

“...in winter, plough”: Zooarchaeological evidence for the changing role of draught cattle and horses in medieval England AD 400-1400

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Abstract

Cattle were the tractors of medieval England and provided power essential for agricultural production, yet horses were not widely used for draught until after AD 1250. Evidence for the use of cattle and horses for draught purposes in England between AD 400 and 1400 is presented. Findings are based on zooarchaeological analysis of the animal economy and pathological and sub-pathological changes to cattle feet, alongside documentary evidence for the use of cattle and horses for traction. The use of draught cattle varies depending on social structure and economic pressures, and the effect of the increasing use of horses on a decline in the use of cattle in some areas can be observed.

Kurzfassung

Rinder waren die Zugmaschinen des mittelalterlichen Englands und lieferten die für die landwirtschaftliche Produktion unerlässliche Kraft, während Pferde erst nach 1250 n. Chr. in großem Umfang als Zugtiere eingesetzt wurden. Im Artikel werden Belege für den Einsatz von Rindern und Pferden als Zugtiere in England zwischen 400 und 1400 n. Chr. vorgestellt. Die Ergebnisse basieren auf zooarchäologischen Analysen der Viehwirtschaft und pathologischen und subpathologischen Veränderungen an Rinderfüßen sowie auf urkundlichen Belegen für den Einsatz von Rindern und Pferden als Zugtiere. Der Einsatz von Zugvieh variiert je nach sozialer Struktur und wirtschaftlichem Druck, und die Auswirkungen des zunehmenden Einsatzes von Pferden auf einen Rückgang des Einsatzes von Rindern in einigen Gebieten können beobachtet werden.

Résumé

Les bovins étaient les tracteurs de l'Angleterre médiévale et fournissaient une puissance essentielle à la production agricole, mais les chevaux n'ont été largement utilisés pour le trait qu'après 1250. Cet article présente les preuves de l'utilisation de bovins et de chevaux à des fins de traction en Angleterre entre 400 et 1400. Les conclusions sont basées sur une analyse zooarchéologique de l'économie animale et des changements pathologiques et sub-pathologiques des pieds des bovins, ainsi que sur des preuves documentaires de l'utilisation des bovins et des chevaux pour la traction. L'utilisation du bétail de trait varie selon la structure sociale et les pressions économiques, et l'on peut observer l'effet de l'utilisation croissante des chevaux sur le déclin de l'utilisation du bétail dans certaines régions.

Resumen

Aunque se le puede considerar al ganado como análogo al “tractor” de la Inglaterra medieval y proporcionaba la energía esencial para la producción agrícola, los caballos no fueron utilizados ampliamente para el tiro hasta después de 1250. Se presentan pruebas del uso del ganado vacuno y de los caballos para el tiro en Inglaterra entre los años 400 y 1400. Las conclusiones se basan en el análisis zoo-arqueológico de la economía animal y en los cambios patológicos y subpatológicos de las patas del ganado, junto con las pruebas documentales del uso del ganado vacuno y del caballo para la tracción. El uso del ganado de tiro varía en función de la estructura social y de las presiones económicas, y se observa el efecto del uso creciente de los caballos sobre el descenso del uso del ganado en algunas zonas.



Introduction

In the medieval world cattle and horses were vital draught animals, providing much of the power required for arable cultivation as well as hauling and carting. This paper presents the results of a project (Feeding Anglo Saxon England) investigating changes in agriculture in England between AD 400 and 1400, which corresponds to the English medieval period¹. This period witnessed substantial changes to both society and economy. At the beginning of the period there was a relatively small population of c.1.5-2 million people living in England, and nearly everyone would have been directly involved in farming. People throughout the country lived in extended family groups on isolated farmsteads, producing much of their food and raw materials from the surrounding land². Cattle were a hugely important form of portable wealth and would have been used for light draught duties such as pulling an ard³. The documentary evidence suggests that until the eleventh century, heavy, wheeled ploughs with mouldboards or coulter were uncommon and ard cultivation would have predominated⁴.

From the ninth century, a rising population combined with an increase in trading and urban settlements meant that people were not solely employed on the land but had non-agrarian jobs requiring agricultural produce to be available on the commercial market⁵. In many parts of England, social changes meant that large rural estates were owned by an elite, and the workforce was organised into villages where agricultural output was overseen by a lord⁶. Increased production required extensification, whereby larger fields were cultivated, and crop rotation was employed⁷. The expansion of arable production onto new land meant that in many areas heavier soils were brought into use, requiring new, heavier plough technology so that, by the eleventh century, pictorial evidence shows substantial ploughs with wheels, coulter and mouldboards⁸.

When, where, and how this transformation of agriculture emerged, and whether it had a significant impact before the Norman Conquest in 1066, remain contentious issues, largely because scholars have been forced to rely on a limited range of indirect evidence, both written and archaeological. There has been a lack of direct, closely dated evidence for early medieval fields themselves and for the conditions in which crops were grown. The FeedSax project interrogated and combined information from pollen, plant remains, landscape archaeology, stable isotopes and animal bones⁹. The latter was used to reconstruct changes in animal husbandry, tracking the changing exploitation of livestock for primary (i.e. meat) and secondary products (e.g. wool, manure, and power).

This chapter draws on some of this new evidence, combining zooarchaeological and documentary evidence to track the changing use of cattle and horses for draught

power in medieval England to better understand their role in the transformation of agricultural production.

Material and methods

Cattle did not evolve to pull ploughs and carts and the biomechanical stresses placed on their lower limb bones when undertaking such activities can ultimately result in adaptive remodelling that is visible macroscopically¹⁰. The zooarchaeological focus of the FeedSax project involved recording pathological and sub-pathological changes associated with draught use on cattle autopodia (metapodials/ cannon bones and phalanges/ pastern and hoof), some examples of which are illustrated in **Figure 1**. Cattle autopodia from 20 archaeological sites in England (**Figure 2, Table 1**) were recorded using a widely used and tested method, to generate a modified Pathological Index (mPI) for the combined results from each site¹¹. This index produces values on a scale of 0 to 1: with 0 indicating no adaptive remodelling and values approach 1 indicating the most pronounced changes, and the increased likely presence of draught cattle. Front and hind foot bones are separated as the fore legs naturally carry more body weight and are affected by loading to a greater extent than the hind legs, even in non-draught animals¹². It is not possible to determine which specific activities cattle were used for (ploughing, carting, haulage) using this approach, and indeed it is likely that they were used for numerous draught purposes.



Figure 1 – Examples of deformations to the foot bones of cattle that may be caused by excess or repeated loading. A: distal metapodials or cannon bones, normal (left) and exhibiting exostosis and broadening (right). B: first phalanx or pastern bone, normal (left) and examples of proximal lipping (middle) and proximal and distal exostosis (right)

1 Hamerow et al. 2020; Id. 2019.
 2 O'Connor 2014.
 3 Holmes et al. 2021a.
 4 Banham/Faith 2014, 44; Holmes forthcoming-a.
 5 Dyer et al. 2018.
 6 Campbell 2000.
 7 Hamerow et al. 2019.
 8 Banham/Faith 2014, 47.
 9 Hamerow et al. 2020.

10 Thomas et al. 2021.
 11 Bartosiewicz et al. 1997; Holmes et al. 2021b; Thomas et al. 2021.
 12 Holmes et al. 2021b; Thomas et al. 2021.

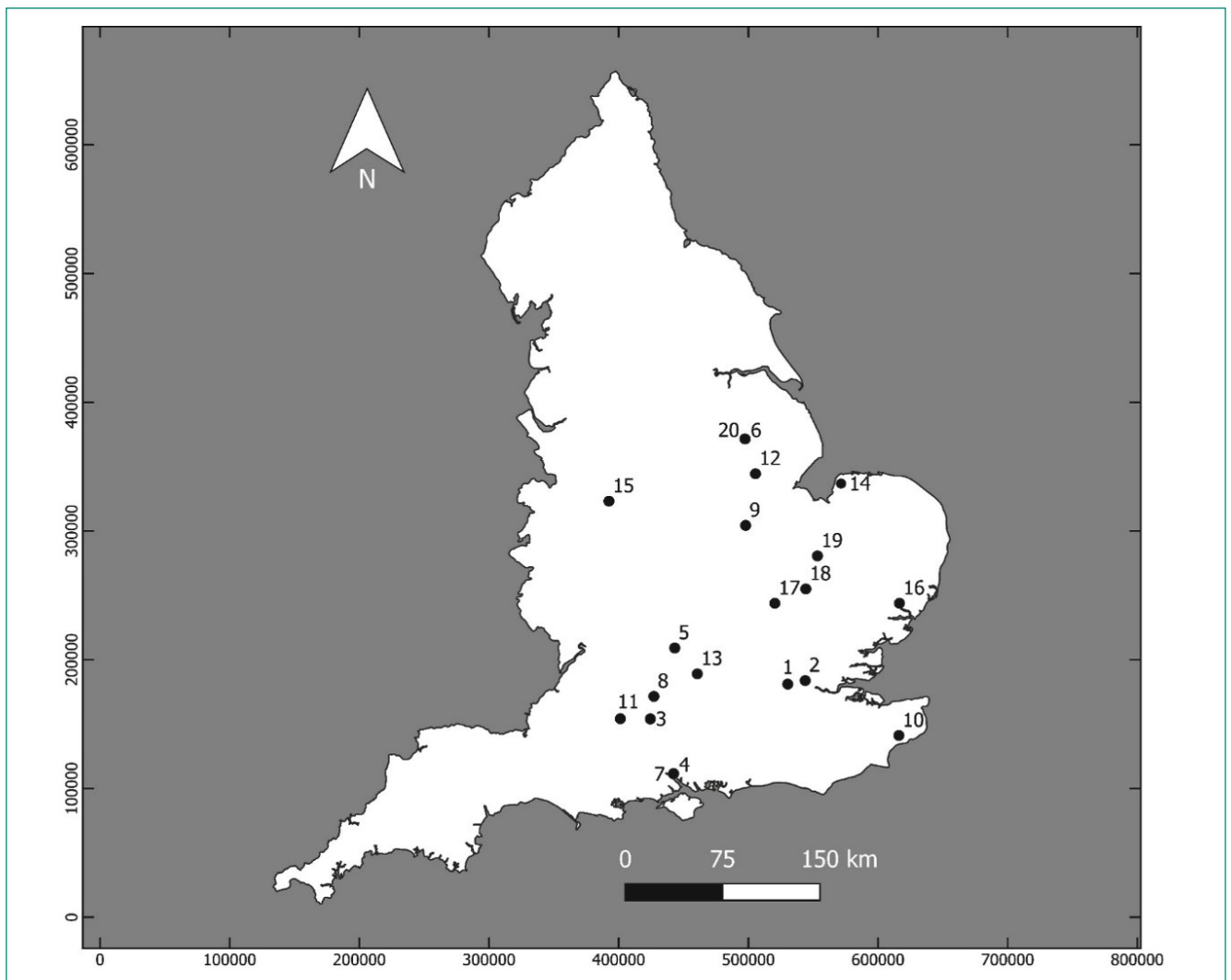


Figure 2 – Location of archaeological sites from which data were recorded (see Table 1 for site details)

Site	Map	Dates	County	Region ¹³	Geology ¹⁴	Elevation	Reference
Bow Street, London	1	600-750	Middlesex	South east	Valley terrace	19	Holmes 2019
Barking Abbey, London	2	500-1500	Middlesex	South east	Valley terrace	9	Holmes and Gordon 2020
Cadley rd, Collingbourne	3	700-900	Wiltshire	South east	Chalk	130	Hamilton-Dyer 2001
Cook Street, Southampton	4	650-875	Hampshire	South east	Valley terrace	2	Bourdillon 1993
Eynsham Abbey	5	500-1330	Oxfordshire	Central zone	Clay	74	Ayres et al 2003
Flaxengate, Lincoln	6	870-1400	Lincolnshire	Central zone	Clay	42	O'connor 1982
French Quarter, Southampton	7	900-1350	Hampshire	South east	Valley terrace	2	Bates and Nicholson 2011
High Street, Ramsbury	8	750-1300	Wiltshire	South east	Chalk	116	Coy 1980
Ketton	9	850-1066	Rutland	Central zone	Clay	51	Holmes 2018
Lyminge	10	400-1300	Kent	South east	Chalk	101	Thomas 2013
Market Lavington	11	400-1400	Wiltshire	Central zone	Clay	88	Bourdillon 2006
Quarrington	12	450-900	Lincolnshire	Central zone	Valley terrace	25	Rackham 2003
Reading Rd, Wallingford	13	900-1300	Oxfordshire	Central zone	Valley terrace	58	Holmes 2020
Sedgeford	14	650-1025	Norfolk	East Anglia	Chalk	36	unpublished
Stafford	15	900-1300	Staffordshire	Western lowlands	Valley terrace	77	Carver 2009
Stoke Quay, Ipswich	16	700-1500	Suffolk	East Anglia	Valley terrace	25	not published
Stratton	17	600-1350	Bedfordshire	Central zone	Valley terrace	41	Maltby forthcoming
Trumpington Meadows	18	600-1066	Cambridgeshire	South east	Clay	30	Rajkovic 2018
West Fen Rd, Ely	19	700-1400	Cambridgeshire	East Anglia	Clay	22	Higbee 2005
West Parade, Lincoln	20	1050-1375	Lincolnshire	Central zone	Clay	18	Scott 1999

Table 1 – Case study site information (Map numbers relate to Figure 2, elevation in metres above ordnance datum)

¹³ Rippon et al 2013.

¹⁴ Lowerre 2010.



Results

Figure 3 illustrates the mean mPI scores for cattle from each site. The solid line indicates the average value for all sites and the broken line indicates the mean mPI values for the semi-feral herd at Chillingham, which were never used for ploughing or other draught use¹⁵. The fact that mPI values from medieval sites exceed the values of the semi-feral herd at Chillingham indicates that cattle were used for draught purposes at all sites to varying degrees. There are clearly a number of sites with notably high mPI mean values indicating more intensive use of cattle for ploughing. A full description of these data is provided elsewhere¹⁶, but the key changes are highlighted here. Between AD 400 and 650 evidence for the intensive or repeated use of draught cattle is sporadic (**Figure 3**) and occurs alongside contemporary sites where mPI values are low (i.e. they are well below the mean value for all sites). From AD 650 a greater proportion of sites are recorded with higher values, suggesting that draught cattle became more widely (or intensively) used. Between AD 1025 and 1200, the presence of high mPI values at all sites suggests that the use of draught cattle was widespread and common. Eleventh and twelfth century sites that continue into the thirteenth century produced consistently lower mPI values, suggesting that the use of cattle for draught work diminished. Two sites occupied in the fourteenth century (Flaxengate and West Parade, both in Lincoln), once again produced high mPI values, which may be due to the provisioning of the town with older cattle at the end of their working lives.

Discussion

Cattle were the go-to tractors for much of the medieval period, reflected in their economic value¹⁷ and evidence for their draught use in all periods. Horses were less abundant, were considered to be more expensive to feed and look after¹⁸, and were not commonly eaten at the end of their working life, unlike cattle, making them less profitable to keep in large numbers. The animal economy in England in the post-Roman period (AD 400-650) centred on small, self-sufficient family farms that did not require extensive agricultural methods. The relatively small population at this time also meant that cultivation could take place on lighter soils suited to the use of ards, which were less taxing for draught cattle. This is reflected in the pathological index data for cattle, which implies that draught use was neither intensive nor protracted for most animals.

The increasing use of cattle for draught work observed from AD 650 coincides with an increase in the age of cattle¹⁹ and the establishment of the first proto-urban trading centres, which housed a population of craft workers and merchants²⁰. Feeding these communities required surplus production from the surrounding countryside, and cattle were increasingly vital to work the land and support the production and transportation of enough grain. The earliest material evidence for heavy plough technology also comes from this period, in the form of a seventh-century coulter, from the high-status site of Lyminge, Kent²¹.

The eleventh century increase in cattle pathologies suggests that they were commonly used by all tiers of farming society for draught work, either intensively and/or for extended periods of time, enough to produce high mPI values at all sites in the data set (**Figure 3**). It coin-

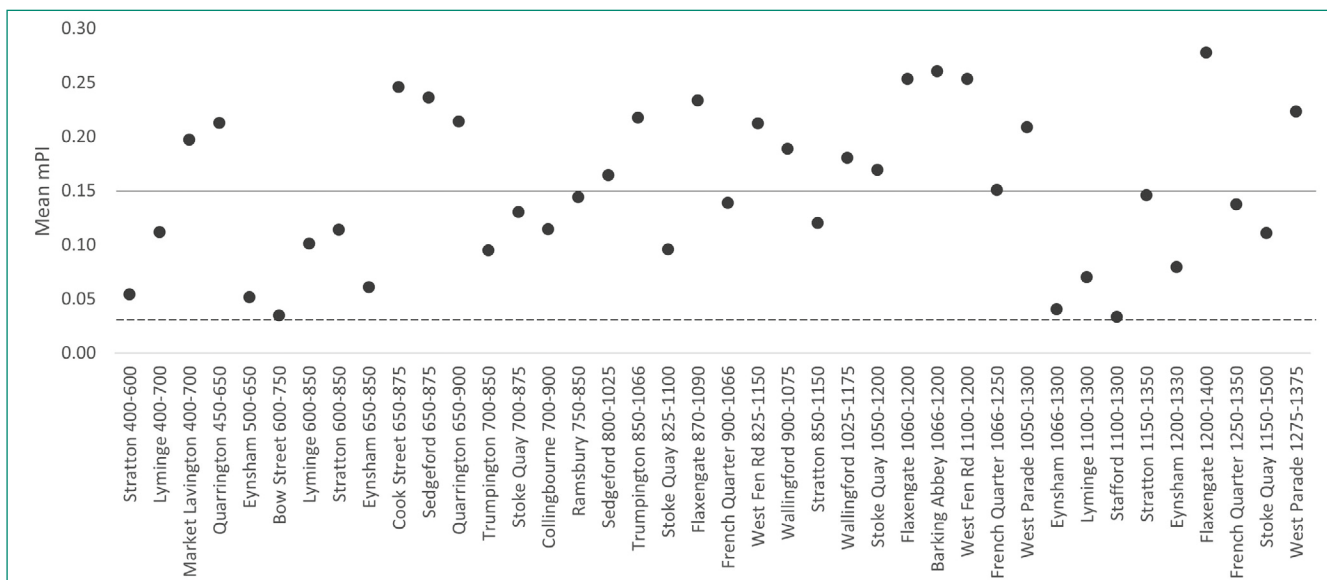


Figure 3 – Mean modified Pathological Index (mPI) for posterior elements from all assemblages with ≥ 5 elements – in order of the mid-point of the date range of each assemblage (solid line describes the mean mPI from all assemblages, and the broken line is the mean of a semi-feral herd of modern cattle)

15 Thomas et al. 2021.

16 Holmes forthcoming-a; Id. forthcoming-b.

17 Id. et al. 2021a.

18 Langdon 1986.

19 Holmes et al. forthcoming.

20 Crabtree 2018.

21 Thomas et al. 2016.

cides with another period of major growth brought about by the establishment of towns based on commercial markets and trade. Heavy ploughs are also portrayed in pictorial documents in this period, which further suggests they were common sights²². In summary, increased production required to feed a larger and non-farming population combined with a need to cultivate more fertile but heavier soils and a subsequent technological change to heavier ploughs is reflected in observations of an increase in draught cattle use in the archaeological record. This is consistent with Langdon's²³ work based on documentary sources that showed working horses were scarce in the eleventh century, and comprised between 1 and 10 % of the total number of working cattle and horses. At this point, cattle bore the burden of heavy draught work.

A decline in the widespread use of draught cattle from AD 1200 coincides with the increase in horse numbers relative to cattle as horses started to be more frequently used for carting and ploughing²⁴. In some areas on light soils (notably Norfolk, the Chiltern Hills and parts of Kent) farms that used horses exclusively for draught work became increasingly common, and in other areas the use of mixed horse and cattle teams increased²⁵. Cattle continued to be more commonly used for draught work on the heavy clay soils of the midlands and although horses were integrated into the agricultural regimes of farmers in the southern and eastern areas of the country, cattle held out in the north and west²⁶. Another potential cause of the decline in draught cattle includes a fall in arable output that occurred from the mid-fourteenth century in response to the reduced population because of the Black Death²⁷, which would have required fewer draught animals. There is also evidence for an increase in the demand for beef cattle in this period²⁸, and the associated increase in younger animals would reduce the mean mPI of older draught cattle.

There is nothing to indicate that horses were directly involved in improving agricultural production, but they were able to reduce the costs associated with the farm and the increased use of horses came in response to several factors. They were faster and had greater endurance than cattle, being able to work more land per hour, and for more hours in the day²⁹. This allowed a reduction in the number of animals required in a team, and the number of farmhands to work the team. Technological innovations such as harness improvements (e.g. the use of the padded collar) and shoeing, specific to horses were in place and available by the eleventh century³⁰. Langdon further suggests that the most profound effect was the use of horses for carting, particularly in the twelfth and thirteenth centuries, coinciding with significant market growth. Horses were used for moving goods around by all sections of society: peasants and elites, rural and urban populations, and they not only moved goods faster,

but also increased the distance covered in a day than was previously possible with cattle.

Conclusion

Figure 4 presents a summary of the data discussed here. Until the seventh century the English economy was based on small, self-sufficient farms where the ard was widely used and animals were not intensively worked. Cattle were a store of wealth, while horses were rare and expensive to keep. Increasing production began in the mid-seventh century as a surplus of grain was required to feed the labourers working in proto-urban trading centres, and this can be observed in an increase in cattle foot pathologies and the earliest physical evidence for plough technology.

From the eleventh century draught cattle were apparently widespread and common, which coincides with larger urban populations, heavier ploughs and the need for substantially increased arable production. Yet a decline in the use of cattle for traction occurs from the thirteenth century, partially at least, in response to the increased use of horses for carting, hauling and ploughing.

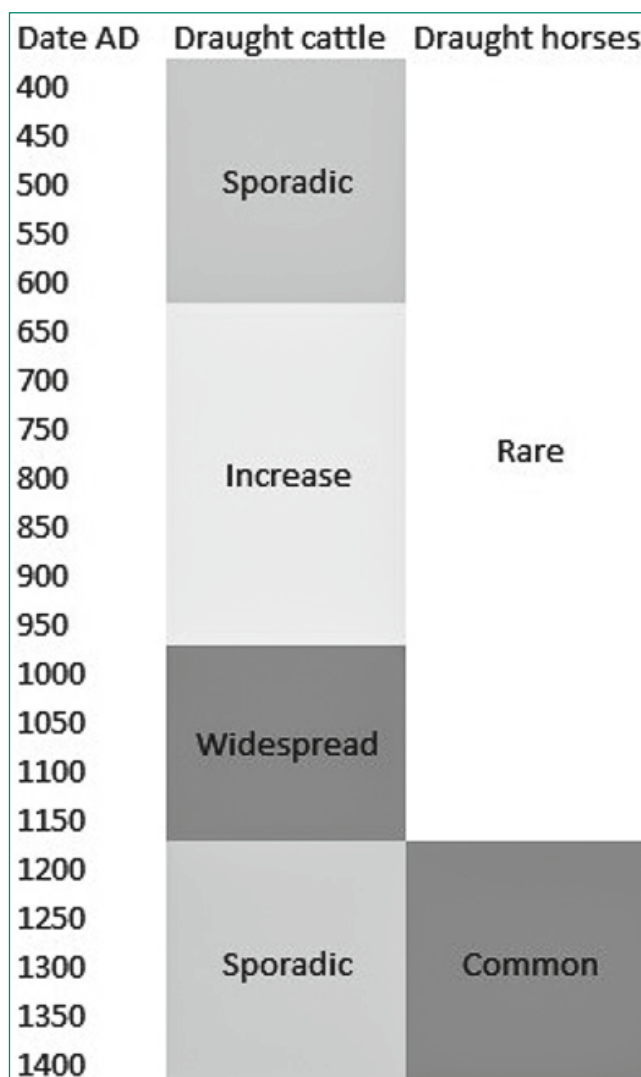


Figure 4 – Summary of the evidence for draught cattle and horses

22 Banham/Faith 2014, 47.

23 Langdon 1986.

24 *Ibid.*, 99.

25 *Ibid.*, 100.

26 *Ibid.*, 159.

27 *Ibid.*, 97.

28 Holmes et al. forthcoming.

29 Langdon 1986, 160.

30 *Ibid.*, 20.



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List of Figures

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