tools, the plow, and domesticated draft animals ... or to particular environments which challenged the creative powers of the inhabitants ... Comparative evidence now suggests that a great many peoples practice intensive cultivation with rudimentary tools, and that the necessary knowledge need not be diffused from a few centers of cultural innovation but may be developed to meet localized needs.” (Netting 1971:21)

This statement illustrates several points that form a useful introduction to this paper. First, it shows that the central argument made here – early farming in

central and south-east Europe was intensive – builds on a long-standing criticism of technology-driven evolutionary models of agricultural development. A more subtle evolutionary framework was proposed by Boserup (1965), who identified demographic pressure rather than technological innovation *per se* as the cause of intensification. According to this view, early forms of agriculture were extensive, involving long fallow periods and low energy inputs per unit area, and only became more intensive as a result of technological change fuelled by population pressure. Boserup (1965) ignored the beneficial effects of ‘rudimentary’ measures such as manuring, middening, careful hand tillage and weeding on crop yields (Grigg 1979). Following Kruk (1973), Sherratt

(1980) rejected the notion of a 'primeval' phase of shifting cultivation in Neolithic Europe but preserved the idea of low inputs per unit area by arguing that early 'horticulture' was confined to naturally fertile floodplain plots, recharged by spring flooding and requiring minimal soil preparation. This paper, however, will present evidence of labour-intensive cultivation, characterised by close integration of crop and livestock husbandry.

Second, Netting's statement raises the question of local (re-)invention of intensive farming methods. Given that the technology required is minimal, to argue that intensive agriculture represents the 'norm' across much of Neolithic Europe is not to deny the potentially diverse origins of Neolithic communities (*cf. Zvelebil 2000*), or to insist on a single 'centre of cultural innovation'. Rather, the intention here is, by demonstrating the intensive nature of early farming, to focus attention on the daily, seasonal and annual exigencies of farming in the Neolithic.

A third issue raised by Netting's comments is what constitutes 'intensification' of farming. This term is often used to refer to the application of farming technologies such as ard-tillage and ox-traction, but in fact these methods are associated with an extensification of agriculture: as the scale of cultivation expands due to the greater efficiency of the ox-drawn ard and metal harvesting tools, so inputs of labour per unit area are reduced (*Halstead 1992*).

MODELS OF NEOLITHIC FARMING IN EUROPE

A range of crop and animal husbandry models has emerged for various parts of Europe in the Neolithic. Table 1 presents a simplified summary of these models. Animal husbandry can broadly be characterised as intensive or extensive. Extensive animal husbandry refers to large-scale herding and consequently the need to move herds over considerable distances in order to find adequate grazing (*Halstead 1987; 1996a; 1996b; 2000; Russell 1988.15-16*).

This form of animal husbandry is associated with a lack of manuring since animals are often herded well away from arable land. Crop husbandry regimes compatible with extensive herding, therefore, would involve little or no manure input per unit area. Such extensive crop husbandry regimes are: shifting cultivation, in which crops are grown over a few seasons on newly cleared forest soil fertilised by ash; extensive ard cultivation, in which crops are grown on a large-scale with the help of the ox-drawn ard; and floodplain cultivation, which exploits fertile crop growing conditions created by seasonal flooding of alluvium and the downward movement of water and nutrients from surrounding slopes. As indicated in Table 1, there are various ways in which these forms of low intensity cultivation may relate to animal husbandry. The closest integration is seen in the use and management of oxen maintained to pull the ard plough – such animals are kept close to the settlement, are stalled through the winter and supplied with fodder. The manure from stalled oxen may be spread on to arable fields, but the large scale of ard cultivation is such that manuring inputs and crop yields per unit area remain low. The chronic shortage of manure in this sort of system is evident from the scale of cultivation as it compares with the manure produced by traction animals. Ethnographic evidence suggests that a pair of oxen can cultivate c. 5–10 ha or more per year (*Halstead 1995; Forbes 2000*), while each animal produces about 12 tons of manure per year (*Rowley-Conwy 1981*). Given that intensive manuring may require something like c. 30–100 tons of manure per hectare (*cf. Alcock et al. 1994; P. Halstead field notes from Asturias, Spain*), it is evident that a pair of oxen cannot provide enough manure to treat the area cultivated intensively.

By contrast, intensive garden cultivation represents a form of farming that is closely tied to similarly small-scale and intensive livestock management (*Halstead 1987; 1996a; 1996b; 2000; cf. Russell 1988.15*) (Tab. 1). The nature of this interdependence between crops and livestock is summarised

<i>Crop husbandry models</i>	<i>Animal husbandry models</i>	<i>Integration of crops and animals</i>
Shifting cultivation	Extensive herding	Regenerating plots may be used as pasture
Extensive ard cultivation		Cattle traction to pull carts and the ard plough
Floodplain cultivation		The floodplain also offers seasonal pasture
Intensive garden cultivation	Intensive herding	Complex interdependence (see Table 2)

Tab. 1. Simplified summary of crop and animal husbandry models, showing relationships between crops and animals.

<i>Animal contribution to crop husbandry</i>	<i>Crop contribution to animal husbandry</i>
Manure to fertilise the soil, provided by animals grazing crops/stubble or by spreading of collected manure	Crop by-products and products (spoiled or surplus) used as fodder
Grazing of unripe crops to prevent lodging and promote tillering	Cultivation plots, which may be surrounded by hedges or fencing, provide grazing

Tab. 2. Interdependence between crop and animal husbandry in intensive mixed farming.

in Table 2. Movements of herds around settlements are relatively small-scale, resulting in a conservation of manure for use on arable plots. Particularly over the winter, animals kept close to the settlement require shelter and fodder, which may include surplus or spoiled crops and crop by-products as well as leafy hay/branch fodder. With careful management, a household herd consisting of a few cattle, sheep/goats and pigs (*cf. Suter and Schibler 1996*) would produce enough manure to maintain high fertility levels in small-scale cultivation (e.g. 1–2 ha per household). Animal manure may be applied directly, by spreading of collected manure from penned areas or stalls, or indirectly, by allowing animals to graze stubble. Historical and ethnographic evidence (*Tusser 1984.105; Forbes 1995; 1998; Burns 2003; P. Halstead, field notes from Asturias and Greece*) also attests to the use of sheep and goats to graze unripe cereals at a vegetative stage of growth in order to promote tillering (the production of multiple stems per plant), resulting in relatively short, dense crop plants that are less prone to lodging (falling over). Otherwise, high fertility encourages the growth of tall plants and hence may increase the danger of lodging, though other factors (weed infestation, weather, straw-length of cereal variety) also contribute.

In small-scale intensive management, animals are generally kept for their meat and perhaps also for milk and wool/hair, though the culling pattern is not geared towards intensive dairying or wool/hair production (*Halstead 1981; 1996a; 1996b; 2000*). This ‘multi-purpose’ exploitation of livestock may extend to include use of unspecialised traction animals, such as cows (e.g. those that do not produce much milk), which can be used to reduce human labour expended on tillage but do not greatly increase the scale of cultivation (*Halstead 1995; Bogaard 2004*).

Anthropologists and archaeologists have for some time recognised the adaptive advantages of intensive cultivation for farming families as well as the social significance of this form of husbandry, for example in the emergence of permanent social inequalities (*Netting 1971; 1990; Halstead 1989b*).

Halstead’s work on Neolithic Greece (*1981; 1996a; 1996b; 2000*) has focussed on archaeozoological and environmental evidence to build a case for intensive herding and cultivation. More recently, analyses of archaeobotanical assemblages from Neolithic sites in the western loess belt and Alpine Foreland (*Bogaard 2004*) and the Great Hungarian Plain (*Bogaard et al. in press a, b*) have made use of new ecological techniques (e.g. *Charles et al. 2002*) for the inference of crop growing conditions from arable weeds associated with crop remains. These studies suggest that intensive garden cultivation combined with intensive herding represent the ‘norm’ across central and south-east Europe during the Neolithic. Such general continuity in farming methods may appear surprising given the considerable differences in climate from the south-east to north-west, i.e. from the Mediterranean pattern of wet, frost-free winters and hot, dry summers, through the frosty winters and hot summers of central Europe to the cooler, wetter summers of the north-west. On the other hand, the ‘buffered’ and artificial character of intensive crop growing conditions would facilitate continuity in this form of husbandry (*Bogaard 2004*).

The following sections briefly review the evidence for intensive mixed farming in three adjacent regions of central and south-east Europe – the western loess belt and the Alpine Foreland; the Great Hungarian Plain; and the southern Balkans and Greece (Fig. 1). These regions will be dealt with in this order – the reverse of a chronological arrangement according to the timing of the agricultural transition – because the author’s own research (*Bogaard 2004*) has mostly concentrated on the first region to be discussed.

Western loess belt and Alpine foreland

Bogaard (2004) carried out a series of ecological comparisons between modern weed floras from known crop husbandry regimes and archaeobotanical samples of arable weeds associated with charred crop material from Neolithic sites (c. 5500–2200 BC)

in the western loess belt (mostly Germany) and the Alpine Foreland. The results indicate that cultivation plots tended to be permanent – that is, used for an extended period of time such as decades or even centuries, thus ruling out shifting cultivation (see also Bogaard 2002). Furthermore, the major cereal crops (mostly einkorn and emmer) were autumn-sown, with the implication that, even where it was topographically feasible, cultivation did not tend to take place within the spring flood zone of rivers and streams. Growing conditions of high soil disturbance and fertility appear to have been maintained with high inputs of labour, including manuring/middening, tillage and weeding.

Cattle were the dominant livestock in these areas. There is as yet little published evidence for the mortality profiles of LBK cattle assemblages, though indications are that cattle were mostly killed as juveniles, and hence that meat production was emphasised (Arbogast 1994.93; Benecke 1994a.95; 1994b.122–3). Domesticated cattle and pigs appear to have been distinctly smaller than their wild counterparts throughout the earlier Neolithic (Benecke 1994a.48–55; Döhle 1997; Lüning 2000.105), implying a lack of regular cross-breeding between wild and domesticated populations and hence that herding was relatively small-scale and intensive. The only available demographic evidence for intensive dairying comes from the later Neolithic in the Alpine Foreland, where the scale of stock husbandry would be restricted by the lack of permanent pasture and the need to provide winter fodder (Higham 1967; Becker 1981; Jacomet and Schibler 1985; Halstead 1989a; Gross et al. 1990; Hüster-Plogmann and Schibler 1997; Hüster-Plogmann et al. 1999). Though livestock may have played a critical economic role as an ‘insurance bank’ against crop failure, particularly in regions of harsh climate, the evidence points to small-scale intensive mixed farming rather than to large-scale, extensive cattle pastoralism alongside shifting, extensive arid or floodplain cultivation.

Archaeobotanical analyses of waterlogged animal dung are available from several Neolithic lakeshore settlements of the Alpine Foreland, such as Egolzwil

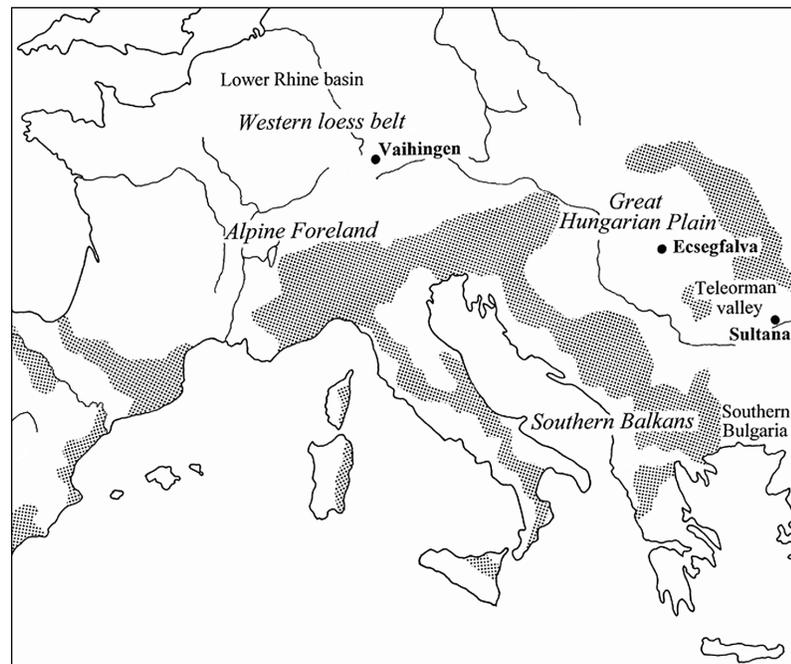


Fig. 1. Map showing the regions and sites mentioned in the text.

3 (Rasmussen 1993), Horgen-Scheller (Akeret and Jacomet 1997), Arbon-Bleiche 3 (Akeret et al. 1999) and Weier (Robinson and Rasmussen 1989). These analyses have revealed a variety of feeding practices, including twig or branch foddering (prior to leaf emergence) and consumption of crop material. Mostly these analyses concern sheep/goat pellets, though cattle foddering, as well as the spreading of manure across an arable plot adjacent to the settlement, have been documented at Weier (Robinson and Rasmussen 1989). A link between dung and winter sheep/goat feeding at Arbon Bleiche 3 has been used to argue that herds were moved away from settlements in the summer as part of a transhumant cycle (Akeret et al. 1999), though an absence of dung containing summer vegetation could simply reflect the fact that animals were not kept in the settlement during this season of abundant grazing.

There is possible evidence for the use of cows as traction animals as early as the LBK (Döhle 1997), a practice that would not alter the scale of cultivation significantly (above). The best evidence for the use of oxen as traction animals dates to the end of the Neolithic sequence in the Alpine Foreland, in the Corded Ware phase (Hüster-Plogmann and Schibler 1997; Schibler and Jacomet 1999). Though there may have been a trend towards somewhat more extensive cultivation in some areas during the later Neolithic (Schibler and Jacomet 1999), the archaeological samples available from later Neolithic sites in the loess belt and Alpine Foreland appear to reflect in-

tensively maintained growing conditions and hence a restricted scale of cultivation (Bogaard 2004).

Neolithic cultivation in the western loess belt and Alpine Foreland, therefore, can be characterised as small-scale, intensive and integrated with intensive livestock husbandry, but within these parameters there is emerging archaeobotanical evidence for variability between regions and sites and also within the archaeobotanical record of a single site. Regional cohesion in crop growing conditions is evident, for example, amongst LBK sites of the Lower Rhine-Meuse Basin and may reflect the existence of localised crop husbandry traditions (Bogaard 2004). The best example of intra-site variability in growing conditions is the LBK site of Vaihingen/Enz in the Neckar valley (Bogaard 2004), where a relatively large set of archaeobotanical samples rich in potential arable weeds suggests a continuum from relatively high to relatively low intensity cultivation. Nucleation and enclosure of longhouses at this settlement (Krause 2000) may have exaggerated the inevitable 'fall off' in cultivation intensity with increasing distance from home (cf. Jones *et al.* 1999).

Great Hungarian plain

There is increasing evidence that, contrary to earlier statements based on small samples (e.g. Kosse 1979), the faunal assemblages of early Neolithic sites of the Körös culture (c. 6000–5500 BC) in south-east Hungary are dominated by domesticated livestock, especially sheep/goat, with a relatively minor component of wild fauna (Bartosiewicz *in press*). Furthermore, demographic data on sheep/goat culling patterns from the Körös site of Endrőd 119 (Bökönyi 1992) and from the recently excavated Körös site of Ecsegfalva 23 (Bartosiewicz *pers comm.*; *in press*; Pike-Tay *in press*) point towards generalised/meat-oriented management rather than intensive dairying or wool production. The detection of dairy fat residues on potsherds from Ecsegfalva (Craig *et al.* *in press*) is consistent with a generalised herding strategy in which livestock were exploited for a range of products.

Archaeobotanical data from sites of this early Neolithic phase in the Hungarian Plain are scarce, but ecological analysis of the potential arable weed assemblage from Ecsegfalva 23 by Bogaard *et al.* (*in press a; b*) points towards intensive cultivation. Moreover, the topography of the area suggests that high dry ground in the vicinity was far more than sufficient to accommodate small-scale cultivation

(Bogaard *et al.* *in press a; b*). Microwear analysis of sheep/goat mandibles from Ecsegfalva 23 by Mainland (*in press*) points towards high soil ingestion and over-grazing in penned areas, while MacPhail (*in press*) has detected soil micromorphological evidence for 'stalling refuse' at the site, again consistent with small-scale and intensive herd management integrated with arable farming.

Clearly, more interdisciplinary investigations such as those focussed on Ecsegfalva 23 are required in order to broaden this picture of early Neolithic crop and animal husbandry, but initial indications are that intensive mixed farming can be traced from the LBK back to the earlier Neolithic of the Hungarian plain.

Southern Balkans and Greece

Halstead (1981; 1996a; 1996b; 2000) has drawn together evidence for intensive mixed farming in Neolithic Greece (seventh-fourth millennium BC). Arguments include a lack of evidence for wide-scale woodland clearance in the pollen record or for ox-traction in faunal assemblages, the predominance of sheep (a species associated with open vegetation), mortality evidence that sheep were exploited for meat and a decrease in the size of domestic pig and cattle through the Neolithic (consistent with a lack of interbreeding with wild relatives). Moreover, Halstead (1981; 1996a; 1996b; 2000) estimates that Greek tell villages would require implausibly large herds to be supported primarily by livestock and concludes that cereals and pulses provided the bulk of the diet, though livestock offered a vital alternative source of food in times of crop failure.

Until recently there has been little archaeobotanical evidence for Neolithic arable weed floras in the southern Balkans or Greece, though Halstead (1981; 1996a; 1996b; 2000) has emphasised the diversity and prevalence of labour-intensive pulse crops. The work of Marinova (2001), therefore, on weeds associated with charred crop remains (including crop stores) at several Neolithic tell sites in southern Bulgaria is particularly critical. Floristically, these weed assemblages overlap considerably with those of central Europe and hence appear to be consistent with intensive cultivation (though this remains to be demonstrated by statistical and ecological analysis of the particular combinations of weed species occurring on a sample by sample basis). Recent studies of Late Neolithic-Early Bronze Age archaeobotanical assemblages in northern Greece (Valamoti and Jones 2003; Valamoti 2004) shed important new light on

the use of livestock dung as fuel – implying that herds were kept near the settlement – as well as on animal feeding practices, including grazing of weeds in stubble/fallow fields and possible feeding of crop material to livestock.

Ongoing archaeobotanical work by the author further north, in the Teleorman valley of south-central Romania (Bogaard 2001, *unpublished*), has so far produced small assemblages of potential arable weeds from ‘flat’ sites of the Cris, Dudești and Boian cultures (sixth-early fifth millennium BC). The limited evidence recovered so far would again appear to reflect intensive, small-scale cultivation given the occurrence of annual weed species common on Neolithic sites in central Europe, such as Fat Hen (*Chenopodium album*), Black Night-shade (*Solanum nigrum*) and Black Bindweed (*Fallopia convolvulus*). A recently found cache of *Chenopodium album* seeds at Sultana-Malu Roșu (Bogaard and Stavrescu-Bedivan *unpublished*), a Gumelnița culture (later 5th millennium BC) tell site in southern Romania, echoes occasional similar finds at LBK and later sites in central Europe (Helbaek 1960; Knörzer 1967; Kroll 1990; Bakels 1991; Brombacher and Jacomet 1997; Lüning 2000:92). Given the suitability of Fat Hen as a separately collected wild plant food (Stokes and Rowley-Conwy 2002), such finds urge caution in the uncritical use of this species as an indicator of intensive cultivation (see also Bogaard 2004). At the same time, it is possible that intensive cultivation in arable plots played a dual role for both successful cereal/pulse husbandry and the encouragement of alternative food sources such as Fat Hen.

DISCUSSION

Given the obvious relevance of routine practice for apprehending culture as lived experience (e.g. Whittle 2003:22–49), the nature of early farming practices in Neolithic Europe is of fundamental importance if we wish to understand the societies that emerged from the agricultural transition. The practice of small-scale, intensive farming in south-east and central Europe reflects a similar series of constraints and possibilities for the development of Neolithic communities in these areas. In addition to constraints on mobility for at least part of the community, for example, intensive mixed farming would encourage the development of household claims to fixed plots of land (Bogaard 2004).

Against this backdrop of similar constraints and potentialities, however, Neolithic communities in south-

east and central Europe clearly took on a range of forms in terms of settlements and houses, distribution, longevity etc. Kotsakis (1999) has recently considered the different implications of Neolithic ‘tell’ settlements versus ‘flat’ sites in northern Greece, concluding that the more dispersed form of flat sites would allow more labour-intensive cultivation of plots interspersed between houses than would be feasible beyond the edges of nucleated tells. While new studies such as that of Valamoti (2004) will clarify this contrast in Greece, there is evidence that differential nucleation of longhouses among LBK settlements in central Europe was associated with different degrees of variability in cultivation intensity (above, Bogaard 2004). The implication is that different degrees of nucleation could amplify the potential for emerging differences in productivity between households, unless mechanisms were in place to ensure an even distribution of cultivation plots at varying distances from home (cf. Forbes 1982:353; 2000). Thus, the marked ‘separation between household and productive space’ (Kotsakis 1999:73) evident in nucleated settlements such as tells would have the effect of creating an extended continuum of cultivation intensity and hence more scope for differences in productivity between households than in more dispersed settlements. Moreover, a greater continuum of cultivation intensity surrounding nucleated settlements could accelerate inter-household competition, promoting tell formation in areas with a tradition of mud-brick architecture and superimposed rebuilding (Halstead 1999).

In this perspective, it is misleading to invoke radical differences in crop husbandry between tells and flat sites, such as a shift from manual horticulture to arid-based agriculture (cf. Chapman 1990). As Kotsakis (1999) suggests, the fundamental difference lies not in tillage method but in social attitudes to household versus productive space and continuity in the use of household space through time. It has been argued elsewhere (Bogaard 2004; Bogaard *et al. in press b*) that long-lived, intensively cultivated plots would themselves be the object of descent-based claims. Perhaps the contrast between tells and flat sites reflects a difference in emphasis between claims on household space, on the one hand, and productive space, on the other: in tells, the identity of the household is linked to household space and to its place in the community structure, whereas in flat sites with no superimposed rebuilding and greater household dispersal, proximal house replacement over time reflects a predominant concern with claims over ‘sectors’ of the residential area together with

surrounding arable plots (cf. Bogaard 2004; Bogaard et al. in press b).

An issue raised at the start of this paper concerned the problem of identifying the 'origins' of intensive mixed farming, given its technological simplicity. Notwithstanding the possibility that intensive cultivation could have developed independently in different areas, the apparent continuity of intensive mixed farming across south-east and central Europe raises the possibility that the range of crops and livestock adopted in south-east Europe were already embedded and integrated in earlier patterns of intensive mixed farming in the Near East. This question lies beyond the remit of the present paper (Bo-

gaard in prep) but may help to explain the 'packaged' nature of Neolithic life from its beginnings in the Fertile Crescent.

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