

Towards an Agricultural Geography of Medieval England

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[A review article of John Langdon, *Horses, Oxen and Technological Innovation: The Use of Draught Animals in English Farming from 1066-1500*, CUP, 1986. xvi + 331 pp. 42 figures. £30.]

Abstract

Horses, Oxen and Technological Innovation is shown to make a major substantive and methodological contribution to the agrarian history of medieval England. Langdon's findings, derived in part from a national sample of manorial accounts, lend further support to the view that a more specialized and integrated pattern of food production and supply began to evolve during the thirteenth century. Horse haulage, although costly, increased the speed and range of market transactions; whilst horse traction allowed the emergence of more intensive forms of arable husbandry and greater specialization in livestock production. To illustrate the last point results are presented from a national survey of demesne livestock. These developments are expressed in the form of greatly increased spatial differentiation and can be related to the effect upon economic rent of the contemporary growth of several major urban markets.

*H*orses, *Oxen and Technological Innovation* makes a major contribution to the study of a period whose basic economic outlines are progressively changing. In establishing an appropriate data-base for his chosen subject, Dr Langdon draws upon an impressive and imaginatively assembled array of published and unpublished sources, and uses them to obtain significant new insights into the husbandry and economy of this period.¹ With the publication of this book there can be little doubt that medieval agricultural history has at last come of age. Not that considerable scholarly endeavour in this field has been absent during the past thirty years. But the valuable crop of individual and estate studies which have been produced, though they have added greatly to existing knowledge, have afforded few radical new insights and have tended to reinforce traditional assessments of the

agriculture of the period.² Moreover, the picture of medieval agriculture that has emerged has been patchy and unsystematic, a function of the adherence to an estate-orientated methodology. Most of what has been written continues to relate almost exclusively to the demesne rather than the peasant sector and is disproportionately concerned with those leading ecclesiastical estates for which there are

¹ Over 30 years ago R H Hilton drew attention to the wide range of sources relating to medieval agriculture: 'The Content and Sources of English Agrarian History before 1500', *Ag Hist Rev*, III, 1955, pp 3-19. Significantly, Dr Langdon was trained in Hilton's own Birmingham stable, where his supervisor was Dr C C Dyer.

² Notable examples include J A Raftis, *The Estates of Ramsey Abbey*, Toronto, 1957; E M Halcrow, 'The Administration and Agrarian Policy of the Manors of Durham Cathedral Priory', unpublished BLitt thesis, University of Oxford, 1959; J Z Titow, 'Land and Population on the Bishop of Winchester's Estates 1209-1350', unpublished PhD thesis, University of Cambridge, 1962; I Keil, 'The estates of the Abbey of Glastonbury in the Later Middle Ages', unpublished PhD thesis, University of Bristol, 1964; I Kershaw, *Bolton Priory*, Oxford, 1973; E Searle, *Lordship and Community: Battle Abbey and its Bantien*, Toronto, 1974; B F Harvey, *Westminster Abbey and its Estates in the Middle Ages*, Oxford, 1977; C C Dyer, *Lords and Peasants in a Changing Society: The Estates of the Bishopric of Worcester, 680-1540*, Cambridge, 1980. Current orthodoxy largely derives from the writings of M M Postan, most notably 'Medieval Agrarian Society in its Prime: England', pp 548-632 of M M Postan (ed), *The Cambridge Economic History of Europe*, I, Cambridge, 2nd edition, 1966. See also J Z Titow, *English Rural Society 1200-1350*, London, 1969; and E Miller and J Hatcher, *Medieval England: Rural Society and Economic Change 1086-1348*, London, 1978. For an alternative view see H E Hallam, *Rural England 1066-1348*, London, 1981.

well-preserved archives.³ Some parts of the country have been well served in this respect, but geographically the coverage has been uneven. The forthcoming volumes II and III of the *Agrarian History of England and Wales* – conceived as long ago as 1956 – should eventually go a long way towards rectifying this, but may well suffer from having been too long in the making.⁴

I

The methodological challenge confronting all analyses of estate or regional farming systems is to reconcile the individual case study with the creation of a consistent and systematic picture of the country as a whole. Without some national frame of reference no full evaluation is possible of what is typical or unusual about individual farms or regions. There is an obvious limitation to any national picture of agriculture which is built up piecemeal from independent regional studies. Dr J Thirsk makes explicit acknowledgement of this in her introduction to Volume V, Part I, of *The Agrarian History of England and Wales*, when she states (of the national map of farming types):

some boundaries which separate farming types are also the boundaries between chapters; in other words, authors on either side of a county boundary have not always agreed in their identification of the dominant local farming type.⁵

This problem is compounded when, as in these volumes, the picture is built up

qualitatively rather than quantitatively. It is here that Langdon's study breaks important new ground, and not just in a medieval context. He takes as his unit of analysis the country as a whole and establishes regional variations in the technology of haulage and traction by a process of disaggregation.⁶ Since the labour required in such an exercise is considerable – the PhD thesis upon which the book is based took almost six years – sampling and quantification provide two of his most essential tools.⁷ This applies particularly to one of the most original achievements of the book: the creation of a national data-base from information contained in manorial accounts.

The rich store of agricultural information contained in the annual accounts drawn up each Michaelmas by the reeve or bailiff of a manor has long been extensively used by historians.⁸ What is not so fully appreciated is the fact that these accounts survive in their thousands. The small number of estates, like those of the bishops of Winchester and abbots of Westminster, with long and relatively complete runs of accounts, have tended to divert attention away from the much more typical situation in which an individual demesne is represented by perhaps just one or two stray *compoti*. For Norfolk alone almost 2000 accounts are extant for the period 1238–1450, representing some 219 different

³ Exceptions are F J Davenport, *The Economic Development of a Norfolk Manor, 1086–1565*, Cambridge, 1906; K Ugawa, *Lay Estates in Medieval England*, Tokyo, 1966; D Postles, 'Problems in the Administration of Small Manors: Three Oxfordshire Glebe-Demesnes, 1278–1345', *Midland History*, IV, 1977, pp 1–14; R R Davies, *Lordship and Society in the March of Wales 1282–1400*, Oxford, 1978; R H Britnell, 'Minor Landlords in England and Medieval Agrarian Capitalism', *Past & Present*, 89, 1980, pp 3–22; M Mate, 'Profit and Productivity on the Estates of Isabella de Forz (1260–92)', *Econ Hist Rev*, 2nd ser, XXXIII, 1980, pp 326–34.

⁴ Publication of Volume II, edited by H E Hallam, is imminent: it deals with the period 1066–1350. Contributions to Volume III, which deals with the period 1350–1500, are currently being finalized. Its publication may be anticipated in 1988 or 1989.

⁵ J Thirsk (ed), *The Agrarian History of England and Wales, V, 1640–1750. I. Regional Farming Systems*, Cambridge, 1984, p xxi.

⁶ Regional farming systems have attracted increasing attention in recent years, although they have hitherto lacked any wider frame of reference. Examples include: D Roden, 'Demesne Farming in the Chiltern Hills', *Ag Hist Rev*, XVII, 1969, pp 9–23; P F Brandon, 'Demesne Arable Farming in Coastal Sussex during the Later Middle Ages', *Ag Hist Rev*, XIX, 1971, pp 113–34; B M S Campbell, 'Agricultural Progress in Medieval England: Some Evidence from Eastern Norfolk', *Econ Hist Rev*, 2nd ser, XXXVI, 1983, pp 26–46; M Mate, 'Medieval Agrarian Practices: The Determining Factors', *Ag Hist Rev*, XXXIII, 1985, pp 22–31.

⁷ J Langdon, 'Horses, Oxen, and Technological Innovation: The Use of Draught Animals in English Farming from 1066 to 1500', unpublished PhD thesis, University of Birmingham, 1983.

⁸ For a discussion of manorial accounts etc see P D A Harvey, 'Agricultural Treatises and Manorial Accounting in Medieval England', *Ag Hist Rev*, XX, 1972, pp 170–82, and especially his editor's introduction to *Manorial Records of Cuxham, Oxfordshire circa 1200–1359*, Oxfordshire Records Society, 50, 1976.

demesnes, 60 per cent of them with fewer than five *compoti*.⁹ Not all counties are as well documented as this, and in the remote north-west and south-west of the country it takes much hard work in the archives to turn up any account rolls at all. But for England as a whole the total number of extant grange accounts is possibly in excess of 20,000. These are scattered through numerous public and private archives and it is from these Langdon has drawn his sample of 1565 accounts (including several which are available in print), providing him with information on 637 demesnes for the period 1250–1320 and 399 demesnes for the period 1350–1420. With more diligent searching and a larger sample size the geographical coverage of both these data-sets could undoubtedly have been improved.¹⁰ Yet it is unfair to quibble, for the achievement is considerable and the samples do yield a clear and consistent picture with the regional detail sketched in bold but simple strokes. More rigorously researched local and regional studies will no doubt refine this picture and add much detail, but it is unlikely that they will alter its basic outlines. In the long term the potential of this kind of approach is considerable, especially when harnessed to modern methods of data storage and analysis, for it is capable of transforming the scale and sophistication of analysis.¹¹ On the one hand, even the smallest and most miscellaneous scraps of evidence become usable; on the other, the opportunity exists to obtain a real insight into the organization

and development of the demesne economy at large.

Just as significant as the transformation of scale and method employed in this study is the equal attention which is bestowed upon both lords and peasants. Many researchers would have been tempted by the abundance of explicit and relatively straightforward information available for seignorial husbandry to shirk the responsibility of investigating that of the peasantry, for which available evidence is altogether more haphazard, equivocal, and limited. Instead, Langdon puts this documentary imbalance to advantage by using the strength of seignorial documentation to establish a comparative framework, within which the more scrappy and miscellaneous evidence available for the peasantry can be evaluated. As is plain, the trends thus established for the peasantry can never be as clear as those identified for the demesnes, but considerable confidence does attach to the relative relationship between them. Moreover, sources do exist which cast at least some light on peasant agriculture: inventories, lay subsidies, heriots, maintenance agreements, surveys, tithe returns, and extents. Langdon displays considerable resourcefulness in seeking out these data and thereby demonstrates the very real potential which exists for learning more about the husbandry of this neglected but crucial group.¹²

⁹ There is no official listing of these Norfolk accounts, although a handlist is available on application to the author. The accounts themselves are dispersed among twenty-five public and private archives.

¹⁰ A summary register of manorial records may be consulted at the National Register of Archives, Quality House, Quality Court, Chancery Lane, London. A search of this register showed that Langdon's sample could be considerably improved in such counties as Staffordshire, Shropshire, and Herefordshire. In Cornwall, Cheshire, Lancashire, Cumberland, Westmorland, and Northumberland, on the other hand, there is a genuine paucity of records.

¹¹ A computer analysis of seignorial agriculture in England 1250–1450 is currently in hand based upon data partly supplied by Dr Langdon. The results of this analysis will appear in my forthcoming book.

¹² Studies of the social and economic relations of the peasantry, by contrast, proliferate. Recent examples include Z Razi, *Life, Marriage and Death in a Medieval Parish: Economy, Society and Demography in Halesowen, 1270–1400*, Cambridge, 1980; R M Smith (ed), *Land, Kinship, and Life-cycle*, Cambridge, 1984; B A Hanawalt, *The Ties that Bind: Peasant Families in Medieval England*, Oxford, 1986; J M Bennett, *Women in the Medieval English Countryside: Gender and Household in Brigstock before the Plague*, Oxford, 1987; M K McIntosh, *Autonomy and Community: The Royal Manor of Havering, 1200–1500*, Cambridge Studies in Medieval Life and Thought, 5, 1987; A R DeWindt, 'Redefining the Peasant Community in Medieval England: The Regional Perspective', *Jnl Brit Stud*, 26, 1987, pp 163–207. Agricultural production on peasant holdings has received rather more attention on the continent, for instance: E Le Roy Ladurie and J Goy, *Tithe and Agrarian History from the Fourteenth to the Nineteenth Centuries: An Essay in Comparative History*, Cambridge, 1982; G Bois, *The Crisis of Feudalism: Economy and Society in Eastern Normandy c1300–1550*, Cambridge, 1984.

II

That methods of investigating medieval agriculture are now being transformed is timely, for there is a mounting body of evidence which suggests that the performance of the agrarian sector is itself due for reassessment. Until now there has been a strong tendency to regard the medieval rural economy as relatively undeveloped and undifferentiated. Insofar as different farming regions existed it is thought that they derived less from a process of economic differentiation arising from interaction with the market, than from the influence of ecological, cultural, and institutional features. They were formal rather than functional regions and reflected such things as natural resource endowment, field systems, culture and ethnicity, and the degree of manorialization.¹³ This view of the medieval rural economy tends to be most fully articulated by those who view it from the perspective of the sixteenth century. For instance, according to Dr J Langton:

the spatial system of medieval times, one of almost discrete local economies loosely linked through London, was transformed [after 1500] by the greater cohesion imposed by London's growth and by the inter-position of hierarchical steps and whole regional economies between the two old levels.¹⁴

Yet such a verdict sits increasingly uncomfortably with the available evidence, which suggests that the economy of *circa* 1300 had certain very important things in common with that of *circa* 1600.

In the first place, historical opinion increasingly favours a medieval population at peak – *circa* 1300 – equal to or greater

than the early seventeenth-century demographic maximum of 5.5 millions.¹⁵ This shift in opinion stems from a reassessment of the accuracy of the 1377 Poll Tax returns coupled with the steady accumulation of comparatively small pieces of evidence, all of which point to extremely high rural population densities in much of the country by the end of the thirteenth century.¹⁶ Scholars of the period have long been familiar with the notion that it was experiencing conditions of relative over-population, but that the population may have been absolutely so large raises obvious questions about the organization of the agricultural sector and, in particular, the extent to which it was geared towards exchange rather than self-sufficiency. The thirteenth century is now known to have experienced a tremendous proliferation of trading institutions, and in certain localities it has been shown that all members of rural society were deeply involved in the market nexus, with all that this implies about market specialization.¹⁷ The possibility that a more specialized and integrated pattern of food production and supply may have been evolving during the thirteenth century is lent further credibility by the revised population estimates which have recently been made of several of the larger medieval towns at this time. London, in particular, has been shown by Dr D Keene to have attained a maximum *circa* 1300 of at least 90–100,000 – twice the conventionally accepted estimate.¹⁸ The task of provisioning such a city, plus the other leading cities of the realm (whose accepted population

13 Studies which lay stress on these factors include H L Gray, *English Field Systems*, Cambridge, Mass, 1915; D C Douglas, *The Social Structure of Medieval East Anglia*, Oxford Studies in Social and Legal History, IX, 1927; G C Homans, *English Villagers of the Thirteenth Century*, Cambridge, Mass, 1941; W G Hoskins, 'Regional Farming in England', *Ag Hist Rev*, II, 1954, pp 3–11; J C Jackson, 'Regional Variations in Agriculture in Medieval England', *Northern Universities' Geographical Journal*, I, 1960, pp 41–53.

14 J Langton, 'Industry and Towns 1500–1730', Chapter 7 in R A Dodgshon and R Butlin (eds), *An Historical Geography of England and Wales*, 1978, p 194.

15 M M Postan, *The Medieval Economy and Society: An Economic History of Britain in the Middle Ages*, 1972, p 30; Miller and Hatcher, *op cit*, p 29; Hallam, *op cit*, pp 246–7; E A Wrigley and R S Schofield, *The Population History of England 1541–1871: A Reconstruction*, 1981.

16 For an up-to-date review of this evidence see: R M Smith, 'Human Resources in Rural England', Chapter 3 of G Astill and A Grant (eds), *The Medieval Countryside*, Oxford, forthcoming.

17 R H Britnell, 'The Proliferation of Markets in England, 1200–1349', *Econ Hist Rev*, 2nd ser, XXXIV, 1981, pp 209–221; K Biddick, 'Medieval English Peasants and Market Involvement', *Jnl Econ Hist*, XLV, 1985, pp 823–31.

18 D Keene, *Cheapside before the Great Fire*, London, 1985.

estimates must all now be open to doubt), cannot but have exercised an influence over a very extensive area.¹⁹ Certainly, the lure of such large-scale urban demand would help to account for the highly specialized and intensive demesne farming systems which are now known to have developed in certain parts of the country, systems which were more complex and technologically advanced than was previously thought possible at this date.²⁰

III

Langdon's work lends further support to the notion that English agriculture underwent important organizational changes during the course of the twelfth and thirteenth centuries, over and above the general expansion in production which it has long been accepted took place over this period. In the first place, a significant transformation was effected in the technology of traction and, more particularly, of haulage. At the time of Domesday horses provided little more than 5 per cent of total animal draught force on the demesne, and no more than 10 per cent in any of the regions for which there are figures. There are signs that the level of horses was already higher among peasant draught stock, but this cannot be quantified. In contrast, by the beginning of the fourteenth century horses accounted for at least 20 per cent of the animal draught force on demesnes and almost 50 per cent on peasant farms, and these figures exceeded 50 per cent and 75 per cent respectively in certain regions. The changeover from oxen to horses was greatest for hauling, to the extent that horses easily dominated the carriage of

goods by vehicle by the end of the thirteenth century.²¹ The horse's adoption into ploughing was less spectacular: mixed teams gained in popularity and some all-horse farms emerged, with progress being most pronounced on the smallest holdings. As Langdon acknowledges, the pace of innovation was comparatively slow, and must to some extent have been conditioned by the supply of animals, but the scale of the eventual transformation was no less considerable for that.

Substitution of the horse for the ox made particular progress in certain regions and played an important part in establishing regional variations in agriculture. This extended to more than just the adoption of horses *per se*, for it tended to encourage a shift from natural to produced fodder, and had an important influence upon the number and type of other animals kept. Among all regions it was East Anglia which stood in the van of progress. Here, a shift towards a greater use of horses was already taking place by the first half of the twelfth century and it was only towards the end of that century that horses began to be employed in increasing numbers in the Home Counties and the east midlands. The spread of horses was very much a diffusion process and in Norfolk – one of the counties where they appeared earliest and in which their adoption eventually proceeded furthest – account rolls are numerous enough, and survive from a sufficiently early date, to allow the process to be reconstructed in some detail. Table 1 and Figure 1 illustrate the changing ratio of oxen to horses in this county over the 200-year period 1250–1449 (these trends are derived from a survey of all extant Norfolk grange accounts).²² As Langdon

¹⁹ Norwich may have had a population of at least 18,000: T H Hollingsworth, *Historical Demography*, 1969, pp 363–4. The population of Winchester circa 1300 (approximately the 17th ranking town in the urban hierarchy) has been estimated at 10–12,000: D Keene, *Winchester Studies*, 2, *Survey of Medieval Winchester*, 1, part 1, 1985, pp 366–70.

²⁰ P F Brandon, 'Cereal Yields on the Sussex Estates of Battle Abbey during the Later Middle Ages', *Econ Hist Rev*, 2nd ser, XXV, 1972, pp 403–20; Campbell, *op cit*; Mate, *op cit*, 1985.

²¹ J Langdon, 'Horse Hauling: A Revolution in Vehicle Transport in Twelfth- and Thirteenth-Century England?', *Past & Pres*, 103, 1984, pp 37–66.

²² These results comprise part of a comprehensive analysis of Norfolk demesne farming which will be presented in full in my forthcoming book. I am grateful to J Orr for research assistance.

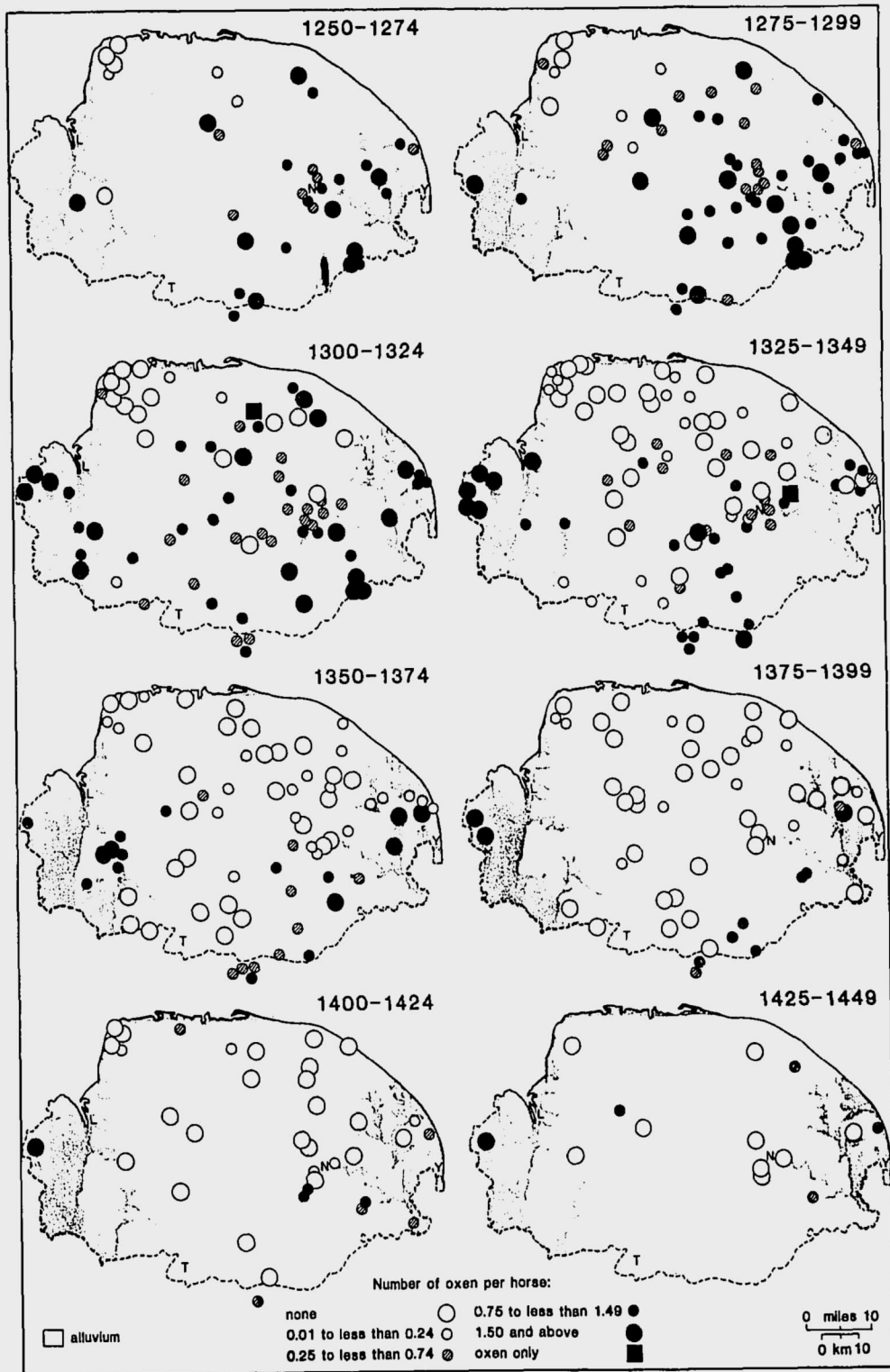


FIGURE 1
Norfolk: the changing ratio of oxen to horses, 1250-1449

TABLE 1
Mean Number of Oxen per Horse on Demesnes
in Norfolk and England, 1250-1449²³

Years	Norfolk	England
1250-1299	0.84	4.98
1275-1324	0.88	4.48
1300-1349	0.64	4.04
1325-1374	0.45	3.96
1350-1399	0.41	4.35
1375-1424	0.34	4.20
1400-1449	0.27	4.89

observes, horses seem first to have been utilized for farm traction on the light, dry soils of the extreme north-west of Norfolk. They are recorded in significant numbers here in the reign of Henry I on the Ramsey Abbey demesnes of Brancaster with Deepdale, Ringstead, and Holme-next-the-Sea.²⁴ As early as the mid-thirteenth century demesnes in this locality had converted to all-horse teams and in the county as a whole horses already significantly outnumbered oxen. In this respect Norfolk was far ahead of the rest of the country. At a national level oxen consistently outnumbered horses by at least four to one, and although horses steadily gained in relative numbers down to the mid-fourteenth century, they lost ground thereafter. In Norfolk, however, the advance of the horse experienced no such setback: demesnes converted first from all-ox teams to mixed teams, and then from mixed teams to all-horse teams. By the middle of the fifteenth century it was horses which outnumbered oxen by almost four to one. The stages by which this was achieved are shown in Figure 1; the areas which were most resistant to change tending to be those which were remotest from the initial source of innovation, especially where for-

age was abundant and soils were relatively heavy. Thus oxen remained in a majority on the demesnes of the Norfolk fenland throughout this two-hundred-year period, and they long retained an important role on the heavy soils of the south-east of the county, where mixed teams persisted throughout. Elsewhere, however, the horse was consistently in the ascendant and as its use spread so plough-teams got smaller. Towards the end of the fourteenth century, when demesne profits began to be squeezed by rising wage rates and depressed corn prices, small two-horse and one-man teams began to become a common sight on demesnes in all the lighter soil districts. It is probably no coincidence that in the mid 1390s Chaucer chose to sit Oswald, the reeve of Bawdeswell:

upon a ful good stot, that was all pomely grey and
highte Scot.²⁵

The figure of the reeve reminds us, as Langdon demonstrates quite emphatically, that the horse was much more a peasant than a demesne animal. Indeed, it is the medieval peasant, for long regarded as too backward and under-capitalized a creature to have made much contribution to the development of agriculture and the raising of its productivity, who emerges from this study as technologically the most active member of medieval society. Some recent research has suggested that this might have been the case but until now the necessary hard evidence has been lacking.²⁶ Patently, the economics of peasant small-holdings were very different from those of seignorial demesnes, hence the differential which is apparent from the very beginning in the respective rates at which the work horse was adopted. Whether or not the same applied to other aspects of contemporary

²³ The results for England have been recalculated from Langdon's original, unpublished data. I am very grateful to him for supplying these to me. These figures indicate a proportion of working horses *circa* 1300 lower than that calculated by Langdon and, contrary to his impression, some reduction in work-horse levels after 1350.

²⁴ *Horses, Oxen and Technological Innovation*, p. 43.

²⁵ J. Winny (ed.), *The General Prologue to the Canterbury Tales*, Cambridge, 1966, p. 70, lines 617-18.

²⁶ Campbell, *op cit*, pp. 39-41. The view that output per acre on peasant holdings was less than that obtained by a well-managed demesne in the same locality, is stated most explicitly in Postan, *op cit*, 1966, p. 602.

technology now becomes an open question and it is time that it was addressed. Certainly, a more innovative, dynamic, and productive peasant sector would go a long way towards explaining how medieval demographic and urban growth managed to proceed as far as they did; for it was peasant cultivators who tilled the greater part of the land in medieval England.

For Langdon, all of these developments – technological change, the emergence of regional variation, and the greater innovativeness of the peasantry – are ultimately explicable in terms of changes in the market economy. Lords and peasants were both increasingly drawn into this economy during the twelfth and thirteenth centuries and this seems to have been the incentive which promoted the substitution of the quicker but costlier horse for the cheaper but slower ox. The rise of horse-hauling proceeded concurrently with the rise of the market economy, since horse haulage increased the speed and range of market transactions. The resultant increased circulation of goods should have been a direct stimulant to the economy and undoubtedly helped to sustain the urban growth which is such a conspicuous feature of the period. In the case of horse traction, this was associated with increasing regional differentiation and the evolution of farming systems of differing degrees of intensity. This is symptomatic of a market system of growing sophistication in which land use and its intensity are increasingly a function of economic rent. The progressive diffusion of the horse, therefore, derived not just from the expansion of the economy but from the fact that the economy was also becoming more integrated and complex.

IV

The problem is to establish the precise contribution which greater use of horses made to this general economic process of

expansion and elaboration. On the face of it the economic benefits of horse haulage seem clear enough. Other things being equal the more rapid transit of goods should have reduced transport costs, extended the sphere of the market, and increased the rate of circulation. The only problem is that the heavy, oat-fed cart horse favoured on many demesnes was extremely costly to maintain. On the estates of Peterborough Abbey, for instance, Dr Biddick has calculated that in the opening decade of the fourteenth century more was invested in cart horses and transport (fodder, shoeing, maintenance of carts, wages of carters etc) than was made in wool sales – the abbey's principal cash crop – from its flock of 4000–9000 sheep.²⁷ Of course, on many demesnes and virtually all peasant holdings ordinary working horses served the dual function of traction and haulage, and this would have helped to keep transport costs down, but the fact remains that improved haulage was frequently only obtained at a high financial price.

When it comes to the advantages of horse traction Langdon is at something of a loss, since he can find little evidence that greater use of horses led to an improvement in agricultural productivity. Improved speeds of ploughing (the horse could work up to 50 per cent faster than the ox) may have led to some reduction in costs and hence an improvement in profit margins, since the same amount of work could be done by fewer animals, but there is no evidence that higher yields were ever a significant outcome. Of itself this is hardly surprising, since the method of traction had no direct bearing upon the fertility of the soil. Had Langdon considered the issue of productivity in all its aspects, however, he would have realized that one of the main benefits of replacing oxen with horses was the greater intensity

²⁷ K Biddick, *The Economy which was not One: Pastoral Husbandry on the Estate of Peterborough Abbey*, forthcoming.

of cultivation which it allowed. One of the most effective ways of expanding arable output was not to raise yields but to crop the land more frequently.²⁸ This meant reducing fallows to a bare minimum and utilizing them solely as a means of cleansing the land of weed growth (by means of repeated summer ploughings). Since fallows no longer supplied forage the cultivation of fodder crops became unavoidable. Because this imposed a significantly increased workload on the labour force it became important to convert that fodder into traction with the maximum degree of efficiency; hence the substitution of the horse for the ox.²⁹ Such a changeover was also encouraged by the fact that the greater intensity of cropping meant a much more demanding ploughing schedule with, often, a major seasonal imbalance between autumn and spring. Intensive arable regimes such as these had evolved in both Norfolk and Kent by the end of the thirteenth century and in both areas demesnes employed either mixed or all-horse teams.³⁰

Furthermore, grain output is not the only element in agricultural productivity, and it is important not to overlook the gains which may have accrued to the livestock sector from greater use of the horse. Most medieval farms were mixed farms. Except on the very smallest holdings animals were essential to provide haulage and traction and resources accordingly had to be devoted to their upkeep as well as to the maintenance of breeding stock to supply replacements. Only after these needs had been satisfied could additional animals be

kept exclusively for their meat, dairy produce, fleeces or hides. Since horses worked faster than oxen fewer resources therefore needed to be reserved exclusively for the maintenance of the plough. Fodder and especially forage could be diverted to the use of other stock, allowing higher stocking densities (with consequent benefits for the arable in terms of increased manure supplies) and the development of much more specialized forms of livestock production. Langdon, it is true, recognizes this possibility and speculates that it may well account for the prominence of horses in Essex, whose heavy soils might otherwise have led oxen to be preferred.³¹ As he points out, London's voracious demand for meat may have encouraged farmers in the Home Counties and East Anglia to sell their ploughing and hauling oxen as meat cattle and to replace them with horses instead. Thereafter, female cattle would have been retained as breeding and milking stock and the unwanted bullocks used to supply the meat demands of the metropolis. This explanation works very well and can be applied to a much more extensive geographical area, as is borne out by a general analysis of the demesne livestock population in the country as a whole.

Figure 2 illustrates the broad regional variations which existed in the composition of demesne livestock during the period 1250-1349, on the basis of a national sample of 741 demesnes. Much of the relevant data was supplied by Langdon himself and this has been supplemented by additional material drawn from various published and unpublished sources (including original account-roll information relating to 126 demesnes in Norfolk).³² Map A shows the number of oxen per horse whilst

²⁸ M Overton, 'Agricultural Revolution? Development of the Agrarian Economy in Early Modern England', Chapter 4 in A R H Baker and D Gregory (eds), *Explorations in Historical Geography: Interpretative Essays*, Cambridge, 1984, pp 125-7; B M S Campbell, 'Arable Productivity in Medieval England: Some Evidence from Norfolk', *Jnl Econ Hist*, XLIII, 1983, pp 379-404.

²⁹ For an elaboration of this point see E Boserup, *The Conditions of Agricultural Growth*, London, 1965, pp 35-39.

³⁰ Campbell, *op cit*, 1983 ('Agricultural Progress'); R A L Smith, *Canterbury Cathedral Priory*, Cambridge, 1943; Mate, *op cit*, 1985.

³¹ *Horses, Oxen and Technological Innovation*, pp 261-2; for the involvement of one Essex community in livestock production for the metropolitan market see McIntosh, *op cit*.

³² Again, I am grateful to Dr Langdon for making his original research notes available and to G Alexander, J Orr, and J Power for research assistance. A fuller discussion of these and other results will appear in my forthcoming book.

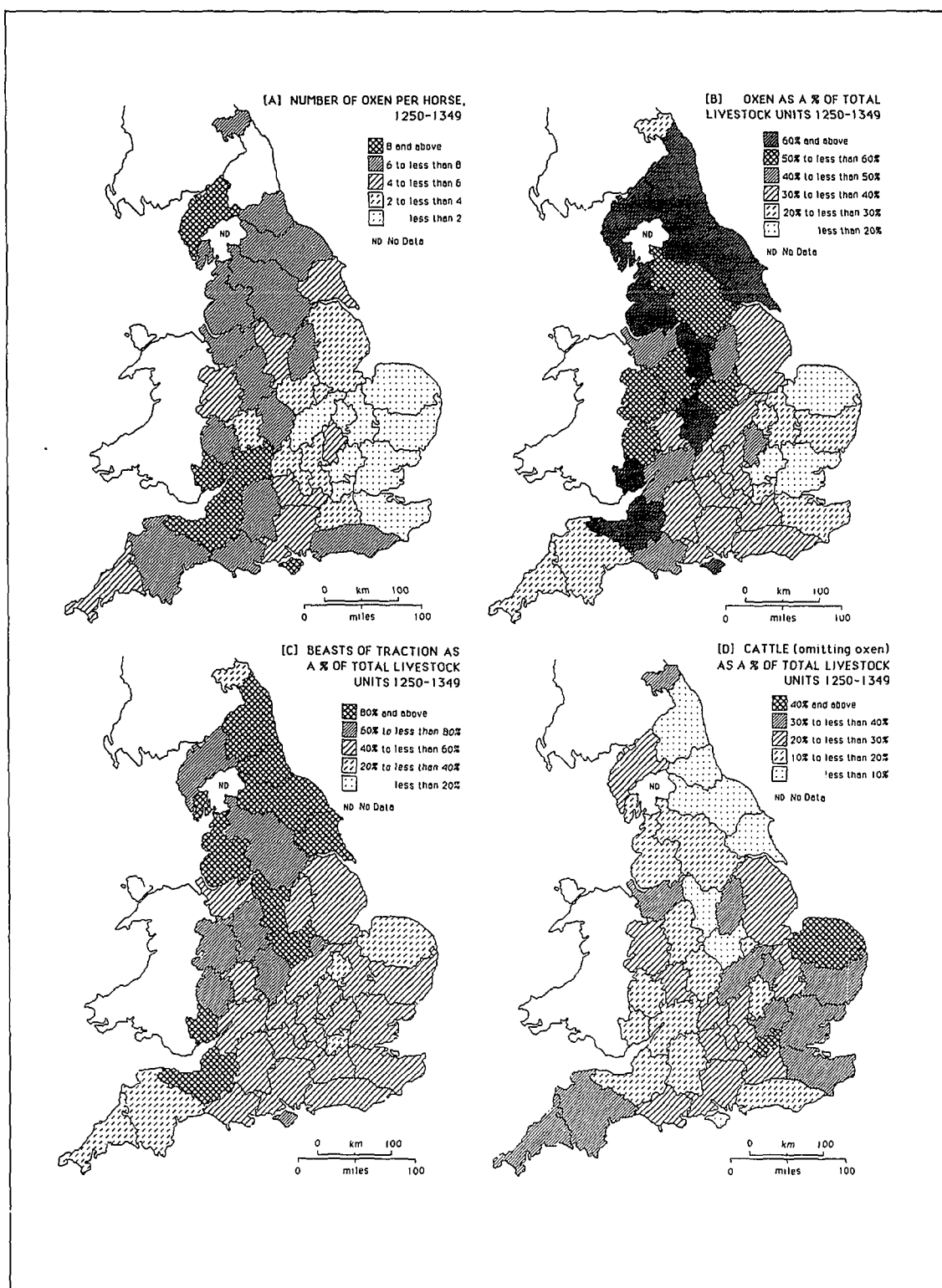


FIGURE 2

Maps B, C, and D show, respectively, oxen, beasts of traction, and cattle (omitting oxen), as a percentage of total livestock units (the latter calculated using a weighting of 1.0 for horses, oxen, and cattle, and 0.1 for sheep and swine).³³ The patterns thus revealed should not be regarded as definitive, but they do suggest a number of highly significant relationships. In particular, it was in the most horse-dominated counties – notably Norfolk, Essex, and Hertfordshire – that oxen were least in evidence and beasts of traction (ie horses plus oxen) accounted for the smallest proportion of total livestock. Non-working animals made up over 60 per cent of all demesne livestock in these counties, with breeding and dairying herds especially to the fore.³⁴ There were other parts of the country where the ratio of livestock to crops was higher, but very few where non-working animals assumed such relative importance. East Anglia and the Home Counties are popularly perceived as arable districts *par excellence*, yet at the beginning of the fourteenth century they supported highly intensive mixed farming systems in which cattle assumed a unique prominence. In this respect, the outstanding position of cattle in the livestock economies of Middlesex and Norfolk speaks eloquently of the influence of urban demand from London and Norwich.³⁵ The ox may have dominated in the north and

west, but the south and east was the preserve of the horse and cow. Indeed, this regional pattern suggests that the more pastoral counties of the extreme north-west and south-west were serving as reservoirs of working animals for those counties further south and east which could not satisfy their own breeding requirements.³⁶

Contrary to Langdon's conclusion, adoption of the horse does therefore seem to have allowed the evolution of more intensive and productive mixed husbandry systems, with consequent benefits for the economy. Such systems naturally incurred considerable costs; hence they only developed when justified by the prevailing level of economic rent.³⁷ This helps to explain why they were so clearly orientated towards the main centres of urban demand, as well as why diffusion of the horse remained so geographically circumscribed. Nor did the productivity benefits of horse traction necessarily end there, for at least as important as the physical productivity of the land was the relative productivity of labour.

In all pre-industrial economies the limits to economic growth were set by the productivity of labour in agriculture. It was output per person rather than output per acre that determined the release of resources – food supplies, raw materials, labour, and capital – to other sectors of the economy. Direct measures of labour productivity are hard to obtain (although demesne accounts contain much of the necessary information); hence indirect measures are normally preferred. Of these, the level of urbanization is the one most

³³ These weightings are based on those used by J T Coppock, *An Agricultural Atlas of England and Wales*, 1964, p 213; J A Yelling, 'Probate Inventories and the Geography of Livestock Farming: A Study of East Worcestershire, 1540-1750', *Trans Inst Brit Geog*, 51, 1970, p 115; an equivalent method is used in R C Allen, *The 'Capital Intensive Farmer' and the English Agricultural Revolution: A Reassessment*, Department of Economics, University of British Columbia, Discussion Paper No 87-11, 1987, pp 27-33. For alternative weightings see J Z Titow, *Winchester Yields*, Cambridge, 1972.

³⁴ An analysis of herd demography in these counties reveals a strong bias towards female, adult animals (Campbell, forthcoming).

³⁵ In Norfolk demesnes with well-developed cattle herds were especially prominent in a belt of country approximately 5-15 miles north of Norwich. Examples include Alderford, Attlebridge, Hainford, Haveringland, Hevingham, Kerdiston, Marsham, and Wroxham.

³⁶ C Skeel, 'The Cattle Trade between Wales and England from the Fifteenth to the Nineteenth Century', *Trans Roy Hist Soc*, 4th ser, IX, 1926, pp 137-8; R Cunliffe Shaw, *The Royal Forest of Lancaster*, Preston, 1956; Davies, *op cit*, pp 115-16. The presence of surplus oxen, reared for trade, may lead Langdon to over-estimate mean plough-team size in some of the counties of the extreme north and west.

³⁷ On the effect of economic rent upon land-use and farming intensity see M Chisholm, *Rural Settlement and Land-use: An Essay on Location*, London, 1962, especially Chapter 2, 'Johann Heinrich von Thunen', pp 20-32.

commonly used. It is on this basis that E A Wrigley has recently demonstrated that English agriculture experienced a marked increase in labour productivity during the late seventeenth and eighteenth centuries, with the result that the urban population rose from 8.0 per cent of the total in 1600 to 27.5 per cent in 1801. No such estimates have yet been made for the Middle Ages, and the uncertainty surrounding all population estimates for this period may mean that they are never possible. Yet the twelfth and thirteenth centuries do afford clear evidence of urban growth and there can be little doubt that society was more urbanized by the end of this period than it had been at the beginning. This is certainly a development to which more widespread use of the horse may have made an indirect contribution. Regardless of whether yields rose, labour productivity in agriculture should have risen, simply because adoption of the horse would have enabled existing tasks to be performed faster. This effect was even more pronounced when the number of ploughmen was reduced from two to one, a development which was already taking place in a few localities at this time and which can be presumed to have been especially characteristic of peasant holdings.

V

The technology of haulage and traction is, for even more reasons than those advanced by Langdon, a subject of central importance to our understanding of the medieval economy. This book tells us much about how that economy developed and affords

new insights into the process of medieval technological change. Along the way it also has a lot of useful things to say about such secondary matters as the incidence of coaration, the size of plough teams, types of plough, and the various forms of farm vehicle and their distributions. It represents a major new methodological departure and draws attention to several major areas where further research is needed. Obviously, the whole question of livestock productivity should be high on future research agendas.³⁹ So, too, should urban food supply in general and interregional trade in animals in particular, since there is a very real possibility that certain aspects of livestock production were organized at a national level, with the major centres of urban demand the ultimate focus. Moreover, much more needs to be known about regional farming systems and the place of haulage and traction within them. Several technical mysteries also remain, notably whether reductions in plough-team size and the eventual introduction of one-man ploughs were contingent upon further refinements in plough design and the breeding of stronger animals. Finally, Langdon's data are tantalizingly thin for the later Middle Ages, a period which may have witnessed significant changes in the use of horses and oxen. During the fifteenth century some farms, he believes, went over completely to horses whereas others bolstered the use of oxen. Since this runs counter to expectations, and to the trend implied by the ox:horse ratio given in Table 1, it would clearly repay closer investigation. The potential for further research is therefore considerable and it is a tribute to the scholarship of this book that this should emerge so clearly.

³⁸ E A Wrigley, 'Urban Growth and Agricultural Change: England and the Continent in the Early Modern Period', *Jnl Interdisciplinary Hist.* XV, 1983, pp 683-728. Also, R C Allen, *The Growth of Labour Productivity in Early Modern English Agriculture*, Department of Economics, University of British Columbia, Discussion Paper No 86-40, 1986.

³⁹ The only systematic treatment of medieval livestock husbandry remains R Trow Smith, *A History of British Livestock Husbandry to 1700*, London, 1957.