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Chapter 19
The Earliest Farming in Britain: towards a new synthesis

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In this contribution we review previous understandings of the earliest farming in Britain, and then bring together various recent lines of evidence. We will argue that new findings go some considerable way towards resolving the debates of previous decades, and allow us to come to a firmer view of the earliest farming than has hitherto been possible.

Twentieth century data and theory

British archaeologists were among the first in Europe outside Scandinavia to consider the nature of the earliest farming. However, limited data meant that this early attempt was flawed, and at the end of the 20th century, prehistorians argued for substantial modifications.

Assembling the package, 1940-1970

In the mid-20th century, the leading authorities were in no doubt that farming was introduced into Britain by immigrants from the near continent (Childe 1940, 40; Fox 1943, 84; Piggott 1954, 90). Farming methods were however thought to have been extensive. Domestic animals were viewed as more important than cereals, because cereal productivity was low (*ibid.*). In Denmark, Johannes Iversen (1941) had argued that the palynological evidence indicated that cereals were grown in temporary plots: fields were cultivated for just a couple of years before they lost their fertility, so the farmers then moved on and cleared a new patch of forest. Grahame Clark integrated this with the British evidence then available. Neolithic farmers, he argued, had no means of increasing soil fertility, but practiced shifting cultivation. The ard was introduced only in the Late Bronze Age, the heavy wheeled plough at the end of the Iron Age (Clark 1940, 19-20; 1945, 67; 1952, 97*ff.*). He proposed that cattle stalls inside houses were known only in the Iron Age, coinciding with the appearance of the plough; in the shifting cultivation phase cattle were not stalled (Clark 1952, 125).

Since cattle were not stalled, this implied that they were mainly herded away from the settlements. As a result, their manure would not be available for putting on the fields. Curwen (1946) considered agriculture in detail: before the plough, temporary fields were cultivated with hoe and digging stick. The appearance of the ard around 1000 BC coincided with "the discovery of the value of manure" (Curwen 1946, 64), which together allowed the establishment of permanent fields. Piggott (1954, 92) argued that the causewayed enclosures were cattle kraals (stockades or corrals), where the animals were rounded up after grazing the common pasturages during the summer.

With hindsight, we can see that this model was based on very partial data; however, its demise came not from the discovery of new data, but the development of new theoretical perspectives.

Unravelling the package, 1969-2010

The new theoretical perspective was that the earliest farmers were not immigrants: farming was developed by the local hunter-gatherers, partly using indigenous wild resources, partly those acquired from farming neighbours. This was developed in the early days of the 'new archaeology', but was carried over into the post-processualist theoretical landscape.

Two very influential papers appeared in the journal *Antiquity* in 1969. Higgs and Jarman's *The origins of agriculture* argued that the distinction between wild and domestic had been drawn too rigidly: close human-animal relationships might go back far before the Neolithic, so Mesolithic domestication was a distinct possibility (Higgs and Jarman 1969). Humphrey Case's *Neolithic explanations* in contrast argued for agricultural colonisation, concluding that farming as known from the causewayed enclosures was a mature system; this implied that a pre-monument phase awaited discovery (Case 1969, 180-181). Both papers implied that agriculture might have started earlier than hitherto suspected - and the search was on for ever-earlier signs of farming.

Little hard information was however forthcoming. Bradley (1978, 32) noted that evidence for cereals had hardy advanced in the previous 20 years. Pollen evidence was however suggestive: small clearances were visible before the elm decline, which was seen as coinciding with the accepted start of the Neolithic (*op. cit.,* 8-11). Edwards and Hirons (1984) identified some pollen grains as cultivated cereals, citing three pre-elm decline instances in Britain, and five in Ireland. Some very early radiocarbon dates had been obtained from Ballynagilly and other Irish Neolithic sites. British Neolithic monuments had also produced early dates (reviewed in Schulting 2000), though not as early as the Irish ones. Ballynagilly was widely cited as showing that very early farming should be expected in Britain (*e.g.* Evans 1975, Dennell 1983, Rowley-Conwy 1995). In the faunal record there was nothing corresponding to the early cereal pollen evidence. Indigenous domestication of native wild cattle and/or pigs was however widely suggested, both for various areas of Europe (*e.g.* Zvelebil 1995) and specifically for Britain (*e.g.* Evans 1975, Bradley 1978, Dennell 1983).

Implicit in the indigenous origin of agriculture was the idea that it occurred gradually – in contrast to an abrupt immigration event. The post-processual agenda extended gradualism much later: most of the Neolithic was only partially agricultural and continued to subsist to a considerable degree on wild resources, and had a nomadic settlement pattern. In these discussions, the nutritional importance of cereals in the economy was downplayed, although their symbolic value was often stressed, so that they were regarded as 'special' foods primarily for use during feasting (*e.g.* Thomas 1991, 1999; Edmonds 1999; Whittle 1999; Richmond 1999), so that "these people were, from an economic point of view, still formally Mesolithic" (Thomas 2003, 388). The same arguments were made for domestic animals. They predominated at the causewayed enclosures, but these sites were not residential, nor did they date from the earliest part of the Neolithic. The first major pre-enclosure faunal sample came from the Coneybury 'Anomaly.' Although the assemblage was dominated by domestic cattle, it had an unusually high frequency of roe deer (Maltby 1990), which suggested continuity from the Mesolithic (Whittle 1999, 58; Richmond 1999, 20). Temporary clearances and shifting cultivation were often suggested (Whittle 1999, 64; Richmond 1999, 23).

This vision of shifting, low-intensity agriculture is quite reminiscent of the arguments put forward by Clark and Curwen 75 years ago. However, even in the last century more evidence was emerging that cast doubt on it, and this has redoubled in the last couple of decades. In the rest of this paper we bring this together into a new vision of the earliest agriculture in Britain.

New data, new methods: intensifying the earliest agriculture

The last twenty years have seen the appearance of more new information than the previous sixty. In this section we review this, and argue that it reveals an intensive agricultural system from the very start of farming. This contrasts with the understanding prevalent until recently – for example Richmond states that "actual agricultural intensification perhaps did not take place for over a millennium following the initial introduction of domesticates" (Richmond 1999, 3; cf Thomas 2003, 2013).

Sharpening the chronology

The advent of the radiocarbon accelerator in the later 20th century led to a huge increase in the number of dates. Awareness of the importance of dating well-contexted short-lived items (bones, cereal grains, nutshell etc) rather than amalgamated samples of wood charcoal has grown in parallel. As a result, the claimed early dates have been questioned. Kinnes (1988) cautioned that pre-elm decline claims for cereal cultivation were problematic. Schulting (2000) critically reviewed the available dates and concluded that there was no reliable trace of agriculture before ~4000 cal BC. The very early Neolithic dates from Ireland, so important in implying that parallel evidence would be forthcoming in Britain, now also appear most dubious (Bergh 1995, Cooney *et al.* 2011, Whitehouse *et al.* 2014).

This development culminated in the two *Gathering Time* volumes (Whittle *et al.* 2011). This huge project obtained and synthesised numerous radiocarbon dates, and concluded that agriculture appeared ~4000 cal BC in southern England, the major constructional phase of long barrows and causewayed enclosures appearing ~3750 cal BC. For Wales there is some evidence before ~3750 cal BC, but compared to southern England it is modest (Treasure *et al*. 2019). The Neolithic was also early in southern and eastern Scotland, as Sheridan (2003, 2010) had already shown, but in their summary map Whittle *et al.* (2011, fig. 14.177) famously placed quasi-medieval dragons over northern England and North Wales, and also NW Scotland, to highlight the lack of knowledge of these areas.

In southern England and possibly Wales there is therefore a pre-causewayed enclosure farming phase, c. 4000-3750 cal BC. Here we refer to this as the 'earliest Early Neolithic' (eEN), reserving 'full Early Neolithic' (fEN) for the period c. 3750-3300 cal BC. The picture in Scotland is more nebulous, with no separately definable eEN, so the 'Scottish Early Neolithic' (ScEN) spans the whole period from 4000/3800-3300 cal BC; and the generally poorer conditions of preservation of animal bone also cause problems. Nevertheless, a consistent pattern emerges for the whole of Britain. Sites discussed in the following are mapped in fig. 19.1.

Intensifying animal husbandry

Recent work in southern Britain has produced a number of faunal assemblages from the eEN (fig. 19.2). Although numerically small, all of these are dominated by domestic cattle. There is no sign of 'transitional' assemblages, with mixtures of wild and domestic animals, except Coneybury which has fairly numerous wild animals, mainly roe deer. The remains may derive from a single feast, probably involving groups of farmers and hunter-gatherers (Gron *et al.* 2018). If so, this could be a 'special' depositional context, but the other eEN assemblages in fig. 19.2 are apparently from domestic contexts, so at these sites no 'special' role is implied for the cattle. It is remarkable how similar the eEN assemblages are to those of the fEN causewayed enclosures. The minimal role of wild animals is surprising, since the forests presumably contained many.

The Scottish pattern is more complex. The ScEN starts within a century or two of the southern eEN, but no faunal remains survive from the earliest phase. Fig. 19.2 therefore plots the three earliest assemblages available. They date from the second half of the 4th millennium cal BC: the dates for Knap of Howar I span the ScEN and the Later Neolithic, Tofts Ness and Northton 1 date to the start of the Later Neolithic. As early as the preserved faunal remains allow us to see, the assemblages are dominated by domestic animals. The sites are all on islands, not the mainland (fig. 19.1), but even here there is minimal trace of wild terrestrial or marine mammals. Cattle decrease somewhat – but they are replaced by sheep, not deer or seals (fig. 19.2).

The focus is thus strongly on domestic animals. The nature of cattle husbandry has been a topic of debate. Legge (1981a) showed that females were predominant among the adult cattle at the fEN causewayed enclosures. The same was true at Bronze Age Grimes Graves, where there were numerous mandibles of cattle aged about one month; mandibles cannot be biometrically sexed, but the very juvenile ones had to be mainly the 'missing' males, killed before they became adult. This pattern was argued to show that the animals were milked: most males were killed very young so their milk would be available to the herders (Legge 1981b). In contrast, the fEN causewayed enclosures lacked the large numbers of very young mandibles. Legge (1981a, 2008) argued that the young adult females at these sites were animals culled as superfluous to the needs of the adult milking herd.

Objections were soon raised. Legge's 1981 papers appeared in the same year as Andrew Sherratt's (1981) exposition of the 'secondary products revolution', in which dairying was relegated (along with other non-meat products such as traction, wool etc) to the end of the 4th millennium BC. Some argued that Neolithic cattle would not release their milk in the absence of the live calf, so the numerous dead calves actually indicated that their mothers were *not* milked (Clutton-Brock 1981, 220; also Entwistle and Grant 1989). Modern cows do yield their milk in the absence of the calf, but Neolithic cows would not because they were "primitive and recently domesticated animals" (Noddle 1983, 99). Legge's response was to cite numerous ethnographic cases of cows being induced to yield milk in the absence of the calf; and by 4000 cal BC cattle had already been domestic for several millennia, so he argued that "the term 'primitive' is more of a value judgement than an observed or known fact" (Legge 1989, 227).

This debate has somewhat languished, although more ethnographic instances have added ever more support to the dairy hypothesis (e.g. Halstead and Isaakidou 2017). Fig. 19.3 shows that modern adult cattle are sexually dimorphic (Higham 1969). In comparison, the adult cattle at three fEN causewayed enclosures are clearly overwhelmingly dominated by females. The eEN Coneybury assemblage also comprises females, a conclusion based on both aDNA and metrical evidence (Gron *et al.* 2018); distal metacarpal is plotted in fig. 19.3. The very limited evidence available from Scotland appears similar: the sheep and particularly the cattle from Knap of Howar I contain a large proportion of newborn animals (Noddle 1983). It is not clear what criteria Noddle used to age these animals; her results are also plotted in fig. 19.3. The scarcity of assemblages large enough to demonstrate similar patterns means that the zooarchaeological evidence cannot at present go much further.

However, major and widespread support for Neolithic dairying has more recently emerged from the study of lipids (fats) preserved in ceramics (Dudd and Evershed 1998). Over twenty years of organic residue analysis on Neolithic pottery assemblages has contributed considerably to our understanding of the timing and pace of the exploitation of secondary products from domesticated animals since their introduction to Britain. To date, the analysis of over 800 potsherds from Early Neolithic contexts across Britain (and also Ireland: Smyth and Evershed 2015) demonstrates that dairying was an important component of the first farming economies to reach Britain. In many cases, organic residue analysis has also acted as a proxy in providing information regarding Neolithic animal husbandry practices, given the general poor preservation and geographical distribution of animal bone recovered from British Neolithic contexts (Copley *et al.*, 2005; Cramp *et al.*, 2014).

An overwhelming predominance of dairy products is associated with eEN and ScEN pottery in Britain. Fig. 19.4 plots various examples. The left chart plots 10 sites from Scotland and the Isle of Man. These all date to the earliest, Carinated Bowl, phase of the ScEN, and are thus likely to date to before 3700 cal BC (Cramp *at al.* 2014, 2) – earlier than any of the Scottish zooarchaeological assemblages. The right chart plots two eEN sites from southern England. Both charts show a major predominance of sherds falling into the ruminant dairy fat area.

Calculus in fEN human teeth from Hambledon Hill and Hazleton North has recently been shown to contain the milk protein β-lactoglobulin, the specific amino acid sequence indicating the consumption of milk from species of Bovidae – in the British context, cattle, sheep, and/or goat (Charlton *et al.* 2019).

This evidence suggests that herds were to a considerable extent managed for dairying, implying these first British farmers had already developed the expert knowledge required to establish and maintain a dairy herd. The significance of the lipid evidence is twofold. First, it shows that a large proportion of the pottery was used for dairy products, testifying to the major importance of this resource. Second, it extends the geographical range of dairying well beyond the limited area of the zooarchaeological assemblages, testifying to its ubiquity. Fig. 19.1 shows how the ScEN Carinated Bowl samples are scattered across southern Scotland – an area with no ScEN zooarchaeological evidence at all.

This recent evidence for widespread and intensive dairying forces a major re-evaluation of Neolithic agriculture in Britain. It conflicts with the traditional assumption that intensification increases progressively through time. The lipids even suggest a *decrease* in dairying intensity in the later Neolithic (Cramp *et al.* 2014, 3), which accords with Legge's (1989, 233) suggestion that the earliest agricultural communities would have more intensive economies than those of later times: the earliest farming settlements, small and widely scattered, would have to be largely self-sufficient, and thus produce all their own foods. Economic specialisation and interdependence could increase later as human populations increased and became more networked.

Other aspects of intensification would be worth exploring: in the earliest Neolithic of southern Scandinavia, incremental isotope analysis reveals that herders manipulated cattle breeding to produce calves over several months, not just in one season, presumably so that fresh milk would be available through most of the year (Gron *et al.* 2015); and strontium isotope analysis shows that individual cattle were transported long distances, presumably to maintain the diversity of the stock (Gron *et al*. 2016). Whether such practices were also carried out in Britain is unknown.

Intensifying cereal cultivation

The first evidence that cereal cultivation was more intensive than formerly believed came from the South Street long barrow, under which was preserved a large expanse of criss-cross ard furrows (Fowler and Evans 1967). Above the ard marks grassland was established before the mound was constructed (Evans, in Ashbee *et al.* 1979, 296). The mound is poorly dated but not particularly early, with an estimated start of construction of 3565-3105 cal BC (Whittle *et al.* 2011, 105). The South Street ard marks are thus fEN or early Middle Neolithic. Such marks have turned up elsewhere – Thrane (1982) states that by 1981, no fewer than 43 Neolithic instances were known in Denmark.

The visibility of ard marks is largely dependent on the burial mounds that cover them. The rarity of mounds earlier than the causewayed enclosures means that we should therefore not expect to see such marks surviving from the eEN. Whether the ard was present at this time is therefore unknown. In the early stage of a clearing, the persistence of tree roots would make ard cultivation difficult, and at this time the digging stick was more probably used. The ard indicates a degree of longevity of cultivation – ards are not part of shifting cultivation regimes because the tree roots cause difficulties, and because ash from the burnt vegetation supplies fertility. Ard cultivation is a major commitment to an arable regime, because plough oxen need to be bred, reared and trained specially.

Numerous samples of Neolithic plant remains have been recovered from Britain in recent years. The eEN crop package consisted of emmer wheat, naked and hulled barley, free threshing tetraploid wheat and flax. Emmer was the most common cereal, followed by barley. The ScEN crop package was similar, except that emmer wheat and barley appear to have been equally important in mainland Scotland, with barley dominant on the Scottish islands (Bishop *et al.* 2009). Among the earliest dated crop remains in Britain are those from Penhale Round, Cornwall where an emmer wheat grain has been dated to 3970-3640 cal BC (Carruthers 2015), and Lismore Fields where a flax seed was dated to 3950-3640 cal BC (Hedges *et al.* 1991). The earliest directly dated free threshing tetraploid wheat was found at Thanet Earth, dated to 3940-3660 cal BC (Carruthers in press).

Fig. 19.1 maps the sites directly dated to the eEN in England (from Longford in prep.), sites that are definitely or probably of eEN date in Wales (from Treasure *et al.* 2019), and all the ScEN samples containing more than 10 cereal grains (from Bishop *et al.* 2009). The criteria for inclusion in fig. 19.1 are thus somewhat uneven. Several more sites could be added in southern England that are pre-3500 cal BC. Three sites in northern England – Coupland, Woodbridge Quarry and Bolam Lake (see fig. 19.1) – probably fall before 3300 cal BC (though the cereals have not been directly dated) and would extend the Scottish distribution further south (Longford in prep.).

Fig. 19.5 shows some of these assemblages in more detail. Domestic plant species are not so universally predominant as among the animal bones. The interpretation of plant remains is however problematic for various reasons. Plant remains survive mainly when charred. A sample of 1000 animal bones probably accumulated over a long period, and should reflect the economy fairly accurately, because all discarded bones are waste products; dogs may destroy softer elements, but this is common to all species. A sample of 1000 charred plant items might, however, be created in just a few moments, and will reflect the circumstances of only that specific time and activity – and will therefore certainly *not* reflect the entire plant economy. Before charring, some items will be desirable foods, others mere waste products. Interpretation of plant macrofossil samples is therefore complex.

Some of the samples in fig. 19.5 have substantial proportions of wild plants such as hazelnut shell, apple/pear, and weed seeds. Some early discussions interpreted this as evidence that cereals were a relatively minor part of the plant economy (Entwistle and Grant 1989, Moffett *et al.* 1989), and this led some to suggest that they were unusual foods consumed in 'special' contexts (Thomas 1991, 1999; Richmond 1999). However, the complexities of charring mean that the wild items are over-represented in the samples. Cereal grains, intended to become food, would rarely be deliberately charred. The weeds are likely to be mainly crop contaminants, sieved from the cereals before they were ground, and discarded as a waste product – perhaps directly into the fire, where they would become charred. Hazelnut shell is likely to be over-represented for several reasons: shell fragments are also waste; they survive well in the ground; and the fragments are often relatively large and visible during excavation, and thus more likely to be observed and recovered (Legge 1989, Jones 2000, Jones and Rowley-Conwy 2007, Rowley-Conwy 2004). Furthermore, recent charring experiments have shown that hazelnut shell survives the charring process at a wider range of temperatures than cereal grains do, so they will enter the archaeological record disproportionately often (Bishop 2019). Discussion continues – some continue to regard the proportions of nutshell and cereal grains as a fairly direct reflection of economic practice (*e.g.* Mulville and Robinson 2016). Most however would agree with the analysts of the Parc Bryn Cegin sample, heavily dominated by hazelnut shell (fig. 19.5):

> "The recovered remains included large numbers of fragments of charred hazelnut shell. From this it might be concluded that hazel was a more important food resource than cereals…. However, one must consider that hazel nutshell is inherently robust and survives charring well. It may, therefore, be somewhat overrepresented in these deposits as has been suggested may be the general case for British Neolithic sites" (Schmidl *et al.* 2008, 129).

Thus while wild plants no doubt formed a useful dietary adjunct, and though there was probably some degree of variability between sites, the Neolithic plant economy was probably based primarily on cereal agriculture.

Cereal fields can be made more productive by the application of animal manure. Until fairly recently manuring was thought to be a relatively late phenomenon, part of the 'secondary products revolution' (Bakels 1997). Recent work using nitrogen isotopes has however shown that crops from several Neolithic sites across Europe were manured (Bogaard *et al.* 2013; Gron *et al*. 2017). In Britain, the cereals at eEN Lismore Fields were receiving high levels of manuring, higher than at fEN Hambledon Hill. Samples are so far very small, but the available evidence once again suggests that agriculture was *more* intensive in the eEN than later (Jones and Bogaard 2017). A different pattern emerges from four Welsh sites: Plas Gogerddan, Gwernvale, Cwm Meudwy and Parc Bryn Cegin. Here only a minority of grains revealed much manuring (Treasure *et al.* 2019). The evidence now available is limited and patchy, and more needs to be done.

Primrose McConnell's estimable *Note-book of Agricultural Facts and Figures* quotes several cases of cows producing between 12,000 and 13,000 kg manure per year, and one of 18,000 kg. He also states that the minimum amount of manure to be applied to cereal crops is around 12.5 tons/ha (McConnell 1897, 116-118). The lower figures suggest that one animal can provide manure for about 1 ha/year. The effects of manuring can be seen from the long-term experiments at the Rothamsted Experimental Station. Fig. 19.6 shows yields from two adjacent plots in which barley was grown every year for 110 years. One plot was manured, the other was not. The result is clear: the manured plot produced between two and four times the quantity of barley. The importance of manuring in the eEN can hardly be overstated.

Integrating the system

The evidence described above suggests that various aspects of the farming economy operated at a high level of intensity. It is however piecemeal. Fig. 19.1 shows a 'shotgun scatter' across Britain. Rarely do we see more than one form of intensification at a single site. In the eEN, we have domestic animals and cereals together only at Hazleton North and Windmill Hill (old land surface), domestic animals and diary lipids only at Eton Rowing Course, and cereals and manuring only at Lismore Fields (Hambledon Hill is fEN). In Scotland only Lockerbie (lipids and plant remains) and Knap of Howar (animal bones and plant remains) provide more than one line of evidence; and in Wales, Parc Bryn Cegin has two: plant remains and lipids.

Two alternative scenarios are possible. In one, the full range of intensive practices occur together. This is termed 'intensive' or 'garden' cultivation, present in central and southeastern Europe (Bogaard 2005). The components of such a regime were present in Britain in the eEN and ScEN. People subsisting under such a regime would get most of their sustenance from the intensively cultivated cereals. In the other scenario the components remain more separate. Thomas contests the garden cultivation model, arguing that "it seems unlikely that the whole range of subsistence tasks was contained in microcosm within small family farmsteads" (Thomas 2013, 418). This scenario envisages a series of largely separate, low-intensity activities carried out by different groups: low-productivity cereal growers moving their plots quite often; and herders moving cattle between grazings – an *extensive* system.

We argue for the garden cultivation system, because the whole is much greater than the sum of the separate parts. Establishing new clearings in deciduous woodland is a difficult business, far harder than in the tropical or northern boreal zones where shifting cultivation has been documented (Rowley-Conwy 1981). The oft-quoted high yields of rye in burnt clearings in northern Scandinavia are no basis for assuming high yields of emmer wheat or barley in new clearings in eEN Britain (Rowley-Conwy 2003). At Coneybury, the cattle were grazing open ground, while the roe deer lived in the forest (Gron *et al.* 2018, fig. 11). Many southern Scandinavian Early Neolithic cattle from a variety of sites were also grazed on open ground (Gron and Rowley-Conwy 2016, fig. 2). The crucial point is that palynology suggests that *in neither area was there a great deal of forest clearance* – the major eEN clearance phase began later (Scaife forthcoming, Treasure *et al.* 2019). Thus the clearings in which the cattle grazed must have been small, and the animals apparently did not range widely.

All the economic activities we can see were restricted to these small clearings. Wild mammals were unimportant. Wild plants, especially hazel and apple/pear, were more significant – but a long-lasting clearing in deciduous woodland would form a ‘mantle vegetation,’ a natural hedge or thicket surrounding the clearing (Groenman-van Waateringe 1983). This mantle vegetation would comprise species like hazel and apple/pear, so the availability of these ‘wild’ plants may have been the result of (conscious or unconscious) niche construction by the farmers.

Since cattle were not grazed in the forest, small clearing size implies small cattle herd size. All the manure would thus be available for spreading on the small but intensively managed cereal plots. All this suggests that, at least in some areas, the clearings operated as small-scale but integrated and intensive agricultural units. Similar evidence has emerged for southern Scandinavia (Gron this volume).

Stable isotopes in human bone provide considerable support for this. Fig. 19.7 plots determinations from a selection of key sites. Every Neolithic sample is from a directly dated human bone, the entire calibrated range falling before the date in the key. Many more slightly later Neolithic specimens could be added, all showing the same pattern. Coastal Mesolithic specimens are plotted for comparison, and they show a wide range of variation: people with a marine diet were consuming animals (presumably seals, fish and shellfish) while people eating more terrestrial foods consumed a higher proportion of terrestrial mammals and plant foods.

The Neolithic samples in contrast are remarkable homogeneous, particularly those from southern England. There is a little more variability in Scotland, but only at Sumburgh in Shetland do Neolithic individuals show sporadic use of marine foods - and those that do tended to die earlier, suggesting that this was not a diet of choice (Montgomery *et al.* 2013). The slight evidence for some contribution of marine foods to Neolithic human diets in Orkney may in fact be at least partly due to the consumption of seaweed-eating sheep (Balasse *et al*. 2019; Schulting and Richards 2009; Schulting *et al*. 2017). The homogeneity particularly in δ^{15}N does not suggest specialist groups of cattle herders and cereal farmers eating different diets. Wild herbivores typically have δ^{15}N values of around 2-4‰, so all the farmers were consuming some animal protein – probably largely dairy products (see above).

We are limited by the accuracy of our dating methods, and the fortuitous survival, recovery and analysis of materials of different types. But within these limits, the indications are more and more in favour of the existence of an intensive and integrated garden system, involving small groups of people in small clearings. Remarkably little use was made of wild resources.

Immigrants or indigenes?

The more intensive and integrated the first agricultural system, and the more abruptly it appears, then the more likely it is to have been brought by immigrants. Anne Tresset argued for this, stating that “it would appear wholly far-fetched to posit that local Mesolithic groups sailed to the continent and brought back domesticated animals” (Tresset 2003, 25). Julian Thomas has questioned this: “but what exactly makes this so far-fetched? Why is it necessary to hypothesise the existence of a group of otherwise archaeologically invisible Neolithic colonists rather than entertain the possibility of routine maritime contacts between Mesolithic and Neolithic people?” (Thomas 2013, 164). The answer to Thomas’s question is rather straightforward: garden agriculture is not a set of separate traits that can be individually adopted. The expertise, the experience, and even the language required to operate the system all require a depth of knowledge that could not have been acquired by hunter-gatherers without a lengthy period of apprenticeship. This would require a lengthy Mesolithic presence among the farmers across the Channel – something for which there is no archaeological trace (Sheridan 2010, 90).

Recently, Ray and Thomas (2018) have argued that farmers are generally not good colonisers, especially by boat, because they would have to construct shelters and gardens, while living off the land until the first harvest; and they have questioned whether the scouts proposed by Case (1968) could have gathered sufficient information about the lands to be settled (Ray and Thomas 2018, 83). But these difficulties are largely imaginary. The colonisation of the Pacific was undertaken by farmers with stone technologies, involving scouting and colonisation over distances vastly greater than in eEN Britain; and the extermination of some 8000 native taxa of animals and plants across the Pacific testifies to the farmers' capacity to live on native resources until their agriculture began producing (Anderson 2002). In Britain the earliest stone quarries and flint mines fall in the eEN, and most of the earliest sites along the southern English and Irish Sea coasts are actually within sight of the sea; this suggests that much early scouting and prospecting took place by boat, and involved locating not just suitable agricultural land but also stone sources (Topping 2019). The Pacific again offers a useful insight. New Zealand was first settled around AD 1280, by Polynesians arriving from islands with few or no stone resources. Yet within a century or two they had located and were exploiting numerous sources of obsidian, as well as a variety of basalts, greenstones, garnet and many others (Sheppard 2004). Scouting for stone raw material sites evidently facilitates colonisation. Thus colonisation by farmers is by no means unfeasible; quite the opposite, since farmers essentially engage in niche construction with an economy that, environmental and/or social constraints aside, is eminently translocatable.

Recent whole-genome DNA studies support this: British Neolithic people were ultimately of Aegean/Anatolian origin. They had a modest admixture of hunter-gatherer genetic material, but not more than could have been picked up by their agricultural ancestors as they crossed Europe (Brace *et al.* 2019). All in all the Mesolithic contribution to eEN and ScEN agriculture appears minimal.

This conclusion is very different from the consensual view held as recently as the 1990s. The arrival of farming has everywhere become more abrupt, as our understanding of chronology improves (Rowley-Conwy 2011). Cereal cultivation did not start gradually. Multiple AMS dates on charred grains demonstrate an abrupt start at ~4000 cal BC (Brown 2007, Stevens and Fuller 2012). Mesolithic "Cereal-type" pollen, so important to the argument in the 1980s (see above), has all but disappeared from the discussion because of widespread scepticism regarding identification and contamination; the 1100 pages of the *Gathering Time* volumes contain just a couple of brief and critical mentions (Whittle *et al.* 2011, 808, 849).

The same has happened to the appearance of domestic animals. Cattle genetics reveal a Near Eastern origin of Neolithic domestic stock (Edwards *et al*. 2007). Zooarchaeology confirms the abrupt arrival of all the domestic species (Serjeantson 2014). Local domestication of aurochs has gone the way of Mesolithic "cereal" pollen, although the historiography of the local domestication claim is not without interest. Various authorities mentioned this possibility in the 1970s and 1980s (see above), which can be traced back to a paper by Peter Jewell (1963). This paper is cited by A. G. Smith (1970) as follows: "the possible slow emergence of the domesticated cattle from the native aurochs … suggested by Jewell (1963) for England serves to emphasise that grazing animals may have been under human control even at this [later Mesolithic] stage" (Smith 1970, 89). Smith's paper appears to have been responsible for the subsequent cascade of mis-citations; this is what Jewell actually says:

> "To suppose that these [Neolithic domestic cattle] were a stock newly domesticated from Britain's wild *Bos primigenius* seems contrary to what we know of the long and difficult process of domestication; moreover, the behaviour of wild cattle is such as to render some sort of herding of wild beasts quite impossible" (Jewell 1963, 86).

There are also misunderstandings in some arguments that wild animals were extensively hunted late into the Neolithic. Andrew Richmond makes the following statement:

> "Legge (1981:174, 179) assumed that domesticated faunal remains on enclosure sites represented surplus from other Neolithic sites, and that the rearing of dairy herds was a primary activity of Neolithic groups. These views require a level of rethinking in the light of the present discussion which sees most faunal assemblages 'completely dominated by species which are suited to a woodland habitat' (Barrett *et al*. 1991:20)" (Richmond 1999, 34).

The implication of this statement is clear: Barrett and colleagues have proven Legge wrong. However, the 'woodland species' in question are in fact *domestic* cattle and pigs; and the zooarchaeologist being quoted is actually none other than Legge himself, in his contribution to the volume by Barrett *et al*.; the correct citation should be Legge (1991, 20).

Such misunderstandings aside, the evidence more and more suggests that agriculture arrived as a fully-formed economic system, carried to the shores of Britain by immigrants from the near continent. Fig. 19.1 shows a concentration of sites in the south, and also in Scotland. The north of England, from about the Humber and the Mersey to the Tweed – one of the "dragon zones" of Whittle *et al*. (2011, fig. 14.177) – remains largely blank. Is this simply the result of a lack of archaeological work? Or was there a 'leapfrog' colonisation up the coasts that bypassed this area? This is a major target for future research.

Conclusion

Recent work has transformed our understanding of the earliest agriculture in Britain. Successive views have tended to regard early agriculture as 'primitive,' simply because it was early. But in Britain such 'early' farmers were the heirs to several millennia of skills and experience built up by people whose very lives depended on their farming. There remain many gaps in our knowledge; but the multiplication of biomolecular methods in the last couple of decades has revealed that the earliest farming was intensive and complex. And in hindsight we had no right to be surprised by this.

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Fig. 19.1. Map of Britain showing key early sites. Animal bones are those graphed in fig. 19.2. Lipids showing dairying from named sites are those plotted in fig. 19.4; the remainder are from Dunne and Evershed (unpublished). Plant remains from named sites are those graphed in fig. 19.5 or otherwise mentioned in the text; see text for details of site selection; the remainder are from Treasure et al. (in press), Longford (in prep.) and Bishop et al. (2009). Isotopes from named sites are those plotted in fig. 19.7; the remainder are from Schulting (2013 and unpublished). For sites with evidence of manuring, ard marks, and calculus containing milk protein, see text.

Fig. 19.2. Frequencies of animal bones in NISP (Number of Identified Specimens) from Neolithic sites belonging to the southern English earliest Early Neolithic (eEN), causewayed enclosures of the Early Neolithic (EN), and from Scotland. 'Wild' is the sum of aurochs, red deer, roe deer, and wild boar. Ascott-under-Wychwood (midden below mound) from Mulville and Grigson (2007); Hazleton North (midden below mound) from Levitan (1990); Windmill Hill from Grigson (1999); Coneybury from Maltby (1990); Eton Rowing Course Area 6 from G. G. Jones (2013); Hambledon Hill from Legge (2008); Etton 1A, 1B from Armour-Chelu (1998); Knap of Howar period I from Noddle (1983); Tofts Ness phase 1 from Nicholson and Davies (2007); Northton from Finlay (2006).

Fig. 19.3. Kill patterns in Early Neolithic faunal assemblages. Top: distal metacarpal measurements of Neolithic cattle, compared to those from a sample of modern animals. eEN Coneybury from Maltby (1990, fiche table 2.4); fEN Windmill Hill from Grigson (1999, appendix 1.1), Hambledon Hill from Legge (2008, table 8.28), and Etton from Armour-Chelu (unpublished); modern cattle from Higham (1969,

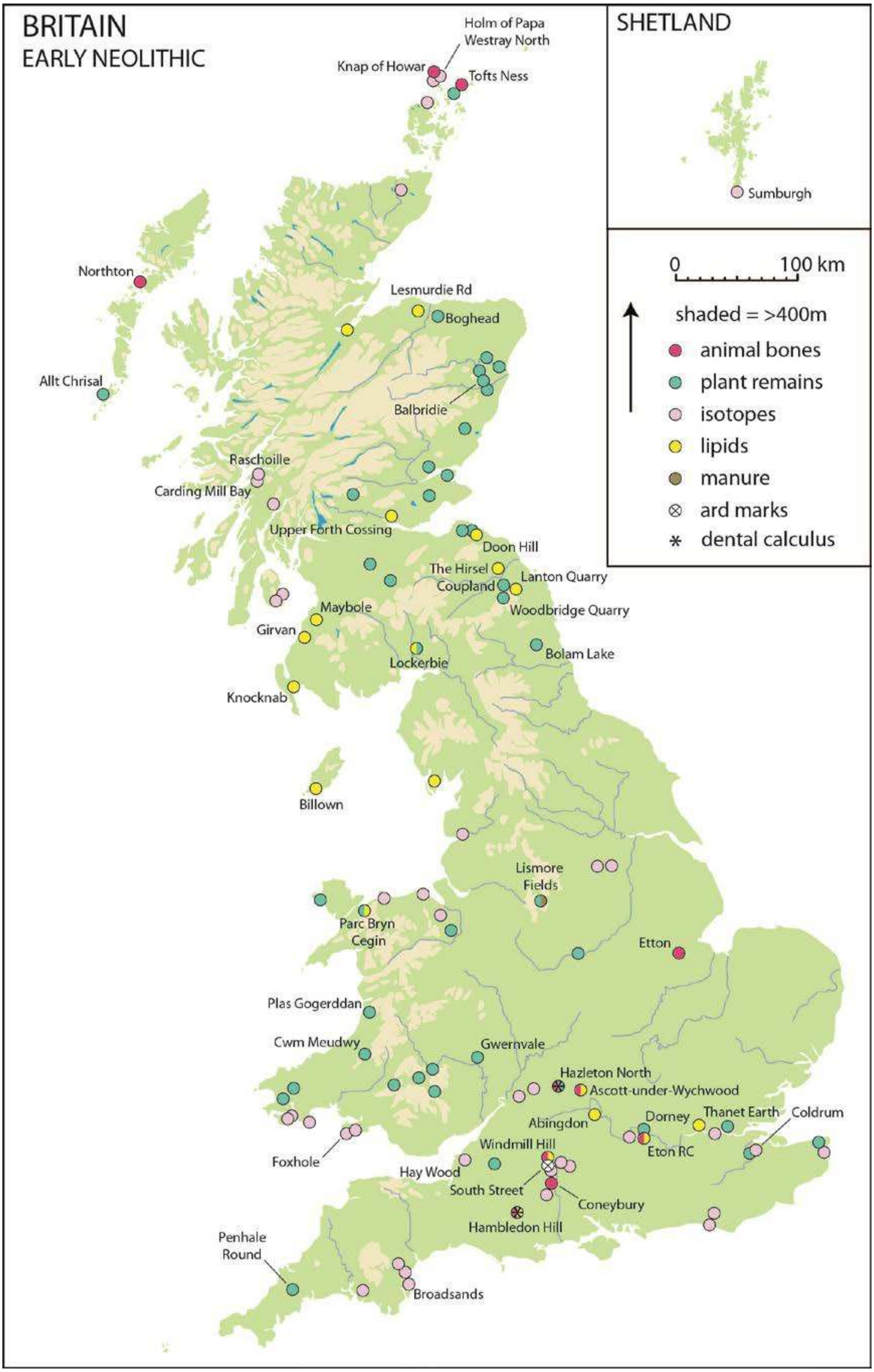
supplementary table 2.2). Bottom: age distributions of the cattle and sheep from Knap of Howar period I, Orkney, from Noddle (1983, table 2).

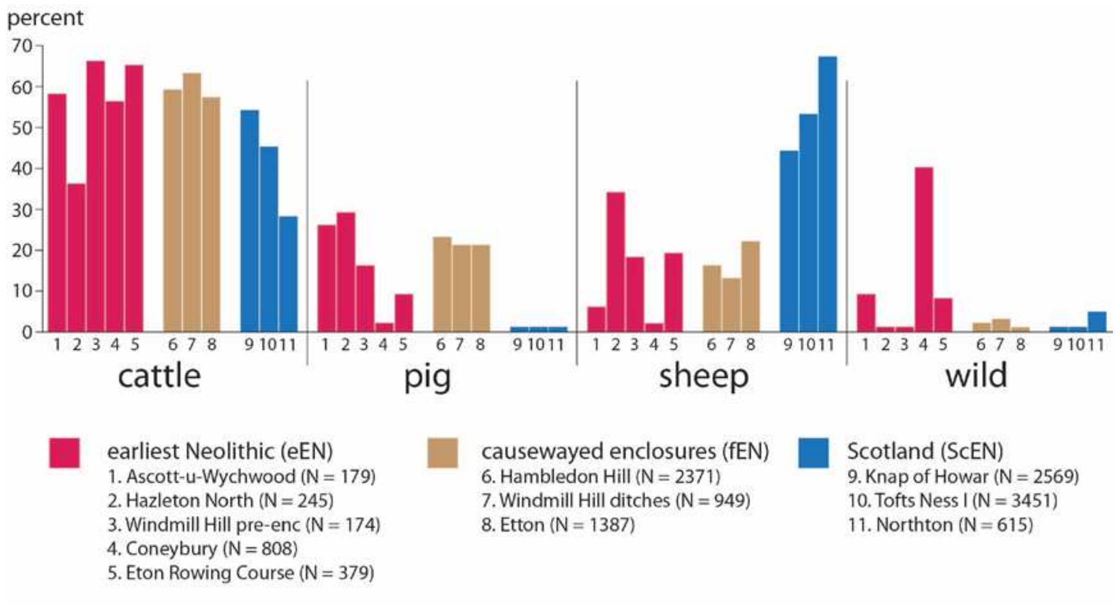
Fig. 19.4. Lipids in ceramics from eEN and ScEN sites, compared to the distributions of modern samples (ellipses). The coloured ellipses plot the distributions of modern experimental samples. Left: Carinated Bowl sites from Scotland and the Isle of Man, redrawn with modifications from Copley et al. (2014, fig. 7a and table S3). Right: eEN Eton Rowing Course and Ascott-under-Wychwood (midden below mound) in southern England, amalgamated and redrawn from Copley et al. (2005, fig. 3A) and Copley and Evershed (2007, fig. 11.4) respectively. Sites are mapped in fig. 1.

Fig. 19.5. Some early assemblages of charred plant remains; see text for details and fig. 1 for locations. Some reports quantify hazel shell fragments, others just mention their presence; for the latter, '+hazel' is added. Hazleton North (midden below mound) from Straker (1990); Lismore Fields from Jones and Rowley-Conwy (2007); Dorney from Robinson (2000); Plas Gogerddan from Caseldine (1992); Parc Bryn Cegin from Schmidl et al. (2008); Balbridie from Fairweather and Ralston (1993); Boghead from Maclean and Rowley-Conwy (1984); Allt Chrisal from Boardman (1995).

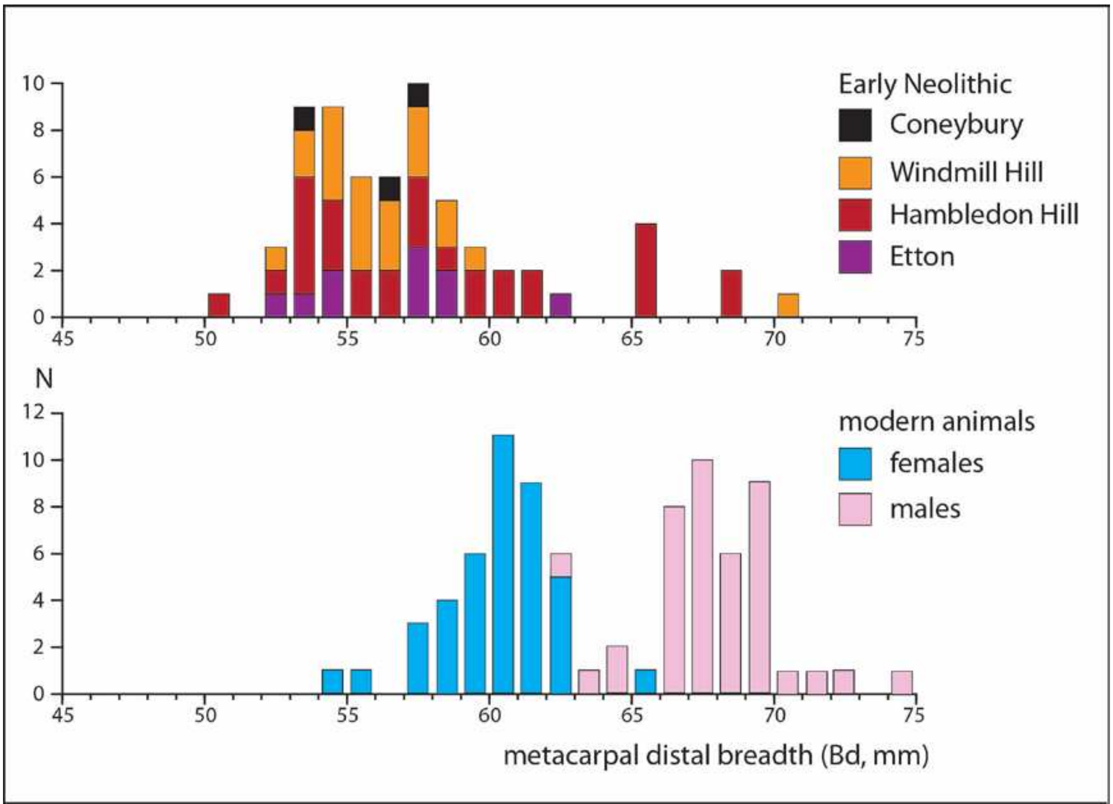
Fig. 19.6. Comparison between manured and unmanured barley yields over 100 years. Hoosfield plots 6-2 and 7-2, figures from Rothamsted Experimental Station (1970, 18-22, table 4).

Fig. 19.7. C and N isotopes from human bone. Every Neolithic specimen has been directly dated, and the calibrated range of each falls entirely before the date in the caption. Broadsands from Schulting (2013, table 6.5); Coldrum from Wysocki et al. (2013, table 1); Foxhole from Schulting et al. (2013, tables 1 and 3); Hay Wood from Schulting et al. (2013, table 1); Holm of Papa Westray North from Bownes (2018, tables 6.15 and 6.17) and Schulting and Richards (2009, tables 23 and 24); Raschoille Cave from Bownes (2018, tables 6.15 and 6.17); Carding Mill Bay from Schulting and Richards (2002, tables 2 and 4); Mesolithic coastal specimens from Schulting and Borić (2017, fig. 7.5).

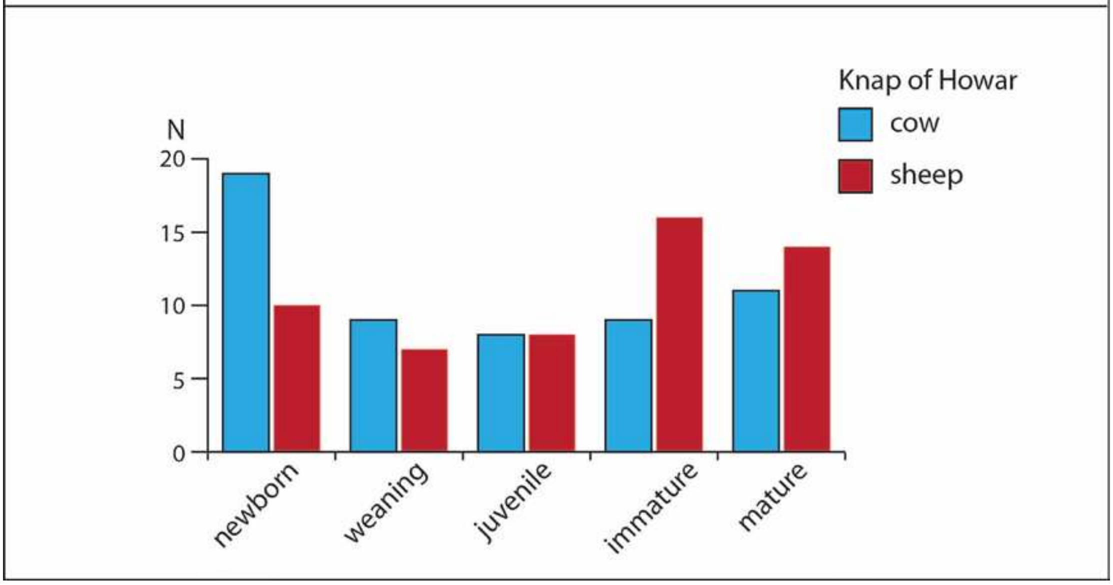

BRITAIN
EARLY NEOLITHIC
SHETLAND
Sumburgh
0
100 km
shaded = >400m
animal bones
plant remains
isotopes
lipids
manure
ard marks
dental calculus
Holm of Papa
Westray North
Knap of Howar
Tofts Ness
Northton
Allt Chrisal
Lesmurdie Rd
Boghead
Balbridie
Raschoille
Carding Mill Bay
Upper Forth Cossing
Doon Hill
The Hirsel
Lanton Quarry
Coupland
Woodbridge Quarry
Maybole
Girvan
Lockerbie
Bolam Lake
Knocknab
Billown
Lismore
Fields
Parc Bryn
Cegin
Etton
Plas Gogerddan
Cwm Meudwy
Gwernvale
Hazleton North
Ascott-under-Wychwood
Abingdon
Dorney
Thanet Earth
Coldrum
Eton RC
Windmill Hill
Foxhole
Hay Wood
South Street
Coneybury
Hambledon Hill
Penhale
Round
Broadsands



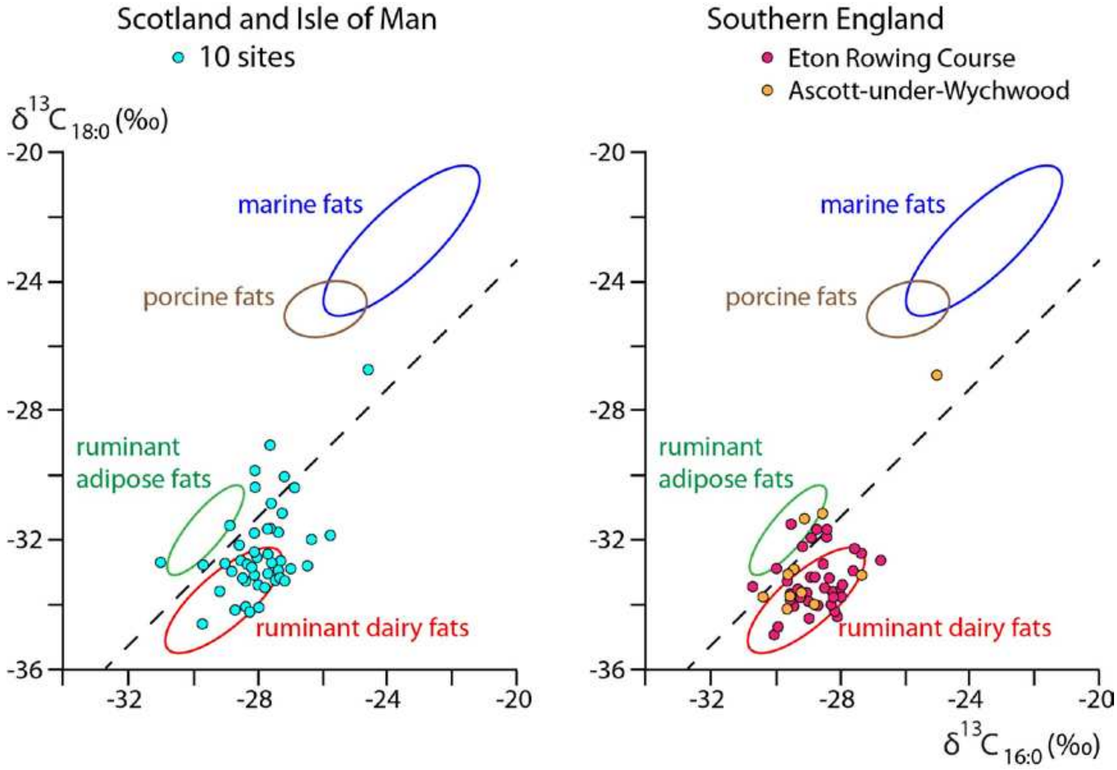
percent
70
60
50
40
30
20
10
0
1 2 3 4 5 6 7 8 9 10 11
cattle
pig
sheep
wild
earliest Neolithic (eEN)
1. Ascott-u-Wychwood (N = 179)
2. Hazleton North (N = 245)
3. Windmill Hill pre-enc (N = 174)
4. Coneybury (N = 808)
5. Eton Rowing Course (N = 379)
causewayed enclosures (fEN)
6. Hambledon Hill (N = 2371)
7. Windmill Hill ditches (N = 949)
8. Etton (N = 1387)
Scotland (ScEN)
9. Knap of Howar (N = 2569)
10. Tofts Ness I (N = 3451)
11. Northton (N = 615)



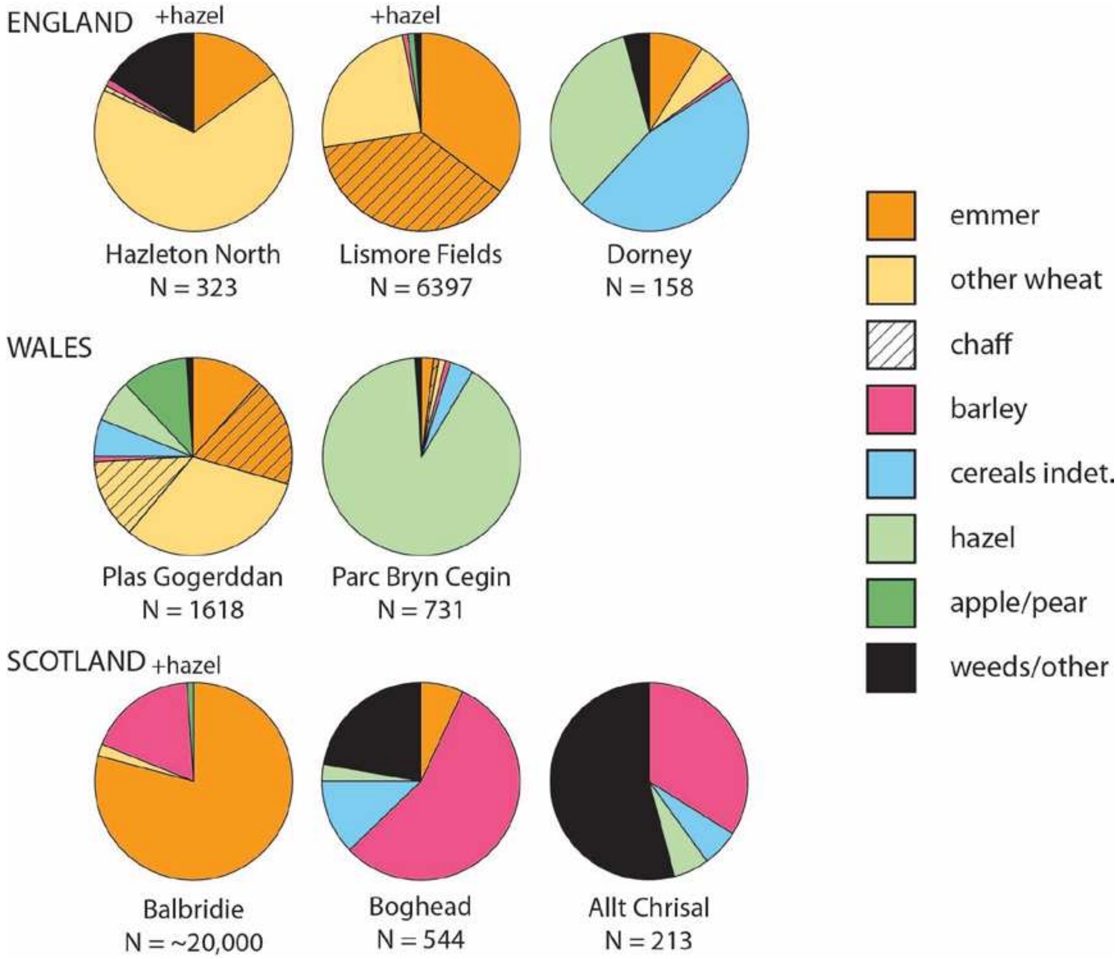
N
Early Neolithic
Coneybury
Windmill Hill
Hambledon Hill
Etton
modern animals
females
males
metacarpal distal breadth (Bd, mm)

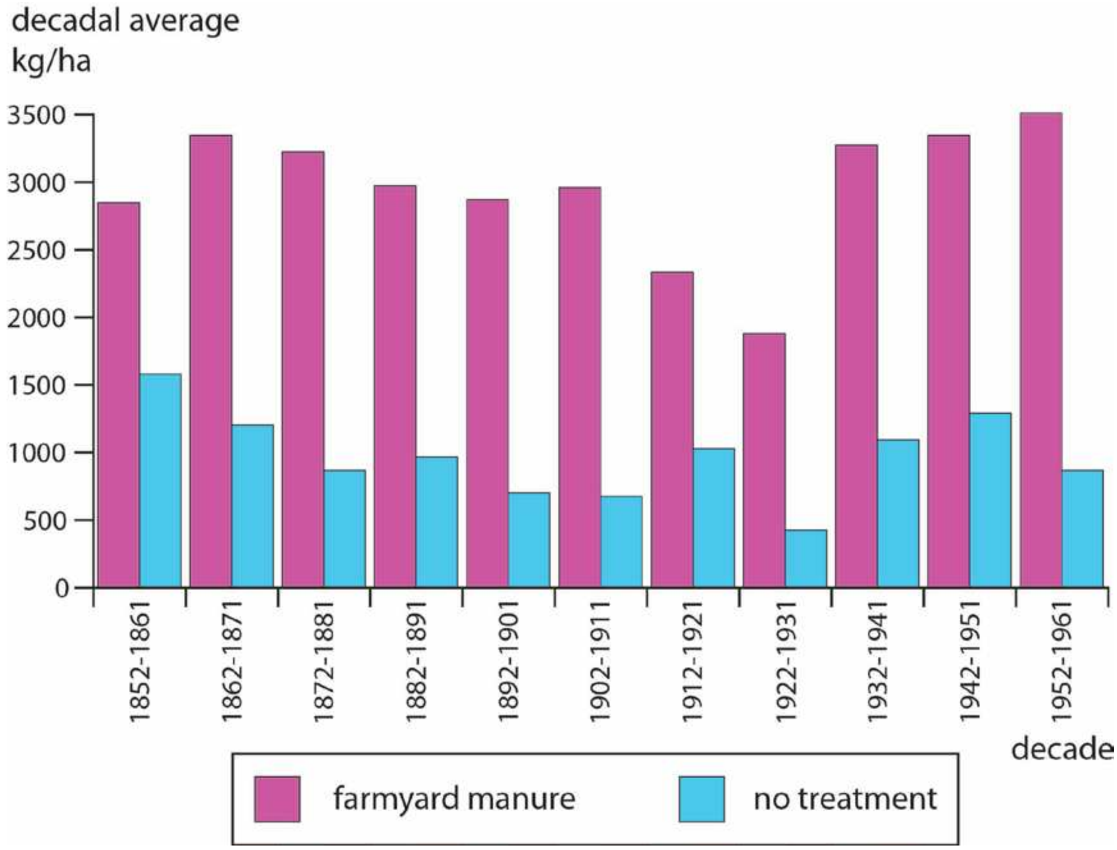


Knap of Howar
cow
sheep
N
newborn
weaning
juvenile
immature
mature

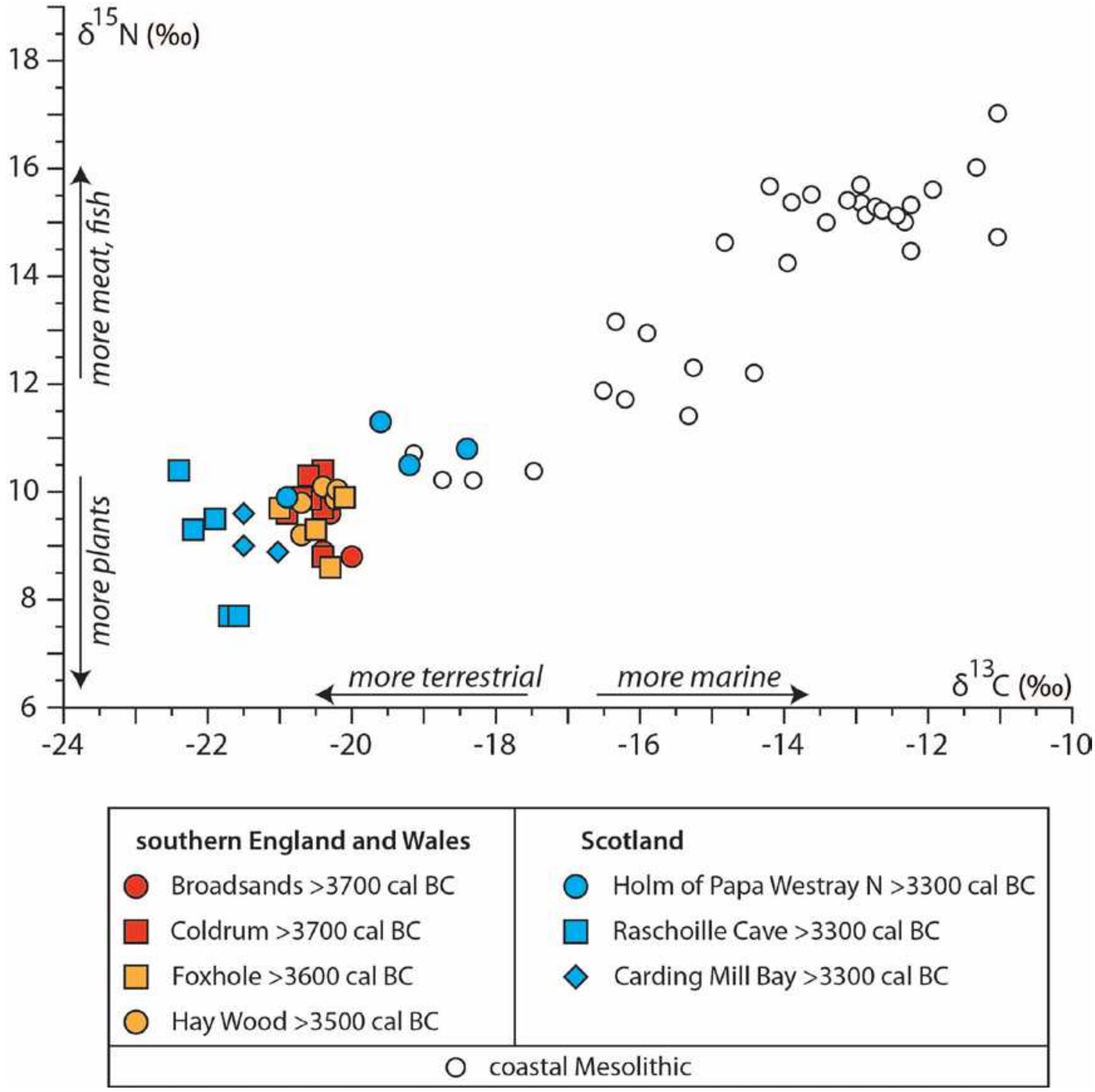


Scotland and Isle of Man
10 sites
Southern England
Eton Rowing Course
Ascott-under-Wychwood
δ13C 18:0 (‰)
δ13C 16:0 (‰)
marine fats
porcine fats
ruminant adipose fats
ruminant dairy fats
-20
-24
-28
-32
-36
-32
-28
-24
-20


ENGLAND
+hazel
+hazel
Hazleton North
N = 323
Lismore Fields
N = 6397
Dorney
N = 158
WALES
Plas Gogerddan
N = 1618
Parc Bryn Cegin
N = 731
SCOTLAND
+hazel
Balbridie
N = ~20,000
Boghead
N = 544
Allt Chrisal
N = 213
emmer
other wheat
chaff
barley
cereals indet.
hazel
apple/pear
weeds/other



decadal average
kg/ha
3500
3000
2500
2000
1500
1000
500
0
1852-1861
1862-1871
1872-1881
1882-1891
1892-1901
1902-1911
1912-1921
1922-1931
1932-1941
1942-1951
1952-1961
decade
farmyard manure
no treatment



δ15N (‰)
more meat, fish
more plants
more terrestrial
more marine
δ13C (‰)
18
16
14
12
10
8
6
-24
-22
-20
-18
-16
-14
-12
-10
southern England and Wales
Broadsands >3700 cal BC
Coldrum >3700 cal BC
Foxhole >3600 cal BC
Hay Wood >3500 cal BC
Scotland
Holm of Papa Westray N >3300 cal BC
Raschoille Cave >3300 cal BC
Carding Mill Bay >3300 cal BC
coastal Mesolithic