The Antiquity of Dairying in Temperate Europe

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The Problem

The antiquity of dairying is a problem which has received scant archaeological attention, yet one which is crucial to the understanding of prehistoric animal husbandry in the Old World. The keeping of animals for their milk leads to an entirely different set of economic relationships and social structures conditioned by the carnivorous exploitation of domestic stock. Historically it has been difficult to establish that the milk from domestic animals was exploited earlier than the 4th millennium B.C. in the Near East and the 3rd millennium B.C. in Europe. Most of the available evidence for the earliest dairying in the Near East and Europe has been iconographic and from the interpretation of certain container forms as having been associated with milk handling (Sherratt 1981:275-82). Recently, however, data from earlier European Neolithic sites indicate an even greater antiquity for dairy production.

The modern populations of temperate Europe are unusual among the world's peoples in that the majority of the adults can ingest raw milk without adverse side-effects. Most of the world's adult population does not produce a sufficient amount of the enzyme lactase which is required to metabolize lactose or milk sugar. As a result, they suffer from cramps, diarrhea, and vomiting when they drink milk. The development of a tolerance for lactose through the continuation of lactase production into adulthood is thought to have been a relatively late evolutionary process occurring sometime in the last few millennia among the peoples of northwest Europe who subsequently spread throughout the world (in the past 500 years), and Asian and
The Linear Pottery Culture

The LBK culture (Linearsehmetalik; Linear Pottery) is the earliest known Neolithic farming culture of temperate Europe, and is named after its characteristic pottery (Fig. 1). LBK sites are widely distributed from the western Ukraine to northeast France (Fig. 2), showing a marked association with areas having low soil loss. Loess, a fine-grained yellowish material, carries a fertile and well-drained topsoil that, presumably, was the main attraction for these Neolithic farmers. Despite the wide geographical range of LBK sites, their material culture and chronology are markedly coherent. The earliest radiocarbon dates for LBK are in Hungary, around 4600 b.c. (uncalibrated; ca. 5400 B.C. recalibrated), while those from Germany and Poland are only about 100 years later (Quitt 1967).

LBK material culture and settlement locations both differ from those of the indigenous Mesolithic hunter-gatherers of the area (Tringham 1969; Hahn 1961). Many features of LBK culture can be paralleled in the Neolithic period of the Balkans, which begins about 3000 years earlier. For example, some of the pottery forms, the characteristic D niere formation 'shoe-last' axe or adze, and the use of spongy shell (imported from the Mediterranean) all strongly indicate cultural connections. Moreover, the LBK farmers cultivated wheat and barley and their domesticated sheep and goat must have derived from the south-east, since these species are not known to have been native to temperate Europe. A fair case can be made that LBK farmers were colonizers, moving north-westward out of the Balkans into the cooler and more heavily forested regions of central Europe (though, needless to say, there are arguments over this).

One notable feature of LBK, however, is not found in the Balkan Neolithic—the very large timber 'long-houses,' often 30 meters (about 100 feet) or so long. These are known only from their ground plans, of course; the pattern of wall-slots and post-holes dug into the subsoil to carry the timber uprights of the structure (Fig. 5). The houses occur in groups, almost all on loess soils, and are known from numerous excavations. These groups are usually called 'villages,' although the occasional overlap of house-plans shows clearly that not all houses were contemporary. The often wide spaces between houses, and the millisecond of plowing that has destroyed most stratigraphy on the sites, make it difficult or impossible to establish clearly the chronological relationships of houses in a 'village.'

It may well be that, in many cases, neighboring houses were successive, not contemporary, and that the typical settlement was a 'hamlet,' or even a more or less isolated individual farmstead.

LBK sites without the famous 'long-houses' are also known, however. Some of these are on the loess lands, and are often the very earliest LBK sites in a given region, predating the establishment of long-house settlements. Others are found right off the loess, in areas where 'long-house' settlements never occurred at all—for example on the north European plain, where the terrain was considerably less well-drained than the loess lands, and where the soils and vegetation were substantially different. It is at such sites, far less eye-catching than the 'long-house' settlements, that most of the pottery sieves or strainers have been found; these sites, moreover, appear to have been occupied only seasonally, during the summer months. As this article proposes, therefore, there is a good case for interpreting them as summer camps, around which cattle were grazed and at which milk was processed. In the fall, presumably, the herders would drive their cattle back to the permanent settlements with their long-houses, carrying cheeses and perhaps other products of the summer's activities.

The use of their milk (e.g. Milasuva 1978; Serratt 1981:276-77). Linear Pottery culture faunal assemblages are almost always composed primarily of the bones of domestic cattle, with sheep/goat and pig represented in decidedly smaller proportions. Only on some East German sites do the frequencies of sheep/goat bones exceed those of cattle (Mulder 1964). Bones of wild mammals are generally rare, suggesting a relatively low degree of hunting. Traces of other wild species, such as fish, birds, and molluscs, are also rare, although their absence may be due more to the recovery methods used in the excavations than to the economic patterns of the inhabitants.

Linear Pottery faunal samples are generally small, and it is not possible to assess whether the cattle were used primarily for either meat or dairy production solely on the basis of their age distribution. In order to make a reliable judgement, the samples would have to be large enough to permit an evaluation not only of their aggregate age profiles but also of the relative proportions of males, castrates, females, and juveniles (see Stein, this issue). My subjective assessment of the metrical data from a number of Linear Pottery sites suggests that, in most instances, the assemblages are dominated by mature females. Lege has argued that a female bias in the adult cull and a high nazo cull, presumably of male calves, can be taken as an indication of a dairy economy (1981a).

In some areas, there does appear to have been a relatively high degree of calf-killing at Linear Pottery settlements. Mulder, in his study of Linear Pottery faunal remains from the East German sites, found an age distribution among the cattle bones of 60.3 percent adult, 11.5 percent subadult, and 28 percent juvenile individuals. Although it is unclear what Mulder's upper limit for his...
juvenile category it, appears that many individuals in this group were under six months of age, with most probably under one year old. Mater takes this to represent 'autumn slaughter' due to shortages in winter fodder (1964:64). Leiper has pointed out that the killing of calves to free milk for human consumption is functionally similar to such 'autumn slaughter' in that it involves a reduction in the fodder requirements of the herd while increasing the food output for humans (191b:180). In his words, "cattle could hardly be kept for the annual production of meat of one little carcass," and instead, the killing of infantile and juvenile animals is the result of their keepers' desire to have undivided access to the mothers' milk production. The killing of calves may not necessarily be the worst approach in a dairy economy. Amoroso and Jewell (1963) have pointed out that it is generally difficult to persuade lactating cattle to let down their milk without their young around (save for modern breeds of "improved" livestock). In the African cultures which they studied, the practice was to keep the calf with the mother, allow it to suckle, and then remove it from the udder before exhausting the mother's milk supply. Among cattle-herding cultures such as the Karamojong of Uganda, the calves are generally weaned, since their economic usefulness as adults outweighs the amount of milk they might consume as infants (Dyson-Hudson and Dyson-Hudson 1970:122). Legge is of the opinion that although cattle in Africa seldom surrender their nursing calves to the cow, the cattle commonly do so, and that African husbandry practices cannot be generalized to include them. Stacy has speculated that the prehistoric European (181b:21).

Economics and Ecology

If the age and sex data from Linear Pottery faunal assemblages are still ambiguous about the extent of domestication during this period, they do provide some hints of culling patterns consistent with dairy production. These data sound economic arguments as to why the livestock kept by Linear Pottery communities should not have been used primarily or solely for meat production. It must be remembered that Linear Pottery communities were dealing with an environment which was largely unfamiliar to them. Each new tract of loess or loamland near relations and disadvantages which took time to sort out (Bogucki 1979). In a situation in which decisions were tempered by risk and uncertainty, a concentration on cattle primarily as a meat source would seem to be a poor economic strategy. Since cattle require 42 to 45 months to reach their optimal meat weight, a great deal of labor and energy must be invested in each head in return for its meat yield. Not only would the stock have to be assured adequate supplies of forage and water, but they also would have to be maintained through the winter on cut fodder. If no dairy products were to be obtained from the herd, all this investment of labor, time, and energy would far outweigh the 300-400 kilograms of usable meat that could be obtained from each head. Moreover, if meat was the only return expected from the cattle economy, it would have been impossible for a self-sufficient Neolithic community to increase the output from its herd quicly in response to temporary dairy production problems in other subsistence sources without either maintaining an enormous reserve of surplus animals or seriously affecting the viability of the herd as a reproductive population.

Given the uniparous nature of cattle, and the potential for the loss of animals to predators and disease, Neolithic communities would have needed to be very selective in their slaughter of cattle in order to assure that sufficient breeding stock remained. If they had only regarded cattle as "a meat bank" that would offset crop failures and shortfalls, it would have been necessary to predict crop yields three or four years in advance in order to receive the maximum return on their investment. There is an ecological rationale for Neolithic dairying as well. The process by which plants are converted to milk and meat involves a net loss of energy at each step. When humans milk their lactating stock, they place themselves at an earlier point in the conversion chain than when they slaughter the animals for their meat. As a result, a much higher proportion of the original energy input can be taken back in the form of milk, thus permitting maintenance of a larger human population than can be returned in the form of meat. Ingold argues that "milch pastoralism" is the most efficient use of uncultivable land, while "carnivorous pastoralism," in which meat is the only desired product, is no more efficient than intensive cultivation and generally less in the long run (1960:176).

Had meat been the only return desired from their domestic stock, it would have made much more sense for Linear Pottery communities to concentrate on pig husbandry. Pigs are multiparous and reach a high meat weight and sexual maturity within a year of birth (Grigson 1962:288). The forested environments in which most Linear Pottery sites are found, both the floodplain forests of the loess belt or the woods of the North European Plain, would have been excellent sources of pannage. Yet pigs are consistently the rarest domesticated taxon in Linear Pottery faunal assemblages. At Linear Pottery sites in the Polish lowlands, pigs are virtually absent, and it is not until several centuries later that they appear prominently in faunal assemblages (Bogucki 1982, 1984a).

The relative proportions of cattle and pigs on Linear Pottery sites, along with the generally low degree of exploitation of wild herbivores such as red deer and roe deer, make it appear reasonable to conclude that meat was not the sole reason why these communities kept domestic cattle (and sheep and goats as well). Rather, it would seem that cattle served a variety of purposes in the economy and were slaughtered only when they were no longer economically useful. For most males, this would be either as calves or when they had reached their maximum meat weight, and were then cut for production of milk or calves. In any case, Linear Pottery communities clearly had access to milk and to ignore such a resource would negate the economic and ecological rationale for keeping domestic cattle in the central European late Neolithic economy in central Europe. The hypothesis that the Linear Pottery ceramic sieves played a role in the production of dairy products finds considerable support in both the European archaeological and ethnographic records. The best-known examples of ceramic sieves from later European prehistory are found at the Bronze Age sites of central Italy. On the basis of their similarity to the metal vessels used by modern Italian shepherds for the separation of curds from whey in the production of sheep cheese, these vessels have been interpreted as cheese strainers (Barker 1991). Modern counterparts to the prehistoric sieves are found not only in central Italy, but in many other parts of Europe as well, particularly among the pastoral societies of the Balkans (Novak 1896; Dumit 1969). In all cases, these sieves are associated with dairy production, serving to strain curds from whey in the manufacture of cheese. In central Europe, ceramic sieves were also used for cheese manufacture into the first part of this century and formed an important product of the small-scale ceramic industries in many localities. Decorated vessels for cottage cheese production are not confined to European peasant cultures. North American examples from Vermont, an area that still has a significant dairy component in its economy, are evidence enough that the presence of clay sieves, presumably for cheese production, on Linear Pottery sites indicates that people of this culture had at their disposal a means for concentrating whey from liquors in milk before they may have had. In milk products such as cheese and yogurt, meat is consumed as a byproduct of the whey in their production, and what little remains in cheese becomes secondary to lactic acid. Aged mature cheese contains no lactose. Without dairying, the herding of cattle in the Neolithic forests of temperate Europe would have been of questionable value, and the Neolithic inhabitants may have had any argument that the Neolithic inhabitants of temperate Europe did not milk their cattle due to a possible intolerance of lactose.
The Social Context of Neolithic Dairying

The evidence of the clay sieves and the faunal remains associated with them indicates that there is a very high probability that milking and the use of dairy products would have been a standardized activity in the Early Neolithic. Dairy products (such as cheeses and probably yogurt) were known by the earliest Neolithic inhabitants of temperate Europe. Dairy products, which could be transported and stored, may have played a significant role in the Early Neolithic subsistence system. As noted above, the establishment of a successful agricultural economy in the uncharted forests of temperate Europe was an uncertain undertaking for the small Neolithic communities. Grain crops would have been subject to the predations of wild herbivores and plant diseases, as well as having to adapt to a shorter growing season than in southeastern Europe. In addition, there is some evidence to indicate that fields were generally quite small and that the crops were often contaminated with a variety of weeds (Dowson 1971). Based on these factors and other constraints, Gregg has argued that it would have been impractical for grain crops to have met more than 50 percent of a Neolithic community's nutritional requirements and that there could be some degree of reliability in subsistence. The more diversified their economic strategy, the more secure the Neolithic communities were.

The establishment of dairying as an economic pursuit during the Early Neolithic in temperate Europe fits in nicely with the model of the organization of these communities which has emerged in recent years. Linear Pottery and other Early Neolithic settlements have tradition-ally been viewed as "villages," with the level of integration of activities that this term implies. However, the argument has been made that the settlements really represent large concentrations of individual households or farmsteads, each an independent productive unit (Linning 1982; Grgic 1986). The fine-grained chronological analysis of these settlements shows that not all houses were contemporaneous and that the actual density of population was not as great as the site plans suggest. The model of inde- pendent households as the funda- mental social and productive unit of Neolithic society is supported by ethnographic data which indicate similar patterns in virtually all small-scale agrarian societies world-wide (e.g., Netting, Wilk, and Arnold 1984).

Two crucial resources are of funda- mental concern to any agrarian household: land and labor. In Neo- lithic Europe, potential agricultural land was effectively unlimited, parti- cularly in the lowlands colonized by the Linear Pottery culture. In- stead, a more critical problem for a Neolithic household was the amount of labor which it could mobilize, exchange internally, or through external cooperative arrangements with other households. Agricultural commu- nities, then, are inclined to have high reproductive rates in order to maintain such labor pools. Much of the labor would be required for only a limited range of activities, such as field clearance, planting, and harvesting, and could be underused during much of the growing season. Livestock manage- ment would provide an additional productive activity which would have been more productive than the cultivation year when major physical activity would not have been required in the fields.

There is also evidence, sometimes abundant, for the cultivation of wild plants in these rural areas. Although the amount of time required for this activity would have been relatively small, the production of these plants would have contributed to the household's economy.

The presence of ceramic vessels on a number of Linear Pot- tery sites suggests that the milking of domestic cattle was practiced by the Early Neolithic peoples of temperate Europe around 4500 B.C. (5400 B.C.), when these data are combined with the zoo-archaeological evidence from Linear Pottery sites, it appears that a system of dairy husbandry developed in Neolithic temperate Europe to supplement the cereal cultivation which formed the mainstay of the subsistence system. Such a diversified economy would have been crucial to the successful establishment of agrarian communities in the forests of temperate Europe. In some areas, such as the lowlands of the North European Plain, dairy husbandry appears to have been particularly important in the post-Clovis in- stance subsistence practice during this period.

The recognition of such an an- tiquity for dairy production in temperate Europe does not nega- tively conflict the notion that towards the end of the Neolithic there was a shift towards the maximum utilization of temperate Europe, Sherratt has termed the "Secondary Products Revolution" (1981, 1983). At this time, food shortages in temperate Europe, subsistence systems appear to have emerged which had a greater emphasis on the cultiva- tion of domestic animals, particularly cattle. Despite these changes, however, the proportions of domestic animals in the Neolithic diet remained relatively stable, although this shift towards the exploitation of domestic animals may have been a gradual process, as appears to have been the case in this area during the Late Neolithic and Early Bronze Age (1981,59).

The results of these systems, however, low several millennia earlier, during the colonization of temperate Europe by the Linear Pottery culture.
Dairying in Irish Prehistory

The Evidence from a Ceremonial Center

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A basic archaeological question is whether dairying was an important component of prehistoric Irish subsistence as well as evidence. For dairy cattle in the Iron Age comes from the faunal remains (animals bones) from the Early Irish ceremonial site of Dún Alline, Co. Kildare. The site, which was excavated by Bernard Wailes of the University of Pennsylvania between 1988 and 1975, is located about 30 miles southwest of Dublin. (See Wailes 1978 for an interim report on the Dún Alline excavations.)

Dún Alline is traditionally associated with the kings of Leinster and is one of a small number of Irish royal sites of the pre-Christian period (Wailes 1982). Radiocarbon age determinations indicate that the site was occupied between about 300 B.C. and A.D. 400. At Dún Alline the main architectural features are a series of concentric circular ditches which would have held upright wooden posts forming a palisade. The site is surrounded by a bank and ditch which encircles an area of 13 hectares (Fig. 1). At Dún Alline and the other royal sites the bank is located outside the ditch. This is not an effective design for a fortification. Iron Age forts in the British Isles and on the continent have banks surrounded by ditches.

In Dún Alline, Co. Kildare, Ireland, aerial view from the north. The considerable site (ca. 13 hectares) and roughly oval form of this Iron Age ceremonial site clearly contrast with the generally rectilinear form of the modern fields surrounding it.

Historical sources indicate that cattle have played a primary role in the Irish economy since the days of St. Patrick. In early Irish society “land was measured in terms of the cows it could maintain, legal compensation was reckoned in terms of cattle, a man’s standing in society was determined by his wealth in cattle, and cattle raiding was a recognized form of warfare and adventure for young nobles.” (O’Corrán 1973:53). The Irish cattle seem to have been used primarily for dairying: meat was seen almost as a by-product. A wide variety of milk products was consumed, including fresh milk thickened milk, soured and skimmed milk, pressed and unpressed cheeses, and salted and sweet butter (O’Sid 1948, 1949). Dairy products were known as white foods (beannadh) or summer foods denoting their season of availability.

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