THE AGRICULTURAL HISTORY REVIEW



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This volume contains a complete transcript of this important document with an introductory essay which places it, and its author, in context. It will be essential reading for all those interested in the development of husbandry techniques, and the organisation of farming, in eighteenth-century England.

Susanna Wade Martins is a Research Associate at the Centre of East Anglian Studies at the University of East Anglia. She is the author of numerous books on agricultural history and the farming landscape, including *A Great Estate at Work* (Cambridge 1980) and *Historic Farm Buildings* (Batsford 1991).

Tom Williamson is a lecturer at the Centre of East Anglian Studies, and has written widely on landscape archaeology and local history. His latest book is *Polite Landscapes: Gardens and Society in Eighteenth-Century England* (Alan Sutton 1995).

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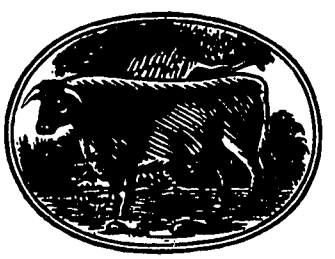
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edited by
A D M PHILLIPS and D G HEY

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Re-establishing the English Agricultural Revolution*

By MARK OVERTON

Abstract

This paper makes a case for re-establishing the eighteenth and early nineteenth centuries as a crucial period of agricultural advance in England worthy of the description 'agricultural revolution'. It therefore counters the stream of claims made since the 1960s that developments in earlier centuries were of more significance. The two key indicators of progress are taken to be, first, an unprecedented increase in agricultural output brought about by an equally unprecedented increase in land productivity, and, second, an unprecedented increase in labour productivity which was a necessary corollary to industrialization. New evidence is presented to demonstrate that these changes were mainly a feature of the period from 1750, and, although the seventeenth century was not devoid of developments in agricultural technology, it was not until the late eighteenth and early nineteenth that these and other developments came to fruition in an 'agricultural revolution'.

For many years the fortunes of English agriculture from the early modern period onwards have been discussed in terms of the existence or otherwise of particular 'agricultural revolutions'. Periods of 'revolutionary' change have been identified for at least five periods between 1560 and 1880, and each has been characterized by a different combination of 'significant' agricultural developments. Debate about the character and chronology of these 'revolutions' has reached something of an impasse in recent years, partly because they have not been backed up by sufficient quantitative evidence, and partly because too little attention has been given to the criteria by which the 'significance' or otherwise of agricultural change should be judged. Yet the substantive issues with which the debate has been concerned remain of central importance to understanding the development of both English agriculture and the English economy.[1]

Of the various periods under consideration, it is remarkable that the least popular contender for the title of 'agricultural revolution' is the century after 1750. This period was identified by an early generation of agricultural historians as the period of the 'agricultural revolution', and subsequently by Chambers and Mingay in their influential textbook published in 1966.[2] However, most contributors to the debate have emphasized the significance of earlier periods. Kerridge considered that 'the agricultural revolution dominated the period between 1560 and 1767 and that all its main achievements fell before 1720, most of them before 1673, and many of them much earlier still'.[3] Writing in the 1960s Jones considered that from the mid-seventeenth century 'English agriculture underwent a transformation in its techniques out of all proportion to the rather

* A version of this paper was presented to the Spring Conference of the British Agricultural History Society, Durham, April 1994. I am grateful to the anonymous referees of this paper for their constructive comments.

[1] Recent reviews of the agricultural revolution include Mark Overton, 'Agricultural revolution? Development of the agrarian economy in early modern England', in A R H Baker and D Gregory, eds, *Explorations in Historical Geography: Interpretative Essays*, 1984, pp 118–39; *idem*, 'Agriculture', in John Langton and R J Morris, eds, *Atlas of Industrializing Britain 1780–1914*, 1986, pp 34–53; J V Beckett, *The Agricultural Revolution*, Oxford, 1990; Mark Overton, 'Agricultural revolution? England, 1540–1850', in A Digby and C H Feinstein, eds, *New Directions in Economic and Social History*, 1989, pp 9–21. Further development of some of the arguments in this paper will be found in Mark Overton, *Agricultural Revolution in England: The Transformation of the Agrarian Economy, 1500–1850*, 1996.

[2] R E Prothero, *English Farming Past and Present*, 1912; P Mantoux, *The Industrial Revolution in the Eighteenth Century*, 1928, pp 156–61; J D Chambers and G E Mingay, *The Agricultural Revolution, 1750–1880*, 1966.

[3] E Kerridge, *The Agricultural Revolution*, 1967, p 328.

limited widening of the market', and 'If there was a revolutionary phase it ... had come during the Commonwealth and Restoration periods', and his conclusions were reinforced by the work of John.[4] Thus Wallerstein, in his survey of the secondary literature published in 1980, found a 'widespread historiographic impression that England had an agricultural revolution *circa* 1650 to 1750'.[5] The verdicts on agrarian developments from the sixteenth century in the authoritative Cambridge *Agrarian Histories*, published during the 1980s, have done nothing to clarify matters. *Volume V* concludes that for the century after 1650 a depression in grain prices prompted innovation and enterprise, but the full harvest of this ingenuity in the form of an 'agricultural revolution' was not reaped until after 1750.[6] On the other hand, the succeeding *Volume VI*, dealing with the period 1750–1850, considers that although the agricultural changes in the century after 1750 were remarkable, 'It could hardly be said that they amounted to an agricultural revolution', since they were a limited preparation for the greater changes yet to come.[7]

In the 1990s, two important contributions have reinforced the view that the 'agricultural revolution' was a phenomenon of the period before 1750. Allen has argued that what he calls the yeoman's agricultural revolution occurred mainly in the seventeenth century: 'most of the productivity growth in early modern England was accomplished by small farmers in the open fields during the seventeenth century' and was marked by a 'doubling of corn yields', whereas the eighteenth century saw a landlord's revolution through enclosure which did not increase output but redistributed income from farmers and labourers to landlords.[8] Finally, Clark in a general discussion of the 'agricultural revolution' has concluded, 'There was no agricultural revolution between the early eighteenth and mid nineteenth centuries', and offers the extraordinary opinion that 'the finding of little productivity growth in agriculture from 1700 to 1850 is consistent with all of the reliable information we have for agriculture in this period'.[9]

There is some very recent evidence to suggest that the tide is starting to turn against this revisionism. In a recent paper on Norfolk it was argued that 'it is the period after 1740 that clearly emerges as having undergone the most rapid and profound transformation of technology and productivity',[10] and for the same county it has also been claimed that for the thirty years after 1790 'an almost complete break with the past was made over the working lives of one generation of farmers'.[11] More importantly, perhaps, Devine has recently argued that 'there was a radical departure from the pattern of the past in the last quarter of the eighteenth century' in the agriculture of lowland Scotland.[12] Scotland is not England, but agricultural practice in the lowlands was not unrelated to that in parts of England. In this paper I shall argue

[4] E L Jones, 'Agriculture and economic growth in England, 1660–1750: agricultural change', *Jnl Econ Hist*, XXV, 1965, p 1; *idem*, 'Agriculture, 1700–80', in R Floud and D McCloskey, eds, *The Economic History of Britain since 1700*, 1981, p 85. John's contributions include, A H John, 'The course of agricultural change, 1660–1760', in L S Pressnell, ed, *Studies in the Industrial Revolution*, 1960, pp 125–55; *idem*, 'Agricultural productivity and economic growth in England, 1700–1760', *Jnl Econ Hist*, XXV, 1965, pp 19–34; *idem*, 'Aspects of economic growth in the first half of the eighteenth century', *Economica*, new ser, 28, 1961, pp 176–90.

[5] I Wallerstein, *The Modern World-System II*, 1980, p 263.

[6] J Thirsk, ed, *The Agrarian History of England and Wales, V, 1640–1750: Part II, Agrarian Change*, 1985, pp xxx-xxxi.

[7] G E Mingay, ed, *The Agrarian History of England and Wales, VI, 1750–1850*, 1989, pp 953, 971.

[8] R C Allen, 'The two English agricultural revolutions, 1450–1850', in Bruce M S Campbell and Mark Overton, eds, *Land, Labour and Livestock: Historical Studies in European Agricultural Productivity*, Manchester, 1991, p 236; *idem*, *Enclosure and the Yeoman. The Agricultural Development of the South Midlands 1450–1850*, 1992, p 21.

[9] G Clark, 'Agriculture and the industrial revolution, 1700–1850', in J Mokyr, ed, *The British Industrial Revolution: An Economic Perspective*, 1993, pp 246, 249.

[10] Bruce M S Campbell and Mark Overton, 'A new perspective on medieval and early modern agriculture: six centuries of Norfolk farming, *c.*1250–*c.*1850', *Past and Present*, no 141, 1993, p 105.

[11] Susanna Wade Martins, 'From black-face to white-face – an aspect of the agricultural revolution in Norfolk', *Ag Hist Rev*, 41, 1993, p 30.

[12] T M Devine, *Transformation of Rural Scotland: Social Change and the Agrarian Economy, 1660–1815*, Edinburgh, 1994, p 165.

the case that the years from *c* 1750 to *c* 1850 witnessed unprecedented changes in output and productivity in English agriculture, which warrant appellation of the term 'revolution'.

In attempting to re-establish the case for an agricultural revolution during this period, I shall first examine the evidence of changes in output and of the productivity of land from the sixteenth century onwards; second, discuss the evidence of husbandry developments which may have contributed to these changes; third, provide some evidence of changes in labour productivity; fourth, briefly review the hypotheses that might account for changes in labour productivity; and finally, in the light of this evidence, offer some criticisms of recent revisionist interpretations of the 'agricultural revolution'.

I

Resolution of the question as to whether or not an 'agricultural revolution' took place during a particular period is both a conceptual and an empirical issue. Whether or not agricultural developments in particular periods are interpreted as revolutionary depends on how the concept of an 'agricultural revolution' is defined. Three sets of criteria can be identified in the literature as implicitly or explicitly constituting the grounds for claiming an 'agricultural revolution'. The first of these embraces a wide variety of changes in farming techniques. These range from the introduction of new fodder crops and new crop rotations, the watering of meadows, the improvement of livestock breeds, and the introduction of machinery.[13] The second is the fact that English agriculture was successful in responding to the challenge of feeding a growing population, an argument that has been employed for the sixteenth and early seventeenth centuries, and for the century after 1750.[14] The third is the view that an 'agricultural revolution' is best characterized as an increase in output brought about by improvements in productivity, where productivity is defined as output per unit of input. Indices of productivity vary depending on the combinations of inputs and outputs employed. The two most important agricultural inputs, and therefore the two most important productivities, are land and labour.[15] Grigg first stressed the importance of productivity change as an indicator of an 'agricultural revolution', and it has been accepted by most recent writers, including both Allen and Clark.[16] Earlier writers, however, have been rather reluctant to engage with concepts of productivity *explicitly*; their 'agricultural revolutions' are *implicitly* based on productivity change, although their concepts of agricultural productivity are woolly and ill-defined: for example, the productivity of land is often misleadingly equated with grain yields per acre (often for wheat alone) while discussions of the productivity of labour have been subsumed in the issue of the 'release' of labour from the agricultural to the industrial sector of the economy during the industrial revolution.[17]

It could be argued that these three conceptions of an 'agricultural revolution' are

[13] These are reviewed in Overton, 'Agricultural revolution? Development of the agrarian economy', pp 119–23.

[14] Chambers and Mingay, *Agricultural Revolution*, pp 3–4; Kerridge, *Agricultural Revolution*, p 332; G E Mingay, 'Dr. Kerridge's "Agricultural Revolution": a comment', *Ag Hist*, 43, 1969, p 497; R B Outhwaite, 'Rural England, 1500–1750', *Histoire Sociale – Social History*, 2, 1968, pp 85–97.

[15] Agricultural productivity is discussed in Mark Overton and Bruce M S Campbell, 'Productivity change in European agricultural development', in Campbell and Overton, *Land, Labour and Livestock*, pp 1–50. Eric Partridge, *Usage and Abusage: A Guide to Good English*, Harmondsworth, 1969, p 247 writes, '**productivity** is a horrible word; use output'. The first part of the statement may be correct but the second is not: productivity and output are not equivalent.

[16] D B Grigg, *The Agricultural Revolution in South Lincolnshire*, 1966, pp 190–1; Allen, *Enclosure and the Yeoman*, p 1; Clark, 'Agriculture and the industrial revolution', p 229; Overton, 'Agricultural revolution? England, 1540–1850', pp 18–19.

[17] For a discussion of confused conceptions of labour productivity see N F R Crafts, 'Income elasticities of demand and the release of labour by agriculture during the British industrial revolution', *Jnl European Econ Hist*, 9, 1980, pp 167–8.

rather narrow: they are concerned primarily with changes in the methods and techniques for producing food, with what Marx called the 'forces of production'. A wider conception of an 'agricultural revolution' would link these to changes in what he called the 'relations of production', which other writers sometimes refer to as institutional change. These issues are concerned with the establishment of private property rights to land, the replacement of feudal tenures and estates with leaseholds for a period of years, changes in the size of farms, and changes in the ways in which people were employed by others on the land. Yet a further way of looking at the issue would be in terms of the role of agriculture in the world-economy: when, in the nineteenth century, the English food supply network became global. However, in one sense at least this paper follows a conventional path since it is concerned with production and not primarily with distribution, institutional change, or the world-economy.[18]

In terms of the argument presented here, the twin achievements of the agricultural sector before 1850 of most significance are, first, the increase in output which was sufficient to break the 'Malthusian trap' and allow population to expand beyond the pre-industrial ceiling, and second, the increase in the productivity of labour in agriculture which was a necessary precondition for industrialization. If we take a very long term perspective – from the advent of sedentary agriculture in the neolithic period until well into the seventeenth century – output per unit of both land and labour was generally low and always prone to decline. In the absence of technological progress, agricultural output could only be raised by increasing inputs of land or labour or both. If new land was brought into cultivation thus raising output, it tended to be of lower quality than that already being farmed; therefore output per acre of the new land would be lower, which would bring down the average output per acre of all land being farmed. Similarly, output could rise if more labour was expended in growing crops, particularly for tasks like weeding. Although output might rise, output per worker would probably fall since the extra output secured by the additional labour would be less than the average output produced by each existing worker.[19]

From 1250 to about 1700 the population of England was unable to exceed a maximum of about 5.5 million. Whenever population grew – in the late thirteenth century or in the late sixteenth and early seventeenth centuries – it was unable to break through this ceiling. Although grain yields rose under pressure of this population growth, they too were unable to break through a ceiling of about 18 bushels per acre for wheat. Malthus' argument was broadly correct: the supply of agricultural products was limited by the area cultivated. Once all available land is cultivated then an output ceiling is set which limits the size of the population. This was Gregory King's assumption in the final decade of the seventeenth century when he made a forecast of English population growth. He was roughly correct in estimating English population at 5.50 million in the 1690s (in fact it was probably nearer 5.06 million), but thereafter his forecasts were increasingly wide of the mark: he forecast 6.42 million for 1800 (it was in fact 8.66 million) and 7.35 million for 1900 (in fact 30.51 million).[20]

King's forecasts were wrong because he failed to predict the agricultural revolution.

[18] Overton, 'Agricultural revolution? England, 1540–1850', p 19, discusses some institutional changes.

[19] Overton and Campbell, 'Productivity change in European agricultural development', pp 17–28.

[20] King's figures are reported in C Whitworth, ed, *The Political and Commercial Works of Charles d'Avenant*, 5 vols, 1771, vol 2, p 177. The relationship between the rate of growth of population and the rate of growth in food prices suggests that the 25-year period after 1786 marks a crucial turning point for agricultural production: see E A Wrigley and R S Schofield, *The Population History of England 1541–1871: A Reconstruction*, 1981, pp 402–12.

Technological change in agriculture enabled both output and land productivity to make a fundamental break with the past: population rose above 5.5 million in the late 1730s and continued to rise, and average English wheat yields rose above 18 bushels per acre by 1800 and continued to rise towards 30 bushels per acre by the mid-nineteenth century. At the same time, this increasing output was achieved by a declining *proportion* of the work-force; in other words the productivity of labour was rising as well, which is, of course, the necessary corollary of an industrial revolution defined as an increase in the proportion of the work-force in industry.[21] By 1800 England was unique in the world in having only about 30–35 per cent of its work-force engaged in agriculture.[22] The point is not about whether agricultural employment grew or declined in absolute terms, or whether there was a movement of people from the countryside to the towns, but whether more food was produced by each person working in agriculture.

II

Defining the changes in the agricultural sector of the economy which are held to be significant in this way sets the empirical agenda: the measurement of output and productivity. The absence of national statistics for either before 1850 obviously calls for some ingenuity in undertaking this task: three strategies are adopted in Table 1. The first method (referred to as 'population' in the table) takes the size of the population as an indicator of agricultural output, assuming constant consumption per head, but making allowance for exports and imports. This modification of population numbers with assumptions about exports and imports is essentially the procedure adopted by Deane and Cole in their estimates of agricultural output, although their population estimates have been superseded and their import figures refined.[23] The second method ('volume') employs direct estimates of the volume of output using a wide range of sources and is based mostly on the work of Chartres and Holderness in the Cambridge *Agrarian Histories*.[24] These estimates are based on information recorded by contemporaries, assumptions about the per capita consumption of various products, and scattered information from farm-based evidence. In some cases contemporary estimates have been revised and informed guesses have been used to interpolate the gaps. The revisions are often based on the evidence of population growth, assumptions about per capita consumption, and the progress of agricultural technology, which introduces a degree of circularity into their construction. Thus these volume output figures must be subject to quite a wide margin of error and are not independent of output estimates based on population growth. In addition, the interpolation of gaps in the time series may have the effect of smoothing over fluctuations. The third method ('demand equation') is that used by Crafts who points

[21] The productivity of labour is defined here as the output of agricultural products divided by the proportion of the work-force engaged in agriculture.

[22] G Grantham, 'The growth of labour productivity in the production of wheat in the *Cinq Grosses Fermes* of France, 1750–1929', in Campbell and Overton, *Land, Labour and Livestock*, p 341; Clark, 'Agriculture and the industrial revolution', p 228.

[23] P Deane and W A Cole, *British Economic Growth, 1688–1959*, 2nd edn, 1967, pp 64–75. For further details on these estimates see M Overton, 'Land and labour productivity in English agriculture, 1650–1850', forthcoming in Peter Mathias and John A Davis, eds, *The Nature of Industrialization, V, Agriculture and Industrialization*, 1994. Population figures are from Wrigley and Schofield, *Population History*; import and export estimates are from a variety of sources and are very rough; they make an allowance for imports from Scotland, Wales and Ireland.

[24] The combined value of the output of wheat, rye, barley, oats, potatoes, mutton, beef, pork, milk, butter, cheese, wool, tallow, and hides based on the estimates in J C Chartres, 'The marketing of agricultural produce', in Thirsk, *Agrarian History of England and Wales, V, Part II*, pp 406–502; Gregory King's estimates in J Thirsk and J P Cooper, eds, *Seventeenth Century Economic Documents*, 1972, pp 782–3; and B A Holderness, 'Prices, productivity and output', in Mingay, *Agrarian History of England and Wales, VI*, pp 84–189. Prices are from G Clark, 'Labour productivity in English agriculture, 1300–1860', in Campbell and Overton, *Land, Labour, and Livestock*, pp 215–6 and A H John, 'Statistical appendix', in Mingay, *Agrarian History of England and Wales, VI*, pp 974–1009.

TABLE 1
English agricultural output and productivity

	1300	*1600*	*1700*	*1750*	*1800*	*1850*
A) Output						
Output (population method)		80	100	121	159	272
Output (volume method)			100	127	191	285
Output (demand equation method)			100	143	172	244[a]
B) Area						
Arable area			100		128	170
Sown arable area			100		135	199
Meadow and pasture			100		147	103
Total area			100		138	132
C) Land Productivity						
Land productivity (population)			100		115	207
Land productivity (volume)			100		138	216
Crop productivity[b]	3.05					6.73
Livestock productivity[b]	1.04					6.56
Wheat yields[c]	79	72	100	123	136	180
Cereal yields[d]	115	92	100	135	158	250
D) Labour Productivity						
Labour productivity (population)		77	100	126	141	197
Labour productivity (volume)			100	134	170	206

[a] 1831; [b] Clark's estimates in wheat bushel equivalents; [c] Hampshire, Hertfordshire, Lincolnshire, Norfolk, Suffolk. The 1300 average is for Norfolk and Hampshire only; [d] Norfolk and Suffolk.
Sources: see text.

out that output trends based on population are inconsistent with the behaviour of agricultural prices. When agricultural prices are falling it is likely that per capita consumption of food will increase, and conversely when prices are rising per capita consumption should decrease. He therefore estimates agricultural output by taking prices and wages into account together with assumptions about the income and price elasticities of demand.[25]

Given the diversity in their methods of estimation it is comforting that all three estimates of output are in broad agreement: English agricultural output rose by between 2.5 and 3 times from 1700 to 1850 and more than doubled in the century after 1750. The principal difference between the estimates lies in the timing of growth in the eighteenth century, since Crafts' figures suggest a faster rate of growth in the first half of the century (when food prices were relatively low and per capita consumption may have increased) compared with the second half (when food prices were rising and per capita consumption may have decreased). Of the three estimates only the one based on population may be taken back before 1700, and from this perspective the turning point of the agricultural revolution mirrors the turning point in population growth: it is a phenomenon of the period after 1740. However, it is also the case that the rate of growth of agricultural output was more rapid than the rate of growth of population in the first half of the eighteenth century than it was over the succeeding 100 years from 1750 to 1850, when population growth was outstripping the growth in agricultural output. Population grew at an average of 0.26 per cent per annum from 1700–1750 whereas all the agricultural output indices grew more rapidly (ranging from 0.38 to 0.60 per cent per annum): from 1750–1850

[25] N F R Crafts, 'British economic growth 1700–1831: a review of the evidence', *Econ Hist Rev*, 2nd ser, XXXVI, 1983, pp 177–99; R V Jackson, 'Growth and deceleration in English agriculture 1660–1790', *Econ Hist Rev*, 2nd ser, XXXVIII, 1985, pp 333–51.

population grew at an average of 1.07 per cent per annum and the estimates of agricultural output ranged from 0.77 to 0.82 per cent per annum.

III

To measure land productivity we need to relate these estimates of output to estimates of land area (the input) in agricultural production. For 1700 we have to rely on the guesses of Gregory King, but by 1800 there are several independent estimates, and by mid-century some fairly reliable statistics.[26] While output went up by about 2.75 times between 1700 and 1850, the farmed area rose by 1.3 times. As Table 1 shows, the arable area increased by a greater amount, and the sown arable area nearly doubled, reflecting a decline in the area of fallow and an increase in the area of rotational grassland. Dividing output estimates by estimates of total area gives estimates of land productivity. These doubled between 1700 and 1850, suggesting that increases in productivity were more important than the growth in the land area, a development argued earlier to be of revolutionary significance.

These measures of land productivity are the preferred ones because they relate the total output of food to the total agricultural area. They can be compared with the popular but misleading indicator, wheat yields per acre. Cereal yields per sown acre can be a misleading guide to land productivity because they relate cereal output to the area sown with cereals and not to the entire arable area. For example, cereal yields per sown acre could be rising at the same time as cereal yields per arable acre were falling if land was being cropped at low intensity with long fallows. Thus, for example, a rotation in which wheat was followed by several years fallow might have high yields per *sown* acre of wheat, but a relatively low yield in terms of wheat output per *arable* acre which includes the fallow. Obviously wheat yields take no account of the yields of barley and oats (whose acreage exceeded that for wheat in England from 1300 to 1850), or of the productivity of livestock. However, using crop yields per acre it is possible to get information covering a much longer time span. Wheat yields per sown acre for five eastern counties show relatively little change from *c* 1300 to 1550; a growth rate of 0.46 per cent per annum from 1550 to 1650, 0.30 per cent from 1650 to 1750, and 0.35 per cent from 1750 to 1850. For the one county for which they are available, Norfolk, a weighted index of wheat, barley and oat yields (Tables 1 and 4) shows almost no change from 1300 to 1700, but a two-and-a-half-fold increase by 1850, reflecting proportionately greater yield increases for barley and oats than for wheat.[27]

For livestock we have less information. Clark has calculated land productivity for livestock products and for cereals at two benchmark dates, 1850 and *c* 1300, using fairly reliable contemporary estimates for southern England.[28] As the figures in Table 1 show, crop output per acre roughly doubles, but livestock productivity rises six fold. Unfortunately he is unable to calculate intervening estimates of livestock productivity.

Taking all these figures together suggests that for the country as a whole, land productivity may have risen threefold from 1300 to 1850, with a 50 per cent increase from 1300 to 1700 and a doubling, a 100 per increase, from 1700–1850. On the evidence of one county, almost all the increase in crop output per sown acre came

[26] H C Prince, 'The changing rural landscape, 1750–1850', in Mingay, *Agrarian History of England and Wales, VI*, p 30; see also D B Grigg, *The Dynamics of Agricultural Change*, 1982, p 185.

[27] Mark Overton, 'The determinants of land productivity in early modern England', in Campbell and Overton, *Land, Labour and Livestock*, p 306 gives the figures for both Norfolk and Suffolk from 1580. Table 1 is an abbreviation of tables in Overton, *Agricultural Revolution in England: The Transformation of the Agrarian Economy*.

[28] Clark, 'Labour productivity in English agriculture', pp 215–6.

after 1700, although for wheat (in five counties) the rise started earlier, around the middle of the sixteenth century. Nevertheless, it was not until the early to mid-eighteenth century that wheat yields were breaking through the medieval ceiling of around 18–20 bushels per acre. Although it seems that the magnitude of the rise in livestock productivity is much greater than that for crops, its chronology is unknown.

IV

This evidence points overwhelmingly to the eighteenth century as the period when changes in output and land productivity began to accelerate rapidly and reached unprecedented levels. In so far as it can be extended backwards there is little to suggest comparable increases in earlier periods. Further light can be shed on output and productivity change by looking at evidence of changes in agricultural technique, although the trap must be avoided of assuming that certain husbandry changes are necessarily indicative of productivity change, or that certain productivity changes imply certain husbandry changes. The presence of turnips and clover, for example, does not mean that cereal yields were necessarily rising, nor does evidence of yield increases imply the cultivation of turnips and clover.[29] But, if evidence of major changes in husbandry methods is coincident with a rise in land productivity then it adds weight to arguments about the chronology of productivity change based on the estimates shown in Table 1.

It is common to divide changes in output into those brought about by extensions to the cultivated area, and those brought about by changes in output per acre. The latter are held to be more important since they hold the promise of greater increases in output than do the former. Relatively little new land was available in the sixteenth century, when at least three-quarters of the land farmed today was being cultivated, yet between *c* 1500 and the present day average wheat yields have risen over twelve-fold.[30] In practice the distinction between extending the cultivated area and improving yields through technological change breaks down, for extensions to the cultivated area really involve an intensification of agricultural output, since virtually no land produced nothing. Thus the reclamation of fen, marsh, heath, moor, and woodland for arable farming merely involved replacing a low intensity agricultural system with one of higher intensity. Moreover, in some cases such reclamation would have been impossible without technological change of some kind: the best example perhaps is the conversion of heaths and downland to high intensity arable farming which was only possible with the use of grass substitutes like clover, and root crops like turnips.[31]

There is abundant evidence of land reclamation in England from the sixteenth century onwards but quantitative estimates are lacking until the eighteenth century. It is possible though that fen draining in the seventeenth century increased the arable area of England and Wales by up to 10 per cent. Over the course of the eighteenth century the estimates in Table 1 show that the area of arable, meadow and pasture grew by 38 per cent. But there was still much ground to conquer: Williams estimates that about 20 per cent of England

[29] P Glennie, 'Measuring crop yields in early modern England', in Campbell and Overton, *Land, Labour and Livestock*, p 255; *idem*, 'Continuity and change in Hertfordshire agriculture, 1550–1700: II – trends in crop yields and their determinants', *Ag Hist Rev*, 36, 1988, p 156; Mark Overton, 'The diffusion of agricultural innovations in early modern England: turnips and clover in Norfolk and Suffolk 1580–1740', *Trans Inst Brit Geogrs*, new ser, 10, 1985, pp 205–21.

[30] The figure of the area cultivated is a guess derived by working backwards from nineteenth-century estimates; the increase in wheat yields is assumed to be from an average of 10 bushels (roughly 0.25 tonnes) to 3 tonnes per acre.

[31] Overton, 'The diffusion of agricultural innovations'; *idem*, 'Determinants of land productivity', pp 319–20; Anon, 'Management of three farms in the county of Norfolk', *Gentleman's Magazine*, XXII, 1752, p 502.

and Wales was wasteland in 1800, but that this figure fell to 6–7 per cent by 1873.[32]

Agricultural production also intensified by increasing the area actually sown with arable crops through the reduction of land under fallow. Table 1 shows that the sown arable area almost doubled between 1700 and 1850 as the proportion of fallow fell. The first truly reliable estimates of the fallow acreage are not available until the 1830s (in the tithe files) when some 12 per cent of the arable area was still under fallow (Table 2), which fell to 4 per cent by 1871.[33] The 1700 estimate from King puts fallow at 20 per cent of the arable. This reduction in fallow was made possible by the introduction of root crops. Clear evidence for this is provided by the information in the tithe files. For England as a whole using county-based data, the correlation between the proportion of land under fallow and under turnips is a remarkable −0.84: in three counties using data for individual tithe districts the coefficient reaches −0.90.[34] Turnips first appear in England in the sixteenth century, and in certain parts of the country became common in the late seventeenth and early eighteenth centuries. Indeed, they were being grown by over half the farmers in Norfolk by 1720. Yet, as Table 3 shows, on average these farmers had only 7 per cent of their cropped acreage under turnips during 1660–1739, compared with 24 per cent in the 1830s, and the crops do not seem to have been cultivated particularly well. Thus even in the most famous and progressive agricultural county the major impact of turnips was after 1750, facilitating a reduction in bare fallows, assisting in the

TABLE 2
Crop proportions in England, 1801–71 (percentages)

A) Comparisons of single crops across time

	1801	*c 1836*	*1871*
Wheat	33	37	36
Barley	17	17	19
Oats	30	23	19
Peas & beans	10	8	10
Turnips	9	15	16
Potatoes	2	–	5
Clover/seeds	–	23	20
Fallow	–	12	4

Wheat, barley, oats, peas, beans, and turnips: percentage of wheat, barley, oats, peas, beans, and turnips.
Potatoes: percentage of wheat, barley, oats, rye, potatoes, peas, beans, and turnips.
Fallow and clover/seeds: percentage of wheat, barley, oats, peas, beans, turnips, clover, and fallow.

B) Comparisons within single periods

	1801	*c 1836*	*1871*
Wheat	32	23	25
Barley	19	13	14
Oats	26	12	12
Peas & beans	11	5	7
Turnips	8	11	12
Potatoes	2	–	3
Clover/seeds	–	22	22
Fallow	–	12	4

1801 counties: Bedford, Buckingham, Cambridge, Cheshire, Cornwall, Cumberland, Derby, Durham, Essex, Gloucester, Hampshire, Hereford, Kent, Lancashire, Leicester, Lincoln, Middlesex, Monmouth, Northampton, Northumberland, Rutland, Shropshire, Somerset, Stafford, Surrey, Sussex, Warwick, Wiltshire, Worcester, East Yorkshire, North Yorkshire, and West Yorkshire.
c 1836 counties: Bedford, Berkshire, Buckingham, Cambridge, Cheshire, Derby, Durham, Essex, Hampshire, Hertford, Huntingdon, Kent, Lincoln, Norfolk, Northumberland, Oxford, Rutland, Shropshire, Stafford, Suffolk, Surrey, Sussex, Warwick, East Yorkshire, North Yorkshire, and West Yorkshire.
1871: all English counties.
All available counties used in part (B); only those with extant information for all three periods used for part (A).
Sources: see footnotes 33 and 36.

[32] M Williams, 'The enclosure and reclamation of waste land in England and Wales in the eighteenth and nineteenth centuries', *Trans Inst Brit Geogrs*, no 51, 1970, pp 58–69.

[33] Many parishes enclosed by act of parliament would have had their tithes commuted at the time of enclosure. Thus the data in the tithe files may be biased towards open-field farming. Comparisons of farming in enclosed parishes with open parishes suggest the latter would have lower proportions of fodder crops like turnips and clover, slightly lower wheat yields, and significantly lower yields of barley and oats: Allen, *Enclosure and the Yeoman*; M E Turner, 'Agricultural productivity in England in the eighteenth century: evidence from crop yields', *Econ Hist Rev*, 2nd ser, XXXV, 1982, pp 489–510; *idem*, 'English open fields and enclosures: retardation or productivity improvements?', *Jnl Econ Hist*, XLVI, 1986, pp 669–92. The tithe file data are from R J P Kain, *An Atlas and Index of the Tithe Files of Mid-Nineteenth-Century England and Wales*, 1986, p 460; the 1871 data are from BPP, 1871, LXIX, *Agricultural Returns for Great Britain for 1871*.

[34] Pearson product moment coefficient. The county-based data are reproduced in R J P Kain and H C Prince, *The Tithe Surveys of England and Wales*, 1985, pp 226–8. Tithe district data are available from the ESRC Data Archive at the University of Essex.

TABLE 3
Norfolk: trends in agricultural production, 1250–1854

	1250–1349	*1350–1449*	*1584–1640*	*1660–1739*	*1836*	*1854*
Percentage Grain[a]						
Wheat	19	18	29	20	48	49
Percentage Sown Area[b]						
Grain	87	87	87	84	49	52
Legumes	14	13	9	14	27	24
Clover	0	0	0	2	25	21
Turnips	0	0	0	7	24	22
Livestock ratio[c]	32	36	51	70		61
Draught beasts[d]	8	6	14	11		11
Grain Yields[e]						
Wheat	15	12	15	15	23	30
WACY[f]	11	9	9	10	21	26

[a] Percentage of wheat, rye, maslin, barley, and oats; [b] Area sown with arable crops excluding fallow; [c] Livestock units per 100 cereal acres; [d] Oxen and horses per 100 sown acres; [e] Bushels per acre; [f] Weighted Aggregate Cereal Yield: see note 47.
Source: see footnote 10.

reclamation of light land, and providing more fodder for sheep and cattle.[35]

The introduction of turnips is one of the most dramatic and visible signs of changes in cropping, but there were others. The first cropping statistics providing anything approaching a national coverage come from the 1801 crop return, and these can be compared with evidence from the tithe files and the fourth of June returns already mentioned.[36] However, different crops were recorded for each of these three surveys, so Table 2 is divided into two parts: the first enabling comparisons to be made between time periods, and the second within time periods. Table 2A shows that there was little change in the proportions of wheat and barley over the first seventy years of the century, but a reduction in the proportion of land sown with oats. The other development was the increased cultivation of potatoes, albeit on a small scale nationally; locally however, the proportion of arable land under potatoes could be much higher than the national average and was over 25 per cent in Lancashire by 1871 for example.

[35] Overton, 'Determinants of land productivity', pp 306, 313.
[36] The 1801 data are discussed and presented in M E Turner, 'Arable in England and Wales: estimates from the 1801 crop return', *Jnl Hist Geog*, 7, 1981, pp 291–302.

Published information on crop proportions from the sixteenth century to the eighteenth century derived from probate inventories is available for at least nine counties. However, there are no changes in cropping which compare in speed or magnitude with the spread of turnips and clover in the eighteenth and nineteenth centuries shown in Table 2A. The only change of note is the decline of rye. Rye had never been common in some counties (such as Cornwall and Kent) but in others, especially Hertfordshire, Norfolk, Suffolk, and east Worcestershire the proportion of the sown acreage under rye declines from over 15 per cent in the sixteenth century to under 5 per cent by the eighteenth.[37]

The other trend evident from inven-

[37] The information in this paragraph is based on the quantitative evidence of crop proportions in J Whetter, *Cornwall in the Seventeenth Century*, Padstow, 1974, pp 46–7; P Glennie, 'Continuity and change in Hertfordshire agriculture: I – patterns of agricultural production', *Ag Hist Rev*, 36, 1988, p 61; C W Chalklin, *Seventeenth-Century Kent*, 1965, p 78; J Thirsk, *English Peasant Farming: The Agrarian History of Lincolnshire from Tudor to Recent Times*, 1957, pp 39, 78, 89, 102, 136, 157, 173, 188, 224–5, 246, 280–1, 302–3; Overton, 'The determinants of crop yields', p 306; W G Hoskins, 'The Leicestershire farmer in the sixteenth century', in *idem*, ed, *Essays in Leicestershire History*, Liverpool, 1950, pp 123–83; *idem*, 'The Leicestershire farmer in the seventeenth century', in *idem*, ed, *Provincial England*, 1963, pp 149–169; M A Havinden, 'Agricultural progress in open field Oxfordshire', *Ag Hist Rev*, IX, 1961, p 81; J A Yelling, 'Changes in crop production in east Worcestershire 1540–1867', *Ag Hist Rev*, 21, 1973, pp 18–34.

tories is the growth in the regional specialization of production from the second half of the seventeenth century onwards. In eastern Norfolk, for example, an intensive mixed husbandry developed centred on the production of wheat and the stall feeding of bullocks with barley. East Worcestershire also saw a swing to wheat, but within a less intensive husbandry system which saw a reduction in livestock densities. The rise of a specialist dairying industry has been charted in Shropshire and Hertfordshire; in the Midlands there appears to have been a swing to permanent pasture for the fattening of cattle.[38] These trends are reinforced by the indirect evidence from marriage seasonality which suggests increasing regional specialization from the 1660s.[39] Despite these changes prior to the mid-eighteenth century for Norfolk at least, 'the magnitude of the changes that occurred during the hundred years after 1740 were out of all proportion to those which had occurred during the preceding five hundred years', and changes of similar magnitude were happening elsewhere.[40]

This evidence of land reclamation and changes in crop proportions reinforces the view that increases in both output and land productivity were likely to have been more rapid from the eighteenth century onwards than before, and that these increases were accompanied by unprecedented changes in the crop mix and by the introduction of new crops. Evidence of husbandry changes that might have led to improvements in crop yields is more problematic because it is also necessary to demonstrate the connections between such husbandry changes and changes in yields. We can, however, be fairly certain that the 'limiting factor' to cereal growth before the early nineteenth century was the supply of nitrogen.[41] Thus evidence of husbandry changes that would have made more nitrogen available to cereals should provide some support for the view that yields were rising.

In fact it is possible to identify many strategies adopted by farmers which would have made more nitrogen available to cereals, although of course farmers would not have interpreted their actions in these terms. The ploughing of permanent pastures had the effect of exploiting reserves of nitrogen which may have been responsible for raising yields in some areas in the late sixteenth century as the initial consequence of a switch to convertible husbandry.[42] Better use was made of existing manures, and, from the mid-seventeenth century, greater use of new manures was advocated including seaweed and human waste.[43] Apart from adding nitrates to the soil farmers also adopted strategies that would have made more soil nitrogen available to cereals by improving soil structure through better drainage, and reducing acidity through the addition of lime and marl.[44] But by far the most important change was the introduction of clover. It is likely that the cultivation of clover in the late eighteenth and early nineteenth centuries increased the supply of nitrogen to English

[38] Campbell and Overton, 'New perspective on medieval and early modern agriculture', pp 38–105; Yelling, 'Changes in crop production in east Worcestershire'; J A Yelling, 'Probate inventories and the geography of livestock farming: a study of east Worcestershire, 1540–1750', *Trans Inst Brit Geogrs*, no 51, 1970, pp 111–26; Peter Edwards, 'The development of dairy farming on the north Shropshire plain in the seventeenth century', *Midland History*, 4, 1978, pp 175–89; Glennie, 'Continuity and change in Hertfordshire agriculture, I'; John Broad, 'Alternate husbandry and permanent pasture in the Midlands 1650–1800', *Ag Hist Rev*, 28, 1980, pp 77–89.

[39] Ann Kussmaul, *A General View of the Rural Economy of England, 1538–1840*, 1990.

[40] Campbell and Overton, 'New perspective on medieval and early modern agriculture', p 61. Evidence from elsewhere derived from the sources in note 37 and the tithe files.

[41] Robert S Shiel, 'Improving soil fertility in the pre-fertiliser era', in Campbell and Overton, *Land, Labour and Livestock*, pp 51–77.

[42] *Ibid*, pp 62–3.

[43] Donald Woodward, ''An Essay on Manures': changing attitudes to fertilization in England, 1500–1800', in John Chartres and David Hey, eds, *English Rural Society, 1500–1800: Essays in Honour of Joan Thirsk*, 1990, pp 251–78.

[44] Glennie, 'Continuity and change in Hertfordshire agriculture, II'; W M Matthew, 'Marling in British agriculture: a case of partial identity', *Ag Hist Rev*, 41, 1993, pp 97–110.

TABLE 4
Cereal yields in England, 1801–71 (bushels per acre)

	1801	*c 1836*	*1871*
Wheat	22	21	28
Barley	29	30	34
Oats	32	33	43
WACY[a]	17	18	25

[a] Weighted Aggregate Cereal Yield.
Counties used are: Bedford, Buckingham, Cambridge, Cornwall, Derby, Devon, Durham, Essex, Gloucester, Hampshire, Hereford, Huntingdon, Kent, Lincoln, Northumberland, Shropshire, Somerset, Stafford, Surrey, Sussex, Warwick, East Yorkshire, North Yorkshire, and West Yorkshire.
Source: see footnote 47.

farmers by over 60 per cent.[45] The first national figures for the acreage of clover are not available until the tithe files of the 1830s, but by then clover (and 'seeds') accounted for over 20 per cent of the arable area. For the two counties for which we have earlier comparative information, the precocious Norfolk and Suffolk, the figure of 3 per cent of the cropped area for the first three decades of the eighteenth century compared with 24 per cent in the 1830s suggests that the diffusion of the crop was very rapid in the years after 1740.[46] Table 4 gives yield figures for a selection of English counties after 1801 and shows that the major rise in yields comes after the 1830s (although the figures for the 1830s may be underestimates).[47]

[45] This figure is based on the work of G P H Chorley, 'The agricultural revolution in Northern Europe, 1750–1880: nitrogen, legumes and crop productivity', *Econ Hist Rev*, 2nd ser, XXXIV, 1981, pp 71–93, adjusted for England.

[46] Overton, 'Determinants of land productivity', p 306. Figures for Norfolk alone are shown in Table 3.

[47] For 1801 the yields are from Turner, 'Agricultural productivity in England in the eighteenth century', pp 489–510. See footnote 33 for the 1830s. For 1871 the figures are from P G Craigie, 'Statistics of agricultural production', *Jnl Roy Stat Soc*, 46, 1883, pp 1–58 reporting a survey by the *Farmer and Chamber of Agriculture Journal*. The Weighted Aggregate Cereal Yield is defined as:

$$Y = \sum (y_i \cdot p_i / p_w \cdot a_i / \sum a_i)$$

where Y is weighted yield, y_i is the yield of crop i in bushels per acre, p_i is the price of the crop per bushel, p_w is the price of wheat per bushel, a_i is the acreage under crop i.

V

Evidence about the productivity of crops is much more plentiful than evidence about the productivity of livestock, which is unfortunate since changes in livestock productivity were of more significance. The output of livestock products could have risen through two processes: first, through an increase in the number of livestock, implying an increase in the density of livestock per acre, implying in turn an improvement in fodder supplies; and second, through an improvement in the livestock themselves, so that animals produced more food in response to a given amount of fodder. In the one study available, for Norfolk, it has been found that livestock densities double in the seventeenth century, which suggests improvements in fodder output per acre.[48] This is associated with the breakdown of the rigid division between permanent pasture and permanent arable, and the development of convertible or ley husbandry. But establishing a grass ley was difficult ('to make a pasture breaks a man, to break a pasture makes a man'[49]) and the sowing of grass leys stimulated the search for appropriate grasses (or more specifically grass seed), which in turn stimulated the cultivation of clover and other so-called 'artificial' grasses from mid-century. In other areas of the country fodder supplies were increased through the floating of meadows, although the area of meadow capable of being developed in this way was necessarily limited by topography.[50] Important as these changes were, they do not compare with the extension of fodder supplies from the eighteenth century onwards.

Improvements in livestock themselves are also difficult to measure, despite the

[48] Mark Overton and Bruce M S Campbell, 'Norfolk livestock farming 1250–1740: a comparative study of manorial accounts and probate inventories', *Jnl Hist Geog*, 18, 1992, pp 377–96.

[49] H I Moore, *Grassland Husbandry*, 3rd edn, 1946, p 17; see also Allen, *Enclosure and the Yeoman*, pp 126–8.

[50] G G S Bowie, 'Watermeadows in Wessex: a re-evaluation for the period 1640–1850', *Ag Hist Rev*, 35, 1987, pp 151–8.

din of propaganda from a few very successful livestock breeders in the eighteenth century, and a growing volume of evidence of the rapid spread of new livestock types. In Norfolk the traditional sheep breed was largely replaced by Southdowns, Leicesters, and cross-breeds in the first quarter of the nineteenth century, and other evidence again suggests that breed improvements were only of major significance from the late eighteenth century onwards.[51] For cattle the major improvement was the development of the Shorthorn, but again the chronology is similar: the breed is developed towards the end of the eighteenth century and only becomes dominant by the middle of the nineteenth century.[52]

What impact these breed changes had is hard to observe directly. However, estimates of the volume of output of animal products show a two-and-a-half-fold increase between 1700 and 1850, yet the number of animals does not seem to have increased very much.[53] This suggests considerable improvement in the productivity of livestock (in terms of output per animal). This was partly due to improvements in fodder, partly due to breed changes, and partly due to an increased turnover of animals. Gregory King estimated that, in the late seventeenth century, less than one-fifth of the nation's cattle stock was slaughtered each year, whereas around the turn of the nineteenth century it was about a quarter, implying a 25 per cent improvement in supply, irrespective of any change that may have taken place in animal weights.[54]

TABLE 5
Ratios of animal and animal product prices (1550–1750 = 100)

Period	*Cattle/ Beef*	*Sheep/ Mutton*	*Sheep/ Wool*	*Swine/ Cattle*
1560–09	104	–	83	63
1610–59	110	80	83	86
1660–09	99	84	85	121
1710–59	87	141	155	147

Sources: see footnote 55.

Another indirect measure of increases in the output of livestock products per animal is given in Table 5. The table compares the price of livestock with the price of livestock products and thus gives an indication of the output per animal (the price of cattle divided by the price of beef per pound, for example, should give some indication of the number of pounds of beef per animal). Unfortunately the data in Table 5 can only be taken as far as 1760 after which no available series of livestock prices is extant.[55] For what they are worth the figures suggest a slight fall in the productivity of cattle between the mid-sixteenth and the mid-eighteenth centuries, but an increase for both mutton and wool of some 78 per cent during the first half of the eighteenth century, in comparison with the preceding century. It is also evident that the price of pigs relative to cattle had been increasing continuously since the sixteenth century: in the second half of the sixteenth century seven pigs were equivalent to one cow, by the mid-eighteenth century the number had reduced to three.

[51] Peter Wade-Martins, *Black Faces: A History of East Anglian Sheep Breeds*, Ashford, 1993; J R Walton, 'The diffusion of improved sheep breeds in eighteenth- and nineteenth-century Oxfordshire', *Jnl Hist Geog*, 9, 1983, pp 175–95.

[52] J R Walton, 'The diffusion of the improved Shorthorn breed of cattle in Britain during the eighteenth and nineteenth centuries', *Trans Inst Brit Geogrs*, new ser, 9, 1984, pp 22–36.

[53] See footnote 24 for sources for the calculation. In terms of 1850 prices the output of meat and dairy produce rose from £18.921 million in 1700 to £51.840 million in 1850.

[54] Thirsk and Cooper, *Seventeenth Century Economic Documents*, p 783; Holderness, 'Prices, productivity and output', p 157.

[55] Prices are from W Beveridge, *Prices and Wages in England from the Twelfth to the Nineteenth Century: Vol I Price Tables: Mercantile Era*, 1939, pp 144–7 (for mutton at Eton, 1600–1840) and pp 209–10 (for beef at Charterhouse, 1713–1830); J E T Rogers, *A History of Agriculture and Prices in England*, Vol IV, 1882, p 333; Vol V, 1887, pp 347–53, Vol VII, 1902, p 284 (for beef 1562–1712 at Cambridge); P J Bowden, 'Statistical appendix', in Thirsk, *Agrarian History of England and Wales, IV*, pp 839–45; *idem*, 'Statistical appendix', in Thirsk, *Agrarian History of England and Wales, V, Part II*, pp 843–6 (for wool 1500–1749); B R Mitchell and P Deane, *Abstract of British Historical Statistics*, 1962, pp 494–5 (for wool 1750–59). Livestock prices from some 20,000 probate inventories for Durham, Hertfordshire, Lincolnshire, Norfolk, Suffolk, and Worcestershire are also used.

These findings prompt many questions, not least about the appropriateness of the method. But if they are broad indications of trends in output per animal then improvements in wool and mutton yields take place before the breed developments of the late eighteenth century and therefore presumably must reflect improvements in fodder supplies and in the management of sheep flocks. Yet the lack of change in the ratio of beef and cattle prices would suggest that no significant improvements in fodder supplies were having an effect here. The rise in the value of pigs relative to cattle suggests that pigs were increasing in size. Pigs respond well to increased feeding and can eat a wide range of products. It has been suggested that during the early modern period there was a growing tendency for pigs to be housed and fed on household waste, rather than rooting freely in woodlands, a suggestion corroborated by the evidence of Table 5.[56]

VI

The discussion hitherto has been concerned with output and the productivity of land. Information on the productivity of labour is more difficult to produce. Although sources are available from which 'bottom up' estimates of labour productivity can be calculated for individual farms, very few such calculations have been made. In their absence the best estimates of labour productivity available at the moment divide the indices of output already discussed by the number of workers in agriculture (Table 1). The difficulties of estimating employment levels before the first census with appropriate information (in 1831) necessitates using a rather crude indicator of those working in agriculture which is the size of the 'rural agricultural population' as estimated by Wrigley for a series of dates back to 1520.[57] Interpretation of the trend in labour productivity based on the proportion of the population 'working' in agriculture is difficult because such estimates ignore the amount of time workers actually spent working, and the extent to which women and children were actively working on the land. Thus the slow growth in labour productivity of 0.15 per cent per annum over the 150 years between 1520 and 1670 may be illusory if on average each worker was working for more hours a year in the mid-seventeenth century than they had been in the mid-sixteenth century. If this was the case (and a number of factors, including the reduction in religious holidays with the Reformation, suggest that it was[58]) there may well have been a *fall* in labour productivity during the long sixteenth century. There is less doubt, however, that a sustained increase in labour productivity was underway from around the mid-seventeenth century, at around 0.45 per cent or higher per annum, and that from 1700 to 1850 labour productivity doubled.

VII

In the absence of any detailed studies of the determinants of labour productivity at local level we are left with a string of untested hypotheses as to why this growth in labour productivity took place. The increases in output per acre already discussed played a part in increasing labour productivity but they were unlikely to have been the major factor. While some agricultural operations required the same labour input irrespective of crop yields, such as ground preparation, many were directly proportional to yield such as threshing and to a slightly lesser extent harvesting. Thus

[56] J Wiseman, *A History of the British Pig*, 1986, pp 8–21.

[57] E A Wrigley, 'Urban growth and agricultural change: England and the Continent in the early modern period', in *idem*, *People, Cities and Wealth: The Transformation of Traditional Society*, Oxford, 1987, p 170.

[58] W G Hoskins, *The Age of Plunder*, 1976, pp 108–11.

higher yields inevitably meant more labour was required unless harvesting or threshing technology changed. The list of possible explanations for improvements in labour productivity is long and growing, but it may be divided into four categories: changes in labour practices, improvements in the amount of energy available in farm work, increases in farm size, and changes in employment practices. Little mechanization of farming took place before the mid-nineteenth century, but there were two changes in farming practice that may have been of some significance to labour productivity. The first was the introduction of improved ploughs in the eighteenth century, particularly the Rotheram plough which reduced the labour requirement from both men and horses during ploughing.[59] It is also likely that labour was saved through changes in harvesting techniques from the mid-eighteenth century but the chronology of the change from sickle to scythe is in some dispute.[60]

Hunt has suggested that regional variations in labour productivity in the mid-nineteenth century may have been due to the inadequate diets of labourers in some areas.[61] Poor diets reduce the energy for farm work; thus low labour productivity might have been associated with nutritional deficiency. This argument could be applied chronologically as well as spatially. Thus the apparent upsurge in labour productivity from the mid-seventeenth century might be linked to the relatively low price of foodstuffs and the rise in real wages, especially during the first three decades of the eighteenth century. The substitution of animal for human labour and effort has recently been suggested by Wrigley as another potential source of rising labour productivity. He shows that pro rata English farmers had two-thirds as much animal power at their disposal than their French counterparts at the turn of the nineteenth century. Thus the amount of horsepower available for each man employed in agriculture is estimated to have risen by 63 per cent between 1700 and 1850.[62] This hypothesis is attractive for agriculture makes tremendous demands for energy, and we have evidence from Norfolk that the supply of energy in the form of beasts of traction was increased during the early modern period. Not only was the number of beasts increasing from the Middle Ages, but the more efficient horse was replacing the ox.[63] A similar pattern existed in other counties although the chronology was usually much later.

The link between labour productivity and farm size is simply that larger farms appear to have employed fewer people per acre, so that if average farm size increased, the average number of employees would decrease. Allen argues that this was the case from the mid-seventeenth century using evidence on the relationship between employment and farm size from data compiled by Arthur Young in the 1760s, applied to a new body of data on farm size in the south Midlands. These farms were growing in size during the eighteenth century and by implication would have been using less labour per acre.[64] On the other hand, evidence from Belgium and Ireland in the nineteenth century suggests that small farms could be more efficient in their use of labour than larger ones.[65]

[59] G Marshall, 'The 'Rotheram' Plough: a study of a novel 18th century implement of agriculture', *Tools and Tillage*, III, 1978, pp 149–67.

[60] E J T Collins, 'Harvest technology and labour supply in Britain, 1790–1870', *Econ Hist Rev*, 2nd ser, XXII, 1969, pp 453–73; J A Perkins, 'Harvest technology and labour supply in Lincolnshire and the East Riding of Yorkshire 1750–1850, part one', *Tools and Tillage*, 3, 1976, pp 46–58.

[61] E H Hunt, 'Labour productivity in English agriculture, 1850–1914' *Econ Hist Rev*, 2nd ser, XX, 1967, pp 285–8.

[62] E A Wrigley, *Continuity, Chance and Change: The Character of the Industrial Revolution in England*, 1988, pp 35–45; *idem*, 'Energy availability and agricultural productivity', in Campbell and Overton, *Land, Labour and Livestock*, pp 323–39.

[63] Campbell and Overton, 'Norfolk livestock farming', p 383.

[64] R C Allen, 'The growth of labour productivity in early modern English agriculture', *Explorations in Econ Hist*, XXV, 1988, pp 117–146; *idem*, *Enclosure and the Yeoman*, pp 211–27.

[65] P Solar and M Goossens, 'Agricultural productivity in Belgium and Ireland in the early nineteenth century', in Campbell and Overton, *Land, Labour and Livestock*, pp 372–6.

The final category, changes in employment practices, covers many possible factors. Evidence is available of changes in employment relationships, but the effect of these on labour productivity (as opposed to other effects) has not really been explored. Some changes in employment practices from the eighteenth century could have increased labour productivity derived by using the proportion of the labour force as the denominator in the calculation, but would have made little difference to labour productivity calculated using output per man hour. The duration of many labour contracts was reduced from the year, to the week, or sometimes to the day; often the process went further and workers were paid by piecework rather than a flat rate.[66] Thus proportionately fewer agricultural workers would be needed. This accords with the decline in the incidence of farm servants, since servants were hired by the year on an annual contract.[67] Furthermore, the introduction of turnips and clover made demands for labour at periods when they had otherwise been low. Thus while the extra output from these crops would appear in the numerator of the labour productivity calculation, the extra labour input would not be included in the denominator if it was being measured in terms of the proportion of the work-force employed in agriculture rather than as the number of hours worked.[68]

Other changes in employment are more imponderable. Hunt has also argued that some farmers were more concerned with providing work than making efficient use of labour.[69] On the other hand improvements in farming skills and farm management undoubtedly took place from the eighteenth century, but are extremely difficult to pinpoint. The supply of farming books increased from the mid-seventeenth century but while some of these advocated best-practice techniques, others were quite bizarre in their recommendations. The provision of formal agricultural education in England did not occur until the nineteenth century, but that is not to say that levels of skill and management were not improving. By the nineteenth century English farmers had a growing range of literature advising them how to farm more profitably, and how to use labour more efficiently.[70]

VIII

The evidence reviewed so far points towards the same conclusion. If the criteria for an 'agricultural revolution' are taken to be unprecedented changes in output and in the productivities of land and labour, then it is the period after the mid-eighteenth century that emerges as having experienced such a revolution. It was during the eighteenth century that population was able to break through the ceiling of 5.5 million, that crop yields made a sustained improvement on medieval levels, and land and labour productivity were rising together. There were some productivity improvements in the seventeenth century, especially with livestock, but they cannot compare with the magnitude of changes in the eighteenth century. There were also some important changes in agricultural practice before the eighteenth century. Production was intensified from the sixteenth century, and was becoming more

[66] A Armstrong, 'Labour I: rural population growth, systems of employment, and incomes', in Mingay, *Agrarian History of England and Wales, VI*, pp 671–95.

[67] A Kussmaul, *Servants in Husbandry in Early Modern England*, 1981.

[68] C P Timmer, 'The turnip, the new husbandry, and the English agricultural revolution', *Quarterly Journal of Economics*, LXXXIII, 1969, pp 375–95.

[69] Hunt, 'Labour productivity in English agriculture', pp 288–90.

[70] K Tribe, *Land, Labour and Economic Discourse*, 1978, pp 53–79; H S A Fox, 'Local farmers associations and the circulation of agricultural information in nineteenth-century England', in *idem* and R A Butlin, eds, *Change in the Countryside: Essays on Rural England, 1500–1900*, Inst Brit Geogrs Special Publ, X, 1979, pp 43–63; J D Sykes, 'Agriculture and science', in G E Mingay, ed, *The Victorian Countryside*, 2 vols, 1981, vol I, pp 267–70; K Hudson, *Patriotism with Profit: British Agricultural Societies in the Eighteenth and Nineteenth Centuries*, 1972, pp 113–29; N Goddard, 'Agricultural literature and societies', in Mingay, *Agrarian History of England and Wales, VI*, pp 331–83.

regionally specialized in the seventeenth, but it was not until after 1750 that high yielding fodder crops were grown on a substantial scale enabling intensification through a reduction in fallow and a massive increase in the supply of nitrogen to farmland.

The arguments for an 'agricultural revolution' commencing in the sixteenth century therefore fail to carry conviction. There is some justification in the claim that breaking the distinction between pasture and arable is revolutionary, or at least is a change of potentially revolutionary significance, although the evidence on which the claim is based is open to varying interpretations. The ploughing up of pasture land can also be interpreted as a desperate attempt by farmers to cash in on reserves of nitrogen to produce as much grain as possible in the face of overwhelming demand. Putting land back under a temporary ley would be much more difficult, and it was not until clover and other grass seeds became more widely available in the eighteenth century that true convertible husbandry could take place. For all his footnotes Kerridge's arguments are not persuasive, and the moderate rise in yields from the mid-sixteenth century is most likely the consequence of increased labour inputs, and labour productivity was probably falling from the mid-sixteenth to the mid-seventeenth centuries. Coupled with evidence of widespread reclamation and the halt to population growth in the mid-seventeenth century this period is more suggestive of a Malthusian check than an agricultural triumph.[71]

Nor is there any evidence to suggest that changes in the century after the Restoration were of more significance than those that were to follow. English agriculture had achieved an export surplus by 1750, and output was growing at a faster rate than was population. Jones argued that the period saw a rise in crop yields through the introduction of cost-cutting innovations, and while his arguments are consistent and coherent, elegance is no substitute for evidence.[72] New crops were certainly being grown, although both the scale and manner of their cultivation suggest their impact on output and productivity was minimal until after 1750. It is true that in some areas crop yields may have been rising although they were still within medieval norms until the eighteenth century, but rises in yields were not yet associated with the introduction of new crops.[73] In fact the changes of most significance were concerned with livestock husbandry: the striking evidence from national prices suggests improvement in the yield of both wool and mutton during the first half of the eighteenth century, although cattle appear to be producing no more meat. For Norfolk, there is also the remarkable doubling of livestock densities in the seventeenth century reflecting an improvement in fodder supplies which is less conspicuous than the innovation of turnips and clover. Also of likely significance for this period is the probability of a steady improvement in labour productivity after 1670, but this is a phenomenon which has

[71] R S Schofield, 'The impact of scarcity and plenty on population change in England, 1541–1871', in R I Rotberg and T K Rabb, eds, *Hunger and History*, 1985, pp 67–94; Campbell and Overton, 'New perspective on medieval and early modern agriculture', pp 44–5, 95–99.

[72] Most of Jones' arguments are supported by scattered instance from farm accounts and contemporary literature. A major assumption, that the terms of trade favoured livestock, is an exaggeration since terms of trade moved only slightly in favour of livestock and could have been more than offset by government inducements to maintain arable cultivation, together with the development of both markets and new ways of marketing grain: E L Jones, *Agriculture and the Industrial Revolution*, Oxford, 1974, p 72; John, 'Agricultural productivity and economic growth', pp 19–25; M W Flinn, 'Agricultural productivity and economic growth: a comment', *Jnl Econ Hist*, XXVI, 1966, pp 93–8; Mark Overton, 'An agricultural revolution, 1650–1750', in *idem*, E J T Collins, M E Turner and D N McCloskey, *Agricultural History: Papers Presented to the Economic History Society Conference*, Canterbury, 1983, pp 6–7; Patrick O'Brien, 'Agriculture and the home market for English industry, 1660–1820', *Eng Hist Rev*, C, 1985, pp 773–800; but see also the comments of Glennie, 'Continuity and change in Hertfordshire agriculture, II', pp 157–8.

[73] Overton, 'Diffusion of agricultural innovations'.

been omitted in accounts of early modern agriculture.

While Jones' arguments are not backed up by sufficient evidence, Clark's recent dismissal of an 'agricultural revolution' taking place from the eighteenth century stems from a rejection of conventional historical evidence in favour of deductions based on economic theory. He prefers to infer agricultural developments from a calculation of productivity based on a comparison of input and output prices, which fails to reveal much productivity change. Although this exercise is based on (unspecified) economic assumptions which may be inappropriate for the eighteenth- and early nineteenth-century economy, and uses price data which may have a regional bias, Clark chooses to accept its results: in short he relies on economics not evidence.[74]

Trouble with evidence also undermines Allen's recent claim that 'the yeoman farming system of seventeenth-century England produced a revolution in corn yields'.[75] The suspicion that this might be a rather sweeping generalization is raised when it is realized that the evidence for this statement is based on yields in part of Oxfordshire, and confirmed when that evidence is examined in detail. The yield statistics for wheat derive from 28 plots of ground in part of Oxfordshire over a period of 177 years from 1550–1727 with each observation coming from a different plot of land. Moreover, the estimation of yields on these plots is problematic and particularly so when compared to later yields from different sources.[76] It may be that the trend of yields in Oxfordshire is correct, for there were undoubtedly regional variations in yield trends, but unlike, say, Glennie's work on Hertfordshire, where yields were rising as a consequence of better ground preparation, Allen adduces little evidence as to why this should be the case apart from an assertion that wheat varieties were being improved to yield more highly.[77]

IX

Allen also strongly supports another revisionist argument: that enclosure had little effect on productivity change. From the early 1960s a number of historians began to argue that enclosure was not a pre-requisite for husbandry innovations and that open-field farmers were quite capable of introducing both turnips and clover to improve their output and productivity.[78] Thus they argue that agricultural improvements of revolutionary significance were possible in the open fields before the parliamentary enclosure movement after 1750. Allen develops this point by arguing that for the south Midlands yield increases were not associated with enclosure. Indeed he has to do this to sustain his argument that crop yields rose in the seventeenth century rather than in the eighteenth. It would seem unfortunate therefore that he finds abundant evidence of crop innovation in enclosed parishes ('enclosed farms were the most progressive'[79]), since such innovation might be expected to lead to greater productivity. The evidence for innovation comes from parish by parish agricultural censuses for Rutland and Huntingdon compiled by Parkinson and published in his *General Views* of those counties.[80] Undaunted, however, Allen argues that

[74] Clark, 'Agriculture and the industrial revolution', pp 242–9; see also C Knick Harley, 'Reassessing the industrial revolution: a macro view' in Mokyr, *The British Industrial Revolution*, pp 191–7.

[75] Allen, *Enclosure and the Yeoman*, p 208.

[76] The yield of barley is based on 35 different plots of ground: R C Allen, 'Inferring yields from probate inventories', *Jnl Econ Hist*, XLVIII, 1988, pp 117–25; Mark Overton, 'Re-estimating crop yields from probate inventories', *Jnl Econ Hist*, L, 1988, pp 931–5.

[77] Overton and Campbell, 'Productivity change in European agricultural development', pp 38–41; Glennie, 'Continuity and change in Hertfordshire agriculture, II', pp 150–2; Allen, *Enclosure and the Yeoman*, pp 206–7; Overton, 'Determinants of land productivity', p 290.

[78] Jones, 'Agriculture and economic growth in England', p 8; Kerridge, *Agricultural Revolution*, pp 19–20.

[79] Allen, *Enclosure and the Yeoman*, p 112.

[80] R Parkinson, *A General View of the Agriculture of the County of Rutland*, 1808; *idem*, *A General View of the Agriculture of the County of Huntingdon*, 1811.

despite this evidence of innovation neither crop yields nor total agricultural output were higher in enclosed villages.

Why did innovation take place if neither yields nor output increased? This is a strange finding which flies in the face of both theoretical and empirical evidence of a link between these crops and increases in output.[81] Parkinson reports acreages of arable, meadow and pasture, but not the acreages under particular crops, which Allen deduces from somewhat ambiguous evidence of crop rotations. Nor does Parkinson record livestock output, and Allen is therefore forced into the hazardous procedure of estimating the output of livestock products from the number of animals. Grain yields are recorded directly, and Allen maintains they show little difference between parishes which are open and those which have been enclosed, especially for wheat, a finding which conflicts with Yelling's opinion of Parkinson's data.[82]

The most important problem, however, is that Allen is not comparing the situation before and after enclosure in the same parishes, but is comparing different parishes in the first decade of the nineteenth century. Most of the enclosure that had taken place by this time had resulted in the conversion of arable to pasture and was not designed to increase arable production. Much enclosure was still to come and was to be more geared towards improving grain output. Thus it might be that those arable open-fields remaining when Parkinson's census was taken were more productive than those that had been enclosed, since it is reasonable to assume that the least profitable arable open fields are the most likely to have been enclosed for pasture. Contemporary evidence for Rutland and Huntingdonshire based on a survey of incumbants and comparing the *same* parishes before and after enclosure gives a different picture.[83] Following enclosure in Huntingdonshire sheep numbers are reported as rising in 14 villages and falling in 3, and in Rutland rising in 8 villages and falling in none; cattle numbers are reported to rise in 10 villages and fall in 3 in Huntingdonshire, and in Rutland to increase in 5 villages and remain constant in 1.[84] This contrasts with Allen's conclusions from his manipulations of Parkinson's data that a decline in the number of animals took place 'after enclosure', and that 'enclosure... did not lead to more livestock' based on the *cross sectional* comparison of open and enclosed parishes.[85]

These comparisons around 1800 are mostly between parishes which had been enclosed for pasture and arable open-field parishes. Another kind of enclosure involved the reclamation of light-land lowland wastes for arable land. An early example of such an enclosure was at Canwick, in Lincolnshire, and although merely one example it is instructive. Following enclosure wheat yields rose by only 10 per cent, but barley and oat yields by 40 and 78 per cent respectively. The most significant change, however, was with livestock; the numbers of sheep rose by 33 per cent and the value of their output increased by an astonishing 590 per cent. This was because flocks kept only for folding on the arable and for their wool were replaced by flocks of improved breeds of sheep which were better fed with fodder crops and kept primarily for their mutton.[86] Wheat yields are but one indicator of land productivity and given the widespread introduction of fodder crops may not be

[81] Shiel, 'Improving soil fertility'; Chorley, 'Agricultural revolution in Northern Europe'; Overton, 'Determinants of land productivity', p 314.

[82] J A Yelling, *Common Field and Enclosure in England 1450–1850*, 1977, p 204.

[83] *General Report on Enclosures drawn up by order of the Board of Agriculture*, 1808.

[84] *Ibid*, p 254.

[85] Allen, *Enclosure and the Yeoman*, pp 114, 117–8.

[86] *General Report on Enclosures*, pp 270–1. For the economics of different types of enclosure see *idem*, pp 286–9; Wade-Martins, *Black Faces*.

the most appropriate index of land productivity.

This is not to argue that agricultural improvement was impossible without enclosure. New methods were introduced within open field systems and groups of villagers could agree to change their ways within the confines of common property rights. But enclosure accelerated the process dramatically, gave immediate opportunities to make new profits, and the transformed landscapes it produced were a constant reminder that a new agricultural order was in place.[87]

X

In the face of so much evidence to the contrary why is it that so very few historians now credit the agricultural developments in the century after 1750 as being revolutionary? Undergraduate historians often adopt an uncritical tendency to believe that 'newer is truer', that the more recent references on (or not on) their reading list are more likely to provide them with a more 'correct' answer. This is associated with an implicitly Whiggish notion of progress applied to the writing of history; that for some reason today's histories necessarily improve upon those of the past. It would be unfortunate if this undergraduate ideology persisted and became embodied in academic publication for it is clearly fallacious. The range and quality of historical evidence can improve, as can historians' techniques for processing that evidence; but, ultimately, the issues for historical judgement remain the same: what is the quality of the evidence available and to what extent does answer the questions at issue.

The verdict of this paper, that the agricultural revolution did not get underway until the eighteenth century, echoes the views of an earlier generation of historians although it is based on such new evidence. That evidence overwhelmingly favours the century after 1750 as the period of most rapid and fundamental change in output and productivity, which were associated with equally unprecedented and fundamental changes in husbandry.

[87] Devine, *Transformation of Rural Scotland*, pp 51–2.

Taking Stock: Farmers, Farm Records, and Agricultural Output in England, 1700–1850[1]

By M E TURNER, J V BECKETT and B AFTON

Abstract

The authors take up Patrick O'Brien's challenge of twenty years ago to introduce into agricultural history some hard data on production and output. They present the findings of a pilot project of the availability of farm records for the period 1700–1835. The introduction restates the challenge, after which the paper falls into three main parts and a conclusion. Part one is a brief summary of the current progress in assessing specific aspects of farm production, output, and productivity over the long eighteenth century; part two summarizes the survival rate of English farm records from 1700–1835; and part three is a sensitivity analysis of the value of these records. The conclusion reformulates the challenge into a realistic wider project to open up the hidden data of English agricultural production.

IN 1977 Patrick O'Brien characterized agricultural history as '"soft" precisely because statistics on output at local and national level are almost non-existent'.[2] In specifically referring to the estimation of capital formation he concluded that:

> attempts now under way to measure capital formation for the national economy are unlikely to include a satisfactory index for agriculture before the nineteenth century. Only further and more laborious research into farm and estate records might offer historians a basis for speculation about the contribution of capital formation to the growth of farm output after 1650.[3]

A response to O'Brien's comments by agrarian historians is long overdue. Indeed, it is made even more pressing by two developments: recent research on the sixteenth and seventeenth centuries using probate inventories, which has substantially increased our knowledge of early modern agricultural productivity; and changes in our understanding of the 'agricultural revolution' which have put it firmly back into the later eighteenth and early nineteenth centuries.[4]

Together these have provided evidence for the early modern period and at the same time focused attention even more clearly on what is a black hole in our statistical base on agricultural output and production – at least on anything greater than a local level – for the 'agricultural revolution'. J A Chartres in a chapter on the marketing of agricultural produce in the period 1640–1750 for volume V of the Cambridge *Agrarian History of England and Wales* made tentative estimates of the output of cereals for the years 1695 and 1750, and of livestock for 1695, and B A Holderness, in a chapter on productivity and output for volume VI of the same series covering the period 1750–1850 made a valiant attempt to extend the output figures to 1800 and 1850. However, the brevity of their material and the disparity in some of their figures for 1750 reveal just how far the problem identified by O'Brien nearly twenty years ago remains un-

[1] We should like to thank the University of Hull Research Support Fund for financing the pilot project which is reported here, and two anonymous referees.

[2] P K O'Brien, 'Agriculture and the industrial revolution', *Econ Hist Rev*, 2nd ser, XXX, 1977, p 170.

[3] *Ibid*, p 168.

[4] By the latter we mean the move away from an explanation of the agricultural revolution as a phenomenon of the period prior to 1750. For the clearest recent restatement of this new orthodoxy see Mark Overton's paper in this issue of *Agricultural History Review*.

answered.[5] Our question in this paper is simple: is there a way of bridging the period from the probate inventories of the seventeenth century to the agricultural statistics of the nineteenth century by using the 'farm and estate records' to which O'Brien referred? And if so, are those records robust enough to be able to fill the black hole of the eighteenth century?

In approaching these questions we were aware of two articles published thirty years ago by E J T Collins in which he argued that a body of material existed but had yet to be systematically exploited.[6] We have investigated this material both to establish whether or not Collins was right, and as a preliminary to trying to answer O'Brien's question. In the first part of this paper we look briefly at the existing corpus of material for answering questions about output and productivity in English farming. We present in the second part the results of a survey which suggest that in simple quantitative terms (ie the number of surviving records) the data exist. In the third part we offer some preliminary results based on a sensitivity analysis of the records, and we conclude by suggesting that the work can be done, but that the material originally identified by Collins may not provide all the answers anticipated by O'Brien.

I

The black hole to which we referred above covers the period from roughly 1700 until the 1840s. For the sixteenth and seventeenth centuries we have the recent findings of Overton, Glennie, and others who have derived crop yields from probate inventories.[7] Plausible methods of estimation reveal grain yields in the quarter century or so before 1700 of just over 15 bushels per acre in Norfolk and Suffolk, just under 15 bushels per acre in Lincolnshire, and something between 12 and 16 bushels per acre in Hampshire.[8] There are other estimates for other counties, and if R C Allen's particular method for estimation is adopted those estimates are usually larger. In other words we are building up an interesting county-by-county picture of crop yields at the end of the seventeenth century and the beginning of the eighteenth, and those estimates can be taken back to the sixteenth century.

Unfortunately, probate inventories tend to run out after about 1700, especially in southern and eastern England, and even where they continue into the middle and later eighteenth century the detail they contain thins out considerably. There are no further national data sets prior to the 1790s although spot data and qualitative material can be derived from the travels of Arthur Young and from the *General View(s)* which he and others prepared for the Board of Agriculture between 1794 and 1817. Yet some of those contemporary estimates seem almost to come from another planet. For example, John Middleton, the author of both of the *General Views* for Middlesex, indulged in a little national income accounting as far as agriculture was concerned, but our admiration for his heroic efforts are coloured somewhat when we realize he supposed a figure for the extent

[5] J A Chartres, 'The marketing of agricultural produce', in J Thirsk, ed, *The Agrarian History of England and Wales, Volume V, 1640–1750*, part II, 1985, pp 444–5; B A Holderness, 'Prices, productivity, and output', in G E Mingay, ed, *The Agrarian History of England and Wales, Volume VI, 1750–1850*, 1989, pp 145, 155.

[6] E J T Collins, 'Historical farm records', *Archives*, VII, 1966, pp 143–9; E L Jones and E J T Collins, 'The collection and analysis of farm record books', *Journal of the Society of Archivists*, III, 1965, pp 86–89.

[7] For estimates of early eighteenth-century crop yields see R C Allen, 'Inferring yields from probate inventories', *Jnl Econ Hist*, XLVIII, 1988, p 123; P Glennie, 'Measuring crop yields in early modern England', in B M S Campbell and M Overton, eds, *Land, Labour and Livestock: Historical Studies in European Agricultural Productivity*, Manchester, 1991, p 273; M Overton, 'The determinants of crop yields in early modern England', in *idem*, pp 302–3; M Overton, 'Re-estimating crop yields from probate inventories', *Jnl Econ Hist*, L, 1990, pp 932 and 934. See also G Clark, 'Yields per acre in English agriculture, 1250–1860', *Econ Hist Rev*, 2nd ser, XLIV, 1991, especially pp 447–8.

[8] Overton, 'The determinants', pp 302–3; Glennie, 'Measuring crop yields', p 273.

of England and Wales of 46.9 million acres, just over 10 million acres greater than the true extent, and which, more alarmingly, we understand from J R McCulloch that he and others had adopted uncritically from Arthur Young's own estimate.[9]

However, aside from these doubtfully useful contemporary national appraisals, in the late eighteenth and early nineteenth centuries we can derive harder, mainly local, data from the evidence gathered centrally during the corn crises of the French wars in the 1790s. These include the livestock returns which central government called for from the coastal counties in case the threatened invasion by the French materialized. The invasion scare lasted from 1796 to 1801, and was renewed in 1803. The idea was to implement a plan to 'drive the country' in the event of invasion, that is to marshall the available live and dead stock in coastal and near coastal parishes and transport them inland, and thereby deny the invader an immediate source of supply. The ensuing live and dead stock returns exist in a very fragmentary manner: there are data for entire counties (Dorset, Essex, Lincolnshire, Norfolk, Northumberland and Sussex); for large parts of some counties (Antrim and Down in Northern Ireland, and Dorset again in a second survey); and fragments for other counties (Durham, Somerset and North Yorkshire).[10] The main value of these returns to the historian is in providing a livestock census, but given the poor survival rate (or more likely the uneven manner in which the instructions of central government were carried out) there are not enough of these returns for the west of England counties from which to make plausible national animal estimates.[11]

Of greater value are the other records of the early years of the French wars, records which were generated when the combination of the war and its effects on disrupting supplies, and the concurrent harvest difficulties, threw the country into a panic over food self-sufficiency. The Home Office carried out a number of supposedly national enquiries into the state of the harvest in various years, those enquiries directed to county lords lieutenants in the main, but culminating in the well-known 1801 crop returns, the responsibility for which the Home Office vested in the church through its diocesan offices, and hence to the parish clergy. The main value of the data derived from these various enquiries is in providing a wealth of information on crop yields and crop acreages. There are problems over the quality of the data and over their geographical coverage, yet they have been used to make plausible estimates of the extent both of the national arable acreage and national crop yields on or around 1800, thus furnishing a datum at the end of the eighteenth century which complements the one derived for yields, at least, from the probate records of the late seventeenth century.[12]

After the Napoleonic wars there are no consistent datasets to which we can turn before the reports drawn up by assistant commissioners prior to tithe commutation in the wake of the 1836 Tithe Commutation Act. These reports do not cover the whole country, and although they have been comprehensively mapped

[9] J Middleton, *A General View of the Agriculture of Middlesex*, 1st ed, 1798, 2nd ed, 1807, pp 487 (1st ed), 642 (2nd ed); J R McCulloch, *A Statistical Account of the British Empire*, vol I, 1837, p 5.

[10] M E Turner, 'Land use in England *c* 1800', in A D M Phillips, ed, *Agriculture in Nineteenth-Century England: Land Use Change 1800–1870*, Forthcoming, especially tables 13, 14 and 15.

[11] The local county lieutenancy was charged with the task of carrying out the inventory of live and dead stock, and it is amongst the county lieutenancy records that the best returns can now be found, but as with many things there was apparently uneven devotion to duty at the local level.

[12] See M E Turner, 'Agricultural productivity in England in the eighteenth century: evidence from crop yields', *Econ Hist Rev*, 2nd ser, XXV, 1982, especially pp 499–505; *idem*, 'Arable in England and Wales: estimates from the 1801 crop return', *Jnl Hist Geog*, 7, 1981, pp 291–302; *idem*, 'Land use in England', especially tables 6–9.

doubts remain about the quality of the data. The material is certainly useful as an indication of the type of farming taking place in each district. However, the data relate only to the tithable portion of the produce and they were only estimates of what might be produced on an average. In many instances they were simply nominal figures when the assistant commissioner made estimates rather than ascertaining the true quantities. To these problems we can add the likely bias in the material arising from the fact that most of the parishes commuting tithes after 1836 were still unenclosed, and such parishes were not usually noted either for progressive or innovative farming. The overall database may therefore present a more pessimistic view of agricultural output than would be the case with a true random sample.[13]

Only from the 1850s do we begin to have data available which was systematically collected and collated, beginning with the 1854 surveys of agriculture, and continuing with the relatively complete collection of data from 1866 onwards in the form of the annual agricultural returns, principally of crop acreages and livestock numbers.[14] From 1885 onwards these returns also included data on crop yields (though estimates not measurements) from which output and productivity estimates can be derived. In addition, the 1894 Royal Commission on Agriculture represents an almost forgotten exploitation on a semi-systematic basis of the specific ramifications of the late nineteenth-century agricultural depression.[15] It was in the nature of that enquiry to pose a set of necessary and systematic questions, in order to solicit meaningful answers. As much as anything this was based on considerations of profit and loss during the difficult agricultural times of the 1880s. Perhaps the model for such inquiries was the equivalent depression period after the French Revolutionary and Napoleonic wars which provoked inquiries in the 1830s.[16] Practical farmers, amongst other interested parties, formed a large proportion of the witnesses to all the enquiries.

The gap we need to try to fill is clear, but does the material exist even to begin our quest? The starting point is logically with the farm producers themselves, the farmers, and therefore obviously with the farm records which they kept and which have survived. The best known farm records are those which form part of estate collections, usually because they are either for in-hand farms or home farms serving, at least in part, the agricultural needs of the great house. As such, the management of their production and, in the case of farms in hand, the size and structure of their outputs and inputs, such as capital expenditure, may be atypical. Much is known about the estate, and therefore about the landlord although such studies have largely been self-selected by the survival of estate records, and they are therefore often subject to the bias of size. Many families are still around and still husband their estates, and even when their records are not *in situ* they have often found their way into the public repositories. Big or small however, agricultural, political, social and economic historians have discovered

[13] R J P Kain and H C Prince, *The Tithe Surveys of England and Wales*, 1984; R J P Kain, *An Atlas and Index of the Tithe Files of Mid-Nineteenth-Century England and Wales*, 1986; A D M Phillips, 'Agricultural land use, soils and the Nottinghamshire tithe surveys, circa 1840', *East Midland Geographer*, 6, 1976, p 288; M Sill, 'Using the tithe files: a County Durham study', *Local Historian*, 17, 1986, pp 205–11.

[14] J P Dodd, 'The Agricultural Statistics for 1854: an assessment of their value', *Ag Hist Rev*, 35, 1987, pp 159–70; MAFF, *A Century of Agricultural Statistics: Great Britain 1866–1966*, 1968.

[15] For example, see *Royal Commission on Agriculture, Particulars of Expenditures and Outgoings on Certain Estates in Great Britain and Farm Accounts, B(ritish) P(arliamentary) P(apers)*, c 8125, 1896, as only one volume amongst several which *inter alia* used farm accounts in evidence.

[16] For example, BPP, 1836, VIII, VIIIi and VIIIii, *Report from the Select Committee appointed to inquire into the State of Agriculture and into the causes and extent of the Distress; with the Minutes of Evidence and Appendix.*

much about particular estates and their collective contribution to the national economy.[17]

By contrast, the records for tenanted or owner-occupied farms are likely to give a rather different picture. The difficulty in the past has been to locate and use such material, given that farmers seem always to have been reluctant to keep records, and the smaller the farm (and with this the greater the input of family labour) the less likely they were to have generated material which would have even a chance of surviving. It may be for this reason that relatively little is known of the working farmer.[18] However, the farm records of the working farmer are as close as we may ever approach to the blunt end of agricultural production. Even though tenanted farms were situated on estates, the estate owners were predominantly interested in exacting a rent, and this primary interest was reflected in the main estate records, along with allied involvement such as the provision of capital. From the farms the rents flowed to the landowner, but as far as his estate records are concerned, very often the connection ended with this purely business arrangement.

II

We recognize that the quality and quantity of farm records are not likely to match those of estate records more generally. Yet the importance of seeking out such material cannot be denied. Farmers were the men and women who supplied the landlords with their incomes and the nation with its produce, and they did so during what we might call the long eighteenth century, as the country industrialized. If there was productivity advance and if there was innovation it was due to the acts of farmers. Even where landlords were innovatory, necessarily it was the farmers who had to put new and better ideas into practice. Consequently they played a critical role in providing whatever contribution agriculture made to the industrial revolution, and this makes it all the more necessary that we should try to take up O'Brien's challenge.

Perhaps it is because farming has not been treated as a business that no one has undertaken a systematic review and analysis of surviving farm records in the thirty years since Collins first drew attention to them.[19] We are not referring here to the odd farm or estate record used in the specific biography of person and place, of which countless examples exist, but rather the systematic exploitation of farm account books to study the essentials of agricultural history, whether in regard to agricultural production, capital formation, or estate and farm management. If we can establish the survival of records in quantity, and with a known quality it should be possible to set out an agenda to answer the large questions posed by O'Brien. And once in motion that agenda will necessarily focus the attention on farming as a business enterprise, and on the farmers as the businessmen, although in saying that we are well aware that the extent to which they were business-like remains to be tested.

Table 1 gives the results of our enquiries into the quantity of surviving farm accounts. The first of our three main sources was the University of Reading

[17] The number of studies is legion: the following is just a glimpse of a wider bibliography. On specific 'estates' see S Wade Martins, *A Great Estate at Work: the Holkham Estate and its Inhabitants in the Nineteenth Century*, 1980; R A Kelch, *Newcastle A Duke Without Money: Thomas Pelham-Holles 1693–1768*, 1974; J V Beckett, *Coal and Tobacco: The Lowthers and the Economic Development of West Cumberland 1660–1760*, 1981; and for the collective see G E Mingay, *English Landed Society in the Eighteenth Century*, 1963; F M L Thompson, *English Landed Society in the Nineteenth Century*, 1963; J V Beckett, *The Aristocracy in England 1660–1914*, Oxford, 1986.

[18] We are thinking here of recent secondary works rather than the numerous articles published during the nineteenth century in the *Journal of the Royal Agricultural Society of England* and other similar periodicals, and often written by the farmers themselves.

[19] Since which time D M Woodward's edition of, *The Farming and Memorandum Books of Henry Best of Elmswell, 1642*, 1984 has appeared and should join the list of the few well annotated sets of farmers' records which have been published.

TABLE 1
The farm records database

Survey	*Number of records*
University of Reading Archive 1973 Catalogue (Reading Library)	136 (807)*
Farm records nationwide, project at Reading early 1970s, no catalogue (Rural History Calendar)	423
National Register of Archives Index of *Farmers and Growers* (NRA Index)	250

* These figures are explained in the text.

Library Archives which is also associated with the Rural History Centre (hereafter Reading Library). The catalogue of the Reading holdings was published in 1973, and not a great deal has been added since then. The index to the catalogue reveals that in 1973 a farm record of some description was known to exist for 807 individual English farms, mainly from the early eighteenth to the middle twentieth century. They include a record for a farm in every English county, ranging from just one each for Derbyshire, Northumberland, Rutland and Westmorland, to over 50 for Berkshire, Kent and Wiltshire, and a top score of 171 for Essex.[20]

There is a clear spatial concentration centred on southern and south Midland counties, and a temporal concentration over the last 150 rather than the previous 150 years. A more detailed and specific inspection of the records reveals a possible 136 'archives' (from the 807) which may be used to a greater or lesser degree in the narrower study of agricultural production, output and profitability for the period 1700–1835. These records contain references to one or more of payments, accounts, labour records, receipts, cash books, dairy sales, diaries and journals, miller's accounts, cropping books, sales books, daybooks, and corn and livestock accounts. Ideally such data are required for runs of years thus allowing in a fixed location some sense of the progress in agricultural and technical development. On average, for the years up to the 1740s there are 7 usable documents per annum, rising to 16 for the next four decades and to 37 for the first three decades of the nineteenth century. This more specific appraisal of the whole archive necessarily reveals some serious holes in the spatial distribution with a general implosion of surviving records towards the south and south Midlands. Thus there are no usable records in categories related to agricultural production for Cornwall, Cumberland, Durham, Herefordshire, Huntingdonshire, the Holland and Lindsey divisions of Lincolnshire, Rutland, Sussex, and the Isle of Wight.

Further investigation to reveal the more intimate qualities of these data necessarily reduces the usable archive for a study of farm production alone, though such data may be used in allied studies related to wider questions of farm management and strategy. There is anecdotal evidence, and personal recollection, observation and opinion, and of course accounts concerned with related trades such as brewing, milling, thatching, and butchering. Studies of the broad profitability of individual farms, or groups of farms, can be envisaged.

While the Reading archive is the largest single concentration of these records, and holds great potential, it is not the only archive. Our second source of information came from an earlier project, also undertaken at Reading, in which a detailed calendar was compiled of farm records held in private and public repositories throughout the United Kingdom (hereafter Rural History Calendar).[21] From this list a total of 423 farm records with the potential to

[20] University of Reading Library, *Historical Farm Records*, Reading, 1973, index of farms, pp 293–309. Note we refer here to farms, but there are many more entries for other miscellaneous documents which are not necessarily farm or farming specific.

[21] From information at Reading University Rural History Centre.

offer data for investigation of issues related to agricultural output have been identified for the period 1700–1835. The temporal pattern mirrors that in the Reading archive but, of course, this time the spatial pattern is not determined by proximity to the south of England. The calendar has not been updated since the early 1970s, but farm records have continued to find their way into archives across the country. Consequently, thirdly and finally, we have analysed the computerized index at the National Register of Archives, and this has added over 250 further records (hereafter NRA Index).[22]

The total database runs to about 800 items (Table 1). It is possible that some of the records in the Rural History Calendar overlap with those in the NRA Index, although considerable efforts were made to avoid double counting. Table 2 indicates the distribution of potential archives by county, subdivided by period and by list. Individual farm records frequently stretch across two or even three of our artificial time periods, which explains why the totals given in Table 2 exceed those in Table 1. Our data are not simply spot-date material; rather, they frequently run over long time periods. Figure 1 maps this information to demonstrate spatial coverage. Figure 2 gives an indication of the quantity of surviving records by presenting the material in Table 2 on an annual basis. The volume of potential archives identified in Tables 1 and 2 and Figures 1 and 2 suggests that the material exists to apply a new approach to old problems regarding the agricultural revolution, through farm output and productivity – of which we still know so little – and by a close study of the people who were most directly interested in the business of farming, the farmers themselves. In all of this we accept that the technical and managerial expertise of the farmers may turn out to be as critical as environmental factors in determining output and productivity.

We would emphasize that these farm records remain potentially rather than actually usable. This is particularly so with material located through the NRA Index which by its very nature tends to be the more general of the three lists. For example, in a number of cases where a particularly long run of records appears in the index, closer scrutiny of the archive has revealed the inclusion of early deeds, leases and other material which will not be of particular use in this project. The Rural History Calendar was compiled to target more specific material such as accounts, diaries, cropping books, surveys, valuations, and the like. We also recognize that especially in the early decades of the eighteenth century the scatter of documents in both numbers and geographical coverage will undoubtedly limit the conclusions that can be drawn. The practice of bookkeeping was still in its infancy. Even on an estate managed by a bailiff or steward who was responsible for its management, and hence answerable to the landowner, written records are often sparse. For a farmer to record details of a single farm, and for those records to survive, would be exceptional. Consequently the shortfall in records from the late seventeenth and early eighteenth centuries is not simply a matter of survival rates. The position improves over time, and by the early nineteenth century in all but seven counties there are at least five separate records annually, and the number rises to twenty in thirteen counties.

As a result of these limitations we recognize that those keeping farm records are unlikely to be representative of the class of farmers as a whole. They tend to come from the larger than average holding. The majority of farms in England were too small to generate written records. A farm of under 100 acres would generally not employ sufficient labour outside the family

[22] An appendix of these data is under construction and copies can be obtained from the authors.

TABLE 2
Historical farm records by counties and time periods

County	*Reading Library*			*Rural History Calendar*			*NRA Index*			*Total*		
	1700–44	*1745–89*	*1790–1835*	*1700–44*	*1745–89*	*1790–1835*	*1700–44*	*1745–89*	*1790–1835*	*1700–44*	*1745–89*	*1790–1835*
Beds	0	0	6	0	3	4	0	1	10	0	4	20
Berks	2	3	10	2	9	11	0	0	1	4	12	22
Buck	3	5	5	1	2	2	0	2	2	4	9	9
Cam	0	1	2	1	5	10	0	3	9	1	9	21
Ches	0	1	2	0	4	4	0	3	4	0	8	10
Corn	0	0	0	1	5	7	0	1	1	1	6	8
Cumb	0	0	0	0	1	3	0	0	1	0	1	4
Derb	1	1	1	6	7	5	0	1	3	7	9	9
Dev	2	3	1	4	9	17	1	4	9	7	16	27
Dors	0	2	0	2	2	2	2	7	7	4	11	9
Durh	0	0	0	1	2	2	1	1	2	2	3	4
Essex	1	3	10	9	28	47	2	6	16	12	37	73
Glos	1	3	5	9	9	3	4	8	13	14	20	21
Hants	1	3	5	5	3	4	2	3	11	8	9	20
Heref	0	0	0	3	2	4	1	1	6	4	3	10
Herts	1	3	0	2	5	10	0	4	5	3	12	15
Hunt	0	0	0	2	3	2	0	1	3	2	4	5
I oW	0	0	0	3	4	4	0	2	3	3	6	7
Kent	2	4	7	9	16	13	4	7	7	15	27	27
Lancs	0	0	1	3	6	6	0	3	7	3	9	14
Leic	0	0	2	2	4	4	0	1	5	2	5	11
Lincs H	0	0	0	0	1	1	0	1	3	0	2	4
Lincs K	0	0	1	0	0	0	0	1	2	0	1	3
Lincs L	0	0	0	0	1	13	0	2	9	0	3	22
Middx	0	1	4	0	0	0	1	2	1	1	3	5
Norf	4	2	2	0	3	9	1	2	11	5	7	22
N'ton	0	0	1	2	3	6	0	2	6	2	5	13
N'land	0	0	1	0	2	3	0	0	5	0	2	9
Nott	0	1	0	0	0	3	0	2	4	0	3	7
Oxon	1	2	8	2	3	3	0	0	1	3	5	12
Rut	0	0	0	0	0	0	0	1	1	0	1	1
Salop	1	1	1	1	4	6	0	0	4	2	5	11
Som	0	0	1	2	5	8	0	2	4	2	7	13
Staff	0	1	1	5	8	10	1	2	3	6	11	14

Suff	0	1	2	1	3	10	0	2	6	1	6	18		
Surr	0	0	2	6	4	3	3	6	4	9	10	9		
Suss	0	0	0	4	10	8	5	10	14	9	20	22		
Warw	0	0	3	0	1	4	1	3	5	1	4	12		
W'land	0	0	2	0	2	2	0	0	0	0	2	4		
Wilts	2	4	12	4	5	6	4	7	9	10	16	27		
Worc	0	0	3	1	8	6	0	2	6	1	10	15		
Yorks E	1	0	0	0	0	1	1	2	1	2	2	2		
Yorks N	1	2	4	0	0	4	1	1	2	2	3	10		
Yorks W	1	2	1	2	6	8	1	1	13	4	9	22		
Total	(	180	)	(	571	)	(	385	)	(	1136	)		

In the Rural History Calendar we have been unable to locate 4 records within the divisions of Lincs for the second time period and 6 records for the third time period. In the NRA Index we have been unable to locate one Yorkshire record within its riding for the third time period.

to require labour books. The sale of produce off such a farm would not be complex enough to create a need for detailed farm accounts. As late as 1870 over 80 per cent of the farms in England and Wales were 100 acres or less, and the average farmer probably found little cause to keep detailed written accounts. The sample of farm accounts and related records is likely as a result to represent the more entrepreneurial farmer, the man or woman with a larger than average holding, making more complex sales and purchases, and employing a labour force sufficiently large to require a written record of payments and tasks. There may also be a distinction in the record keeping of tenant farmers and owner occupiers, but we have made no attempt to divide the two categories, partly because by the nineteenth century many owner occupiers rented additional land to supplement their holdings.

III

Having established the survival of a body of material we need now to ask whether it will provide the data to answer the questions posed earlier in this paper. Collins suggested that farm accounts would provide evidence relating to a whole series of subjects:

> the levels of farm output, receipts, expenditure, profits and investment; the influence of price movements on individual farming systems; the ways in which farmers raised capital and in more prosperous times how they invested it; crop and milk yields; lambing and calving rates; the size of the wool clip and livestock weights; innovations in crop variety, animal breeds, farming techniques and implements; rotations and land utilization; land reclamation and enclosure; and marketing methods.[23]

This is an ambitious list, and on closer inspection it seems unlikely that all or indeed most of these suggestions can be examined on anything greater than a long-term local scale, or perhaps a short-term

[23] Collins, 'Historical farm records', p 145.

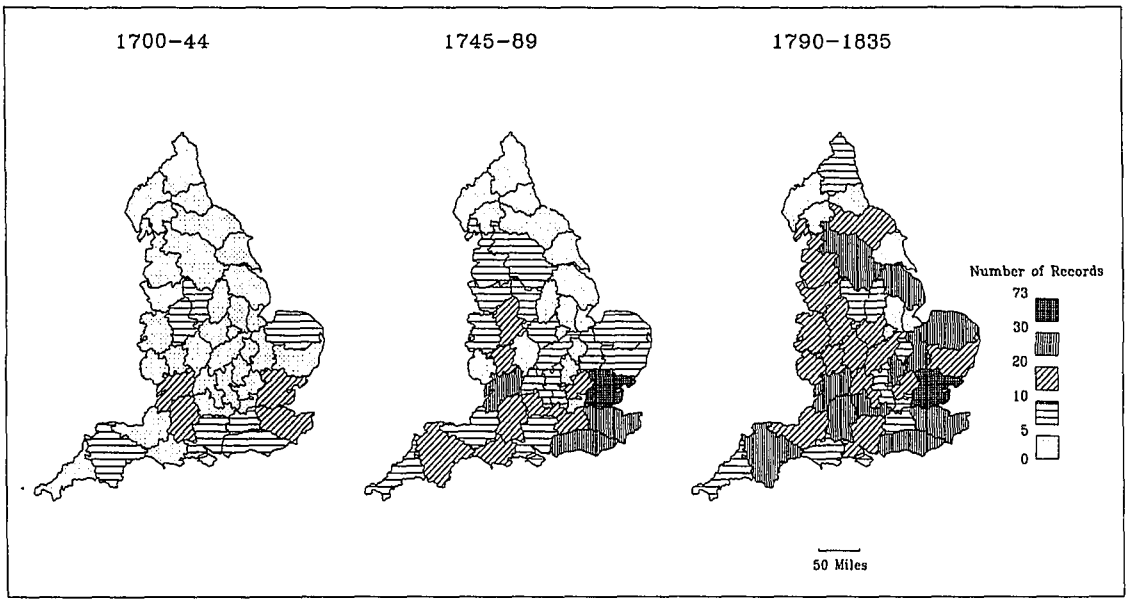


FIGURE 1
Distribution of farm records (Records held at Reading University Library and calendared at the Rural History Centre and the NRA).

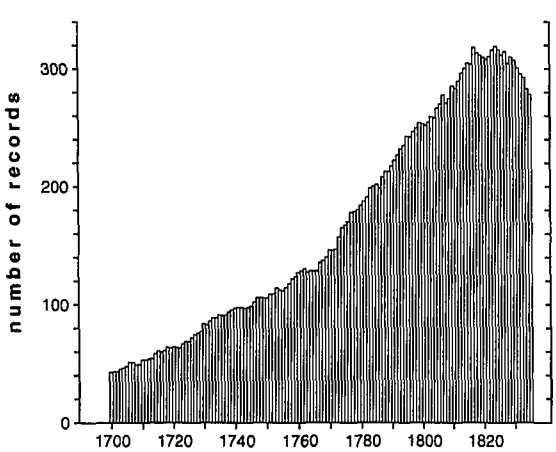


FIGURE 2
Chronology of surviving farm records.

regional scale. It seems highly unlikely, for example, that a long-run annual series of corn yields will be forthcoming for the eighteenth century. Yet an annual series, whilst perhaps the ideal, is not the only way to review change over time. Further research may yet identify significant geographical cross-sectional bunching of farm records in narrow periods, which if interspersed reasonably regularly will serve the same purpose.

We are sceptical, also, as to the possibility of being able on any large scale to relate yields to specific farming systems and soils. In any case, and especially prior to the nineteenth century, we have to take into account considerations of local measurements, and to remember that the bushel – in which most yields were given – is a volumetric measure, often of uncertain size.

Bushel weights could vary from year to year as a result of seasonal factors, manuring treatments, variety of seed, soil types, and other considerations. Without bushel weight data, and thus an indication of the food value of the grain, accurate assessment of true yield is difficult. The extant 1801 crop returns make it perfectly clear that a number of different measures of crop yield were in place, some of which were local. Crops were variously measured in bushels, quarters, measures, sheaves, strikes, sacks, loads, bolls, bags, gallons, pecks, coombs,

seams, thraves, tons, and combinations of these measures. In making their returns, some incumbents were careful to specify which bushel they were using. In both Cornwall and Cumberland, for example, incumbents specified Winchester bushels to distinguish from the local bushel which was worth three Winchesters. In some east of England parishes the produce was reported in coombs which were equal to four Winchester bushels, and in Bedlington in Northumberland it was reported that a boll was worth two Winchester bushels and a stook was worth twelve sheaves. Not only were there many ways to report yields, but those yields as volume measures could vary from year to year in terms of weight. At Aycliffe in Durham, the wheat produced from 17 to 25 stooks per acre, but each stook varied from 3.5 to 5 pecks. In the Norfolk parish of Northwold a bushel of wheat weighed 63 pounds in 1801 but in Tipton in Staffordshire the 'same' bushel weighed 70 pounds.[24]

Included in the shopping list drawn up by Collins are items suggesting that the records will include evidence of farm inputs, although the list concentrates more on outputs. Armed with both inputs and outputs it should be just a short step to measures of productivity, although to claim this on any large scale will exaggerate the richness of these data. For example, farmers' profits and productivity will be largely meaningless without information on the (uncosted) labour of the farmer himself and that of his family, and on the capital employed, both in terms of owned land and buildings and in stock and equipment as well as rented land. Only for individual farms are we likely to be able to obtain information on capital employed and its distribution between farmer and landlord, while in a long-run series we have to be aware of possible changes in the precise delineation of the farm for which calculations of productivity and profit might be possible. Cross references to estate records may be appropriate.

Despite these provisos it is our belief that it is possible to push forward knowledge of the business of farming. Consequently, armed with our general appraisal of the survival of farm records we conducted a sensitivity analysis of a sample of the records. For this purpose we began by using the record collection at Reading (Reading Library). A standardized pro forma was developed to record the types of material in the records. Since the Reading Collection was skewed towards southern England, we also sampled a number of collections identified through the Rural History Calendar and the NRA Index. Approximately 160 collections in archives from fifteen regional or county areas were surveyed. The results of this sample survey are summarized in Table 3 and graphed by category of records in Figure 3.

On the basis of our search through the Reading Library collection, and the survey of collections across the country, we can give some idea of what findings emerge. A relatively small number of records gave direct evidence on agricultural output in the form of arable crop yields. Specific data on arable yields were found for West Sussex (1751–1831), East Sussex (1726–1791), Durham (1824–36), Lindsey (1810–14), Kesteven (1826–35), Middlesex (1817–29), Leicestershire (1817), Kent (1813–20), Hampshire (1786–1835), and Berkshire (1808–22).[25] The data are insufficient to calculate a national yield, but they could form the basis for more detailed examination of comparative output across space and through time.

Furthermore, a more systematic working

[24] M E Turner, *Home Office Acreage Returns (HO67), List and Index Society*, vols 189, 190, 195, HMSO, 1982, 1983.

[25] Reading University Library, P 247, P 323, P 285, P 322; LEI 4/1/1-2; KEN 4/5/1; HAN 11/1/1 and 11/2/1; Lincolnshire Archives Office, 2 T d'E/d/6; Durham Record Office, D/Ph/61/1; East Sussex Record Office, HOOK 16/2-3; West Sussex Record Office, MP 1477.

TABLE 3
Sensitivity analysis of a sample of 160 farm records

Category	*Items*		*Number of references*
Output	Arable	yield	8
		area	37
		quantity	32
	Livestock	age	31
		weight	21
		condition	28
		destination/origin	18
		numbers	26
		reproduction	13
	Others	milk	1
		butter	2
		cheese	0
		wool	10
Inputs	Arable	seeds	13
		manures	11
		buildings	3
	Livestock	feeds	8
		buildings	2
Prices	Crops		70
	Livestock		62
	Other products		43
	Rents/rates		50
	Labour		82
	Inputs		38
Labour Productivity			20
Profitability of Farm			14
Innovation	Rotations		19
	Crops		34
	Livestock breeds		12
	Fertilizers		4
Anecdotal information			42

of a complete archive may yet provide sufficient material to produce other yield series. For example, well-kept labour books provide sufficient detail to calculate yield from major corn crops. These records were generally the best kept and most complete of all farm records. Often they will provide the acreage harvested and the quantities of individual grains threshed. From this information it is simple to calculate yield, and because the figures were being used to calculate payments to the labourer the calculations for area of land and quantity of produce will generally have been accurate.

A number of other possible fields for investigation of the more neglected agricultural sector, livestock production, can be explored. Livestock weights, usually for animals ready for slaughter, were found from Cornwall to Durham, and from Cumberland to Sussex. The wide geographical coverage of the survey has provided examples of animal husbandry at each stage of production from birth to eventual slaughter. In 1699 the farmer at Ruffins Hill Farm, Burmarsh, Kent, achieved a weaning rate of over 8 lambs per 10 ewes. In the November of that year

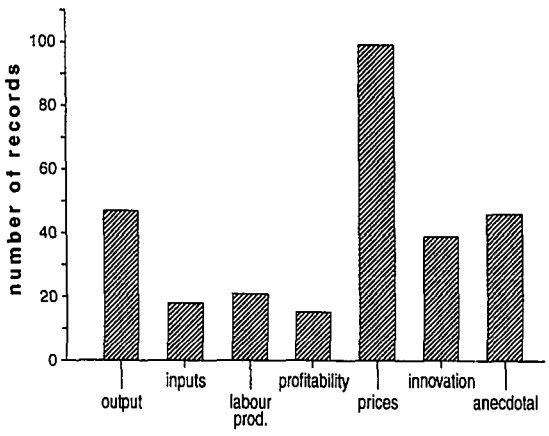


FIGURE 3
Type of data available from a sample of farm records (There are some slight discrepancies in numbers between this figure and Table 3. This discordance arises because the output records refer to arable and livestock outputs, and to yield estimates. Some records give both outputs and yields, but others refer only to one or the other).

he sold 998 lambs bred from his 1243 ewes, 380 of which were in the breeding flock for the first time. At that time these lambs were valued at 5*s* each. The ewes were worth 10*s* and the rams 12*s*.[26] At Stow-on-the-Wold, Gloucestershire, in March 1824 seven cows produced an average of 5.25 gallons of milk daily.[27]

The movement of livestock from breeding and store regions to fattening farms and finally to slaughter provides the link in the various regional production networks. Joshua Ellis Junior of Beaumont Leys Farm in Leicestershire purchased cattle for grazing and then sold them fat the following year. In the autumn of 1817 he purchased two Welsh bullocks at £6 17*s* 6*d* per head, as well as cows, calves, and heifers at Loughborough and Leicester markets. The following year he sold two Welsh bullocks in London at £14 10*s* per head. He also sold a number of the other cattle with a similar mark-up.[28]

The records from Cotton Hill Farm, Bridgnorth, Shropshire, provide greater detail of the sales of fat cattle. In March 1762 a fat cow was killed. The meat weighed 502 lbs of which 48 lbs was fat and 77 lbs was hide, together with an unspecified amount of other offal. The farmer received £4 14*s* ½*d* for the meat, and a total of £6 10*s* 6*d* for the entire animal.

From some accounts details of the proportion of grain produced on the farm and fed to livestock can also be calculated. It is precisely this conjunction of inputs with outputs which will be vital if we are ever able to approach questions of, or even determine, overall productivity and business efficiency. On Torf Hill Farm in Rudby in the North Riding of Yorkshire in December 1823, 55 bushels of barley were winnowed for sale while 43 bushels were used for pig feed. On the same farm oats were fed to pigs, draught horses, mares and foals, fat cattle, cows, and sheep.

The reconstruction of accounts to explore the profitability of a farm should be possible for a broad span of time and over a wide area of England. Accounts which display this potential were found for Surrey, Cornwall, West and East Sussex, Cumberland, Northumberland, Durham, Holland and Lindsey in Lincolnshire. However, farmers were not always consciously profit takers in a modern business sense; indeed, relatively few seem to have kept formal accounts, so that the records which survive are likely to have been compiled by men and women with a reasonably business-like outlook and an education sufficient to provide numerical and literary skills. Our sensitivity analysis shows that a number of accounts were kept in such a way that it is a simple task to calculate crude

[26] Examples in this and the following three paragraphs come from Reading University Library, KEN 19/1/1; GLO 1/2/3; LEI 4/1/2; SAL 5/1/1; YOR 10/1/1.

[27] One of the anonymous referees pointed out that Gloucestershire cows producing so much milk in March must have been artificially fed since Cotswold grass would not have been sufficiently advanced so early in the year. Issues of this nature will require fuller analysis of the records, particularly of inputs.

[28] There are glimpses of the way farm records reveal the workings of the Welsh cattle trade in R J Colyer, *The Welsh Cattle Drovers: Agriculture and the Welsh Cattle Trade before and during the Nineteenth Century*, Cardiff, 1976.

profitability by simply subtracting annual expenditure from annual income. A farmer at Ardington and Lockinge, Berkshire, calculated his income in 1696 at £315 10*s* 2*d* and his expenditure at £88 15*s* 8*d*, leaving a substantial income over expenditure of £226 14*s* 6*d*. In 1753 at Bridgnorth, Shropshire, a farmer earned £459 5*s* 11*d* and spent £451 8*s* 5*d* leaving a modest income over expenditure of £7 17*s* 6*d*.[29] The concept of 'profit' was rather different from its modern business meaning, especially in the eighteenth century, hence our more cautious phraseology of crude profitability and 'income over expenditure'.

IV

Although we are confident that we have identified the great majority of the surviving records, and the categories in which similar records may be found on closer investigation, we are not certain that we will be able to answer the questions posed by O'Brien at least in the form we and he might like. Farm records can of course be much more systematically exploited by creating standard sets of categories – inputs, repairs, rent/rates, wage rates, sales, and so on – which can then be applied to each set of accounts. As Table 3 and Figure 3 show, the type of data recorded varies considerably, which makes such manipulation difficult. Yet while this exercise would be time consuming, it could provide the basis for a useful comparison of farming enterprises both geographically and temporally. From the accounts it would also be possible to create a series of farm-gate prices which could then be compared with national wholesale prices already collected. Labour productivity data are available for Surrey, Middlesex, Cornwall, East Sussex, Lancashire, Cumberland, and Northumberland and could provide much needed information for extending productivity studies already available from land productivity measures, and soon to be augmented by research under way on land rents.[30] Of course, we would have to be aware that the productivity of a farm was not only a reflection of the farmer, as well as the type of land and proximity of markets, but also of the landlord. The willingness of the latter to encourage his tenants, to put capital into the holding, and to use the institutional framework of estate management to bring about improvement can certainly not be overlooked.

Finally, it is possible to glean data on innovation and changing practices from a number of the accounts. Although this may be peripheral to the wider questions, noting the key changes – new crop introduction, new livestock breeds, new uses of inputs, changes in rotations – adds colour to the whole business and development of farming.

Taken together the material is sufficiently comprehensive for us to say a great deal about farmers, their budgets, and the output from their farms. We have hinted at the type of material available, but it will require considerable resources if agricultural historians are to begin to fill the eighteenth-century black hole. O'Brien was right in pointing to the gap, and our analogy of a black hole is apt. In cosmological terms a black hole is full of matter which cannot escape because of gravitational forces. What we have tried to show here is that the black hole of the eighteenth century is indeed full of matter, but that releasing it will not be easy. We are also aware that what we may eventually find will not necessarily be of the same quality as the results which have been achieved for the early modern period. Yet we believe the task of bridging the long eighteenth century is worthwhile, and that there is at least the beginnings of a substantial and relatively untapped database with which to make the attempt.

[29] Reading University Library, BER 43/2/1; SAL 5/1/2.

[30] M E Turner, J V Beckett, and B A Afton, ESRC project R000232415, *Agricultural Rent in England, 1700–1914, Final Report.*

Communities, Protest and Police in early Nineteenth-Century Oxfordshire: The Enclosure of Otmoor Reconsidered[1]

By DAVID EASTWOOD

Abstract

This paper revisits the violent and protested riots which followed the enclosure of Otmoor in Oxfordshire. The redistribution of property rights attended upon enclosure united local communities in protest, fostering social solidarities which transcended class divisions. In order to contain the disturbances magistrates were forced to experiment with new methods of policing. The article suggests that, where enclosure intruded new notions of property rights into communities where traditional entitlements were extensive and widely valued, new patterns of economic allocation would require new police powers to make them work.

In the years since Eric Hobsbawm and George Rudé published *Captain Swing* in 1969, the literature on rural protest in nineteenth-century England has grown in both range and sophistication.[2] A number of recent studies have deepened our understanding of the dynamics of social protest and extended our awareness of the diverse idioms of rural protest.[3] In the process old explanatory paradigms have generally been abandoned. Gone is the tendency to constrain rural protest within a framework of formed or incipient class relationships. The concept of largely static class relationships as the nodal point of rural social conflict has proved descriptively clumsy and analytically blunt. Those who have sought to retain social class as a central dynamic in their reading of rural society have adopted E P Thompson's reformulation of class not as a given set of social relations but as a constructed and contested narrative of social experiences.[4] In the work of Jeanette Neeson, John Archer, Roger Wells, Mick Reed, Keith Snell, Alun Howkins, and Ian Dyck we encounter a rural England comprised not of static, or normative, class conflicts but rather of mutable social alignments.[5] In essence rural England was a theatre for the making and remaking of class relations.

Perhaps the most fruitful line of approach has been the displacement of simple class models of rural protest with more subtlety shaded analyses of the

[1] This is a revised version of a paper delivered to the British Agricultural History Society's Conference on 'Conflict and Cohesion: Midlands Rural Society in the Long Eighteenth Century' held in the School of Continuing Education of the University of Birmingham on 24 September 1994. I am grateful to Dr Richard Hoyle for inviting me to contribute to the conference and to the participants for their helpful comments on my original paper.

[2] E J Hobsbawm and George Rudé, *Captain Swing*, Penguin ed, Harmondsworth, 1973.

[3] Amongst this now extensive literature see especially John Bohstedt, *Riots and Community Politics in England and Wales 1790–1810*, Cambridge, Mass, 1983; John E Archer, *'By Flash and a Scare'. Arson, Animal Maiming, and Poaching in East Anglia 1815–1870*, 1990; David Jones, *Crime, Protest, Community, and Police in Nineteenth-Century Britain*, 1982, pp 33–84; Roger Wells, 'Rural revels in southern England in the 1830s', in Clive Emsley and James Walvin, eds, *Artizans, Peasants, and Proletarians, 1760–1860*, 1985, pp 124–65; E P Thompson, *Whigs and Hunters*, 1975; R W Malcolmson, *Life and Labour in England 1700–1780*, 1981, pp 108–35; Andrew Charlesworth, ed, *An Atlas of Rural Protest in Britain 1548–1900*, 1983; John Stevenson, *Popular Disturbances in England 1700–1870*, 1979, chaps 5 and 11; Mick Reed and Roger Wells, eds, *Class, Conflict, and Protest in the English Countryside, 1700–1880*, 1990.

[4] E P Thompson, *The Making of the English Working Class*, Penguin ed, Harmondsworth, 1968, pp 9–12, 937–9; *idem*, *The Poverty of Theory and Other Essays*, 1968, pp 1–210, 245–301.

[5] J M Neeson, *Commoners: Common Right, Enclosure, and Social Change in England, 1700–1820*, 1993; Archer, *By a Flash and a Scare*; Roger Wells, *Wretched Faces: Famine in Wartime England, 1793–1801*, Gloucester, 1988; M Reed, 'The peasantry in nineteenth-century England: a neglected class?', *History Workshop Jnl*, XVIII, 1984, pp 53–76; K D M Snell, *Annals of the Labouring Poor: Social Change and Agrarian England, 1660–1900*, 1985; Alun Howkins, *Reshaping Rural England. A Social History 1850–1925*, 1991; Ian Dyck, *William Cobbett and Rural Political Culture*, 1992.

communal context of popular protest.[6] Barry Reay's elegant study of the Hernhill Rising of 1838, with its emphasis on protesters' sense of community, local tradition, and communal norms, typifies this approach.[7] The customary culture, which played so large a part in defining plebian mentalities and shaping popular protest, became the central focus of E P Thompson's mature work.[8] Thompson's bi-polar model of a patrician society and a plebian culture does not render class analysis redundant, but offers a very particular contextualization of class tension within the cultural forms of a more traditionally ordered rural society. By making us more sensitive to the role of custom as a powerful organizing principal in rural society, recent historians have given us important insights into the ways in which rural England was shaped. Custom offered a compelling, popular, and anti-modern discourse on entitlement, defining and legitimating rights such as commoning, gleaning, and benefits in kind, which in turn upheld what Jeanette Neeson has described as 'the economy of multiple occupations'.[9] This is not to suggest that communities embodying customary entitlements and traditional rights were harmonious. Customary entitlements could themselves constitute the nodal points of intra-communal conflict. Open fields, commoning rights, and other entitlements had to be policed, and with the rise of the enclosure movement explicitly 'improving' economic principles first challenged and then subverted the salience of custom within rural communities.[10] In short, the paradigm shift from class to community does not necessarily imply that rural communities were any the less fissured but rather that those fissures are best understood within the vernacular of communal discourses rather than in the more formalized language of class conflict.

The Otmoor disturbances in Oxfordshire offer a useful case-study through which to examine and develop models of community and conflict in late-Hanoverian rural England. Not only did these disturbances span half a century, from the 1780s to the 1830s, but they saw local communities polarized between enclosers and defenders of common rights, between legal and customary notions of economic and social entitlements, and between those who favoured new police methods and those who bitterly resisted them. Simultaneously village communities found themselves in conflict with county government, and even with the Home Office by the 1830s. The Otmoor riots reveal communities in conflict on an usually wide scale. Moreover, despite the attempts of one historian (Bernard Reaney in 1970) to explain the Otmoor riots in terms of the conventional parameters of class struggle, the history of the Otmoor struggle confounds rather than confirms the normal class paradigm.[11] Frequently we see class solidarities fractured rather than reinforced, we see the prerogatives of property coming into conflict with a disposition to make concessions in order to restore order, and we see notions of legal entitlement confronting customary expectations. Thus at

[6] C J Calhoun, 'Community: towards a variable conceptualization for comparative research', *Social History*, V, 1980, pp 105–29; *idem*, *The Question of Class Struggle. Social Foundations of Popular Radicalism during the Industrial Revolution*, 1982; Bob Bushaway, *By Rite: Custom, Ceremony and Community in England 1700–1880*, 1982.

[7] Barry Reay, *The Last Rising of the Agricultural Labourers, Rural Life and Protest in Nineteenth-Century England*, 1990.

[8] E P Thompson, *Customs in Common*, 1991, pp 1–15, 97–184.

[9] Neeson, *Commoners*, p 290; Peter King, 'Gleaners, farmers and the failure of legal sanctions in England 1750–1850', *Past and Present*, 125, 1989, pp 116–50; *idem*, 'Customary rights and women's earnings: the importance of gleaning to the rural labouring poor, 1750–1850', *Econ Hist Rev*, 2nd ser, XLIV, 1991, pp 461–76.

[10] Neeson, *Commoners*, pp 134–57.

[11] For a valuable, if partial account see B Reaney, *The Class Struggle in Nineteenth Century Oxfordshire*, 1970. A descriptive summary of events from 1832–35 is offered by A V Brown, 'Last phase of the enclosure of Otmoor', *Oxoniensia*, XXXII, 1967, pp 35–52. See J L and B Hammond, *The Village Labourer*, ed by G E Mingay, 1978, pp 49–56; M G Hobson and K L H Price, *Otmoor and Seven Towns*, 1961, pp 14–16; W E Tate, *The English Village Community*, 1967, p 210. The geography and patterns of cultivation on Otmoor are well covered in C J Bond, 'Otmoor', in *The Evolution of Marshland Landscape*, Oxford University Department of External Studies, 1981, pp 113–35.

the height of the Otmoor crisis, in the spring of 1831, the chairman of Oxfordshire's quarter sessions, W H Ashhurst, argued that everything, even by implication a strict interpretation of formal property rights, should be subordinated in the attempt to restore peace to the county, remarking that, 'whatever might be a person's private feelings, under the circumstances in which Otmoor was placed, it was the duty of every man to allay the feelings of irritation which were there, and to preserve the peace'.[12] Simultaneously, the principal landowners of Otmoor asserted the unfettered rights of property, as redefined through the act of enclosure, informing the Home Secretary that, 'even were we willing, as proprietors, to abandon our clear and indisputable title, we need hardly point out to your Lordship the mischievous consequences which must ensure from allowing property...to be arrested from us by undisguised force'.[13] Here private economic rights directly confronted local politicians' sense of a greater public good and, simultaneously, village communities were experiencing a convulsive transformation of their economic structure and cultural identity.

I

Otmoor was a large area of waste land north-east of Oxford. The low-lying wetlands were surrounded by seven towns, whose inhabitants enjoyed a *de facto* right to common on the moor.[14] Otmoor was subject to regular flooding which critically impaired its agricultural usefulness, and this dampness was thought responsible for a serious strain of cattle distemper known locally as 'Moor Evil'.[15] Despite this, both Davis and Arthur Young, who surveyed Oxfordshire for the Board of Agriculture in 1794 and 1807 respectively, considered the quality of the soil good, and enthusiastically endorsed the idea of enclosure. Many local landowners were equally sanguine.[16] In fact, such optimism was ill-founded, but it was of immense importance in stimulating the movement to enclose the moor and curtail commoning rights.[17] If Otmoor was to be cultivated it would require very substantial capital investment in drainage, fencing, outbuildings, and other basic infrastructure. Capitalizing the project presupposed substantial returns for major landowners and implied a concentration of ownership among a smaller number of self-consciously 'improving' landowners. In this brave new world of enhancing the use-value of underproductive land, customary rights to commoning on the moor found no place, indeed were construed as fundamental obstacles to improvement. The essential legal instrument for legitimizing the engrossment of private holdings at the expense of common rights was an enclosure act.

The turbulent history of Otmoor began in 1786, when the young Alexander Croke proposed draining and enclosing the moor in an attempt to increase the yield of his small estate of Studley Priory. He presented details of a scheme costing an estimated £5250, and canvassed a rate of 9*d* in the pound to be levied on each of the seven towns to defray the expense.[18] Public notices of the intention to petition for a

[12] W H Ashhurst in conversation with Richard Smith, 26 March 1831, cited in *Proceedings on the Trial of the Information, King v Smith*, 1832, p 64. For Ashhurst's career, see David Eastwood, *Governing Rural England. Tradition and Transformation in Local Government, 1780–1840*, 1994, pp 59–61.

[13] PRO, HO 52/15/473, Sir A Croke, T L Cooke and P Serle to Lord Melbourne, 27 April 1831.

[14] The Otmoor towns were: Charlton, Oddington, Noke, Beckley, Horton, Fencott, and Murcott.

[15] J Dunkin, *History and Antiquities of Bullingdon and Ploughley*, 1823, i, pp 123–24.

[16] R Davis, *General View of the Agriculture of Oxford*, 1794, p 22; Arthur Young, *General View of the Agriculture of Oxfordshire*, 1813, pp 227–31.

[17] C S Read, 'The farming of Oxfordshire', *JRASE*, XV, 1854, p 251. Read wryly commented that, 'Like all undertakings destitute of an honest foundation, this enclosure did not prosper'.

[18] A Croke, *Short View of the Possibilities and Advantages of Draining, Dividing and Enclosing Otmoor*, 1787. Croke gave an autobiographical sketch in his *Genealogical History of the Croke Family*, 1823, ii, pp 706–30. His tenure as judge in the Vice-Admiralty Court in Nova Scotia between 1801 and 1815 was marked by controversy.

private act were posted in 1786 and immediately torn down in an unequivocal demonstration of popular hostility. Croke attributed this to the precipitate action of W E Taunton, the county's clerk of the peace, who had a smallholding at Charlton-on-Otmoor and initially favoured the idea of enclosure.[19] However, the root cause of popular resentment was a justified belief that Croke's scheme would effectively prohibit commoning on Otmoor. Croke's reply, that in practice commoning was limited by the wetness of Otmoor, underestimated both the marginal utility of common rights and the depth of popular anger.[20] The villagers, unusually, found an aristocratic ally in the lord of the manor, the earl of Abingdon. The radical earl, whose sympathies embraced Wilkes, the American colonists, and the French revolutionaries, promptly blocked the bill, and proclaimed that, 'As Lord of the Manor, besides the dictates of humanity, I should feel it my duty to protect the cause of the *poorer* inhabitants in preference to those of the *richer* who need no such protection'.[21] Abingdon demonstrated both his contempt for Croke and his populist *bona fides* by impounding Croke's cattle, insisting that he had no right to common pasture. Although he lost ensuing court cases, Abingdon proved his point, and Croke, *pro tempore*, abandoned his aspirations to the life of a leisured gentleman and returned to Oriel College, Oxford, to train as an advocate.[22] He summed up the outcome of this first skirmish, with sarcastic bitterness: 'As his Lordship has marshalled the parties, there are, on the one side, the Earl of Abingdon and the Otmoor mob...on the other all the respectable gentlemen and landholders'.[23]

Croke later described his 1787 scheme as 'patriotic'.[24] Rather less patriotic – to his mind at least – was the revival of plans for enclosure by none other than W E Taunton, after Abingdon's death in 1799 had removed the principal, or at any event the most respectable, obstacle to enclosure. A bitter pamphlet war between Croke and Taunton ensued, in which the clerk of the peace defended his actions as honourable and consistent, and Croke pilloried Taunton as opportunistic and mischievous. In 1800 the duke of Marlborough, another local landowner, in concert with Taunton introduced an enclosure bill against which Croke petitioned. Mutual antagonisms effectively scuppered the bill, and traditional rights survived as a consequence of proprietorial disagreement.[25] It was ironic, if inevitable, that the enclosure act for Otmoor[26] was secured in 1815 when Croke was in Nova Scotia and in the face of his vicarious opposition.[27] There was no spontaneous demonstration of popular outrage at this expropriation of communal rights. Instead enclosure commissioners were appointed and went about their work tortuously. The enclosure settlement was not finalized until 1829, at a cost of around £20,000.[28] Too often enclosure has been conceived in stark terms, as the forcible transfer of property and other entitlements from smallholders and a diminishing peasant class to major property owners. The example of Otmoor, like Neeson's work on Northamptonshire, hints at more equivocal, and more obviously contested processes, in which the interests and pri-

[19] Bodleian Library (hereafter Bodl), G A Oxon b 96(5), A Croke, *Letter to the Proprietors of Otmoor*, 1800, pp 1–2; W E Taunton, *Answer of Mr Taunton to a letter written by Dr Alexander Croke*, 1800, pp 6–10; A Croke, *Second Letter to Proprietors of Otmoor*, 1800, pp 4–13. Taunton was attorney to the earl of Abingdon and ceased to advocate the 1786/87 scheme once the earl's opposition was known.

[20] Croke, *Short View*, pp 8, 21 *et seq.*

[21] Earl of Abingdon, *Case of Otmoor*, reprinted 1831, p 7. Original italics.

[22] Bodl, G A Oxon 4° 49, p 216; Croke, *Genealogical History*, ii, p 709; *idem*, *Second Letter*, *passim*.

[23] Bodl, G A Oxon b 96(4), A Croke, *Answer to Lord Abingdon's Case of Otmoor*, np, nd [?1787].

[24] Croke, *Genealogical History*, ii, p 709.

[25] Hammond, *The Village Labourer*, pp 50–51.

[26] 55 Geo III, c 100.

[27] A Croke, *The Case of Otmoor*, 1831, p 8 *et seq*; Reaney, *Otmoor*, p 27.

[28] PRO, HO 52/9/339-45, Account of Otmoor by A Croke and T L Cooke prepared for Robert Peel.

orities of the propertied emerge slowly and ambiguously.[29]

II

What had hitherto been a local dispute exploded in 1830 with what became known locally as 'The Revolution of Otmoor'.[30] Following the recommendations of the enclosure commissioners, a new cut had been made for the river Ray. This greatly reduced the problem of flooding on the moor, but resulted in the Ray breaking its banks upstream and flooding prime agricultural land. Again fissures were emerging not simply between the propertied and the unpropertied but between different interests within the propertied elite. Newly enclosed property was being valorized at the expense of other property values. In June 1829 aggrieved farmers led an attack upon the new cut and threw down its embankments. As a result twenty-two were indicated for felony at the Oxford assizes. At the ensuring trial, however, Mr Justice Park directed the jury to acquit because the defendants had acted 'to *relieve themselves* from the inconvenience of having their own lands overflowed'.[31] Park's judgment was limited and technical, but was widely, and incorrectly, interpreted as a declaration of illegality against the whole enclosure. Park's decision, however misconstrued, emboldened the protest movement and on 28 August parties from the Otmoor towns began breaking enclosure fences.[32] By 3 September magistrates were finding it impossible to swear-in special constables, and were requesting troops.[33] A series of sporadic attacks culminated on 6 September when a crowd estimated at five hundred destroyed enclosures and swelled the cry: 'Otmoor for ever!'.[34] Forty-two arrests were made and prisoners taken under armed guard from Islip to Oxford gaol. Rioters reached Oxford first and addressed the crowds at St Giles Fair, with the result that when the convoy arrived brickbats, stones, and abuse were hurled. On the corner of Beaumont Street the prisoners were dramatically rescued and a great popular triumph was consummated.[35]

This was the stuff of popular legend, retold then, as now, 'with advantages'. Both symbolically and politically it amounted to serious defeat for both the enclosers and the magistracy. Meanwhile the protest movement acquired a more regular rhythm and clearer patterns of organization. Under cover of darkness, crowds of between one and five hundred ventured on to the moor with blackened faces, frequently disguised as women, and carrying pitchforks, bill-hooks, and even guns. Their targets were the fences, hedges, and bridges being erected during the day by the enclosers.[36] Traditional police measures were wholly ineffective, and magistrates quickly became convinced that order could only be restored by calling in the yeomanry and stationing troops around Otmoor.[37] The rioters sought to raise the stakes, claiming to have 'all the county on their side', and urging sympathetic consideration of their case, 'lest *Otmoor for ever*

[29] Neeson, *Commoners*.

[30] Bodl, G A Oxon 4° 49, 187.

[31] PRO, HO 52/9/351-54, Park to Peel, 25 September 1830. Park agreed they might have been guilty of riot, but they were not tried under this charge.

[32] Oxford County Record Office (hereafter ORO), Documents relating to the Otmoor riots, 1829–35, CPZ 15/1, MSS copy of article from *Gentleman's Magazine* on the Otmoor troubles; CPZ 15/3, Memorandum of J W Henley.

[33] PRO, HO 52/9/208, T L Cooke to Peel.

[34] PRO, HO 52/9/213, Macclesfield to Peel, 7 September 1830; ORO, CPZ 15/1 and 3.

[35] PRO, HO 52/9/332, Capt Hamilton to Peel, 10 September 1830.

[36] PRO, HO 52/9/344–45, (?deposition of Cooke); ORO, CPZ 15/8, Ashhurst to Melbourne, 23 January 1832; CPZ 15/17, Deposition of Richard Thornton, 3 August 1833. The actions of the Otmoor protesters were strikingly similar to those of the *Demoiselles* defending forest rights in the Pyrenean foothills; see J M Merriman, 'Demoiselles of the Ariege, 1829–31', in Merriman, ed, *1830 in France*, New York/London, 1975.

[37] PRO, HO 52/9/213, Macclesfield to Peel, 7 September 1830; HO 52/9/219, Weyland etc, to Peel, 7 September 1830; HO 52/9/228, Lord Churchill to Macclesfield, 9 September 1830; HO 52/9/357, Weyland to Peel, 9 November 1830; HO 52/15/467, Croke to Melbourne, 27 February 1831.

become a war cry beyond the county'.[38] The dramatic events of 6 September and the intensity of violence thereafter constituted a challenge which magistrates could neither ignore nor abate by traditional means.

The gravity of the problem lay in the attacks being more than spontaneous popular uprisings. Actions were concerted and strategy premeditated.[39] In the first instance the inspiration came from local farmers who orchestrated sorties on to Otmoor, and were deeply suspicious of the enclosers. As late as February 1833 Ashhurst thought there was 'much reason to believe that some of the Farmers still give encouragement to these outrages – as it is known that there was a meeting of the Farmers just before the fences were destroyed on the Friday night'.[40] Farmers were not alone in lending coherence and calculation to the movement. Magistrates were convinced that, 'the Parish Constables have so strong a feeling, and are so mixed up in the matter as to render it useless to expect them to do the[ir] duty'.[41] Otmoor exposed the critical weakness of the system of parish constables, for whom communal loyalty was the transcending obligation, and the passage of time did little to erode constables' sympathetic indulgence. In 1833 Michael Cooke, a constable at Fencott, was still shielding and encouraging rioters.[42] The *Crown* at Charlton-on-Otmoor was the starting and watering point for many nocturnal sorties.[43] Here Richard Price, a Charlton overseer, procured ample quantities of beer for volunteer attackers, and urged them to 'go into [*sic*] Otmoor, and cut all down if you can, but mind you are not caught'.[44] Thus the riots not only articulated communal concerns but were disciplined by traditional village hierarchies.

Itinerant radicals fortified the protest. One such, Josiah Jones, supplemented offers of refreshment with the moral assurance that 'the common was taken away in a roguish way'.[45] Material assistance was also offered. In the *Crown* there was a box labelled 'Otmoor Subscriptions'.[46] Most notorious was the fund established by Richard Smith, a radical Oxford wine merchant, who placed newspaper advertisements in April 1831 urging contributions for those 'who have suffered not only by iniquitous enclosure, but also by imprisonment'.[47] Smith was also seen in the *Crown* encouraging the opponents of enclosure to persevere with their strategy of violence which, he believed, would ultimately defeat the enclosers. He was prosecuted on the grounds that his advertisement was prejudicial to the trial of rioters, but the jury split equally and the case was lost. Smith maintained that the trial was mounted by Tories who objected to his active support for Reformers in the 1831 county election.[48] The involvement of Smith hints at the wider political significance of the Otmoor protests. As one hostile poster had it, the people of Otmoor were being 'misled by artful and designing persons'.[49]

Thus the disturbances were sustained by a broad social grouping whose diversity and momentary coherence constituted a serious problem for magistrates. Even proprietors conceded that 'the lower classes of Farmers and the poor in the whole neighbouring Country take part'.[50] By 1834 this

[38] PRO, HO 52/9/226, Anon to Peel, 10 September 1830.
[39] PRO, HO 52/9/211, Weyland and others to Peel, 6 September 1830.
[40] ORO, CPZ 15/8, Ashhurst to Melbourne, 19 February 1833.
[41] PRO, HO 52/9/336, Weyland etc to Peel, 11 September 1830.
[42] ORO, CPZ 15/15, Thornton's deposition, 3 August 1833. Richard Thornton was the only labourer to give evidence to magistrates. He came forward too late to enable charges to be made upon his testimony.
[43] PRO, HO 52/15/469, Croke and Cooke to Melbourne, 21 February 1831.
[44] ORO, CPZ 15/17, Thornton's depositions.
[45] *Ibid.*
[46] *Ibid.*
[47] *Jackson's Oxford Journal*, 2 and 23 April 1831.
[48] *Trial of King v Smith*, pp iii-v; ORO, CPZ 15/15 and 17, Thornton depositions.
[49] Bodl, G A Oxon b 96(10), A Croke, *To the Inhabitants of Otmoor*, 1831.
[50] PRO, HO 52/9/343.

alliance was fragmenting. The farmers, who had as much to lose by the general flouting of property rights as they had to gain from the events of 1829–30, rediscovered a deep distrust for the excesses of popular activity. As early as 1832 Croke thought 'the principal farmers...heartily tired of the business'.[51] It was not, however, until 1834 that the labourers became profoundly suspicious of the farmers' overweening self-interest and thus this critical axis of alliance was fractured.[52] The eventual disintegration of the opposition owed much to the resolution of the authorities and the persistence of the enclosers. Failure bred disillusionment, and gradually, as support ebbed, the Moor towns were isolated and resistance evaporated.

III

At their zenith, the threat posed by the riots was intensified by the apparent incapacity of customary guarantors of authority. Initially both magistrates and the enclosers were bewildered and constrained by what they construed as ambivalence of the law. Mr Justice Park's judgment of 1829 was widely regarded as legitimizing direct action in defence of traditional rights.[53] Later, in 1831, four men were tried for riot and the most the terror of the law could muster were two sentences of eight weeks' imprisonment. This was followed by acquittals of rioters and the fiasco of Smith's trial.[54] J M Davenport, who became clerk of the peace in 1831, was in no doubt that these judgments had had profound effects. 'It unfortunately happened...at the outset of the Otmoor depredations the Defendants on more than one prosecution were acquitted. These acquittals – however just the Verdicts of the Juries on those occasions may have been – re-excited the Rioters, and did in every point of view monstrous harm'.[55] These judgments gave rise to magisterial uncertainty: justices were eager for convictions but could not afford further acquittals. Davenport thought 'that if some examples could be made they would have an excellent effect on the public mind', and, for this reason, 'magistrates have most anxiously wished to effect a conviction'. However, given the solace rioters found in acquittals, justices could only allow a case to proceed if conviction was 'highly likely'.[56] This was a view with which Ashhurst, as chairman of the quarter sessions, wholly concurred.[57] In 1833 Ashhurst considered a proposal to prosecute, at the county's expense, three men arrested carrying bill-hooks on Otmoor. Ashhurst insisted that the county take an opinion from Mr Serjeant Trelford, who duly advised on the difficulties of proving conspiracy. In the light of Trelford's opinion, Ashhurst vetoed the prosecution, arguing that 'it would be madness to go on with the indictment of these men'.[58] A year later justices did risk bringing a case, based upon circumstantial evidence, for destruction of a bridge at night, and the judge's 'stern comments' were believed by magistrates to have had 'a beneficial effect'.[59]

Magistrates' difficulties arose, in large measure, from problems in procuring evidence. Davenport thought rioters were so firmly in league that offering rewards for evidence was a pointless exercise, while Ashhurst and his fellow magistrates lamented the law's leniency towards those

[51] ORO, CPZ 15/8, Croke to Ashhurst, 26 January 1832.
[52] ORO, CPZ 15/17, Layard to Ashhurst, 8 and 28 January 1835.
[53] ORO, 'Cases and Opinions' (complied by J M Davenport), CPX I, p 9.
[54] ORO, CPZ 15/5, Bundle of depositions etc on 1831 trial; 'Clerk of the Peace's Notebook' (kept by J M Davenport), CPN I, p 268. Cases were brought at the county's expense.
[55] ORO, CPX I, p 11.
[56] *Ibid.* The Otmoor trustees also thought convictions essential to their being able to enforce the enclosure act; see Bodl, Leigh Papers, MS Dep. 48/12, bundle 1, Cases against Coleman and others, 1832, p 6.
[57] ORO, CPZ 15/8, Ashhurst to Melbourne, 9 February 1833.
[58] ORO, CPZ 15/17, Ashhurst to Davenport, 9 July 1833; cf CPX, pp 8–12.
[59] ORO, Quarter Sessions minute book, QSM II/9, Easter 1834.

found guilty of breaking fences.[60] Magistrates sought to invoke the moral authority of central government to counterbalance the law's equivocations and successfully petitioned the Home Office to offer a reward of £100 for information leading to rioters' arrest or prosecution. Magistrates placed considerable weight on 'the salutary effect which would be produced by the matter being taken up by the Government, and of the impression that would be felt that the outrages have assumed so serious a complexion as to call for the interference of Executive authority'.[61] Despite the Home Office's intervention, a belief persisted that the case of the Otmoor rioters was a moral one, and the law, by failing to condemn *all* offences against property, legitimized, or at any rate failed to discourage, popular protest. Croke had few illusions on this score: 'Magistrates have shown too great lenity to offenders, and juries have acquitted persons against the evidence. From this relaxation of justice, laws cease to be the wholesome terror of evil-doers, or a protection to the property of individuals'.[62]

The nature of disturbances also confounded traditional communal methods of policing. While parish constables connived at rioting, fellow townsmen refused to serve as special constables.[63] A scheme suggested by Ashhurst for armed special constables to patrol Otmoor foundered on villagers' reluctance to undertake general police duties.[64] 'As might be expected the special constables merely told the Magistrates that they would not act for such a purpose [the general policing of Otmoor], and told the old tale, that they would prevent any disturbances taking place in their own town'.[65] A suggestion that Otmoor be patrolled by special constables from distant parts of the county who were unsympathetic to the rioters was dropped on legal advice that the 1831 Special Constables Act only permitted men 'from the neighbourhood' to be sworn.[66] If sympathy with the rioters undermined the utility of local constables, the risks of confronting armed rioters strengthened local citizens' resolution not to be sworn-in as special constables, with even 'the greater number of those who might be well-disposed...express[ing] their unwillingness to expose their lives to hazard'.[67] In the face of a concerted and armed challenge the traditional system of untrained volunteer constables was not only likely to be ineffective but was also demonstrably inappropriate.

The remaining response to riot was a military one. Troops were stationed around Otmoor in 1830, and during 1831 the yeomanry were frequently called out.[68] In late January 1832 Ashhurst succeeded in persuading Melbourne to station regular troops on the moor,[69] and in March visited the Home Office personally to urge Melbourne to postpone their withdrawal.[70] Although willing to use the yeomanry, *faute de mieux*, Ashhurst considered them ill-suited to general policing. The arrival of yeomanry always ended the disturbance until the yeomanry withdrew and then the rioters reconvened. The consequence was that the yeomanry felt 'they are needlessly

[60] ORO, QSM II/8, Michaelmas 1832; PRO, HO 52/19/268, Ashhurst to Melbourne, 19 February 1832. 7&8 Geo IV, c 27 had reduced the sentence to two months gaol or a fine, and in this respect, at least, Peel's liberalization of the criminal law was unwelcome to magistrates.

[61] ORO, CPZ 15/2, Minute book of Otmoor committee, 14 February 1833; see also CPZ 15/8, Phillips to Ashhurst, 20 February 1833; CPZ 15/14, bundle of posters.

[62] Croke, *Case of Otmoor*, p 4.

[63] PRO, HO 52/15/467.

[64] ORO, CPZ 15/9, Proposals of 23 February 1832. Ashhurst estimated the annual cost of this scheme at £1201.

[65] ORO, QSM II/8, Easter 1832, Report of Ashhurst and Henley; cf CPZ 15/10, Ashhurst's memorandum book, 14 March 1832. CPZ 15/11 lists those willing to serve as special constables in March 1832: 11 from Charlton, 10 at Fencott, and 5 at Murcott.

[66] ORO, CPX I, 7–8; cf 1&2 Will IV, c 41.

[67] ORO, CPZ 15/8, Ashhurst to Melbourne, 23 January 1832.

[68] *Jackson's Oxford Journal*, 5 March 1831; PRO, HO 52/15/489, Macclesfield to Peel, 25 May 1831.

[69] ORO, CPZ 15/8, Ashhurst to Melbourne, 14 February 1832; Phillips to Ashhurst 3 April 1832. Phillips was the Home Office official dealing with Otmoor.

[70] ORO, CPZ 15/10, 12 March 1832.

called out' and became ill-disciplined.[71] For these reasons justices had rejected Home Office proposals to station a troop of yeomanry permanently on Otmoor. 'The Magistrates feel that the Yeomanry are a Body very ill adapted to such a service, and that the season of the year is peculiarly inconvenient for the Farmers to be taken from home'.[72] In order to limit public hostility to the yeomanry justices insisted that it remain under the overall direction of the civil power. This probably blunted its operational efficiency, and certainly frustrated its more enthusiastic officers.[73] The yeomanry could be effective in dispersing riotous gatherings, but was maladroit when it came to surveillance and unsophisticated in day-to-day policing.

Amidst these perplexing circumstances, the quarter sessions handed the management of the Otmoor problem over to a special committee of nine leading magistrates under the chairmanship of Ashhurst.[74] Hitherto the sessions had tended to play down the gravity of the disturbances. In 1830 the lord lieutenant dismissed the riots as a local matter,[75] and throughout 1831 Otmoor magistrates and proprietors rather than formal meetings of quarter sessions forged policy and co-operated with the Home Office.[76] By August 1831 local justices were finding defending their own enclosures 'embarrassing and delicate', and pressed the Home Office to raise the matter with the High Sheriff.[77] The appointment of a special standing committee of the quarter sessions in 1832, the Otmoor Committee, marked the formal assumption of responsibility by the county. This committee immediately concluded that all normal resources were spent and 'that the strongest constabulary force which the Magistrates of the county have it within their means to raise for the suppression of the outrages which still exist on Otmoor will prove totally powerless and insufficient to meet the exigencies of the case'.[78] With the Home Office refusing to sanction the stationing of troops on Otmoor for an indefinite period, the committee persuaded their fellow magistrates to approve the deployment of a trained professional police force on Otmoor. Although the quarter sessions had conceded in 1831 that policing these troubles was a legitimate charge upon the county, many magistrates remained sceptical as to the cost-effectiveness of adopting new and more elaborate methods of policing.[79] Despite these reservations the committee appointed and armed fourteen Metropolitan constables, and for three years Otmoor was policed by a force paid and administered by the county.[80] Predictably perhaps, there was considerable local hostility to the force, and constables, along with the houses where they lodged, were frequently attacked.[81] Problems were not eased by the conduct of Chamberlayne, the superintendent, who was accused by one of his officers of 'drunkenness, partiality, negligence and tyranny'. Chamberlayne was later dismissed and under the guidance of his successor, Mr Layard, both the effectiveness and the reputation of the force improved. The county later affirmed that Layard's 'quiet, but at the same time firm and proper conduct has conciliated all Parties'.[82] The force was never of

[71] ORO, CPZ 15/8, Ashhurst to Melbourne, 23 January 1832. Otmoor magistrates shared Ashhurst's reservations, PRO, HO 52/15/497, Croke, Cooke and Serle to Melbourne, 28 July 1831.
[72] PRO, HO 52/19/282, Ashhurst to Melbourne, 2 April 1832.
[73] ORO, CPZ 15/10, 12 May 1832. A month later the Otmoor committee attempted to dispense with the yeomanry, 2 June 1832.
[74] ORO, CPZ 15/2, *passim*. Davenport acted as secretary to the committee and he, Ashhurst and J W Henley did the bulk of the work.
[75] PRO, HO 52/9/277, Macclesfield to Peel, 10 September 1830.
[76] PRO, HO 52/15/*passim*.
[77] PRO, HO 52/15/499, Croke and others to Melbourne, 1 August 1831.
[78] ORO, QSM II/8, Epiphany 1832.
[79] *Ibid*, Michaelmas 1831; PRO, HO 52/19/268.
[80] ORO, CPZ 15/2, 24 February 1832; QSM II/8, Easter 1832. All constables carried pistols.
[81] ORO, CPZ 15/10, 8 and 10 February, 5 November 1833.
[82] ORO, QSM II/10, Trinity 1835.

sufficient size to prevent all attacks upon enclosures, but it did deter some rioters by increasing the likelihood of detection. The moor was patrolled on moonlit nights, and Layard gradually gathered sufficient information to pre-empt attacks and make arrests. In an ironic reversal of fortunes, by 1834 landlords could enclose at night under police protection.[83] The novelty of the force, coupled with the organizational efficiency developed under Layard, enabled it to achieve a degree of success which had eluded more traditional approaches.

The principal objection to the new force was less its novelty than its expense. In the first full year it cost the county £1174 (13 per cent of county expenditure), and between 1832 and 1835 the cost totalled £2870.[84] There was hostility in other parts of the county to funding a police operation designed to protect what was, in effect, property speculation in a small locality. While the quarter sessions came to see Otmoor as more than a local *Jacquerie* and thought it essential to the peace of the county that order be restored on Otmoor, their Otmoor committee was under constant pressure to reduce the number of police deployed. From September 1832 they were withdrawing constables, but, despite the secrecy which surrounded this decision, the reduction of the force to four officers contributed to a renewal of attacks in early 1833.[85] The committee responded by again increasing the force to eight constables, and thereafter were more circumspect in reducing numbers and less eager to heed calls to cut expenditure. In an effort to conciliate ratepayers elsewhere in the county, the committee persuaded Otmoor proprietors to pay the wages of constables remaining after the autumn of 1834.[86] The county continued to pay Layard and meet additional costs, and as late as April 1835 the committee was still urging the quarter sessions 'to incur this temporary expense, in order to procure permanent relief to the county from this burden'.[87] Although the quarter sessions stood firm in the face of sustained pressure to abandon an expensive experiment, the cost of the operation probably reinforced Oxfordshire magistrates' reluctance to adopt the County Constabulary Act in 1839.

In sanctioning special police measures magistrates' primary concern was not the defence of property. In May 1832 magistrates told Otmoor proprietors that, 'The County would have been happy – as was their hope – could this arrangement have effected the double end of ensuring the security of public peace and private property – but both these objects are not to be attained under the present circumstances'. In such circumstances, magistrates believed that maintaining public order remained their principal obligation, and proprietors themselves were instructed to 'take measures for the effectual protection of your private property'.[88] This was not to suggest that magistrates were uninterested in the threat to property, nor did they normally perceive any sharp distinction between preserving public order and protecting private property.[89] Indeed, they were deeply perturbed by the 'fixed determination' of the inhabitants of Otmoor 'not to give any protection to the property on Otmoor',[90] and agreed with Layard that, through their corporate actions, there was a danger of the 'lower orders' undermining the prerogatives of property and 'appointing

[83] ORO, CPZ 15/15, Layard's report 2 March 1834.
[84] ORO, CPZ 15/12, Bundle of accounts. In the financial year 1833–34 the cost fell to £977, and the next year to £499 14*s* 6*d*.
[85] ORO, CPZ 15/8, Ashhurst to Melbourne, 19 February; QSM II/9, Epiphany 1833; CPZ 15/2, 22 September 1832, 1 January, 14 February 1833. The committee realized that any future reduction 'must be a gradual one'.
[86] ORO, QSM II/10, Michaelmas 1834, Epiphany 1835. With four constables on Otmoor this cost the trustees £7 per week.
[87] *Ibid*, Easter 1835; cf QSM II/9, Trinity 1833, Epiphany 1834.
[88] This resolution of the Otmoor committee was conveyed by letter to major proprietors: ORO, CPZ 15/2, 5 May 1832.
[89] See ORO, QSM II/8, 7 February 1832; QSM II/9, Trinity 1834.
[90] ORO, QSM II/8, Easter 1832.

themselves dictators of what shall or shall not be done on Ottmore [*sic*]'.[91] The Otmoor crisis does, however, indicate that magistrates' commitment to the defence of private property was not unlimited and, *in extremis*, the protection of property became a private responsibility whilst maintaining public order was always a corporate duty.[92] To suggest that between 1830 and 1835 Oxfordshire sessions were concerned exclusively with the property rights of those who advocated and stood to gain from enclosure is to attribute to them a narrowness of purpose and a coherence of outlook which their often tentative responses do not bear out. It was with profound relief that the Otmoor committee informed the quarter sessions in October 1835 that 'the county ceases to have a Police Force on the Moor'.[93] It was hardly a victory, but the crisis was over.[94]

IV

As we have seen, recent work has tended to construe rural protest in later-Hanoverian England as both emanating from and contributing to complex processes of social dealignment and realignment. The Otmoor disturbances illuminate precisely one such moment of social transformation. The Otmoor Enclosure Act disturbed patterns of authority and allocations of entitlements both within and between village communities. Parish elites which normally governed the communities as parish officers found their role redefined as the defenders of communal rights against external expropriation.[95] The larger farmers who normally insisted on the rights of property found themselves prominent agents in a violent struggle to defend customary entitlements. And if this alliance of the propertied and the non-propertied in defence of an older community identity ultimately foundered, if property rights eventually again fissured rather than united village communities, the Otmoor disturbances constituted a moment when a sense of community translated into collective action embracing different social groups and transcending more conventional class divisions.

The Otmoor episode also illuminates the interconnections between custom, property, and the law. In sponsoring enclosure, major local landowners tended to identify the public interest with their private advantage. The economics of improvement, as defined by enclosure and mediated by the market, were presented as reallocating private property in ways which might enhance public prosperity. But communities organized around agrarian capitalism, like those embodying customary and collective property rights, depend for their stability on both conventional assumption and legal norms. When, as in the Otmoor riots, conventional assumptions come into conflict with a redefinition of legal entitlement, a latent dissonance between law and custom is revealed. In this dissonant conflict, legal rights were temporarily abated in order to secure public order and restore a sense of communal equilibrium. Coming, as it did, in conjunction with the 'Swing Riots' of 1830–1 the Otmoor uprising highlighted the importance of community and custom in the stabilization of a society with very limited police resources.[96] The passage

[91] ORO, CPZ 15/15, Layard to Ashhurst, 28 January 1835.

[92] It was this aspect of county policy which baffled the fifth earl of Abingdon who thought the interests of property and public order inseparable: ORO, CPZ 15/17, Abingdon to Davenport, 11 May 1832.

[93] ORO, QSM II/10, Michaelmas 1835.

[94] It is impossible to calculate the cost of the riots to the county. The county records do not contain detailed accounts of expenses. In addition to the cost of the police, £263 13*s* 0*d* was spent on special constables before March 1832: ORO, CPZ 15/12. Prosecutions for the St Giles riot cost £243 12*s* 2*d*, and calling out the yeomanry cost £25 per day: PRO, HO 51/19/254, Ashhurst to Melbourne, 5 February 1832. The final cost was probably around £4500.

[95] For the political role of village elites see Eastwood, *Governing Rural England*, pp 24–42; David Eastwood, 'The republic in the village: parish and poor in Bampton 1780–1834', *Journal of Regional and Local Studies*, XII, 1992, pp 18–28.

[96] For 'Swing' in Oxfordshire see Hobsbawm and Rudé, *Captain Swing*, pp 110–13.

from communities which embodied at least residual common rights to communities in which possession and property rights were construed in rigidly private terms was both complex and contested. The Otmoor disturbances reveal some of those complexities and the extent to which new patterns of economic allocation would require new police powers to make them work.

Farm Schools in Nineteenth-Century France and the Case of La Charmoise, 1847–1865

By ALAN R H BAKER

Abstract

After reviewing briefly the development of agricultural education in France as a whole during the nineteenth century, this paper examines in detail the history of one farm school (La Charmoise) which operated in the Sologne, near the Loire valley town of Blois, in the mid-nineteenth century. The creation of the school is shown to have owed much both to the general context of government encouragement of agricultural education and to the specific enthusiasm of its founder, Edouard Malingié, who was strongly committed both to a scientifically and economically rational agriculture and to an active, benevolent Christianity. Examination of the functioning of the school is followed by an assessment of its impact. While the school was widely perceived by contemporaries as being both very useful and successful, consideration of the recruitment and retention of pupils, of staffing, and of the school's financial position indicates that the school had both weaknesses of which contemporaries appear to have been unaware and problems which they were reluctant to acknowledge. The farm school functioned for only eighteen years and its impact was probably not as great as contemporaries thought. It was, nonetheless, one noteworthy component of Malingié's wide-ranging activities as an agricultural improver, which became famous internationally because of his production of a new, fixed breed of sheep, the Charmoise, based in part upon imported pure New Kent rams.

IT is a paradox of French agricultural history that by 1850 France was ahead of any country in Europe in agricultural instruction but still very backward in its farming methods.[1] The idea of agricultural education had originated and was much-debated in France during the second half of the eighteenth century. Theory was well ahead of practice and the few schools which were established were short-lived. The first agricultural school in France to have any significance was that established in 1822 by Mathieu de Dombasle at Roville in Lorraine, in association with his experimental farm there. A second, opened in 1832 at Grignon, some 40 km from Paris, was to become one of the best agricultural schools in Europe, visited by farmers, landowners and agronomists from throughout the Continent. A third school of significance was set up in 1833 by a private company which had established a model farm at Grand-Jouan in Brittany in 1830. The school at Roville closed in 1842 for lack of funds and the other two were taken over by the government, that at Grand-Jouan in 1842 and that at Grignon in 1848.[2]

During the nineteenth century, French governments took an increasing interest in, and control of, agricultural education, both as an integral part of general education in primary and secondary schools and in teacher training colleges, and also as a form of specialist instruction provided by new institutions created for the purpose. By 1914 there was on offer a wide range of agricultural education within an officially-established framework which included local, regional and national schools of general agriculture, and specialist schools in, for example, veterinary medicine, dairying, horticulture, sheep rearing, fruit farming and forestry. It also embraced a network

[1] F B Artz, *The Development of Technical Education in France 1500–1850*, Cambridge, Mass, 1966, p 226.

[2] *Ibid*, pp 220–26.

of agricultural *professeurs* in each department (*département*): although some departments made such appointments from the 1830s onwards, in 1879 they were all required by law to establish such a post within six years (if one were not already in existence), to diffuse information about the best farming practices. In 1912 these *chaires départementales* were transformed into *directeurs des services agricoles* with a wide-ranging role in the diffusion of agricultural information in the state's schools and colleges, as well as more generally within the farming community through lectures, publications and demonstrations.[3] This elaborate structure of agricultural education both extended and replaced the farm schools which were, nonetheless, its experimental foundation.

Until the mid-1830s, French governments merely provided encouragement for the creation of farm schools but gradually they came also to provide financial assistance. As the scale of state funding increased, so did the level of state control over such activities. From 1841 there were appointed state *inspecteurs de l'agriculture* to monitor the expenditure of such subventions and then on 23 July 1847 a government circular stated official policy on the creation and functioning of farm schools. Their aim was to diffuse within farming communities knowledge of scientific agriculture and the best farming practices. Teaching in the schools was to be essentially practical, with pupils gaining experience of all work on the farm. Pupils were to be selected and admitted from the age of sixteen, for three or four years. Tuition would be free and the director of a school would receive 250 fr annually for each pupil (although part of that sum was to be paid to the pupil on leaving school). The staff was to include a director, a *chef de pratique* responsible for managing work on the farm, a *surveillant-comptable* who would teach accounting and surveying, and a *vétérinaire* responsible for the farm's livestock and for teaching basic veterinary care. While the state would meet the staffing and tuition costs, the director of a farm school would be liable for the overall financial health of the enterprise.[4]

Creation of new farm schools soon followed publication of the 1847 circular and by the end of August 1848 twenty-one had been established. Then by a decree of 3 October 1848 the new government of the Second Republic intended a wholesale reform of agricultural education (although it must be acknowledged that the decree drew upon a review which had been underway since 1845, well before the Revolution of February 1848). A three-tiered system of agricultural schools was to be established: on the first level there was to be a farm school in each department (and later in each *arrondissement*), providing a practically-based training for farm workers and small farmers; on the second level there were to be regional agricultural schools, serving a number of departments and providing a more theoretical education for farm managers, large farmers and landowners; and on the third level would be the *Institut national agronomique*, for training agricultural teachers and administrators. Circulars of 28 October 1848 and 31 August 1849 from the Ministry of Agriculture and Commerce made it clear that farm schools were to train good farm workers and practising farmers, with pupils being admitted not because of their attainment at primary school but because of their aptitude for farming.[5] By January 1849 there were twenty-seven farm schools in existence throughout France (Fig 1) and by the end of 1849 seventy.

Only eight had been established before the end of 1847, among them the school set up by Edouard Malingié on his farm,

[3] Th Charmasson, A-M Lelorrain and Y Ripa, *L'Enseignement Agricole et Vétérinaire de la Révolution à la Libération*, Paris, 1992, pp v–cxxi.

[4] *Ibid*, pp xxxi–xxxiii, xxxix–xli and 51–52.

[5] *Ibid*, pp xliv–xlvii.

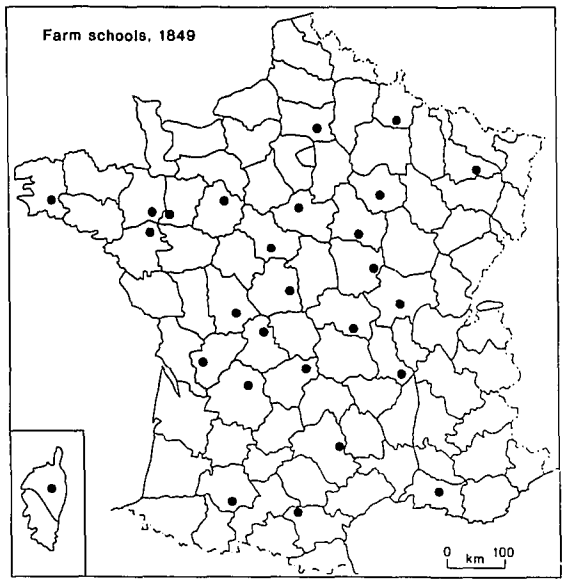


FIGURE 1
Farm schools in France, 1849 (*Source*: *Note sur les établissements d'instruction agricole crées en France, 11 janvier 1849*, Archives Nationales (Paris) F 10 2512 A, data from which is provided in Th Charmasson, A-M Lelorrain and Y Ripa, *L'Enseignement Agricole et Vétérinaire de la Révolution à la Libération*, Paris, 1992, p xlix).

La Charmoise, in the commune (*commune*) of Pontlevoy, 25 km south of Blois, in Loir-et-Cher, officially approved by an *arrête* of 8 November 1847 (Fig 2). The emergence of farm schools needs to be viewed not only in terms of their general historical context but also in terms of the particular individuals whose charisma provided the necessary link between structure and action.

I

Edouard Malingié lived at Pontlevoy for only seventeen years, from his purchase of La Charmoise in 1835 until his death in 1852, aged 53: during that time he had a considerable impact upon the thinking and practice of farmers not only locally but also regionally and nationally.[6] Born at Lille in 1799, Malingié became a pharmacist, like his father and grandfather before him. Soon after qualifying at the University of Paris in 1822 and returning to Lille to his father's practice, he married a farmer's daughter and became so interested in agriculture that he himself took on a small farm in Flanders. Subsequently, during a visit to his brother-in-law at Pontlevoy, Malingié was struck by the sharp contrast between the prosperous, developed farming of Flanders and the poor, backward agriculture of the Sologne. Thus challenged, in 1835 he bought the fifty hectares which then comprised La Charmoise and moved the 440 km south with his wife, children, farming equipment and livestock, there to practise a scientific, experimental and innovatory agriculture upon a hitherto-neglected property with a difficult-to-work soil developed from clay-with-flints.[7] As an improver *par excellence*, Malingié set about bettering the quality of the soil and the quality and quantity of his crop and livestock yields in a range of ways which included marling and liming (he built a lime kiln on the farm), cultivating new (mainly fodder) crops (including rape, sugar beet, lucerne, clover and maize) and manuring heavily (by maintaining a very large flock of sheep, a substantial herd of cattle and a large collection of working horses). He diffused knowledge of his experiments and experiences not only in the *Bulletin* of the *Société d'Agriculture de Loir-et-Cher* (of which he was a member and at times its president) but also at local, regional and national agricultural shows.

The supreme indication of Malingié's

[6] This section of the paper draws upon F Lourdel, *Le Berceau d'une Race Ovine 'La Charmoise': Edouard Malingié et son Oeuvre*, Blois, 1926. So, too, does a recently-published account of Malingié: H Leclert, 'Edouard Malingié (1799–1852): agriculteur et éleveur au domaine de la Charmoise à Pontlevoy', *Bulletin de la Société d'Art, d'Histoire et d'Archaéologie de la Sologne*, 109, 1992, pp 1–48.

[7] For a map showing the topographical and geological context within which La Charmoise was situated, see: A R H Baker, 'The infancy of France's first agricultural syndicate: the Syndicat des Agriculteurs de Loir-et-Cher 1881–1914', *Ag Hist Rev*, 34, 1986, pp 45–59 on p 47.

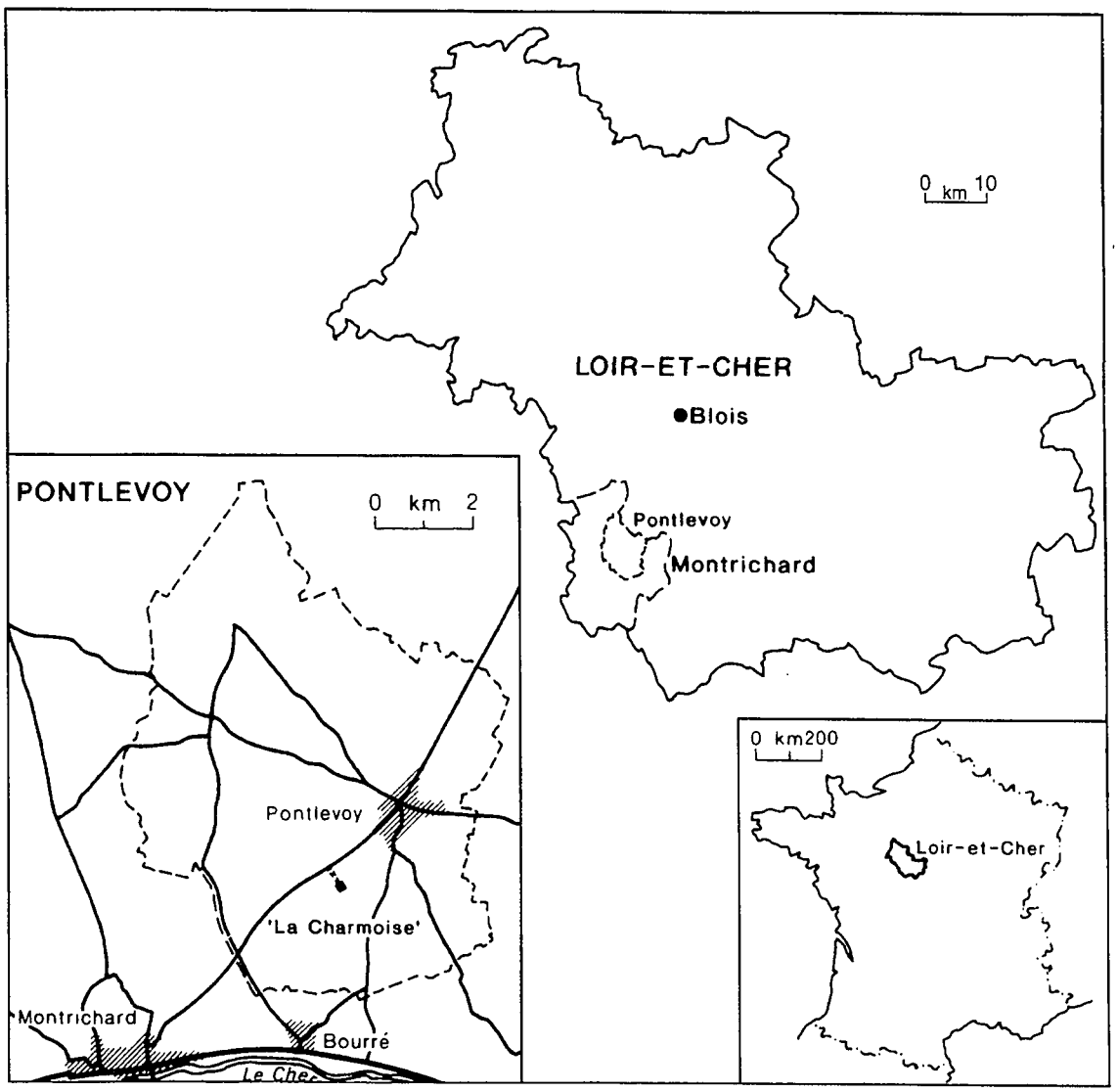


FIGURE 2
The location of the La Charmoise farm school.

scientifically-informed approach to agriculture is evidenced in his development of a new breed of sheep, to which he gave the name 'Charmoise'. Wishing to develop a breed which would be suited to the environmental conditions of the Sologne while having good fattening characteristics and also producing fine quality wool, he sought advice at first hand both from the national veterinary school at Alfort, near Paris, where he learned of the director's preference for Leicester sheep, and from textile manufacturers in northern France, from whom he learned of their preference for wool from Kent sheep. In 1837, 1838 and 1841 Malingié made a number of visits to Kent and purchased from Sir Richard Goord at Faversham and a Mr Cook at Ashford rams, ewes and lambs of the New Kent (Romney Marsh) breed, then drove them with the assistance of a shepherd and his dog from Calais some 600 km to

Pontlevoy. Experimenting with selective breeding, Malingié had by 1844 produced a new breed, the Charmoise, the result of cross-breeding pure New Kent rams with cross-bred ewes (themselves a balanced cross of local ewes from the Sologne, Berry and Touraine, and of Merinos). By then in-breeding the new, cross-bred rams and ewes Malingié established what he claimed was a new, fixed breed and by 1851 he had a flock of 500 such Charmoise ewes.[8]

During his seventeen years at Pontlevoy, Malingié became a significant personality, widely known and respected as an indefatigable improver and as an energetic municipal councillor, lieutenant of the commune's fire brigade, member (and sometimes president) of the *Comice agricole* of the *canton* of Montrichard and also a member (and sometimes president) of the Société d'Agriculture de Loir-et-Cher. His writings and public, reported speeches reveal his strong commitment both to a scientifically and economically rational agriculture and to an active, benevolent Christianity.[9] Both rationality and religion found expression in his creation of a farm school at La Charmoise in 1845.

II

This paper will now provide an account of the foundation, functioning and finale of the school at La Charmoise and then an assessment of its role. Previous accounts have relied upon published reports of the school's activities (such as those of the *Conseil Générale* of Loir-et-Cher) but this paper is additionally and substantially based on unpublished records (notably including correspondence between directors of the school and the Prefect of Loir-et-Cher at Blois and between the Prefect and the Ministry of Agriculture in Paris, and annual reports on the school submitted to the Prefect by an independent Jury or Board of Assessors).[10]

A Ministerial circular of 23 July 1847 stated the government's belief that agricultural education was one of the country's greatest needs and its intention accordingly to promote them, with an immediate plan to establish during 1848 throughout France ten to twelve farm schools in which would be taught sound, theoretically-informed agricultural practices well-adapted to local circumstances. The Minister invited the Prefect of each department to submit proposals for such schools, explaining that for a school even to be considered for approval it would have to be part of a working farm with sufficient capital for its exploitation and appropriate buildings both for the farm itself and for the school's pupils. The government was not offering to meet any capital costs, merely the recurrent costs of the wages of the school's staff.[11]

Malingié responded promptly to the government's invitation: on 16 August he wrote to the President of the Société d'Agriculture de Loir-et-Cher that he had proposed to the Prefect and to the Deputy of the *arrondissement* of Blois the creation of a farm school at La Charmoise. His letter set out clearly the aims of the proposed school: 'Well-behaved youths who know how to read, write and calculate will be admitted free of charge: accommodation, food, heating and clothing will all be provided free. The pupils will be

[8] A Leroy, *Le Mouton Charmoise*, Paris, nd, *c* 1896.

[9] E Malingié, *Considérations sur les Bêtes à Laine au Milieu du XIXe Siècle et Notice sur la Race de la Charmoise*, Paris, 1851. Also Malingié's presidential addresses to the Société d'Agriculture du Département de Loir-et-Cher, published in its *Bulletin*, 13, 1849, pp 311–23; 14, 1850, pp 346–55; 15, 1851, pp 393–406; t 3 no 1, 1852, pp 1–11.

[10] Lourdel, *Le Berceau d'une Race Ovine* and Leclert, 'Edouard Malingié'. The principal unpublished records consulted at the Archives Départementales de Loir-et-Cher in Blois (hereafter AD) in preparing this paper were the following: 7M 227 Projét de création d'une ferme école 1868–1931; 7M 228 Fermes écoles de la Charmoise (Pontlevoy) et de Maray 1847–1865; and an uncatalogued file titled Agriculture: enseignement agricole; phylloxéra; rapports sur les services personnel 1893–1900. All of the sources cited in this paper are located in these files unless it is indicated otherwise.

[11] Archives Nationales (Paris) AD XIX D 256; also Archives Départmentales de Loir-et-Cher 7M 228. The circular is reprinted in Charmasson *et al*, *L'Enseignement Agricole*, pp 51–52.

instructed both theoretically and manually about all of the practices of improved farming, and including those relating to livestock rearing and fattening, dairying, viticulture, and forestry. Their stay at the school will last three or four years, at the end of which those pupils whose conduct and work have been satisfactory will receive a certain sum of money provided by the state.[12] Malingié's proposal was warmly welcomed by the Prefect (who had for some years been receiving favourable reports from the government's Inspecteur de l'Agriculture, M Royer, on Malingié's farming initiatives at La Charmoise), by M Naudin, Vice-President of the Société d'Agriculture de Loir-et-Cher (who said that nothing could better meet the needs of the locality than such a school) and by M de Souvigny, Vice-Secretary of the Society (who lauded the foundation of the school as the most propitious and most important event of the agricultural year 1846–1847).[13]

The farm school at La Charmoise was approved by a Ministerial *arrête* of 9 November 1847 and established officially from 1 January 1848. The *arrête* set out a clear operational framework for the school. Eight pupils, aged at least sixteen, were to be admitted annually to the four-years' course of study which would involve their working on the farm as though they were being paid wages. The school was to have four staff: a director with overall responsibility for the teaching, both practical and theoretical; a *chef de pratique* to assist the director in demonstrating manual work on the farm and to look after the buildings; a *surveillant-comptable* to teach the basics of accounting, to fill any gaps the pupils might have in their primary education in terms of weights and measures and to supervise the pupils' conduct in the school's dormitory and refectory; and a veterinary practitioner both to care for the livestock and to teach basic animal care to the pupils. The *chef de pratique* and the *surveillant-comptable* were required to live at the school and to work under the director's supervision. Himself appointed by the Minister, the director was to be responsible for appointing the other staff. Each of the four staff were to be paid fees annually by the Ministry of Agriculture, respectively 2400fr, 1000fr, 1000fr and 500fr. The director would also receive from the Ministry 175fr annually for each pupil at the school towards his living expenses and it was envisaged that those payments together with the labour provided by the pupils would cover the running costs of the school.

In addition, for each pupil the Ministry would make a one-off payment of 75fr, part of which was intended to meet the maintenance and replacement costs of each pupil's set of clothing with the remainder being available for allocation at the end of each year by the director as prizes to reward enthusiasm, good conduct and skill (the money was not, however, to be handed over immediately but placed in a savings account in the pupil's name and awarded to him on successful completion of the course: any pupil leaving earlier or being dismissed was to lose all claim to the prize money).

A Jury, comprised of the director and four others appointed by the Minister on the recommendation of the Prefect, was to select candidates for entry to the school, with admission being based both upon an applicant's level of primary school instruction and upon his experience of and aptitude for farm work. The Jury was also to conduct examinations in the school at the end of each year, and thus to determine which pupils should be allowed to move into the next year's course of study and, ultimately, awarded their school certificates (*certificats d'instruction*).

Through the Jury and by making the

[12] *Bulletin Soc d'Agric Loir-et-Cher*, 12, 1847, pp 301–302.
[13] *Ibid*, pp 285–86.

director accountable directly to the Minister for the running of the school, the government monitored the quality of the school's educational provision. The first pupils were admitted to the school in 1848. Its printed prospectus emphasized that, apart from initially providing clothing, there would be no cost to the parents of pupils who would be accommodated, fed, maintained and taught free of charge. It also stressed that parents who wished their children to have a Christian education would be pleased with La Charmoise, because the Bishop of Blois had authorized a chapel at the school, served by a dedicated priest with a love of young people and of work in the fields. The school's aim was to provide practical agricultural instruction within a Christian framework for a total of thirty-two pupils, with eight being admitted annually. The prospectus claimed that the staff of the school comprised, in addition to the director, the following: a doctor, a *surveillant* to provide elementary teaching, a *chef de pratique* in charge of the farming work, a *comptable* to teach accounting and mensuration, a vet, a gardener, a shepherd, a cowman, a ploughman and a viticulturalist.

Physically, the school was a large, single-storey building (no longer existing) which served both as class-room and as dormitory (equipped with folding beds). It allegedly stood in the yard of the substantial, sixteenth-century, brick-and-stone farmhouse.[14]

The school was directed by Edouard Malingié for only five years: he died from pneumonia, after a brief illness, in mid-December 1852 while at the height of his agricultural career. His elder son Charles (who had been educated at another agricultural school and who was, apparently, at the time of his father's death the *chef de pratique* at the farm school of La Charmoise) was appointed director of the school from 15 January 1853. Following Edouard's death, his family came to an agreement which involved selling La Charmoise to a woollen textile industrialist who had agreed to let the farm for eighteen years to Charles' brother, Paul. For family reasons, Charles set himself up on a farm elsewhere (near Bourges), resigning as director of the school at La Charmoise on 30 June 1854, to be replaced (by Ministerial appointment on the recommendation of the Prefect) by Paul Malingié, then aged twenty-six. Paul's farming enterprise ran into financial difficulties which forced him to sell, parcel by parcel, some of the lands he himself owned. Paul also followed his father in terms of public service, becoming Mayor of Pontlevoy in 1862; but he died unexpectedly, after only a week's illness, on 8 July 1865, which created a crisis for the farm school.

On the day of Paul Malingié's death, M Menont, the *chef de pratique* at the school, wrote to the Prefect to express his concern for the school's future. The Ministry, appropriately informed by the Prefect, arranged for M Boitel, an Inspecteur Générale d'Agriculture, to visit the farm school, which he did on a number of occasions that summer, in order to consider, together with the Madame Malingié, how best to arrange for the school's future. Paul Malingié's widow, Octavia, was only twenty-nine and their eldest son merely eight years old. On 7 September 1865 the Minister informed the Prefect that Boitel's endeavours to guarantee a future for the school had failed, Madame Malingié having decided to continue farming at La Charmoise but to abandon the farm school: the Minister declared that he had no alternative but to close the school. As for its pupils, the Minister decided that those in the fourth year of studies should have their final examinations brought forward, to be held immediately, and that those in the first three years should be transferred (if they wished) to the three farm schools

[14] Lourdel, *Le Berceau d'une Race Ovine*, p 31.

nearest to La Charmoise, in the neighbouring departments of Indre-et-Loire (at Hubaudières), Loiret (at Montbernaume) and Cher (at Laumoy). As for the staff, the *jardinier, chef de pratique* and *surveillant-comptable* were, by way of compensation, given their wages to the end of November. The Minister's decisions were implemented by the Jury when it met at La Charmoise on 19 September: the three fourth-year pupils were examined and awarded their certificates: of the other pupils, ten decided to discontinue their studies, one opted for Hubaudières, two for Montbernaume and six for Laumoy; one requested to go to the farm school in the department of Mayenne and another to that of Grand-Jouan in Brittany.

The farm school of La Charmoise had existed for eighteen years, from early-1848 until late-1865. Its role will now be assessed, first as perceived by contemporaries and secondly with the benefit of historical hindsight.

III

From the admission of its first pupils in 1848, the farm school at La Charmoise made an immediate and favourable impact both locally within the Petite Sologne and regionally within Loir-et-Cher (while, of course, the farm itself was making an impact nationally with its new breed of Charmoise sheep). In 1852 the Prefect reported to the *Conseil Générale* of Loir-et-Cher that since its foundation four years earlier the school had gone from strength to strength. From at least the mid-1850s the government's Inspecteur Générale de l'Agriculture, M Boitel, reported favourably upon the school to the Ministry. Each year a four-man Jury spent a day – from the mid-1850s two days – at the school to assess applicants and to examine pupils, and the general tenor of the Juries' reports was commendatory. In 1856, for example, the Jury reported: 'The admirable order which rules at the farm school, the good behaviour and sound practical instruction of its pupils, the verdant appearance of its fields, despite the poor season, and finally the magnificence and above all the uniformity off its precious flock of Charmoise sheep, everything here recalls the good traditions left like a rich legacy by much lamented founder of this work'.[15] The Jury concluded that the founder's son, Paul, was managing the school well and that while they were conducting the examinations the Inspecteur Impérial des Bergeries had arrived at the school by chance and had expressed admiration for all that he saw at La Charmoise. The following year the Jury, again praising Paul Malingié's enthusiasm, concluded: 'The theoretical teaching, the practical instruction, the condition of the crops, the management of the livestock, the maintenance of the fine race of sheep, the Charmoise, in a word everything that the Jury has examined has made a most favourable impression'.[16] In 1865, forced by circumstances beyond his control to consider the future of the school, the Minister fully recognized that it had been rendering very great service to agriculture in Loir-et-Cher under successive directors.

It was, then, widely-believed by contemporaries that the farm school was both useful and successful. Such views appear to have been held both by those who had vested interests and clearly wished the school to be seen as a successful enterprise, and by those who had few such interests (such as the members of the Juries) or none (such as the Inspecteur Impérial des Bergeries, with whom indeed Edouard Malingié had been in dispute about the fixity of his 'pure' breed and who might have been assumed not to be kindly disposed to his school enterprise, even when run by one of his sons). There are, how-

[15] AD 7M 228 Procés-Verbal des Opérations du Jury d'Examen de la Ferme-École de la Charmoise, 22 décembre 1856.
[16] AD 7M 228 Procés-Verbal des Opérations du Jury d'Examen de la Ferme-École de la Charmoise, 21 décembre 1857.

ever, grounds for viewing this perception of the school with some scepticism, for it had weaknesses of which contemporaries appear to have been unaware, as well as problems which they were reluctant to acknowledge.

IV

When the school at La Charmoise was closed in 1865, the pupil who asked to be transferred to the agricultural school at Grand-Jouan in Brittany was Jules Tanviray, from Villiers (near Vendôme), who was to become very influential in the development of agriculture in Loir-et-Cher, being appointed from 1 April 1879 as its first *professeur d'agriculture*.[17] The talents of the young Tanviray were both developed and recognized at La Charmoise, where in the spring of 1865 he had been awarded four prizes for his outstanding performances during his first year. Another of the school's famous *alumni* was Alphonse Riverain, who in 1886 succeded Tanviray as President of the Syndicat des Agriculteurs de Loir-et-Cher, which the latter had established in 1883, the first such regional association of farmers in France.[18] That the school produced some outstanding pupils is beyond doubt. What is questionable is the ease with which it did so.

Intended to have thirty-two pupils (eight in each of the four year groups), the school rarely (if ever) had a full complement, its number usually fluctuating between the low and high twenties.[19] Although each year arrangements were made for a notice advertising free places, and inviting applications for them, to be posted at the council offices (*mairies*) of the department's more than three hundred communes, very few applications for admission to the school were received: the number was rarely in excess of a dozen and in many years it was less than the eight places available. The problem of pupil numbers was exacerbated by the fact that inevitably some pupils left the school before completing their studies, for example because of their own ill-health or because the deaths of their fathers necessitated their returning to their own farms. Precisely for that reason, the school's directors did from time to time seek to admit more pupils into the first year of the course but met with great resistance from an inflexible Ministry which insisted that farm schools could only admit eight pupils annually. On occasions, Edouard Malingié admitted more than eight, meeting the costs of the extra pupils himself.

The school was, it seems, admired by the administration and by the agricultural elite of Loir-et-Cher but it was not popular with the farming community generally. Although attendance was advertised as being 'free' and was so in terms of the absence of both tuition fees and maintenance charges, there was none the less a real and prolonged opportunity cost to parents in terms of the withdrawal from their farm of their son's labour for four years just at the time when he was beginning to contribute substantially to work on the farm. Two further difficulties were noted by the Jury in its report of 29 December 1850, leading it to suggest (in the event, fruitlessly) that the minimum age of entry to the school should be raised from sixteen to twenty: first, pupils leaving the school after four years, at the age of twenty, were encountering reluctance, even refusal, by farmers to put their confidence in such young men, despite their schooling; secondly, if a school-leaver were then selected at the age of twenty for military service his farming career was brutally interrupted and the benefits of his schooling seriously eroded (the Jury took the view that it would be better for pupils to have met

[17] Baker, 'France's first agricultural syndicate', p 48.
[18] *Ibid*, pp 48–49.
[19] Pupils at the school were not recorded individually in the *listes nominatives* of any census because they were not considered for that purpose to be residing in Pontlevoy, even though they were living there for four years (AD 202 M293); pupil numbers are therefore taken from the reports of Juries.

their obligations for military service before entering the farm school). Military conscription also implied the possibility of an even longer absence from the parental farm. Boitel, the Inspecteur Générale de l'Agriculture who visited many farm schools, including La Charmoise, was aware of their recruitment problems: in a letter to the Ministry dated 12 July 1876 he emphasized that in districts where such schools existed children aged sixteen or seventeen going into farming did not value either the advantages of a good professional training or the possibility of being awarded medals at the end of it; instead, they preferred to find work on a farm immediately and to earn money (about 200–300fr per annum) for doing so.

For all of these reasons, the school at La Charmoise was not overwhelmed with applicants. In 1850 there were only three, in 1861 only two, and at times the directors openly admitted they were encountering difficulties in recruiting pupils. For example, Paul Malingié reported to the Prefect on 5 August 1860 that recruitment was very difficult because of the high wages paid to farm workers. Since 1858 he had been using an annual 1000fr grant from the *Conseil Générale* to award to the more able and older pupils cash prizes which were equivalent to the wages which a pupil could have earned as a farm labourer in the district during the time they were attending school. But the grant was only sufficient to enable three or four of the best pupils to be thus rewarded, consequently some good pupils became discouraged and left school before completing their course. His request for the annual grant to be increased to 2400fr, restoring it to the level which he emphasized had formerly been recognized by the *Conseil Générale* as being necessary, was not accepted. During the early 1860s Malingié repeatedly stated that recruitment to the school was difficult, a fact which he attributed in 1861 to 'the ever increasing wage-levels in our countrysides. Parents prefer to keep their children at home and to get some profit from them rather than send them to the farm school for four years... Ask the father of a family, a small farmer or a farm worker, why he does not send his sixteen years' old son to the farm school where he would receive free schooling... and he will reply that his son has just come to the age when he can pay back a little for the sacrifices that he, his father, had made in bringing-up his son, and he likes best to keep his son near him so that he can bring in a little money. Ask the son why he doesn't demand of his father to let him go to the farm school. He will reply that he will not earn any money there, that he will be kept in there for four years, and that on balance he prefers to put up with a little more of the disadvantages of staying at home to work at his father's, to enjoy his freedom and to have more money in his pocket than his father will send him each month if he goes to school. With one of them it is the love of profit, with the other love of liberty and pocket-money, with both of them there is scant appreciation of schooling (even of free schooling), those are the real reasons why so few young men are seeking to come to the farm school'.[20]

Malingié sought constantly, but unsuccessfully, to persuade the *Conseil Générale* to increase its grant to the school to enable him to enhance the value of prizes so that the school might compete more readily with the attractions of paid employment. The view of its *Commission des Finances* was that, rather than trying to improve recruitment by offering financial inducements of the kind Malingié proposed, it would be better if the school established for itself a public reputation as providing useful training for those going into farming. Recruitment remained a problem in the

[20] AD 7M 228 Rapport sur la Ferme-École de la Charmoise, 22 juillet 1861 [a letter from the Director, Paul Malingié, to the Prefect].

years prior to the school's closure: for admission in 1860 there four applicants, for 1861 two, for 1862 eleven, for 1863 seven, for 1864 eleven and for 1865 eleven. The problems of recruitment which so concerned Paul Malingié in the years immediately before his death might well have influenced his widow's decision to continue running the farm at La Charmoise but to close the school.

V

The Ministry of Agriculture had initially agreed to make an annual payment to four members of the school's staff, although within a year it agreed additionally to a similar payment to a *jardinier-pépiniériste*, in accordance with its general policy towards farm schools, to provide horticultural instruction. In addition to the school's 'teaching' staff, there were also on the farm itself normally two or three labourers. The veterinary doctor was usually M Goubaix, who practised at the horse stud in Blois, travelling to La Charmoise by horse-drawn *voiture*. The other staff members lived at La Charmoise. The Juries on their annual visits to the school almost invariably commented favourably upon the its sound teaching and administration and upon the very satisfactory performances of its pupils in their examinations on both agricultural practice and theory. The prize-giving which concluded each visitation was held in the class-room and was attended not only by pupils, staff and the Jury but also by many parents of the pupils and by farmers from around Pontlevoy: it was an occasion when members of the Jury and the school's director could praise agricultural improvements generally and the school's contribution to agricultural progress specifically.

Undoubtedly the school was generally well-run but in 1857 there was a serious disciplinary problem: seven pupils were expelled and the affair damaged the reputation of the school for some time afterwards. Some pupils had been taunting M Hubilier, the *surveillant-comptable*, with many drawings and one model of him hanging from a gallows, coupled with the words '*à bas le pion*' ('down with the assistant master').[21] In reporting the incident to the Prefect, the director (Paul Malingié) admitted that there had been a problem of persistent misconduct but asserted that he had complete confidence in M Hubilier (an opinion well-attested by the fact that M Hubilier continued to be employed at the school, certainly until 1861 and possibly until the school's closure in 1865). Possibly the pupils' lack of respect for authority stemmed in part from the fact that the school's staff was relatively young: in 1851, the average age was thirty-eight and the director, Edouard Malingié, was fifty-one but in 1856 the average age was only thirty-two, the director, Paul Malingié, was only twenty-eight and his *chef de pratique*, at merely nineteen, was no older than some of the pupils.

The report of the Jury at the end of 1857, making no reference to these disciplinary problems, stated that the school was 'a perfectly administered establishment and of considerable utility to the country because it produces not only good agriculturalists but also creates a good moral climate and good citizens'.[22] Malingié had reported the incident to the Prefect on 21 March and on 3 April the Prefect replied that the action Malingié had taken to maintain order had the full support of the Ministry. But the matter was not closed. In the summer of 1858 the Ministry wrote to Malingié to say that when M Boitel, as Inspecteur Générale de l'Agriculture, had visited the school he was very impressed with its agricultural standards and manage-

[21] AD 7M 228 Letter from the Director, Paul Malingié, to the Prefect, 21 March 1857. The word *pion*, which also means 'pawn', has a pejorative connotation when used to describe a school master.

[22] AD 7M 228 Procés-Verbal des Opérations d'Examen de la Ferme-École de la Charmoise, 22 décembre 1856.

ment but he was concerned that Malingié showed a too-generous attitude towards the pupils who should be required to show more respect and more attention to all aspects of their work. On 1 August 1858 Malingié sent a copy of the Ministry's letter to the Prefect, pointing out that the director of a farm school had no way of punishing pupils and that the only means of encouraging them was the 35fr awarded annually to each pupil to be set aside as a payment to be made when he completed his course at the school and the prize of 400fr awarded to the best fourth-year pupil. The only form of punishment available was a reprimand in front of the whole school and expulsion after three such reprimands. Malingié stressed that many of the pupils were at the school only because their parents wished them to be and that many of them neither understood nor appreciated their agricultural education; many pupils objected to any school discipline, preferring instead either to return to their homes where there would be greater freedom or to work elsewhere for wages. Malingié argued that the only way to counter such thinking was to provide more financial incentives to the pupils. He pointed out that for 1858 the *Conseil Générale* had allocated 1000fr to the school and that he had distributed it as prizes to pupils: he saw such cash prizes as the best way of attracting and retaining good pupils. He therefore asked if the *Conseil Générale* could restore to its former level of 2500fr its annual allocation to the school at La Charmoise.

The Prefect supported Malingié's request at the meeting of the *Conseil Générale* in late-August 1858 but its *Commission des Finances* argued against making any allocation at all for the following year, on the grounds that instead of establishing a more rigorous disciplinary regime at the school, as the Ministry had demanded, Malingié preferred instead to reform pupils by offering them more prizes. In the event, the *Conseil* agreed to an allocation for 1859 of 1000fr. Malingié was annoyed when he learned, in July 1859, that the report of the *Commission des Finances* had been published and that it misrepresented the Minister's view, because it claimed that he said that pupils at the school lacked respect for their betters and attention to their work, whereas the Minister's letter actually said that they should be required to show more respect and attention. He regretted that his farm school had been represented in the published report as a centre of indiscipline and he invited the *Conseil* to send a deputation to the school to observe it at first hand and then produce a favourable report, to erase the poor public impression of the school created by the previous year's report. The Prefect, in his report to the *Conseil*, supported Malingié strongly and argued that the unfortunate events of 1857 had specific causes, involving a few individuals, and that there had not been a general disciplinary problem; he also stressed that rigorous measures had been taken against those pupils involved. In the light of the Prefect's report, the *Commission des Finances* expressed the view that the disciplinary measures taken by the director had produced good results that year and accordingly recommended an allocation of 1000fr for 1860, which was agreed by the *Conseil Générale*.

VI

The farm school was a mixed, public and private, enterprise but the burden fell more heavily upon the Malingié family than upon the state. For its part, the government paid the wages of some of the staff and the maintenance costs of up to eight pupils admitted each year, and it provided funds for some prizes to be awarded annually. In short, it contributed towards the running costs of the school and its expectation was that, taking into account the labour on the

farm being provided by the pupils without any payment being made to them, the school would at least break even financially on a year-to-year basis. Unfortunately, in the absence of detailed accounts for the school, its financial health cannot be determined precisely but it is clear that it was far from perfect and that the Malingiés' financial commitment to the farm school was considerable.

The Jury of 1850 pointed out that the one-off sum of 75fr provided by the Ministry for the maintenance and replacement of each pupil's set of clothing, with any balance being used at the discretion of the director for prizes, was inadequate even for its primary purpose and that by a pupil's third year the director was having to meet such expenditure from his own resources. The same Jury also argued that the annual payment made by the Ministry for each pupil of 175fr should be raised to equate with the local annual wage of a young farm worker, which it reported Edouard Malingié stated to be 1000fr. Realizing that such an increase was unlikely and was in any event not in the power of the *Conseil Générale* to approve, the Jury merely used the argument in support of its suggestion to the *Conseil* that its annual grant to the school should be increased, but it does at least give some indication of the financial problems involved in running the school.

The Prefect's undoubted enthusiasm for the school was only partially reflected in the level of financial support provided for it by the *Conseil Générale*. During each of its first four years (1848–1851) the school was awarded 1500fr and then for each of the next two years 2500fr. But with a deterioration in the financial position of the department, the *Conseil*, using the strictly-correct argument that school was not one its own institutions, withdrew all financial support: no grant was awarded in the period 1854–1857 and when the grant was reinstated in 1858 it was for only 1000fr and it remained at that level for each of the following years until the closure of the school at the end of 1865. Throughout the school's existence, its directors sought enhanced funding from the department, either towards its general expenses or specifically to enable more prizes to be awarded and the wages of staff to be increased.

Not only was Edouard Malingié required to provide all of the capital expenditure for the project's initiation – which amounted to 13,000fr – but he and his sons also, of their own volition, contributed significantly towards its recurrent costs. Sometimes there were admitted more than the eight pupils funded by the state, their costs being met by the then director himself, and the directors regularly provided funds for prizes which were additional to those paid for by the Ministry and by the department.

From the outset, Edouard Malingié sought additional financial assistance from the *Conseil Générale*. In principle, the *Conseil* was well-disposed towards supporting farm schools in the department. At its meeting on 1 December 1848 discussion of a proposal to establish a number of such schools concluded that with one school already being established in the *arrondissement* of Blois, where farming was not very different from that in the arrondissement of Vendôme, the next priority must be for a school in the *arrondissement* of Romorantin, where farming was both much poorer and very different from that in the *arrondissement* of Blois. It accordingly made a recommendation to the Ministry of Agriculture for the creation of a second school at Lamotte-Louan in the commune of Vernou, a farm selected in part because its central location within the *arrondissement* of Romorantin would facilitate its role in diffusing knowledge about best agricultural practice. No doubt overwhelmed by such proposals and taking into account the fact that it had already approved the establishment of one farm school in Loir-et-Cher,

the Ministry declined to approve this plan for Lamotte-Louan.

VII

The farm school at La Charmoise was Edouard Malingié's project and he committed substantial knowledge and money to it in the five years before his death: it was a practical expression of his firm and explicitly-stated belief that improvement in agriculture depended upon an alliance of knowledge and capital. Charles Malingié was director only from January 1852 until June 1854, when he was succeeded by his brother, Paul. Whereas Charles, the elder of the two, had been to an agricultural school, Paul had not: when recommending him to the Minister for appointment as director, the Prefect pointed out that Paul had nonetheless been active in farming for seven years, learning under his brother's guidance. Paul sought appointment as director when his brother decided to resign. If Charles appears to have lacked the commitment of his father to the farm school at La Charmoise, Paul appears to have had the commitment but to have lacked the formal education and the experience which both his father and his brother brought to the school. Despite that handicap Paul ran the school for eleven years, until his death, but the frustration which he exhibited from time to time and the managerial problems which he encountered might have flowed from that particular disadvantage. It is certainly the case that, on his death, Paul's widow lacked commitment to the project initiated by her father-in-law and the school was in consequence closed. As the school was the private property of the Malingié family and not public property of the Ministry (whose involvement was essentially restricted to overseeing the proper functioning of the school), there was no alternative to closure of the school when Octavia Malingié decided against 'ownership' of the project.

VIII

With closure of the school at La Charmoise, the farming community of Loir-et-Cher lost an institution which many contemporaries valued and thought should be emulated in the two other *arrondissements* of Vendôme and Romorantin, but which was neither copied nor replaced within the department during the course of the nineteenth century. A few tentative proposals were considered (for example, for a school at Le Plessis-St Amand, near Vendôme) but none came to fruition. Some of the difficulties encountered by the farm school at La Charmoise, threatening its operation and eventually leading to its closure, were specific to that particular school but many of its problems were generally being experienced by farm schools throughout France. By the late-1860s the varied difficulties associated with farm schools had come to be recognized by the Ministry and few additional schools were being established.

Following the decree of 1848 which called for a farm school to be created in each of the almost one hundred departments of France there was a sudden but brief flourish of activity: the number of schools increased from twenty-seven at the end of 1848 to seventy by the end of 1849 but that number was never to be exceeded. Their growing cost to the state came under scrutiny because of severe cut-backs in the national budget of 1850. Furthermore, the financial partnership between the state and individuals in the creation and running of farm schools was not perceived ultimately to be mutually beneficial: the state's willingness to contribute only towards the attendance costs of a few pupils at each school and its requirement that the capital costs of such an enterprise should be met by the school's director acted, contrary to intention, as a brake upon the creation of such schools. In addition, from 1875 onwards the government endeavoured to fill the obvious gap in agricultural edu-

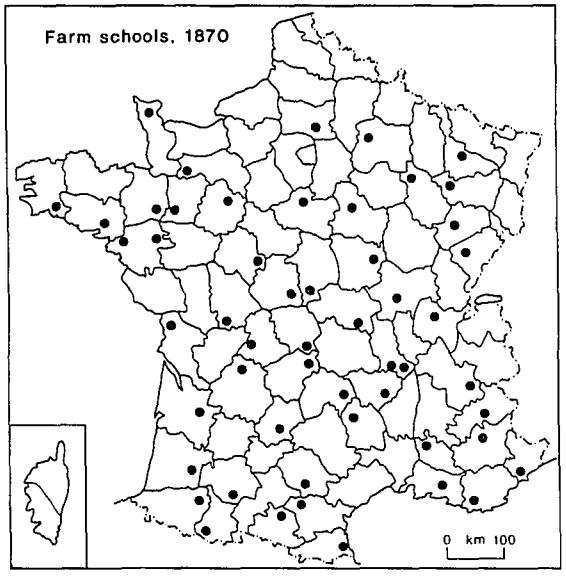


FIGURE 3
Farm schools in France, 1870 (*Source*: *Annuaire du ministère de l'Agriculture et du commerce*, Paris, 1870, pp 21–24, data from which is provided in Th Charmasson, A-M Lelorrain and Y Ripa, *L'Enseignement Agricole et Vétérinaire de la Révolution à la Libération*, Paris, 1992, p lxii).

cation between the local and the national levels by promoting the establishment of regional agricultural training schools (*écoles pratiques d'agriculture*) on an inter-departmental basis. Forty-five such schools existed throughout France by 1900. The development of agricultural teaching in local primary schools in the communes, in public lectures given by the *professeurs d'agriculture* in the departments, and especially in the regional, inter-departmental agricultural training schools diminished the need for farm schools. Additionally, the generally rising level of agricultural wages contributed to disaffection with farm schools and especially with the small sum offered as a leaving gratuity to each pupil who completed his course. Between 1850 and 1865 only ten new schools were opened but in the same period thirty-three were closed. By 1870 there existed only fifty-three schools (Fig 3). An attempt introduced in 1869 to breathe new life into the movement, by reducing the course of study to two years (because many parents were unwilling to be deprived of the labours of their sons on their own farms for longer), by raising the minimum age of entry to seventeen, and by increasing the grant paid to a school in respect of each pupil failed to achieve its objective and the number of farm schools declined to thirty-three by 1875, to sixteen by 1893 and to fourteen by 1900.[23]

The farm school at La Charmoise only existed for eighteen years and its direct impact was probably not as great as contemporaries thought. Admitting only eight pupils annually, the school could not have had more than one hundred-and-fifty pupils during its life-time and the actual number was almost certainly nearer to one hundred. But the school's impact is perhaps better assessed qualitatively and indirectly. Its most famous pupil, Jules Tanviray, was subsequently to extend very effectively the role of agricultural teaching and agricultural improvement in Loir-et-Cher as its first *professeur d'agriculture*. And there can be no doubt that the school, as part of the wider farming enterprise at La Charmoise, served as a centre excellence in scientific agriculture which was seen or heard about by many practising farmers in Loir-et-Cher and indeed, because of the new race of Charmoise sheep, throughout France.

After Paul Malingié's death in July 1865, the *Conseil Municipal* of Pontlevoy (of which he had been member for ten years and of which he was mayor at time of his death) decided at its meeting on 13 August immediately to honour his memory by conceding to his family freely and in perpetuity the plot in the commune's cemetery which held his mortal remains and on 10 July 1866 it agreed to erect a monument to the joint memories of Edouard and Paul Malingié, contributing 200fr for the purpose and setting-up a committee to

[23] Charmasson *et al*, *L'Enseignement Agricole*, pp lxi, xi–xcix.

raise further funds by public subscription, to consider where the monument should be placed and what form it should take.[24] Today, traces of Edouard Malingié are to be found in a street in Pontlevoy named 'Avenue Malingié', in a monumental bust of him erected in 1953 at the end of the avenue, and at the family's grave in the commune's cemetery. There is now no sign of the school at La Charmoise, the school-room having been demolished. As for the Charmoise sheep, a Syndicat des Éleveurs de la Race de la Charmoise was founded in 1896; a flock book of the breed was established in 1927; today there are about forty breeders throughout France, mainly in the Pyrénées, Limousin and Aquitaine.[25] The present farmer at La Charmoise, M Pierre Solon, still breeds sheep on the farm – but Ile-de-France, not Charmoise.[26]

[24] *Régistres des Délibérations du Conseil Municipal de Pontlevoy*, consulted at the Hôtel de Ville of Pontlevoy by permission of the Mayor, M Ferandou. There is no firm indication in the council's minutes that any action was taken, at least before 1871. In effect, the erection of a public monument appears to have been delayed until the opportunity was taken to mark the centenary of the death of Edouard Malingié.

[25] Leclert, 'Edouard Malingié', pp 45–47.

[26] I am grateful to M Pierre Solon and to his daughter, Mlle Sylvie Solon, for welcoming me at La Charmoise and for their assistance with this project.

Silage in Britain, 1880–1990: The Delayed Adoption of an Innovation*

By PAUL BRASSLEY

Abstract

Silage is now the most common way for grass to be conserved as winter fodder. It has become so only within the last twenty years, but this is the culmination of a process which has been going on since about 1880 in Britain. The technique was introduced into this country from continental Europe in the early 1880s, and generated much interest in the wet summers of that decade, to the point where official reports were written upon it and detailed statistics collected which make it possible to assess the extent of its penetration into general farming practice. Thereafter interest dwindled for twenty years, to be revived during and after the First World War, and especially during the Second World War. From the 1940s onwards it is possible to make estimates of national production, which demonstrate gradual adoption until the 1970s, when the rate of adoption increased dramatically. The technical and economic changes which produced these wanings and waxings of interest in silage are discussed, and the conclusions which can be drawn from this case study for the adoption of innovations in agriculture are considered. The most important point to emerge is the necessity for all components of a system to be in place before rapid adoption can occur.

'GOOD hay, sweet hay, hath no fellow' cried Nick Bottom, the weaver, in *A Midsummer Night's Dream*, but he was under the influence of the Queen of the Fairies at the time, and, presumably, he had never tried to make good sweet hay in a bad summer.[1] When, in the wet summers of the 1880s, the farming press began to carry stories about a technique called 'ensilage', which promised good winter fodder in the absence of sunshine, it was not surprising to find that it rapidly attracted the attention of opinion-formers in the agricultural industry. Prominent scientists conducted experiments upon it, and the Royal Agricultural Society and a government commission published reports which confirmed its usefulness. An ensilage society was formed. Thorold Rogers, MP and economic historian, wrote a long letter to *The Times* in 1882 (and followed it up with a book the following year) extolling the virtues of silage as it was made in the USA,[2] where it was rapidly becoming established.[3] Thus the widespread and rapid replacement of hay by silage in Britain, too, might have been expected.

In the event, the process took nearly a century. The rapid adoption of silage, to the point where its production is now ten times greater than that of hay, has taken place, but only in the last two decades. Despite the attention of agricultural scientists, and numerous official campaigns to popularize it, silage has only recently overtaken hay as the most popular method of fodder conservation. Ironically, perhaps, this recent expansion of silage, with its associated use of nitrogen fertilizer, has been blamed for the increasing rarity of

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[1] William Shakespeare, *A Midsummer Night's Dream*, act 4, scene 1, line 33, in S Wells and G Taylor, eds, *William Shakespeare: The Complete Works*, 1988, p 326.

[2] J E Thorold Rogers, *Ensilage in America: Its Prospects in English Agriculture*, 1883. The letter to *The Times* of 23 October 1882 is printed as an appendix to this book.

[3] According to John T Schlebecker, *Whereby We Thrive: A History of American Farming, 1607–1972*, Ames, Iowa, 1975, p 183, the first silo was built in the USA in 1873, by the 1890s most dairy farmers used silage, and by 1914 it was becoming popular in cattle feeding areas. I am grateful to Dr Douglas E Bowers, head of the Agricultural and Rural History Section in the United States Department of Agriculture, for providing me with this and many other references.

meadow flowers and partridges (*Perdix perdix*) and the disappearance of the corncrake (*Crex crex*) from mainland Britain.[4]

This paper seeks to describe the initial introduction of silage in the nineteenth century, trace its progress through the twentieth century, and explain the long delay between its initial introduction and eventual widespread adoption.

I

The system of ensilage 'might be summed up as the burying of grass in trenches', according to John Wrightson, professor of agriculture at the Downton Agricultural College, writing in 1890.[5] If ensilage is the process, the resultant product is now called silage, although it, too, was often called ensilage in the nineteenth century, and the trench or pit in which the grass was buried was called a silo. Cut grass continues to respire, converting sugars to carbon dioxide and water, and giving off heat in the process. When it is turned into hay by the action of sun and wind this process is arrested by drying, which also inhibits the formation of moulds. Artificial drying, either by forced draught ventilation as in barn hay drying, or in a high-temperature drier, has the same effect. When the dry matter content of the grass reaches about 85 per cent, its degradation ceases, but since grass in the field contains only about 25 per cent of dry matter this means that about 3.25 tonnes of water must be lost to produce one tonne of hay. Preservation by ensilage works on a different principle. The action of the enzymes which enable respiration to occur can also be prevented by changing the acidity of the ensiled material in the absence of oxygen. Bacteria present on the crop ferment the sugars it contains to lactic and other acids which, in effect, pickle the ensiled material as long as oxygen is excluded. If oxygen is available the whole heap will decompose like a pile of lawn mowings. The obvious advantage of the process is that the farm's winter fodder supply is no longer so dependent upon the dry weather required to make hay. Moreover, since drying is less important, the grass can be cut when it is younger and leafier and so has a higher feed content. On the other hand, achieving the conditions required to produce the lactic fermentation required to make good silage is no less, and possibly more, technically demanding than making good hay.[6]

Wrightson saw ensilage as a product of the 1880s, but the idea of preservation by burying in pits was much older than that. The word 'silo' is apparently derived from *siros*, a Greek word for a pit used for storing corn, and many of the early references to storage in pits similarly refer to corn, rather than forage, storage. The Roman Columella, for example, refers to *siri*, pits in the ground used for corn storage, especially in the overseas provinces.[7] On the other hand, there seems to be some evidence for the ensilage of green fodder in Carthage in 1200 BC, and Cato, writing about AD 100, speaks of the Teutons storing green fodder in the ground and covering

[4] B H Green, 'The impact of agricultural management practices on the ecology of grasslands,' p 1.9, and T C E Wells, 'Responsible management for botanical diversity' pp 4.4–4.7, both papers presented to British Grassland Society meeting on *Environmentally Responsible Grassland Management*, Hurley, Berks, 1989; A Colston and J Best, 'Vanishing meadows', *Natural World*, No 32, 1991, pp 22–24; A Crofts and R G Jefferson, eds, *The Lowland Grassland Management Handbook*, 1994, esp p 5:8. I am grateful to Caroline Steel of The Wildlife Trusts for this reference. For the corncrake, see also John Arlidge, 'Crofters' care makes isles a haven for corncrakes,' *The Independent*, 10 August 1994, p 5, which reported that farmers in the Western Isles of Scotland were being paid up to £50 per hectare by various conservation bodies to delay harvesting hay meadows until 1 August in order to allow corncrake chicks to fledge before the grass was cut. Many of those on the island of Tiree were reported to use the money to pay for baling their silage.

[5] J Wrightson, 'The agricultural lessons of "the Eighties" ', *JRASE*, 3rd ser, 1, 1890, p 285.

[6] P McDonald, *The Biochemistry of Silage*, Chichester, 1981, pp 11–12 and 42–59; H I Moore, *Grassland Husbandry*, 1946, pp 94–5; J S Brockman, 'Grassland', in R J Halley and R J Soffe, eds, *The Agricultural Notebook*, 18th ed, 1992, pp 198–200.

[7] McDonald, *Biochemistry of Silage*, p 10; K D White, *Roman Farming*, 1970, p 428; storage vessels for grain are referred to as silos in S Isager and J E Skydsgaard, *Ancient Greek Agriculture: An Introduction*, 1992, p 55.

it with dung. In the medieval period wilted grass was ensiled in Italy, in the eighteenth century in Sweden and Baltic Russia, and in early nineteenth century Germany beet tops and leaves were ensiled.[8] 'In so different a climate as that of the islands of the South Seas the natives avail themselves of the principle of the silo for the preservation of bread-fruits', wrote Martin J Sutton in 1895.[9] Clearly the principle was widely known from early times, but apart from prehistoric grain storage pits and isolated references in seventeenth-century manuals of husbandry, it does not seem to have made much impression on farming in Britain until the 1880s.[10]

The first mention of anything resembling silage in the nineteenth-century agricultural literature in Britain appeared in the *Transactions* of the Highland and Agricultural Society in 1843. James Johnston, a lecturer in chemistry at the University of Durham and a well-known writer on agriculture, published an article arguing for the importance of feeding moist materials to livestock, in the course of which he posed the question 'Is it possible to preserve these crops in their moist state? Can I cut them down and so preserve them undried, as to obtain from them, for my cattle, an amount of food more nearly equal to that which the fresh cut grass is capable of affording? A method has lately been tried in Germany, which, by the aid of a little salt, seems in a great measure to attain this object'. He then went on to translate the contents of an article in the *Transactions of the Baltic Association for the Advancement of Agriculture* for 1842 which described the preservation of grass by salting.[11] This is, of course, the same technique as that used in the making of sauerkraut, which preserves green material by producing a lactic acid fermentation, as the process of ensilage does, and which had been known in Germany for centuries.[12] The importance of Johnston's article appears only in hindsight: it seems to have been ignored for nearly forty years.

Johnston was probably correct in postulating a German, or, at least, a non-French, origin for the practice of ensilage of forage crops. Some English writers appear to assume that silage developed in France, perhaps as a result of the importance of Frenchmen in popularizing the idea in England,[13] but although the French had been experimenting with the storage of cereals in silos in the first half of the nineteenth century, they appear to have acquired the idea of storing forage from a French translation of a series of letters written to a German newspaper between 1862 and 1865. These were written by Herr Reihlen of Stuttgart, who, in 1861, attempting to avoid the waste of sugar beet leaves and tops, decided to preserve the leaves and tops from 400 acres of sugar beet in silos five or six feet deep. The experiment was successful, and Reihlen took it further. He had been to America, and on his return to Germany, experimented with growing maize. This was hardly a new crop in Europe, having been grown in Spain since the sixteenth century and in France, Italy and southern Germany since the seventeenth century. However, near Stuttgart, which is near the northern limit for the reliable production of grain maize, he found that his crop did not always ripen, and so took to preserving it in his silos, sometimes alone, and sometimes mixed with beet pulp. By 1870 his silos, ten feet deep and fifteen feet wide at

[8] McDonald, *Biochemistry of Silage*, p 9; it may be worth noting that G Barker, *Prehistoric Farming in Europe*, 1985, p 48 denies that silage was made in the prehistoric period.

[9] Martin J Sutton, *Permanent and Temporary Pastures*, 5th ed, 1895, p 122.

[10] H I Moore, 'The conservation of grass', *JRASE*, 133, 1972, p 29.

[11] James F W Johnston, 'On the feeding qualities of the natural and artificial grasses in different states of dryness', *Trans Highland and Agricultural Soc*, new ser, 9, 1843, pp 60–61.

[12] M Toussaint-Samat, trans A Bell, *A History of Food*, 1992, pp 693 and 775; Henry Woods, in his *Ensilage: Its Origin, History and Practice*, 1883, p 12, advances the same argument.

[13] H I Moore, *Silos and Silage*, 2nd ed, 1950, p 10; S J Watson and A M Smith, *Silage*, 1951, p 15; Woods, *Ensilage*, p 12.

the top, had a total length of three-fifths of a mile.[14] Reihlen's letters were translated by a M Vilmorin-Andrieux and published in the *Journal d'Agriculture Pratique* in 1870.[15] At about the same time Comte Roederer, in the Orne department of Normandy, began making silage of green maize mixed with cut straw and oat cavings, and a M Moreul ensiled unchopped but salted maize. Then in 1877 Auguste Goffart published his *Manuel de la Culture et de l'Ensilage des Mais et autres fourrages verts*, which described the process of ensilage in detail, and was influential not only in France, where it resulted in the decoration of its author by the national agricultural society, but also in America.[16] The story was taken to England by the Vicomte de Chezelles, who farmed in the Oise department, about thirty miles north-east of Paris, and visited the Royal Show at Reading in 1882, where he described his methods of making silage in pits using red clover, sainfoin, lucerne, meadow grass, winter and summer vetches, and maize.[17]

Whether Herr Reihlen thought of the idea of ensiling his sugar beet tops independently, or whether he adapted the ideas of others, is unclear. His influence upon French practice, and, consequently, upon the adoption of silage in Britain and America, seems undeniable.[18] But his was not the only influence. In 1870 Samuel Jonas of Chrishall Grange near Saffron Walden, a large (4200 acres of arable) and prominent farmer, wrote to the *Journal* of the Royal Agricultural Society with details of his system of enhancing the feeding value of cut chaff by mixing it with about one hundredweight of cut tares or green rye and one bushel of salt per ton of chaff: 'It is, if well managed, thus rendered by fermentation as sweet as well-made hay, and eaten by our flocks with great avidity', and had enabled him to feed both sheep and cattle during two winters in which the turnip crop had been a complete failure.[19] Subsequently, in 1874, John Wrightson, then professor of agriculture at the Royal Agricultural College, undertook a ten-week tour of the Austro-Hungarian Empire, and published a report of it on his return. 'In the management and preservation of fodder-crops, the Austrians and Hungarians are in advance of English agriculturists', he argued, and drew attention to the system of making 'sour-hay':

> It is done by digging long graves or trenches, 4 feet by 6 or 8 feet, in depth and breadth, and cramming the green grass or green Indian corn (maize) tightly down into them, covering the whole up with a foot of earth. The preservation is complete, and the wetter the fodder goes together the better. No salt is used, and the operation is as simple as it appears in the description... This sour-hay affords a capital winter fodder, and when cut out with hay-spades, it is found to be rich brown in colour and very palatable to stock. The making of sour-hay is very similar to the process of preserving 'pressling', or sugar-beet pulp, which is also stored in long graves until wanted for winter's use.[20]

[14] H M Jenkins, 'Report on the practice of ensilage, at home and abroad', *JRASE*, 2nd ser, 20, 1884, pp 129–37; E S Bunting, 'History of the maize crop in N W Europe', in E S Bunting, ed, *Production and Utilisation of the Maize Crop*, Ely, 1980, pp 3–13.

[15] Jenkins ('Practice of ensilage', p 136) points out that, ironically, it was a dry season which prompted French interest in ensilage, whereas 'the moving force with us has been a succession of *wet* seasons.'

[16] The first silo in the USA appears to have been built in 1873, at Spring Grove, Illinois, by Fred L Hatch, who had read a translation of Vilmorin-Andrieux's paper while a student at the University of Illinois. However, Goffart's book was perhaps more influential, because it was translated and published in 1879 by Mr J B Brown, president of the New York Plow Co, and mailed to hundreds of his customers in the USA as an advertisement for his firm. See Lyman Carrier, 'The history of the silo', *Jnl American Society of Agronomy*, nd, *c* 1920, p 181; United States Department of Agriculture, *Yearbook, 1899*, Washington, 1900, p 617; Anon, *The First Vertical Silo*, American Society of Agricultural Engineers, 1969. I am indebted to Dr Bowers for all of these sources.

[17] Jenkins, 'Practice of ensilage', pp 137 and 207; Moore, *Silos and Silage*, p 10; at about the same time, M J Sutton claimed to have been 'the medium of first placing ensilage obtained from France before agriculturalists at the Smithfield Cattle Show': see Sutton, *Permanent and Temporary Pastures*, 3rd ed, 1886, p 108.

[18] Although it is worth noting that Sutton (*Permanent and Temporary Pastures*, 5th ed, 1895, p 122) claimed that silage was made in Canada 'long before it became familiar to farmers in Great Britain'.

[19] S Jonas, 'On straw chaff', *JRASE*, 2nd ser, 6, 1870, pp 119–21; Jonas's career is outlined in R Brigden, *Victorian Farms*, Marlborough, 1986, pp 231–2.

[20] J Wrightson, 'Report on the agriculture of the Austro-Hungarian Empire', *JRASE*, 2nd ser, 10, 1874, p 351; according to Primrose McConnell, *The Agricultural Notebook*, 1st ed, 1883, p 120, 'Ensilage is a system of preserving hay or green fodder, originally introduced from Hungary.'

In July 1875 the farm bailiff on earl Cathcart's farm near Thirsk in north Yorkshire recorded in the farm diary: 'Finished leading Grass to make it into "pickeled" Hay', and in that year, or the one after, Mr Arthur Scott of Rotherfield Park, Alton, in Hampshire, began to experiment with ensilage of vetches, clover, ryegrass, oats and meadow grass, which were successful, and mangold leaves, cabbages, comfrey, and artichoke stalks, which were not.[21] There is no evidence to show whether or not Wrightson's article provoked these experiments, but if it did not the coincidence is interesting, if not remarkable.

A succession of poor haymaking seasons occurred between 1875 and 1884. Haytime was wet in 1878 and very wet in 1879, when Disraeli walked out at Hughenden 'asking his farmers whether the dove had left the ark yet.' 1881 was wet with a small hay crop. June and July were wet and cold in 1882, and meadow hay gave a heavy crop which was much damaged. In 1883 thunderstorms in late June were followed by a stormy July, and the following year the early hay crop was good in quality but poor in quantity, while the late crop was heavier but damaged by thunderstorms.[22] Against this background, interest in silage grew. In 1881 Lord Walsingham persuaded Henry Woods, his steward, to build a small experimental silo on the home farm at Merton, near Thetford. Woods was sceptical to begin with, but later recanted to the point of writing a sixty-three page pamphlet extolling the virtues of silage, in which he mentioned other successful experiments in Hampshire, Kent and Suffolk. A party of Norfolk farmers visiting Holland in 1882 were impressed by a Dutch farmer's demonstration of silage.[23] The agricultural press began to give their attention to the subject, and early in 1883 James Howard MP suggested to the Journal Committee of the Royal Agricultural Society that the society should commission an investigation into ensilage and its suitability for English conditions. Several practical farmers were invited to undertake the task; none, in the end, felt that he could spend the necessary time away from his farm. Eventually H M Jenkins, the secretary of the society and editor of its *Journal*, who had previously felt himself unfitted for the job because he already had some knowledge of maize silage and so believed that he might not have an open mind, agreed to do it. His report appeared in the April 1884 edition of the *Journal* and covered 120 pages.[24]

Jenkins began his investigation by sending out a list of twenty-three questions, about the type of silo ('What are the dimensions of your silo? How is it constructed?'), how it was filled ('When did you fill your silo? What crop or crops do you preserve? Are the crops pitted in a whole or chopped state?'), how the material in it was compressed, the costs of the whole process, and the results achieved. He also requested a sample of the silage so made, which he would pass on to Dr Voelcker, the society's consulting chemist, for analysis. The questionnaire was sent to thirty-six farms in Britain, fifteen of which were in Cheshire, Yorkshire, or further north, and six in East Anglia, three in the Midlands, and eight in the south of England, one in Scotland and three in Wales. It was also sent abroad, to five farms in France and one in Holland. Those in France included the farms of his friend M Lecouteux, editor of the *Journal*

[21] Jenkins, 'Practice of ensilage', pp 134 and 152.

[22] E L Jones, *Seasons and Prices: The Role of Weather in English Agricultural History*, 1964, pp 173–6; J M Stratton, *Agricultural Records, AD 220–1968*, 1969, pp 118–23. From 1875 to 1883 the rainfall in June, July and August was above the 1915–50 average in every year except 1876, and in 1879 it was 186 per cent of the average, according to H H Lamb, *Climate: Present, Past and Future*, ii, 1977, p 623.

[23] Woods, *Ensilage*, pp 28–9 and 37–9.

[24] Jenkins, 'Practice of ensilage', pp 126–246; N Goddard, *Harvests of Change: The Royal Agricultural Society of England, 1838–1988*, 1988, p 120.

d'Agriculture Pratique, and an honorary member of the Royal Agricultural Society, the Vicomte de Chezelles, who had had such an important role in introducing silage to Britain, and Comte Roederer, another pioneer. In the resultant article in the *Journal* he printed all the responses at length. Mr Hopkins, who farmed near Cardiff, built an uncovered silo, two-thirds below ground level, which was soaked by the autumn rains and flooded by the adjacent brook in winter, so that only a thin layer of silage in the middle was fit to eat, 'the remainder being fit only for manure.' Most of those who replied had covered silos in which the ensiled material was compressed by portable weights, and there was a roughly equal split between those who used chopped and those who used unchopped material. Many different crops were ensiled: vetches, oats, clover, ryegrass, meadow grass, rye, lucerne, maize, tares, trefoil, coarse grass from the orchard, sainfoin, prickly comfrey, beans, peas – in short, just about anything green was ensiled by one or another of Jenkins' correspondents. The range of weights was similarly wide: concrete blocks, bricks, loose earth, logs of wood, and one hundredweight iron blocks ('three men can lift 24 tons from the bottom on to the side in 3 hours, and can replace them in little more than an hour') were all employed. There were a few examples of 'silos with mechanical means of compression'. Mr C G Johnson of Croft, near Darlington, who had been trained as an engineer, built a brick tower, 28 feet high and 10 feet by 18 feet inside, with an ingenious system of beams and weights which allowed the weight of the silage to exert the pressure on itself. However, the grass still had to be thrown up to the top of the tower by men with pitchforks. On a smaller scale, Mr Stocks of Cleckheaton in Yorkshire developed small wooden portable silos, capable of holding about 25 tons, in which the top could be screwed down. Messrs Reynolds and Co, of Blackfriars Road, London, patented an appliance for compressing fodder in silos by the use of rollers and chains tightened by a screw apparatus. The respondents included a suburban dairy farmer, a sewage farm, and a veterinary surgeon who also had a farm, but the majority were landlords, gentry at least, two MPs, a colonel, two dukes (Hamilton and Sutherland), through their agents, of course, earl Fortescue, and lords Middleton, Tollemache, and Egerton, who had used an old ice-house at Tatton Park, Cheshire, as an experimental silo. The survey contains what is perhaps the first recorded example of pollution by silage effluent, in that the Rev C H Ford of Bishopton in Durham found that 'the ensilage liquor finds its way into the drains, and renders the well water unfit for use'; conversely, Mr Stobart of Pepper Arden near Northallerton had a tap at the bottom of each silo by means of which the 'juice is drawn off and used for feeding the pigs, who take it greedily.' Jenkins also gave details of two silage cutters and blowers, one French and the other by Messrs F and J S Bust of Winterton, Lincolnshire, 'to satisfy those who wish to build or otherwise make silos this summer that the assumed difficulty of filling silos above ground, especially with chopped material, is by no means insuperable.'[25]

After his exhaustive account of the experiences of a relatively small sample of silage producers, Jenkins set out his conclusions. He thought that it was unnecessary to have excessively thick walls for a silo, and that many barns, now less used with the declining output of corn, could easily be converted to silos. For new silos, brick, stone or concrete were the preferred materials. There were no great advantages in having the silo below ground rather than above, but decided advantages in having it on a slope so that it could be filled from

[25] Jenkins, 'Practice of ensilage', pp 142, 164–5, 197, 231.

the top and emptied from the bottom, and in having it roofed. The cost should be about £1 per ton capacity. Chopping of the ensiled material he thought desirable as 'it facilitates the expulsion of air from the silo', and treading was important: 'Englishmen employ horses and men, while Frenchmen add draught oxen to their list of treading machines.' He considered weighting necessary, though he thought that the two hundredweights per square foot he had seen employed in some places excessive. The practice of M de Chezelles, who covered his fodder with about a foot of earth, he thought as good as any other. The total cost of all the operations involved in the filling of the silo averaged about 20–25 shillings per acre, or 5 shillings per ton of silage. Maize was the best crop for silage, grass and clover would do well if cut earlier than for hay, and green oats and rye, possibly buckwheat, but *never* prickly comfrey. He was still waiting for the report of his learned colleague Dr Voelcker on the chemistry involved, but he recognized that lactic fermentation was involved in the production of good maize silage, and that crops cut early, chopped, and well trodden, would make better silage than old, unchopped, wet material, imperfectly trodden. The feeding value of good silage was as great as that of hay, and it was often less risky. Whether or not it should supplant hay depended on the circumstances of the individual farm. The capital costs could not be ignored, but it had a place in wet seasons, and on the clays where turnips were notoriously difficult and expensive to grow, for the suburban dairy farmer, and on southern and eastern arable farms for preserving catch crops of rye or winter vetches, cut in May. Overall, he regarded ensilage 'as a valuable addition to the resources of the English farmer, but not as a complete substitute for the old haymaking process.'[26]

The learned Dr Voelcker reported six months later, having analysed various samples of silage for water content, albuminous compounds (ie those containing nitrogen), soluble carbohydrates, crude fibre and ash, and some for their lactic and butyric acid content. He pointed out that the production of silage was a bacterial process, distinguished between sweet and sour silage, and recognized the importance of sorting out the scientific principles involved if silage making were to be rendered less haphazard, but he remained unclear about its value as an animal feed.[27] It seems reasonable to say that he added little to what had already been reported by Jenkins. The basic outlines of the ensilage process were clear; the details remained fuzzy. Nevertheless, the attention of the leading agriculturalists of the time was clearly drawn to it. Primrose McConnell, writing the first edition of his *Agricultural Notebook* in 1883, gave it only a paragraph, not, seemingly, based on personal experience ('cattle apparently relish and do well upon it'), but by 1892 the third edition of Fream's *Elements of Agriculture* devoted nearly as much space to silage as to hay. Fream reported that the process had only been practised 'on any extensive scale' within the last ten years, during which time the operation had been much simplified, to the point where silage might be made in stacks, as long as the cardinal principle of excluding air from the green herbage was observed, and concluded that it was 'not to be regarded merely as a substitute for haymaking'. On the other hand, the English translation of Wolff's *Farm Foods*, which provided evidence of extensive scientific work on silage in Germany, concluded that 'with moderately good weather it is more advantageous to make ordinary meadow fodder into hay',

[26] *Ibid*, pp 232–46.

[27] A Voelcker, 'On the chemistry of ensilage', *JRASE*, 2nd ser, 20, 1884, pp 482–504.

although it allowed a role for silage in wet seasons.[28]

The years following the publication of the Jenkins report in 1884 saw the spillage of much ink on silage. An ensilage society was established and published instructions on how to make silage.[29] The Private Ensilage Commission under the chairmanship of Lord Walsingham produced a preliminary report to the Agricultural Department in July 1885, to the effect that silage was a 'valuable auxiliary to farm practice', especially in bad weather, and increased the range of crops which might be grown, and most especially maize.[30] They questioned numerous witnesses, including Voelcker, the consulting chemist and Carruthers, the consulting botanist to the Royal Agricultural Society, the Vicomte de Chezelles, and Sir John Bennet Lawes of Rothamsted, who had published opinions antipathetical to silage.[31] The printed replies to their questions ran to over three hundred pages.[32] Their final report to the Agricultural Department, published in 1886, concluded that silage promised 'great advantages to the practical farmer',[33] in that it would insure against unfavourable seasons, improve the quantity and quality of dairy produce, increase stocking rates and increase the supply of manure.[34] It was also in 1885 that Sir Massey Lopes, a Devon landowner, and president of the Royal Agricultural Society, offered a prize of 100 guineas for the best silo in England and Wales. The competition attracted thirty-two competitors, including five members of the House of Lords and a baronet, and was the subject of a fifty-page report in the society's *Journal*. Again the main advantage of silage was seen to be its comparative independence of the weather.[35] From 1884 the official annual agricultural statistics began to print figures for the number of silos and their capacity. The first year's figures revealed the existence of 514 silos in England, 36 in Wales, and 60 in Scotland, with an average capacity of a little over 3000 cubic feet each, and the numbers grew in subsequent years.[36] In the words of John Wrightson, discussing the agricultural lessons of the decade, 'The system of ensilage belongs essentially to the "Eighties"...ensilage is favourably spoken of, and generally accepted, in almost every agricultural district.'[37] The agricultural statistics show that by 1889 silage was produced in every county of England and Wales and most Scottish counties. There were 178 silos in the West Riding of Yorkshire and 158 in Lancashire. Westmorland, Kent, Warwickshire and Dorset all produced more than 35 tons of silage for each thousand acres of mowing grass in the county. In contrast, some counties (Durham,

[28] McConnell, *Agricultural Notebook*, p 120; W Fream, *Elements of Agriculture*, 3rd ed, 1892, pp 227–31; E von Wolff, trans H H Cousins, *Farm Foods: or, The Rational Feeding of Farm Animals*, 1895, pp 157–75.

[29] H Kains-Jackson, 'Experiments in making ensilage during the wet season of 1888', *JRASE*, 2nd ser, 25, 1889, p 281 mentions a *Practical Guide to Making Ensilage in Stacks and Silos*, issued by the Ensilage Society and published by Eyre and Spottiswoode, price 6*d*.

[30] BPP, 1884–5, XX, *Return of the Evidence received by the Private Ensilage Commissioners: part 1, preliminary report and minutes of evidence*, p iii.

[31] Lawes first wrote to *The Times* and *The Agricultural Gazette* about silage in 1882, exhibiting no great enthusiasm for it, again in 1884 ('So long as the making of ensilage is confined to the wealthy, and to enthusiastic amateurs, no harm can be done...'), and in the season 1884–5 conducted a series of experiments on which he reported to *The Agricultural Gazette*: see G V Dyke, *John Bennet Lawes: The Record of his Genius*, Taunton, 1991, pp 239, 240, 248, 296, 326–7. These reports were subsequently reprinted, with minor alterations, as a pamphlet (Sir J B Lawes and J H Gilbert, *Experiments on Ensilage, conducted at Rothamsted, season 1884–5*, 1886), which concluded, *inter alia*, that silage was 'a very good food' for milking cows and fattening oxen, but that the output per acre would be less than that of roots, and that the area under cleaning crops would be reduced, so reducing the area suitable for growing grain crops (pp 55–8).

[32] BPP, 1884–5, LXXXIV, *Return of the Replies to Questions relating to Silos and Ensilage, put by the Agricultural Department, Privy Council Office, to persons who have silos in Great Britain; with their Observations thereon*, pp 295 *et seq.*

[33] Not that the commission was overloaded with practical farmers, although among its members were the agricultural writer Faunce de Laune, James Howard, who originally suggested the production of the Jenkins report, the silage enthusiasts Henry Kains-Jackson and Stanhope Tollemache, and Lords Drogheda and Egerton, landowners.

[34] BPP, 1886, XIX, *Final Report of the Private Ensilage Commissioners*, p 345.

[35] The Judges, 'The silo and silage-stack competition, 1885–6', *JRASE*, 2nd ser, 22, 1886, pp 259–311.

[36] See the references in Table 1 (note a).

[37] Wrightson, 'Agricultural lessons', pp 285–6.

Lincoln, Rutland, Suffolk, Oxford, Shropshire, and Somerset) produced less than 10 tons of silage per thousand acres of mowing grass.[38] Silage had clearly captured the attention of the agricultural establishment. The innovators had sorted out the technique. The way had been made straight for its adoption by those practical farmers to whom the Private Commission had recommended it; would they respond?

II

At first sight the nineteenth-century silage production figures are impressive, with the number of silos and their capacity quadrupling in the six years between 1884 and 1889. In addition, it should be remembered that these were only the figures for silage made in silos. From 1887 the official statistics listed the 'Number of persons who proposed to make ensilage in Stacks', and by 1889 their number (2851) was slightly greater than the number of silos (2825).[39] The implications of this for the output figures are unclear, because the comparative sizes of stacks and silos are not known, although it seems reasonable to assume that the average size of stacks would not exceed that of silos. But if silage production developed rapidly in percentage terms, in absolute terms it remained less important. Although there were nearly 3000 silos by 1889, their average size was small, at between 2600 and 2900 cubic feet, which means that they would hold about 45 or 50 tons of silage (which, if 4 tons of 20 per cent dry matter silage are equivalent to about 1 ton of hay, corresponds to 11 to 13 tons of hay, or the production of 8 acres of grass in a good year or 12 in a bad year). Alternatively, if it is assumed that a cow would eat 40 lbs per day, the average silo would feed 18 cows for a five-month winter period. As Table 1 and the graph derived from it (Fig 1) demonstrate, silage production in the nineteenth century probably never exceeded a figure of the order of 300,000 tons, even if it is assumed that as much silage was made in stacks as was made in silos,[40] compared with hay production which averaged nearly 4.5 million tons and the root crop which averaged nearly 25 million tons in the 1880s. Thus, if all the silage was fed to the dairy herd, which is unlikely, only enough silage was made to feed about 112,000 cows (using the same assumptions as above) which represents about 5 per cent of the dairy herd of 2.5 million cows in the late 1880s.[41]

The series of figures for silo capacity printed in the *Agricultural Statistics* ended suddenly after 1889, for reasons which are not stated, but it is possible to get some impression of the popularity of silage from the figures contained in the annual reports of the consulting chemists to the Royal Agricultural Society. Each year they gave figures for the number of samples sent to them for analysis, and from 1884 these figures included a reference to silage samples: 21 in 1884, 12 in 1885, 7 in 1886 and 10 in 1887. In 1888 the figures for silage and hay samples were stated together, and continued so to be until 1896. Each year between one and seven samples were analysed, except in 1894, when sixteen

[38] The sources of the statistics are given in Table 1 (note a). I am most grateful to Ms Kate Templeton for her help with the production of these figures.

[39] BPP, 1889, LXXXIII, *Agricultural Statistics*, pp 88–9.

[40] The weight of a cubic foot of silage depends upon its composition (ie whether it is made from grass, grass and legumes, cereals and legumes, maize, or arable by-products such as cereals), moisture content, and degree of compaction, which increases as the depth of the silo and the effective weight applied to it increases. Thus A Amos, 'The silage content of tower silos and silage clamps', *JRASE*, 84, 1923, pp 50–60, found that for silage made from oats and tares, material with a high dry-matter content (37.4 per cent) taken from the top of a silo weighed 20.7 lbs per cubic foot, whereas material with a lower dry-matter content (27.5 per cent) taken from 20 feet from the top of a silo weighed 56.7 lbs per cubic foot. Having considered various types of silage made in several different years, he concluded that for a fairly typical moisture content of about 30 per cent, for both tower silos and clamps, a figure of 40 lbs per cubic foot could be used for converting a volume of silage to a weight. The same figure was given for grass silage in McConnell, *Agricultural Notebook*, 12th ed, 1953, p 708, and it is the one used for the appropriate calculations in this paper. In his first edition McConnell equates 4 tons of silage with one of hay (p 120).

[41] MAFF, *A Century of Agricultural Statistics*, 1967, pp 118–23.

TABLE 1
Estimated silage production in Great Britain, 1884–1993

Year	*'000 tons*	*Year*	*'000 tons*	*Year*	*'000 tons*	*Year*	*'000 tons*
1884	33.245[a]	1950	1832[b]	1970	9359[g]	1982	33,506[g]
1885	59.163[a]	1951	1987[b]	1971	11,130[g]	1983	34,070[g]
1886	81.442[a]	1952	2009[b]	1972	13,370[g]	1984	34,972[g]
1887	129.695[a]	1953	2420[b]	1973	16,464[g]	1985	42,348[g]
1888	132.272[a]	1954	2729[b]	1974	17,465[g]	1986	45,864[g]
1889	144.000[a]	1955	2564[b]	1975	17,587[g]	1987	47,673[h]
		1956	3393[b]	1976	17,744[g]	1988	49,197[h]
1940	250[b]	1957	3860[b]	1977	20,730[g]	1989	46,348[h]
1941	540[c]	1960	4760[e]	1978	23,438[g]	1990	48,073[h]
1944	1000[d]	1962	4293[f]	1979	25,660[g]	1991	51,098[h]
1947	350[c]	1967	5600[e]	1980	28,707[g]	1993	52,868[h]
1948	725[c]	1969	8294[g]	1981	30,193[g]		

Sources: [a] BPP, 1884, LXXXV p 210; 1884–5, LXXXIV, pp 82–3; 1886, LXX, pp 80–81; 1887, LXXXVIII pp 306–7; 1888, CVI, pp 90–91; 1889, LXXXIII, pp 88–9, *Agricultural Statistics*. This source gives the total capacity of silos in Great Britain, and this figure is converted to a tonnage by assuming that a cubic foot of silage weighed 40 lbs. The rationale for this assumption is explained in footnote 40.

[b] BPP, 1958/9, VIII, p 321, *Report of the Committee on Grassland Utilisation*, chairman Sir Sydney Caine, Cmnd 547, November 1958; the figures for 1940 and 1957 are also reported in H I Moore, *Grass and Grasslands*, 1966, p 108. Moore was a member of the committee.

[c] E Rea, 'Silage for self-sufficiency', *JRASE*, 110, 1949, p 29. Rea gives the tonnage for 1948, and then mentions that this was 'more than double that of 1947 and one-third more than the wartime peak production of 1941', and the figures for 1947 and 1941 are therefore estimated from this.

[d] H I Moore, *Ploughing for Pasture*, 1944, p 28. Note the conflict between this figure and Rea's remark about the wartime peak of production.

[e] W R Catt, 'Commercial harvesters now', in J K Nelson and E R Dinnis, eds, *Machinery for Silage*, British Grassland Society Occasional Symposium No. 17, Maidenhead, 1985, p 33. Catt's figures are given in dry matter terms for England and Wales for various years between 1960 and 1982. They have been converted to the ones given here by comparing them with the figures given by Marks and Britton (see g) and calculating that an approximate multiplier to reconcile the overlapping figures is 7. Thus they cannot be regarded as anything more than a rough approximation.

[f] This is also a rough approximation, from the remark made in H W Gardner, *A Survey of the Agriculture of Hertfordshire*, Royal Agriculture Society of England, County Agricultural Surveys, No 5, 1967, p 59, that the silage acreage in that county in 1962 was one-sixth of the acreage devoted to hay. Taking the same proportion to apply at a national level, which is clearly unlikely, and assuming that one ton of hay is equivalent to three of silage, this converts the national hay output of 8,587,000 tons (see g below) to 4,293,000 tons of silage.

[g] H F Marks, ed D K Britton, *A Hundred Years of British Food and Farming: A Statistical Survey*, 1989, p 197. This contains the complete list for the years 1969–86 of the estimates of silage production made by the Ministry of Agriculture, Fisheries and Food and printed in their annual series *Output and Utilisation of Farm Produce in the United Kingdom*.

[h] Ministry of Agriculture, Fisheries and Food, Statistics Press Release 64/94, 30 March 1994, Table 7, p UK3.

samples were analysed. From 1897 onwards the annual reports indicated that the consulting chemist continued to offer his analytical services to farmers, but no more silage or hay samples were sent to him.[42] There is a clear impression of dwindling interest in silage, although it was revived to some small extent by the example of Mr George Jacques of Tivetshall in Norfolk, who built a tower silo for oats and tares in 1910.[43] But tower silos were expensive, and even at the height of the silage boom in the 1880s not all had been convinced: a speaker at the Cartmel Show in the Furness district of Lancashire made his audience laugh by suggesting that 'if they got a few more dry seasons, silos and ensilage would die a natural death and there would not even be a *post mortem*.'[44] At the other end of the country a survey of the agriculture of Sussex simply declared that 'Before the First World War there was no silage made in Sussex', while admitting that 'a very few old farmers could remember the attempts at silage making between 1880 and 1890'. By the first decade of the twentieth century a textbook writer explained the lack of interest: 'the root

[42] J A Voelcker, 'Annual report of the consulting chemist', *JRASE*, 2nd ser, XXI, 1885, p 337. Subsequent annual volumes contain similar reports, except for the volumes for 1890 and 1895. The 1891 volume contains 2 reports.

[43] H I Moore, *Grass and Grasslands*, 1966, p 108.

[44] A Mutch, 'Rural society in Lancashire 1840–1914', Unpublished Manchester University PhD thesis, 1980, p 271.

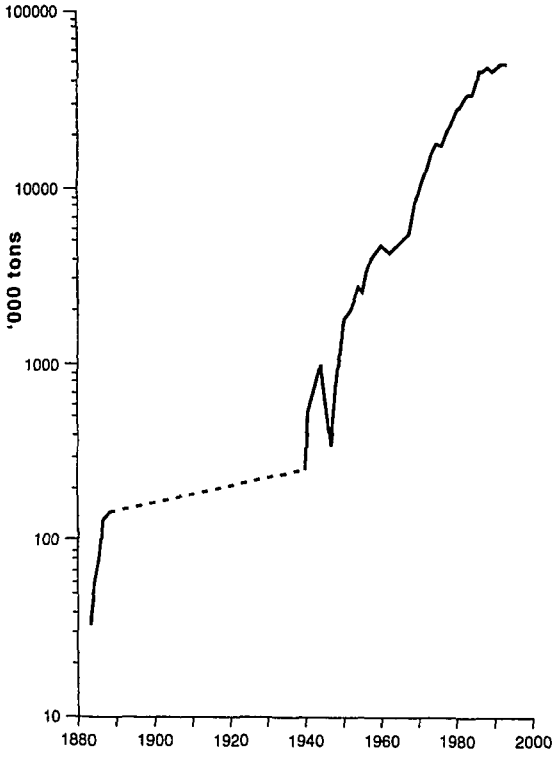


FIGURE 1
Silage production in Great Britain, 1884–1993.

crop is of such cultural and feeding importance, and as a rule a comparatively certain crop, that succulent winter feed is generally obtainable, and it is not often that conditions are such that a reasonable quality of hay crop cannot be secured.'[45]

It was as an alternative to roots that silage was taken up again in Sussex at the end of the First World War, as some younger farmers began to take an interest in American methods using large wooden silos. At Wappingthorn Farm, near Steyning, two wooden silos were roofed and joined to make a fortified gateway into the steading. In 1918 the Food Production Department of the Board of Agriculture had provided advice, working drawings, and priority certificates for materials to farmers wishing to erect brick or concrete tower silos. It was estimated that a one hundred ton silo, thirty feet high and fifteen feet in diameter, could be built for about £310 in concrete or £340 in brick. The Cheshire County Council erected a tower silo at their farm institute at Reaseheath, and a few of the larger farmers in the county also invested in them. In Hertfordshire, too, silage was popular in the period between 1918 and 1923,[46] and in his revision of Ernle's *English Farming Past and Present*, completed in 1936, Sir Daniel Hall observed that in about 1920

> there was a considerable recourse to silage made either in the wooden silos imported from America or round silos of reinforced concrete; a mixture of oats, tares, and beans being the crop most favoured for preservation as a succulent fodder for the winter feeding of milch cows. But even silage making involves a good deal of labour and today the silos are little used except for an excess of grass in a wet season.[47]

As far as the majority of farmers was concerned, Hall was quite correct, but some persisted with it. There was a temporary revival of interest in the 1930s in Northumberland, where several large concrete and brick silos, each costing several hundred pounds, were erected for arable silage to replace increasingly-expensive turnips. A J Hosier, who became well-known for his practice of bail-milking dairy cows, used silage as part of his normal fodder conservation programme from the early 1930s.[48] The real enthusiasts seem to have been the scientists. Amos and Woodman, who worked at Cambridge, wrote several papers in the *Journal of Agricultural Science*

[45] R H B Jesse, *A Survey of the Agriculture of Sussex*, Royal Agricultural Society of England, County Agricultural Surveys, No 2, 1960, p 125; R P Wright, ed, *The Standard Cyclopaedia of Modern Agriculture*, V, nd, *c* 1910, p 59.

[46] Jesse, *Agriculture of Sussex*, p 125; J Weller, *History of the Farmstead*, 1982, p 198; Anon, 'Supply of silos by the Food Production Department', *Jnl Board of Agriculture*, 25, 1918, pp 149–52; W B Mercer, *A Survey of the Agriculture of Cheshire*, Royal Agricultural Society of England, County Agricultural Surveys, No 4, 1963, p 81; H W Gardner, *A Survey of the Agriculture of Hertfordshire*, Royal Agricultural Society of England, County Agricultural Surveys, No 5, 1967, p 58.

[47] Lord Ernle, *English Farming Past and Present*, 6th ed, 1961, p 453.

[48] H C Pawson, *Cockle Park Farm*, 1960, p 174; A J Hosier and F H Hosier, *Hosier's Farming System*, 1951, p 133.

in the 1920s in which they attempted to find out what was going on in the ensilage process, and what determined the nutritive value of silage, while articles in the *Journal* of the Royal Agricultural Society were more concerned with the practicalities of making silage and the comparative costs of silage and roots.[49] In the 1930s S J Watson, who at that time worked at the ICI research farm at Jeallott's Hill, published several papers and eventually a book on silage making.[50] But most farmers remained unenthusiastic.

'Twenty pounds of grass silage produces a gallon of milk and takes the place of 3.5 lbs of imported concentrated food. Thus every six tons of silage made has liberated one ton of shipping space' wrote Dr Ian Moore in a British Council pamphlet in 1944, so explaining official enthusiasm for silage in the Second World War.[51] The foreword to the Ministry of Agriculture's 1944 edition of their bulletin on *Ensilage* made the same argument and concluded 'Indeed, the making of silage is not now merely desirable; it has become a duty!' The use of molasses and acids as additives was better understood as a result of Watson's work at Jeallott's Hill, and cheaper silos, of wire mesh lined with sisal paper or made of concrete slabs erected on the farm, were available. The summer of 1941 produced a bumper maize crop, some of which was ensiled, pea pods were found to produce excellent silage, and there was even research at Jeallott's Hill on the ensilage of bracken ('unlikely to prove profitable' was the conclusion).[52] 'Make silage, make sure' was the ministry's slogan. As the figures in Table 1 indicate, silage production increased significantly, although whether it doubled or quadrupled depends on whether Rea's post-war estimate of half a million tons, or Moore's figure of a million tons, given in what was clearly a work of wartime exhortation if not propaganda, is seen as the more credible. George Henderson, who farmed a small but intensive holding on the eastern slopes of the Cotswolds near Enstone in Oxfordshire, felt that 'The silage campaign has not received the support it deserves. We have learned to value silage so much that we no longer look upon it as a mere wartime expedient, but as something well worth incorporating into our general farming practice for the future.'[53]

Post-war policy maintained the emphasis on 'dollar-saving by greater self-sufficiency', and so silage remained in official favour. In 1947 the Minister of Agriculture launched a four-year plan or expansion programme which envisaged the expansion of silage production from 725,000 tons to 2 million tons and dried grass production from 100,000 to half a million tons, both at the expense of hay output, which, it was envisaged, would fall from 7 to 4 or 5 million tons, all by 1952.[54] Officers of the County Agricultural Executive Committees – the War Ag, still operating in the post-war years – encouraged farmers to make silage in pits, and showed them how to match the size of pit

[49] See, for example, T B Wood and H E Woodman, 'The digestibility of oat and tare silage', *J Ag Science*, 11, 1921, pp 304–9; A Amos and H E Woodman, 'A study of the process of making clamp silage', *J Ag Science*, 15, 1925, pp 444–54; H E Woodman, 'The nutritive value of stack silage', *J Ag Science*, 15, 1925, pp 327–33; A W Oldershaw, 'Crops for ensilage', *JRASE*, 84, 1923, pp 39–49; H W Kersey and C S Orwin, 'The comparative cost of mangolds and silage', *JRASE*, 86, 1925, pp 48–58.

[50] See, for example, S J Watson, 'The conservation of grassland herbage', *JRASE*, 95, 1934, pp 103–16; *idem*, 'The chemical composition of grass silage', *J Ag Science*, 27, 1937, pp 1–42; *idem*, *Silage and Crop Preservation*, 1938.

[51] H I Moore, *Ploughing for Pasture*, 1944, p 28.

[52] H E Woodman and Arthur Amos, *Ensilage*, Ministry of Agriculture and Fisheries, Bulletin No 37, 6th ed, July 1944. The first edition of this work, which was published in 1926, was based on a series of articles in the *Journal* of the Ministry written by Amos and Woodman, who, as footnote 48 indicates, were among the leading research workers on silage at that time: Jesse, *Agriculture of Sussex*, p 125; Watson, *Silage and Crop Preservation*, p 140; F H Garner, 'Recent developments in silage making', *JRASE*, 103, 1942, p 164; W Godden, 'The feeding of livestock', *JRASE*, 106, 1945, p 48.

[53] George Henderson, *The Farming Ladder*, 1944, p 154.

[54] Eric Rea, 'Silage for self-sufficiency', *JRASE*, 110, 1949, pp 28–9.

to the output of their grassland.[55] Helped by the example of such expert farmers as Rex Paterson, who invented and popularized the use of the buckrake, and extension techniques such as the silage competitions run by the National Agricultural Advisory Service for several years in Hertfordshire, output did indeed increase, and the 2 million ton target appears to have been met by 1952, although the quality of the product was not always high.[56] It was comfortably exceeded by 1957 (Table 1), although still agricultural scientists such as Professor M McG Cooper could complain that 'there are surprisingly few farmers making silage in Britain, many less than one would expect having regard to the publicity that has been given to this form of grass conservation and the surplus of grass that is available for this purpose.'[57] Silage was also one of the techniques popularized by the BBC radio programme *The Archers*, which was first produced in 1950 as an imaginative attempt to change the ways of small farmers in the Midlands who were not responding to the advice they were receiving from the Ministry of Agriculture and the county committees.[58] In fact, silage was made on 34,300 holdings in England in 1957, which represented 14.4 per cent of all holdings. The percentage was less in Wales and very much less in Northern Ireland. Dairy farmers were more likely to be silage makers: in a survey of 944 herds in England and Wales carried out by the Milk Marketing Board nearly half of those in the Midlands made silage in 1957, although the comparable figure for east and south-east England was only 26 per cent and for Wales 18 per cent. Over England and Wales as a whole the proportion of surveyed farms producing silage increased from 25.5 per cent in 1955 to 35.7 per cent in 1958.[59] By this time a grant scheme had been introduced, to run, initially, for three years, under the terms of which farms could qualify for grants of up to £250 for roofed silos or £125 for unroofed silos. The precise amount payable on any one farm depended upon the work done: excavation was grant-aided at *3s 6d* per cubic yard, drainage at *2s 6d* per yard run, roofs at *27s 6d* per superficial yard covered, and so on. Nearly 18,000 proposals, involving grant expenditure of £2,762,348 (an average of £155 per farm) had been approved by the end of June 1958.[60]

The Caine Committee on Grassland Utilisation was established in 1957 'to consider methods of further stimulating the better production and use of grass... with a view to reducing the cost of production of livestock and livestock products and securing economies in imports of feedingstuffs...', and its 1958 report endorsed the advantages of silage. Indeed, a minority report by four members of the committee suggested that a subsidy of 15 shillings per ton of silage of adequate quality should be paid to any farmer, for a maximum period of four years per farmer, until national silage output had reached 10 million tons. The justification for their suggestion, apart from the perceived advantages of silage, was that a similar scheme operated since 1955 in Northern Ireland had resulted in the trebling of production there. Moreover, they felt, farmers had been slow to adopt silage because of the risk of

[55] The capital cost of towers was thought to be too great for them to be given equal emphasis. I am grateful to Mr Victor Burke, of Rattery, Devon, who was employed by a War Ag in 1947–8, for this information.

[56] Gardner, *Agriculture of Hertfordshire*, p 57; Rex Paterson, *How We Make Silage*, 1950; Q Seddon, *The Silent Revolution*, 1989, p 27.

[57] M McG Cooper, *Competitive Farming*, 1956, p 35. Cooper was professor of agriculture first at Wye College and then at the University of Newcastle upon Tyne.

[58] The programme's objectives were 10 per cent education, 15 per cent information, and the rest entertainment. I am grateful to Godfrey Baseley, the first producer of *The Archers*, for this information. See also S Laing, 'Images of the rural in popular culture', in B Short, ed, *The English Rural Community: Image and Analysis*, 1992, p 145.

[59] BPP, 1958/9, VIII, *Report of the Committee on Grassland Utilisation* (the Caine Committee), p 321. The figures are given on pp 55–6 in the original pagination of the report.

[60] Anon, *The Farmer and Stockbreeder Grassland Handbook*, 1957, pp 265–9; BPP, 1958/9, VIII, p 36.

turning from purchased feedstuffs, where the return was immediate, to a system which required greater forward planning. The majority of the committee disagreed: 'the failure on the part of many farmers to make silage where there is a clear case for them to do so cannot be attributed to the costs involved in the process but simply to apathy.' No tonnage subsidy was forthcoming, although the recommendations included the continuation of the silo subsidy and further research on silage (there were, after all, three academics on the committee).[61]

Another, less official, initiative took place in the Teign valley in Devon in 1960, where the Nuffield Foundation sponsored the setting up of three machinery groups for making silage, in Longdown, Dunsford and Bridford parishes. The report on the project found that there was 'a general trend towards silage as an alternative to hay', especially since the introduction of the forage harvester, although it was still 'far from being generally accepted in the Teign Valley.' This was not just due to traditional conservatism, but was a logical response to steep land, poor access and difficult farm layouts. The advantages of silage were greater for bigger farms.[62] At this point Devon was one of the counties in which silage appears to have been more popular than it was in the country as a whole. A survey of 27 Devon farms found that 14.7 acres in every hundred were devoted to silage, compared with 22.6 for hay, in 1960. If this pattern had been reproduced nationally it would have implied a level of silage production of something like 16 million tons, which was probably three or four times what it actually was then.[63] Cheshire was another county in which silage was relatively popular in the early 1960s, with between 30,000 and 40,000 acres out of the 120,000 mown acres being devoted to it. The response to the national silage campaign was said to be 'more marked in Cheshire than in any other part of the country because here the cows are thickest on the ground, the need for semi-concentrated fodder the greatest'.[64] In Warwickshire at the same time, Clyde Higgs found that 'The amount of silage made increases every season but all too slowly', although he explained the rapid decline in the root acreage by its substitution by silage, while in Sussex the use of the buckrake in silage making was said to be common in 1960.[65] In Hertfordshire in 1962 six acres were cut for hay for every one cut for silage, and it was 'not now increasing in favour' despite all the recent labour-saving innovations in silage making.[66] Writing in 1969, Harwood Long found that 'Silage has not made as much progress in the Yorkshire dales as one might have expected in an area of such high rainfall', although the West Riding contained more forage harvesters than any other county in England.[67]

All these examples tend to confirm Coppock's judgement that by the early 1970s, 'While silage-making has been increasing in popularity in the post-war period, the number of farmers making silage and the amount made are still small', and that it was more commonly made in midland and southern than in eastern England.[68] Nevertheless, by 1969 the popularity of silage was sufficient to persuade

[61] BPP, 1958/9, VIII, pp 48–62.

[62] J Bradley, *Co-operation: A Report on an Experiment in setting up co-operative Groups for the Purpose of making grass Silage*, University of Bristol, Report no 125, Newton Abbot, 1961, pp 1 and 38–9. I am most grateful to Mr Geoffrey Hearnden of Bridford for providing this reference for me and discussing the project.

[63] V H Beynon, *Grassland Management: An Economic Study in Devon*, University of Exeter, Department of Economics (Agricultural Economics) Report No 138, 1963, p 6.

[64] Mercer, *Agriculture of Cheshire*, pp 81–2.

[65] C Higgs, 'The agriculture of Warwickshire', *JRASE*, 123, 1962, pp 73–4; Jesse, *Agriculture of Sussex*, pp 125–6.

[66] Gardner, *Agriculture of Hertfordshire*, p 59.

[67] W Harwood Long, *A Survey of the Agriculture of Yorkshire*, Royal Agricultural Society of England, County Agricultural Surveys, No 6, 1969, p 140.

[68] J T Coppock, *An Agricultural Atlas of England and Wales*, 1976, p 117.

the statistical branch of the Ministry of Agriculture that it should report silage production tonnages in addition to the production of hay in the annual figures for output and utilization of farm produce.[69] Silage production was beginning to take off. It is interesting to compare two editions of Cooper and Morris's textbook *Grass Farming*: in the third edition, published in 1973, they complained that 'Since 1940, when the drive for more silage got under way, farmers have been adept in finding good reasons why they should not make the stuff'. In the fifth edition, published ten years later, they continued to explain why silage had been unpopular but observed that after the 1960s 'there was a growing feeling that silage was the more sensible product because of the fickleness of the British weather and by 1980, in terms of conserved dry matter, silage was just as popular as hay.'[70] Production rocketed, from less than 10 million tons per year in 1970, to nearly 30 million tons in 1980, to over 50 million tons in the early 1990s. At the same time, hay production fell. It had peaked at 9,692,000 tons in 1971 (a similar tonnage to that of silage for that year) and thereafter fell steadily to less than 4 million tons in 1989.[71] After a century, the technology introduced in the 1880s had become the dominant system of fodder conservation. Why did it take so long?

III

> In consternation, last summer [1888], the farmers throughout England, Scotland and Ireland saw the forage crops of the year washed and rotting on the meadows, or uncut passing their maturity and becoming rather vegetable wire than succulent herbage. A scramble was then made, partly in despair, partly in hope, to save the deteriorated hay-harvest by the new-fangled process of ensilage.[72]

Clearly, that wet season provided the initial impetus for many farmers to begin silage making ('but I have not seen or heard of any that continued the experiment', wrote Primrose McConnell, three years later.[73]). A fine summer had the opposite effect, as in 1955, 'the best in memory for haymaking...scores of farmers have swung back to hay in preference to silage. Many, indeed, have asserted that the progress of silage making has been retarded ten years by the glorious weather of July and August.'[74] The adoption of silage was also delayed, and for a longer time, by other problems: 'ensilage I shall never touch again', McConnell told his diary in 1905:

> I was a member of the Ensilage Society when the craze for that sort of thing was on, and I made a stack of grass ensilage once, but only once, and never more. A stack of hay was put on the top for pressure, but it heated tremendously for all that. It boiled all the albuminoid ratio out of itself, and the outside rotted for a couple of feet inwards. But that was not all; when the stack was opened the smell was perceptible at a village three miles away, when the wind lay in the proper direction, while the man who cut it out and handled it was debarred from all the beershops in the neighbourhood till he could 'sweeten' himself. It put the milk off the cows, tainted it after it was produced, and had eventually to be given to a lot of young beasts. Farmers are blamed for not being progressive, but how could you progress in a case like this, with a smell as bad as ten motor cars?[75]

Thus it appears that the adoption of silage was delayed by labour and quality problems. But would these, by themselves, have been sufficient to cause the length of delay observed in the case of silage?

The best recent summary of adoption theory as it applies to agriculture is by Hill and Ray, who list five factors which affect

[69] H F Marks, ed D K Britton, *A Hundred Years of British Food and Farming: A Statistical Survey*, 1989, p 197.
[70] M McG Cooper and D W Morris, *Grass Farming*, Ipswich, 3rd ed, 1973, p 159 and 5th ed, 1983, p 169.
[71] Marks and Britton, *British Food and Farming*, p 197; see Table 1.
[72] Kains-Jackson, 'Experiments in making ensilage', p 281.
[73] P McConnell, 'Experiences of a Scotsman on the Essex clays', *JRASE*, 3rd ser, 2, 1891, p 321.
[74] H I Moore, 'Silage on the farm: experience and experiment', *JRASE*, 116, 1955, p 60.
[75] P McConnell, *The Diary of a Working Farmer: being the True History of a Year's Farming in Essex*, 1906, p 207.

the rate of diffusion of new technology: information, uncertainty, capital requirements, management demands, and factor pricing. Thus delayed adoption might be explained by a lack of information about the technique, high risks of failure in using it, and its having high capital requirements and demanding skilled management by the farmer, while increasing the demand for expensive inputs or only saving cheap ones. They also point out that the sociological characteristics of innovators or early adopters are likely to be different from those of laggards: the former are likely to have high levels of social status, wealth and education and to operate large or specialized businesses; the latter are not.[76] However, before deciding whether or not this model can explain the initially delayed and subsequently rapid adoption of silage, it is necessary to analyse in more detail the changes which occurred and the explanations advanced by contemporaries. First, we shall examine the problems of silage making and the advantages of alternative winter feeds. These, presumably, were the considerations which were dominant from the late nineteenth century until the early 1970s. Thereafter, the problems with alternative feeds began to increase in importance, while the difficulties of silage making began to be solved. These processes are discussed in the next two sections.

IV

Silage making in the nineteenth century was heavy work, compared to haymaking, because of the extra moisture that had to be moved by the muscles of men and horses. 'I do not for a moment believe that when a farmer can turn his grass into hay in three genial days he will consent to cart nearly four times the weight of freshly-cut grass to the silo', wrote Martin J Sutton in 1886, and commentators were still agreed on 'the heavy nature of the work' in the 1950s and '60s.[77] Having made silage, it was also heavy work to feed it: 'The tough job was cutting it out in the winter – we did this with an old hay knife, and loaded it on to a trailer,' on Arthur Court's dairy farm on the Wiltshire/Somerset border in the 1950s.[78] Moreover, as McConnell's remarks indicate, farmers, farmworkers, and their wives often disliked its smell.[79] There were also problems with labour management, since silage making clashed with root hoeing.[80] It should therefore follow that the cost of silage was high in comparison to that of alternative feeds. Jenkins, in his report for the Royal Agricultural Society in 1884, estimated the cost of filling a silo at five shillings per ton, but, since he gave no comparable cost for haymaking or roots, this figure is of little use for comparative purposes.[81] In the early twentieth century it was suggested that silage involved more labour and horse work than haymaking, and that it was more economical for large than small farms,[82] but the first attempt to make a direct comparison of the cost of silage with other feeds used mangolds as the alternative and concluded that the cost of producing a ton of silage was three times that of a ton of mangolds, although its feeding value was only twice that of mangolds. However, it was admitted that producing a tilth for sowing corn after late-folded roots could be difficult, and that

[76] B Hill and D Ray, *Economics for Agriculture: Food, Farming and the Rural Economy*, 1987, pp 284–93.

[77] Martin J Sutton, *Permanent and Temporary Pastures*, 1886, p 109, W H Jordan, director of the New York Agricultural Experiment Station, made the same point in *The Feeding of Animals*, New York, 1903, p 219, as did Jesse, *Agriculture of Sussex* p 125; Moore, *Silos and Silage*, p 13; Bradley, *Co-operation*, p 38; Cooper and Morris, *Grass Farming*, 3rd ed, 1973, p 159.

[78] Arthur Court, *Seedtime to Harvest: A Farmer's Life*, Bradford on Avon, 1987, p 78; in the 1880s Clare Sewell Read, 'Suggestions for stock-feeding in the winter of 1893–4', *JRASE*, 3rd ser, 4, 1893, p 469, passed all his silage through the chaff-cutter with straw, and then added shredded roots and cake to it before feeding: an early version of complete-diet feeding perhaps?

[79] Moore, *Silos and Silage*, p 13; Higgs, 'Agriculture of Warwickshire', p 73; Cooper and Morris, *Grass Farming*, 5th ed, 1983, p 169.

[80] Moore, *Silos and Silage*, p 13.

[81] Jenkins, 'Practice of ensilage', p 238.

[82] Wright, *Cyclopedia of Modern Agriculture*, p 60.

silage could have a place where a low average rainfall 'renders the root crop uncertain'.[83]

By the end of the Second World War investigators were more concerned with comparing silage costs with those of dried grass and concentrates, as silage was seen as a source of protein. In the late 1940s, with a production cost of about £1 15*s* 0*d* per ton, it was much cheaper than dried grass and about as expensive as hay, although with its higher protein content it was a better replacer of concentrates than hay. In the winter of 1953–4 it was calculated that the cost of food per gallon of milk from silage was less than half of that from cake. Data from a sample of Devon farms in 1961 suggested that it was slightly cheaper to make silage than hay, and by 1971, with increased mechanization, the man-hours required for hay and silage making were roughly the same.[84]

The capital requirements of silage were also high, especially for those who employed some of the more complex weighting arrangements and the steam-powered cutters and blowers described in Jenkins' report. They were also variable: the Royal Agricultural Society's silage competition in 1885–6 showed the cost of silos varying between £15 and £542, at which point they were clearly beyond the reach of the small farmer.[85] It was, perhaps, no accident that the competitors included five peers and a baronet. Hence the comment by Lawes indicating that it was those with capital who first adopted silage.[86] The chopper-blowers and tower silos of the 1920s were also expensive at a time when farming profits were restricted, and even in the early 1960s comments were still being made about the high capital costs of silage.[87] Consequently, it was said at the beginning of the twentieth century, 'Ensilage making is more economical for large than small farms', and one of the conclusions of the silage co-operative project in the Teign valley in Devon in 1960 was that the large farmers (meaning those with more than 75 acres) would benefit more than the small.[88]

The quotation from McConnell's diary draws attention to the quality problem for silage, and McConnell was not alone in finding it difficult to make quality silage: 'the reeking smell of butyric acid was the chief reminder of the silage of that period' [the 1880s] in Sussex, and even in the late 1950s there were still quality problems. Skill is required to make good silage, and not all farmers (or their advisers) possessed it.[89] At least part of the success of silage in the USA resulted from the fact that the crop most commonly ensiled there, as in France, was maize, which is much easier to make into silage than grass.[90] And at least part of the failure of silage in Britain in the late nineteenth and early twentieth centuries must have resulted, paradoxically, from the success of George Fry's advocacy of sweet ensilage.[91] This process involved late cutting, wilting, and allowing air into the silo to raise the temperature to a high level, and produced a brown, sweet-tasting, very palatable silage in which, unfortunately, the results of oxidation reduced the nutritional content to little better than

[83] Kersey and Orwin, 'Cost of mangolds and silage', pp 53–5; Halley and Soffe, *Agricultural Notebook*, p 374.

[84] Watson and Smith, *Silage* p 138; Moore, 'Silage on the farm', p 62; Beynon, *Grassland Management*, p 10; John Nix, *Farm Management Pocketbook*, 4th ed, Wye, 1971, p 71.

[85] The Judges, 'The silo', p 306; even Clare Sewell Read ('Suggestions for stock feeding', p 469) felt that he could not afford a silo, and so made silage in a stack.

[86] see footnote 24 above.

[87] Watson and Smith, *Silage*, p 17; Jesse, *Agriculture of Sussex*, p 125; Moore, 'Silage on the farm', p 60.

[88] Wright, *Cyclopedia of Modern Agriculture*, p 60; Bradley, *Co-operation*, pp 38–9: I am grateful to Geoffrey Hearnden of Bridford, one of the farmers involved in this experiment, for supplying me with this reference, and for pointing out that it is easier to make silage in large quantities than in small. The same point is made in Mercer, *Agriculture of Cheshire*, p 83.

[89] Jesse, *Agriculture of Sussex*, p 125; Seddon, *The Silent Revolution*, pp 28–31.

[90] Moore, *Grass and Grasslands*, p 108; Watson and Smith, *Silage*, p 16; by 1944, according to C Culpin, *Farm Machinery*, 2nd ed, 1944, p 221, there were a million silos in the USA.

[91] G Fry, *Sweet Ensilage*, 1885.

maintenance quality. It 'put back the making of good silage in this country for a generation', according to one commentator, and for fifty years according to another.[92] Even in 1957 the Committee on Grassland Utilisation felt doubtful of the ability of many farmers to make good silage, and thought that tripodding or barn drying of hay were equally worthy of encouragement.[93]

It was not only its drawbacks but also the advantages of alternative winter feeds which slowed the adoption of silage. Its feeding value was no better than that of good hay, which, with the machinery available up to the 1960s, might be made more quickly in a period of good weather.[94] Roots yielded a greater weight of fodder per acre than silage and were also a cleaning crop, which was important when there were no herbicides and weeding was carried out by hoe, moved either by horse or human power.[95] They also had a high water content: Franklin explained how, in about 1890 (in south Northamptonshire), before his father changed from roots to silage 'he found he had to dig a well and erect a windmill to pump a plentiful supply of water to his covered yards and cowhouses, and even today [1953] many farmers cannot change from roots to silage for lack of a plentiful water supply.'[96] Dried grass was the best way of preserving the nutrients in young herbage. Mr Fuller of Neston Park, near Bath, demonstrated a drier at the Bath and West Show at Cardiff in 1884, but the process met with no great success until the 1930s, when Imperial Chemical Industries used it in conjunction with their experiments at Jeallott's Hill in Berkshire on high-output grass production with the aid of fertilizers. The first driers were fuelled by coke or coal, although by the early 1950s oil, which gave better temperature control and lower labour costs, was becoming more popular, and there were several types of drier available, including some mobile ones.[97] But from the inter-war period onwards, one of the main reasons why silage was not needed was that home produced foods were looked upon as providing only bulk and maintenance, while the production ration came from cheap imported concentrates – cereals and oilcakes – 'easy to handle and store, simple to ratio, and obtainable not by the sweat of men's labours, but merely by lifting the telephone!' Animal feed imports rose from 6.1 million tons in 1924–9 to 8.4 million tons in 1935–9, representing about a quarter of the total animal feed supply when measured in starch and protein equivalent terms. Bobby Boutflour, an agricultural adviser employed by Wiltshire County Council, toured the county telling farmers that they could get an extra gallon of milk for every four pounds of cake they fed. He became Principal of the Royal Agricultural College after the Second World War, and the college herd averaged two thousand gallons per cow, with some of them eating up to thirty pounds of concentrates per day. Concentrates were in short supply during the war years and shortly afterwards, but became available again in the 1950s, and by the 1960s were cheap enough to be used as part of the maintenance ration in the barley beef system. By the early 1970s British farmers were buying over two pounds of dairy cake for every gallon of milk produced, in addition to any home-produced cereals they might have fed. High

[92] McDonald, *Biochemistry of Silage*, p 11; T B Franklin, *British Grasslands*, 1953, p 162; Watson and Smith, *Silage*, p 15.
[93] BPP, 1958/9, VIII, pp 53, 57.
[94] Mercer, *Agriculture of Cheshire*, p 83.
[95] Lawes and Gilbert, *Experiments on Ensilage*, p 55; Kersey and Orwin, 'Cost of mangolds and silage', p 53.
[96] Franklin, *British Grasslands*, p 162.
[97] S G Kendall, *Farming Memoirs of a West Country Yeoman*, 1944, p 170; Franklin, *British Grasslands*, p 161; E H Whetham, *The Agrarian History of England and Wales, VIII, 1914–1939*, 1978, p 277; E T Halnan and F H Garner, *The Principles and Practice of Feeding Farm Animals*, 1944, p 134; J A Hanley, ed, *Progressive Farming*, 1949, pp 80–81.

summer stocking rates, less conserved grass, and bought-in cake made money.[98]

V

Therefore, if silage were to be widely adopted, the problems associated with it had to be overcome, or the advantages of the alternative winter feeds reduced, or both.

Perhaps the first of the alternatives to meet difficulties was the root crop, which was reduced in area as the cereal acreage was reduced from the mid-1870s.[99] As land was grassed down, roots no longer had their place as the cleaning crop in the four-course rotation. In the inter-war years basic wage rates for agricultural workers were twice what they had been in 1914,[100] and there were fewer of them available for the labour-intensive task of root hoeing as the number of farm workers steadily declined (Fig 2).[101] Later, from the 1960s onwards, the use of herbicides increased, which further eroded the necessity of the root break.[102] Consequently, as Figure 3 demonstrates, the acreage and output of roots fell more or less steadily from its peak in 1870 to the present day.[103]

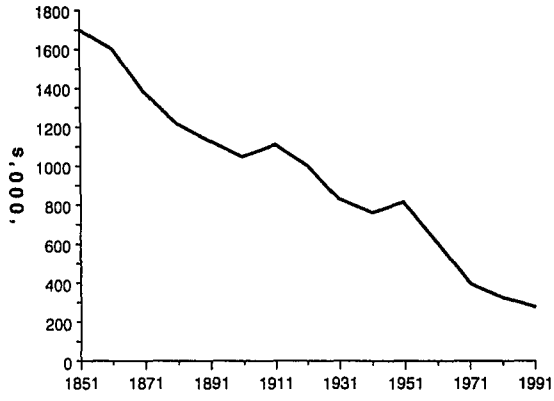


FIGURE 2
Number of farmworkers in Great Britain, 1851–1991.

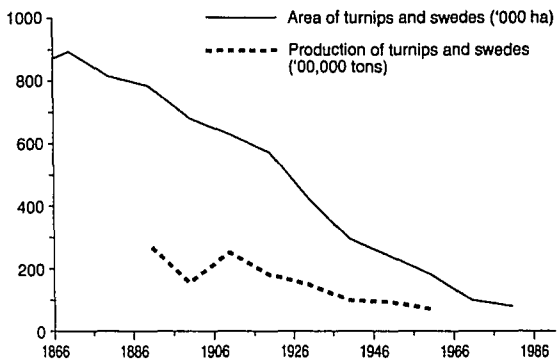


FIGURE 3
Area and production of turnips and swedes in Great Britain, 1866–1986.

Hay production was remarkably stable from the 1880s to the beginning of the 1980s (Fig 4).[104] But even in a good season it could be wasteful of nutrients. Moore summarized the case against it: it was cut when nearing maturity so that it would make more quickly, and consequently its

[98] Watson and Smith, *Silage*, p 17; Cooper and Morris, *Grass Farming*, 5th ed, 1983, p 169; Whetham, *Agrarian History*, p 289; Court, *Seedtime to Harvest*, p 28; Moore, 'Silage on the farm', p 61; Seddon, *The Silent Revolution*, p 36; F Raymond, G Shepperson and R Waltham, *Forage Conservation and Feeding*, Ipswich, 1975, p 16. Between 1954 and 1972 the price of compound feeds (measured in constant prices) decreased by roughly one-third, according to Marks and Britton, *British Food and Farming*, Table 25.12, p 251.

[99] Marks and Britton, *British Food and Farming*, pp 158–62.

[100] *Ibid*, p 142.

[101] Numbers of farm workers are taken from Marks and Britton, *British Food and Farming*, p 138. The decrease in the number of farm workers was seen, at the time, as a reason for the adoption of silage in the 1920s: 'Ensilage not only compares favourably with root-growing in labour costs, but...facilitates the destruction of weeds, partly because these are smothered under the dense foliage and subsequently cut and ensiled before their seeds are shed, and partly because the crop is cleared from the field in early summer, and the land consequently can be broken up in hot weather by steam or tractor and the perennial weeds quickly destroyed' (H Hunter, ed, *Bailliere's Encyclopaedia of Scientific Agriculture*, 1931, p 284). Moore, 'Silage on the farm', p 60, makes the same point.

[102] H Kornberg, *Royal Commission on Environmental Pollution. Seventh Report: Agriculture and Pollution*, Cmnd 7644, 1979, p 10. The figures given are for sales of pesticides by UK manufacturers for home and export use, all at 1976 values, and they show an increase in herbicide sales from about £10 million in 1958 to about £80 million in 1976. However, no figures are quoted for consumption within the UK only (the problems of finding such data are discussed on p 9 of the report), although it is stated that roughly half of all pesticides were sold at home in 1976. The MAFF *Annual Review of Agriculture* gives no separate figures for expenditure on pesticides before 1983 (prior to that they were included with veterinary and electricity costs and rates) and no separate figures for herbicides at all.

[103] Marks and Britton, *British Food and Farming*, p 198; MAFF, *A Century of Agricultural Statistics*, pp 118–19.

[104] Figures for the years up to 1945 are for Great Britain, and are taken from MAFF, *A Century of Agricultural Statistics*, pp 120–21. From 1946 the figures are for UK production and are taken from Marks and Britton, *British Food and Farming*, p 197.

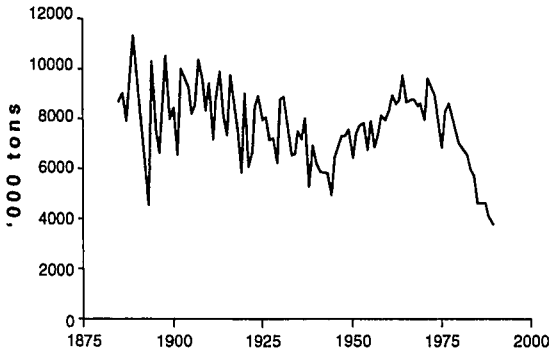


FIGURE 4
Hay production in Great Britain, 1885–1989.

fibre content was increased and its protein content reduced; in hot dry weather, especially when it was tossed about by machinery, there was a risk of loss of the leafier parts of the crop; the anxiety to get it in safely often led to premature carting, so that it was liable to heat in the stack, reducing the digestibility of the protein; in short, even good hay would have a lower energy and protein content than good silage.[105] In a wet season the problems were greater still, despite the advent of tripods, barn driers, balers, conditioners, tedders, and all the other ways in which scientists, machinery manufacturers, and farmers attempted to increase the quality and decrease the handling problems of hay.[106] Paradoxically, the problem was made worse by the increasing use of nitrogen fertilizers on grass. Even in 1905 Primrose McConnell had had problems with a heavy hay crop:

> The extra crop takes a lot of expense in manure and other etceteras to grow it; it is 50 per cent more difficult to cut, because it is certain to be tangled; it has all to be turned, and cocked, and shaken out and 'made' in a way quite unnecessary with a light crop, and then before you get it into the stack the weather breaks, and you get loads on loads of it spoiled...my advice to all whom it may concern is to grow moderate crops; if they do they will have fewer lines of care on their foreheads, they will have more coin chinking in their pockets, and they will prolong their lives.[107]

Despite these considerations, the use of nitrogen, which could treble the yield of a cut, increased by about six times between the late 1940s and the late 1970s, and by then about two-thirds of the total used was applied to the grass crop.[108] In addition, from the mid-1960s the new tetraploid ryegrasses were available, and they were more palatable and digestible because they had a bigger leaf. Consequently they needed more wilting before they would make hay.[109] Thus haymaking remained a problem. Perhaps only big balers really solved the problem of mechanizing it, and even they did not solve the handling problem at feeding time.

The quality and handling problems of hay were solved to some extent by dried grass, but at a significant cost in terms of capital and fuel. Thus it remained a big farmer's or a specialist's product: in 1962, for example, there were only 1100 grass driers in England and Wales.[110] The price of fuel oil, after allowing for inflation, more than doubled between 1970 and 1980, and so increased the variable cost of dried grass to the point where it was too expensive to compete with alternative feeds.[111]

At about the same time, especially in

[105] Moore, *Silos and Silage*, pp 12–13.
[106] Seddon, *The Silent Revolution*, pp 25–7 contains a vivid account of the problems of haymaking; F E Alder *et al*, *The Farmer and Stockbreeder Grassland Handbook*, 1957, pp 106–39 is a good account of the state of the haymaker's art in the late 1950s.
[107] McConnell, *Diary of a Working Farmer*, p 217.
[108] Kornberg, *Royal Commission on Environmental Pollution*, pp 13–15; I am grateful to Dr John Brockman for pointing out the extent of the yield response.
[109] Tetraploid ryegrasses first appeared on the NIAB recommended list in 1964: see National Institute of Agricultural Botany, *Varieties of Ryegrass*, Farmers Leaflet No 16, Cambridge, 1964, pp 4–7. I am very grateful to my colleague David Barnard for this point, and to him and Dr John Kirk for discussing the effects of tetraploid ryegrasses.
[110] MAFF, *Agricultural Statistics, United Kingdom*, 1962, p 22.
[111] These figures are taken from the indices of prices of medium fuel oil or gas oil fuel given in the annual volumes of the *Annual Abstract of Statistics* for the years 1964 to 1983, deflated by the Retail Price Index series (1985 = 100) given in A Burrell, B Hill and J Medland, *Agrifacts*, 1990, p 148. At its lowest, in 1970, the oil price index in real terms stood at 510.2; by 1974 it was 836.1; in 1980, 1179.3; and in 1983, 1492.3. In current price terms (ie not adjusting for inflation) the changes were much greater, nearly trebling between 1970 and 1975, and increasing by 13 times between 1970 and 1983.

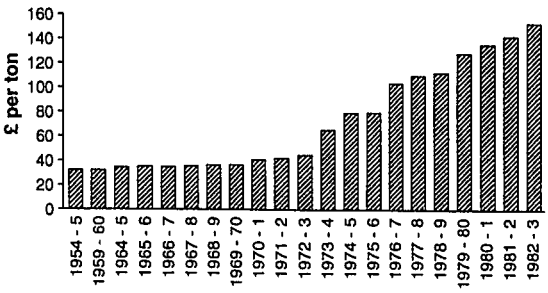


FIGURE 5
Prices of dairy compound feeds, 1954–83.

the years 1973 and 1974, the price of concentrate feeds began to rise (Fig 5) as world prices of cereals and protein feeds rose. For years, in the 1950s and '60s, farmers had been used to buying cake at between £30 and £40 per ton. Now, suddenly, it seemed, the price had doubled. The advantages of getting more than a maintenance ration from bulk feeds were increased.[112] But roots were no longer grown on a large enough scale, there were difficulties in making good hay reliably and cheaply, and dried grass was too expensive. If the quality and handling problems of silage could be overcome, there was a part for it to play.

The first successful attempts to improve the quality of silage were made in the inter-war period, with the introduction of additives. Good silage is made when bacterial action rapidly produces lactic acid, and for this fermentable carbohydrates are required. Thus mature herbage, well chopped, will ferment well, but being mature will have a lower digestibility and protein content than young green grass, which, unfortunately, will contain less fermentable carbohydrates.[113] Professor A I Virtanen, who worked for the Finnish Butter Export Association, introduced the idea of adding a mixture of hydrochloric and sulphuric acids to the grass as it was being packed into the silo in order to increase its acidity rapidly. Farmers in Finland and other Scandinavian countries attended week-long courses to learn how to make silage using this method, which was known as the AIV process after its inventor, and it was successful enough to attract the attention of S J Watson and other scientists working at the ICI experimental farm at Jeallott's Hill in Berkshire in the 1930s.[114] In the USA phosphoric acid was used in a similar process. In Britain, however, the most popular additive until the early 1960s was molasses, which had the advantage that no harm came from excessive application, no damage was done to clothing, containers, or machinery, and the diluted solution could simply be spread on to the crop with a watering can. It produced indirect acidification, in that it was simply a source of fermentable carbohydrate.[115] There was also a combination of these methods, known as the Defu process, which used a mixture of hydrochloric and phosphoric acids and molasses.[116] From the 1950s onwards sodium metabisulphate was added to the list of additives, and by 1980 there was a wide range, under various trade names (eg Sylade, Kylage Extra, Add F and Silage Shield).[117]

[112] Raymond, Shepperson and Waltham, *Forage Conservation and Feeding*, pp 16–17; the reasons for the increases in world prices in the early 1970s are discussed in S Harris, *The World Commodity Scene and the Common Agricultural Policy*, Wye, 1975. The prices charted in Figure 5 are for dairy compound feeds, listed in the 1971, 1975, 1983 and 1989 editions of Federation of United Kingdom Milk Marketing Boards, *UK Dairy Facts and Figures*. In constant price terms, compound feed prices in 1973 and 1974 increased to levels not experienced since the mid-1950s, although by 1982 they had again fallen to their 1972 level. See Table 25.12 in Marks and Britton, *British Food and Farming*, p 251.

[113] H I Moore, *The Science and Practice of Grassland Farming*, 1949, p 112.

[114] Watson, *Silage and Crop Preservation*, pp 131–2; Cooper and Morris, *Grass Farming*, 5th ed, 1983, p 169.

[115] Moore, *Science and Practice of Grass Farming*, pp 112–13.

[116] Charles Crowther, 'The feeding of livestock', *JRASE*, 96, 1935, p 332.

[117] Moore, 'Silage on the farm' p 65; Culpin, *Farm Machinery*, 10th ed, 1981, p 180; the various categories of additive are classified and described in Halley and Soffe, *Agricultural Notebook*, pp 199–200; this also describes a system (known as the Liscombe Star System) for deciding whether or not an additive is needed under various circumstances of grass variety, growth stage, nitrogen level, weather, degree of wilting and chopping: it is clear from this that even with good weather Victorian silage makers would have made better silage if additives had been available.

The other problem to be tackled in the late 1930s was the high capital requirement for building silos. Cheaper concrete silos became available, some costing as little as £15, and the wire mesh and sisal paper silo introduced in 1938 was even cheaper, with a capital cost of £10 for a 40 ton capacity silo.[118] Nevertheless, the problem of getting the grass into the silo remained, and so the advantage still lay with the farmer – usually the big farmer – who could afford green crop loaders and silage cutters and blowers. The biggest contribution towards solving this handling problem was made by the Hampshire farmer, Rex Paterson, in the late 1940s. It was the invention of the buckrake, 'quite one of the most brilliant creations of his fertile brain', according to another Hampshire farmer, John Cherrington.[119] Something like the buckrake had been used by the Hosiers before the war. It was called the haysweep, and mounted on the front of a tractor or an old motor car.[120] Paterson's contribution was to design a more manoeuvreable device, mounted on the hydraulic three-point lift of the cheap (just over £300 for several years after the war) little grey Ferguson tractor. With a buckrake a heap of grass could be collected, then lifted hydraulically and rapidly driven to a clamp made at the side of the field, where the tractor, in the act of depositing the load, also compacted the clamp. Paterson had light land on which he could outwinter his stock, and so the grass was fed back on the land from which it was cut.[121] Quite how many buckrakes there were in the 1950s is uncertain, because until 1968 they were counted along with hay sweeps in the machinery censuses, and, of course, not all of them were used in silage making, but their numbers were quite clearly significant, as Table 2 demonstrates. The buckrake was not really suitable for long-distance transport of grass, and it was the introduction of the forage harvester which allowed the mechanization of farmstead-based silage making. Forage harvesters were first introduced from the USA during the 1940s, and by the mid-1950s domestically-produced machines such as the Hayter Silorator were available. By 1962 it could be said that forage harvesters were replacing buckrakes in Warwickshire and increasing the popularity of silage in Devon.[122] The rate at which they were adopted can be seen from Table 3, which also shows that in recent years the simpler, cheaper, flail types have gradually been replaced by the larger, more complex machines. Sales of self-propelled forage harvesters, the largest

TABLE 2
Number of buckrakes in the United Kingdom

Year	*Number*	
1954	115,130	('hay and silage sweeps, and buckrakes')
1958	102,100	('hay and silage sweeps, buckrakes and hay loaders')
1961	88,400	('hay and silage sweeps, buckrakes and hay loaders')
1968	56,870	
1973	55,310	
1981	46,091	
1985	45,200	

Source: MAFF, *Agricultural Statistics, UK*, annual, various editions.

[118] Halnan and Garner, *Principles and Practice of Feeding Farm Animals*, p 136; according to Moore ('The conservation of grass', p 30) the wire mesh silos were difficult to fill, sometimes collapsed, and could only be regarded as a wartime expedient.

[119] John Cherrington, *On the Smell of an Oily Rag: My Fifty Years in Farming*, 1979, p 132; Cherrington was not the only enthusiast: it was 'one of the most valuable developments in modern grassland farming', according to M McG Cooper, *Competitive Farming*, 1956, p 29, and 'The greatest innovation in connection with silage making' for Jesse, *Agriculture of Sussex*, p 125.

[120] Hosier and Hosier, *Hosier's Farming System*, p 134. In fact, Hosier's hay-sweep was a simpler version of the horse-drawn sweep rake which Primrose McConnell claimed to have introduced from the United States of America in the 1890s: see P McConnell, *The Complete Farmer*, 1911, p 385.

[121] Cherrington, *On the Smell of an Oily Rag*, p 132; Cooper, *Competitive Farming*, p 29; Paterson, *How We Make Silage*.

[122] Culpin, *Farm Machinery*, 2nd ed, 1944, p 226, and 5th ed, 1957, p 283; Moore, *Science and Practice of Grassland Farming*, p 117; Bradley, *Cooperation*, p 38; Higgs, 'Agriculture of Warwickshire', p 76.

TABLE 3
Number of forage harvesters in England and Wales

Type	*1959*	*1962*	*1968*	*1971*	*1976*	*1983*	*1987*
Loader wagons					5570	8308	8390
Simple flail					12,190	8064	6160
Double chop					9740	9898	8370
Metered chop					4940	11,904	13,050
Total	7920	15,260	21,950	23,690	32,440	38,174	35,970

Source: as for Table 2.

and most expensive of all, more than doubled between 1985 and 1992.[123]

Another major development which began in the 1960s was the increase in the size of dairy herds. The average herd size increased from 15 cows in 1942 to 20 in 1960, and then increased by at least one or two in most years to reach 41 in 1974 and 64 when milk quotas were introduced in 1984. Perhaps because these bigger herds could no longer fit into existing cowsheds, and perhaps also because farm improvement grants were available for the purpose, there was at the same time a trend to replace cowsheds by parlours and loose housing or cow cubicles. In 1964 less than 13 per cent of all dairy herds were milked through parlours; in 1974 the figure was nearly 40 per cent, and by 1982 two-thirds of all herds were parlour-milked.[124] Both loose housing and cubicles lent themselves to the self-feeding of silage, which overcame the handling problem. Self-feeding appears to have developed in the early 1950s, but it does not seem to have been widely adopted until the early 1960s.[125] An alternative, high capital approach was the tower silo coupled with a mechanized feeding system, but the numbers of these remained small: there were 1560 tower silos in 1971, and 930 mechanical unloading systems for tower silos in 1973.[126]

Tower silage was usually high quality material because it was well chopped and the tower was almost airtight. Silage made in clamps in the 1950s often had a high proportion (between 15 and 60 per cent was quoted by one author) of waste material in it.[127] At the same time that self-feeding of clamps was being developed there was another important innovation which had a major impact on the quality of the silage in the clamp: the use of polythene sheeting. It enabled the air to be kept out of a clamp, so promoting the lactic acid fermentation which produced high-quality material with little waste. By the early 1960s it was being used in New Zealand to make vacuum silage, in which polythene sheets were joined together to make, in effect, an airtight bag of grass, which was then evacuated by vacuum pump.[128] A simpler system was developed in Britain by Richard Waltham, a Dorset dairy farmer, also in the early 1960s. It involved stacking the grass rapidly in a wedge shape (hence the name of the system, the *Dorset Wedge*), then covering it overnight with a polythene sheet to prevent

[123] I am grateful to my colleague Derek Shepherd, and to Chris Evans of the Agricultural Engineers' Association Ltd for obtaining these figures.

[124] Federation of United Kingdom Milk Marketing Boards, *UK Dairy Facts and Figures* (annual), various editions.

[125] Cooper and Morris (*Grass Farming*, 5th ed, 1983, p 169) credit Rex Paterson with the invention of self-feed soon after 1950. It was discussed as an experimental method in Frank Henderson, *Making Mechanised Farming Pay*, Ipswich, 1954, and as a method under trial in 1955 in Moore, 'Silage on the farm', p 66. Arthur Court (*Seedtime to Harvest*, p 78), who was perhaps more typical of the ordinary farmer, mentions its adoption in 'about 1960', and Mercer, *Agriculture of Cheshire*, p 83 suggests its rapid adoption during the years 1960–63.

[126] Data from MAFF, *UK Agricultural Statistics*, 1974; for an illustration of the mechanisms see Weller, *History of the Farmstead*, pp 59 and 198.

[127] C P van Zeller, 'Vacuum compression silage', *Agriculture*, 72, 1965, pp 219–21.

[128] *Ibid*, p 220.

warm air rising out of the grass and being replaced by oxygen-rich cold air. Clearly the system depended on cheap polythene sheet, and by 1963 this was common enough for ICI to make a promotional film about *Farming with Polythene Sheeting*. By the late 1960s this was the system which both fertilizer companies (and ICI made both fertilizers and polythene) and Ministry of Agriculture advisers were promoting.[129]

By the beginning of the 1970s, therefore, most of the techniques which were needed for the average farmer to consider the adoption of silage were available. Perhaps the final technical change, which allowed the very small producer, with the aid of a contractor, to rely on silage, was the development of big-bale silage, first using plastic bags and subsequently wrapped bales, which are more resistant to damage. By the early 1990s big-bale silage accounted for 20 per cent of the total silage output.[130]

VI

Silage provides a case study of the adoption of a technical innovation in the late nineteenth and twentieth centuries. One interesting historiographical point to emerge from it is concerned with evidence. Much of the material from contemporary textbooks and journals is about the advantages of silage and the reasons why it should be adopted; most of the statistical evidence is about the extent to which it was *not* adopted until recently. In other words, the evidence generated by opinion-formers is at odds with the evidence of the activities of the majority. While this may not be surprising, it is not unimportant, because the ease of access to late-nineteenth and twentieth-century journals make them a tempting source. Yet the story of silage suggests that the picture which emerges from a reading of the contemporary literature may be different from that which appears from an examination of those sources which allow some measurement of the extent to which innovations were adopted. The same point might well apply to other technical changes, such as the adoption of inorganic fertilizers, pesticides, machinery, buildings, new breeds of livestock and new varieties of crops. The British agriculture of the textbook and journal appears to be technically dynamic in the period between 1850 and 1950; on the majority of farms it was less so.[131]

Hill and Ray's list of factors which prevent the adoption of an innovation – lack of information, uncertainty, management problems, high capital requirements and use of expensive inputs – has been shown to be largely applicable in the case of silage, except, perhaps, as far as information is concerned. With all the attention given to silage at agricultural shows and demonstrations, in advertisements, press articles, radio and television programmes, and by advisers, it would be difficult to argue that farmers were unaware of the technique. Even in the 1880s there was somebody making silage in each English and Welsh county. But awareness by itself was not enough to provoke adoption, and the slow uptake of silage provides a good illustration of the other factors on Hill and Ray's list. Quality problems produced uncertainty, as the difficulties caused by sweet ensilage demonstrate. In the USA, where easily-ensiled maize was a more common crop, the spread of silage was much more rapid. Later, the solution of the quality problem by the use of additives and polythene preceded the eventual rapid adoption of silage in Britain. The difficulties of making a quality product might

[129] Seddon, *The Silent Revolution*, pp 29–32; Anon, 'Polythene sheeting', *Agriculture*, 70, 1963, p 43; I am most grateful to my colleagues John Brockman and John Usher for making me aware, from their own personal experience, of the importance of polythene sheeting.

[130] P L Redman, 'Big bale silage', *JRASE*, 144, 1983, pp 113–18; Culpin, *Farm Machinery*, 12th ed, 1992, p 192.

[131] This point is discussed in greater detail in the sections written by the author of this article for E J T Collins, ed, *The Agrarian History of England and Wales, VII, 1850–1914*, forthcoming.

also be seen as a management problem. Farmers understood the problem of haymaking: it was simply a matter of dehydration. The complex biochemistry of silage was more difficult to grasp. The high capital requirements of silage presumably explain why its nineteenth-century adopters were mainly landowners and the bigger farmers; when farms and dairy herds increased in size, and polythene-covered clamps offered a relatively cheap method of producing a palatable product, the rate of adoption was rapid. With the advent of wrapped big bales made by a contractor or a neighbour, even those operating on a very small scale could go over to silage. Changing factor prices – of labour, concentrates, fertilizers and machinery – also had an effect on the process. When labour was cheap, roots were an important component of animal rations. When concentrate prices were low there was little incentive to maximize home-produced protein. Then, gradually, increasing fertilizer applications gave heavier grass crops over which to spread the costs of changing to silage making. Eventually, in the 1970s and '80s, more plentiful machinery and scarcer labour gave the advantage to a fodder conservation process which had, finally, been mechanized. Once farmers had encountered problems with alternative winter feeds, and had learned how to make good silage, reliably, and had the necessary machinery, and had found an easy way to feed it, its adoption was rapid. But until all those parts of the system were in place most of them resisted all the blandishments of enthusiasts, politicians, scientists and advisers for nearly a century.[132]

[132] There are perhaps some interesting comparisons to be made between the delayed adoption of silage and the pattern of adoption of fertilizers in Britain and high-yielding rice varieties in south-east Asia. Inorganic nitrogenous fertilizers were available in the nineteenth century, but their use expanded most rapidly after the 1950s, when shorter-strawed cereal varieties became available, which were capable of withstanding high nitrogen applications without lodging, and output expansion did not, thanks to price support, produce falling prices. Similarly van der Eng explains that the delay in the adoption of high-yielding rice varieties was the result of several inter-dependent factors: see P van der Eng, 'Development of seed-fertilizer technology in Indonesian rice agriculture', *Ag Hist*, 68, 1994, pp 20–53.

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[1] At the time of Raine Morgan's death, this list was unfinished. It has been completed by Janet Collett and Mary Tester of the Rural History Centre, Reading University.

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Conference Report: 'Farming and the Farm Environment' Winter Conference 1995

By PAUL BRASSLEY

THE 1995 winter conference, held jointly with the Historical Geography Research Group of the Institute of British Geographers, took place on Saturday, 2 December at the Institute of Historical Research, London. The theme of 'Farming and the Farm Environment' meant, in this case, farm buildings, three papers being concerned with various aspects of nineteenth-century farm buildings, and one with the medieval period.

The medieval paper, by Dr Christopher Thornton (Victoria County History, Essex), on 'Manorial landscapes: investment in medieval farm buildings and agricultural change on the Bishop of Winchester's estates', took its customary place at the top of the batting order. Beginning with a short review of previous work, much of which appears to argue for low levels of of landlord investment in working farm buildings, Dr Thornton examined in detail the various buildings erected at Rimpton (Somerset) in the thirteenth and fourteenth centuries. Barns, stables, ox and cow byres, calf and sheep houses, a granary, a dovecot, a mill, and cart and wagon houses, in addition to domestic buildings, are among those which can be identified in the pipe rolls and other accounts in the records of the bishopric. There was also comparative material from several parishes in the hundred of Wargrave in Berkshire which demonstrated the effects of assarting and commercial activities on building developments. When the investment required for all this is examined it appears to be quite adequate to cope with the demands produced by the process of agricultural change, and more impressive, perhaps, than previous commentators have allowed.

Dr Tony Phillips (University of Keele), discussing 'Landlord investment in farm buildings in the second half of the nineteenth century – intentions and reality', argued that increasing arable productivity in this period demanded more farmyard manure, which in turn required new buildings. Since neither contemporary sources nor recent historical work are unanimous on the extent of new building, he turned to the records arising from the various Land Improvement Acts passed from the 1850s onwards. Data from several estates in various parts of the country reveal a reasonably constant relationship between loans made under the terms of the acts and total capital investment, which suggests that it is possible to analyse the material from this source for both spatial and temporal variations in capital investment. This process reveals a concentration of capital investment in the mixed farming areas, which is probably not surprising, and a peak of investment in the period 1870–90, which is perhaps less predictable: investment in buildings, in other words, followed prosperity, rather than initiating it.

Dr Colum Giles (Royal Commission on Historic Monuments) presented a paper on 'Farm buildings and regional variations', based on the RCHM's recent survey of English farmsteads, which began by suggesting that farm buildings could be used as an historical source in their own right to provide evidence of changing farming systems. He then compared nineteenth-century farm buildings in west Berkshire and north Northumberland. In the former county, especially before 1850, the aisled, timber framed corn barn with its threshing floor was the biggest building in the farmyard, and little cattle accomodation was provided. In north Northumberland, where mechanization of threshing came earlier, cattle were more important, and farms were bigger, the corn barn was less dominant, and well integrated with open yards and hemels for cattle, root houses and feeding passages. Different buildings, in short, reflected different types of farming.

In her paper on 'Farm buildings as agricultural history', Dr Susanna Wade-Martins (University of East Anglia) also compared buildings in two different areas: Norfolk and Sutherland. She suggested that the increasing pressure to demolish nineteenth-century farm buildings which was evident from 1970 onwards produced several studies, which she characterized as an information-gathering phase. It was now possible to be more analytical, and use existing buildings as evidence for the extent of agricultural change and its effects on different social classes. Thus improved farming in Norfolk initially appeared to be a gentleman's occupation, and was associated with social status, with high farming principles then going down the social scale from the 1860s onwards. In Sutherland, in contrast, many farmsteads indicated a process of complete

rebuilding beginning in the early nineteenth century and financed by landlords intent on producing major changes in rural society.

Dr John Broad (University of North London) is to be congratulated, not only on organizing his first winter conference with great efficiency, but also on finding a topic and speakers to attract an audience of over 60, many of them newcomers to the society's meetings, and all the more welcome for that.

Notes on Contributors

DR ALAN R H BAKER is University Lecturer in Geography and Fellow of Emmanuel College, Cambridge. An historical geographer whose early work was on medieval English (and especially Kentish) field systems, Dr Baker has for some years now focused his research upon the agricultural and social history and geography of rural France (and especially of Loir-et-Cher) during the nineteenth century.

PAUL BRASSLEY is a Senior Lecturer in Agricultural Policy and History in the Seale–Hayne Faculty of the University of Plymouth. His initial research interests were in the seventeenth and eighteenth centuries, but he has gradually transferred his allegiances to more recent periods. He has contributed to two volumes of *The Agrarian History of England and Wales*.

DAVID EASTWOOD is Professor of Social History at the University of Wales Swansea, and has written extensively on Modern British social, political, and intellectual history. His *Governing Rural England. Tradition and Transformation in Local Government 1780–1840* was published by Oxford University Press in 1994, and his most recent book, *England 1750–1850: Government and Community in the Provinces* is in press with Macmillans.

MARK OVERTON is Professor of Economic and Social History at the University of Exeter. He has published widely on the agrarian history of England; most recently, *Agricultural Revolution in England: the Transformation of the Agrarian Economy 1500–1850*, Cambridge, 1996. He is currently working on household economies in southern England, 1600–1750.

MICHAEL TURNER is Professor of Economic and Social History at the University of Hull; JOHN BECKETT is Professor of English Regional History at the University of Nottingham; and DR BETHANIE AFTON is a Research Fellow in Agrarian History at the University of Hull. Together they have completed a book on *Agricultural Rent in England, 1690–1914* which will be published shortly by Cambridge University Press, and with the support of the Leverhulme Trust they are researching for a book on *Farm production and output in England, 1700–1914*, the pilot for which is the substance of their current paper.

Book Reviews

D A CROWLEY, ed, *The Victoria History of the Counties of England: A History of Wiltshire, XV*, OUP for the Institute of Historical Research, 1995. xxii + 338 pp. Maps; illus. £70.

The Wiltshire volumes of the Victoria History continue to appear with remarkable regularity. Volume XV follows only four years after volume XIV, and at 338 pages is considerably longer than the other recent volumes on the county. It contains the history of twenty-five parishes in the south and south-east of the county, mostly on the chalkland of Salisbury Plain, with Amesbury and Ludgershall the only small urban settlements. The medieval economy of the area was dominated by the lands of the two wealthy and aristocratic nunneries of Amesbury and Wilton, while there was a royal castle at Ludgershall which Henry III converted from a stronghold to an elegant country residence with an extensive deer park. Until the later nineteenth century the farming practice of the district was essentially the classic sheep-corn husbandry with very large sheep flocks, and settlement was largely confined to the valleys until inclosure when farmsteads were built on the previously open and treeless downland.

This is a downland area in which there is copious evidence of prehistoric activity, notably Durrington Walls, Woodhenge and the hillfort at Yarnbury, while the volume includes a brief account of Stonehenge, the history of archaeological interest in the site and the indignities which the monument and its surroundings have suffered during the recent past. Within each parish there are numerous settlements along the chalkland streams, each settlement arranged in a narrow strip so as to include meadow, arable and downland, while there are also numerous deserted sites and abandoned churches. In several parishes the complex common field systems were extended only shortly before inclosure in the early nineteenth century. From the seventeenth century this was also an area where husbandry depended upon early grass and abundant hay crops produced by the numerous water meadows along the valleys of the Avon, Bourne, Till and Wylye, and details are provided about the complex workings of the systems, although little is said concerning their origins or construction.

Major changes came to the area during the early twentieth century as the War Department gradually took over more and more of Salisbury Plain for military training. Today the most prominent features include the sprawling army camps such as Tidworth, Bulford and Larkhill, military airfields such as Boscombe Down, artillery ranges and tank-training grounds, creating employment and expansion in centres like Amesbury, Durrington and Ludgershall. Also within the area is the Chemical and Biological Defence Establishment at Porton Down. On a lighter note a firm making fireworks and military pyrotechnics on the high downland above Great Durnford provides employment as well as occasional entertainment through the testing of its products.

In the established fashion of the Victoria History, this volume includes meticulously-researched detail on the descent of manors, ownership, church advowsons and architectural development, land use and parochial charities. Like other recent volumes it is well illustrated, with useful maps and plans and earlier views of churches and houses, several of them from the Buckler collection in Devizes Museum. For agricultural historians it provides a wealth of material and references for chalkland husbandry and downland farming systems.

J H BETTEY

ANN HAGEN, *A Handbook of Anglo-Saxon Food: Processing and Consumption*, Pinner: Anglo-Saxon Books, 1992, reprinted 1993. vii + 171 pp. £7.95.

ANN HAGEN, *A Second Handbook of Anglo-Saxon Food and Drink: Production and Distribution*, Hockwold cum Wilton; Anglo-Saxon Books, 1995. 409 pp. £14.95.

These broad surveys ('synthesising' in the author's words) contain much fascinating information about Anglo-Saxon food and drink, mostly from a practical point of view, but with some attention given also to social considerations such as manners, morals and ecclesiastical constraints and controls. Subjects covered in the first are the making of bread, dairying, butchery, preservation and storage, cooking, meals and mealtimes, fasting, feasting, special regimens, food shortages and adulteration, and in the second cereal crops, vegetables, fruit and nuts, animals, poultry, eggs, fish, imports and fermented drinks, with attention also to food supply, theft, religious communities, hospitality and charity.

The books draw upon a wide range of primary material – principally archaeological, literary and from place-names – and upon secondary sources such as classical documents and later medieval and Tudor traditions, since these, we are told, 'are unlikely to have changed rapidly in the interim'. From this eclecticism, however, arises the principal and unavoidable weakness: that the hard facts get

lost among the speculation, with the same importance being accorded to contemporary religious and heroic literature as to documents and minute archaeological analysis. Some readers may indeed find it useful to learn that 'the ideal meal was the feast, taken in hall, with tables and seating', but the use of detailed evidence about feasting from poems such as *Beowulf* (of which the setting, after all, is pagan Scandinavia) runs the risk of fostering an unreal perception of what life was truly like in Anglo-Saxon England.

Gaps are sometimes filled by the author's own imagination, such as the assertion that 'food cooked by direct exposure to the heat of the fire, or in open pans may have had a smoky flavour'. Generally, though, claims are well referenced, and one of the chief benefits of both books is that readers have here the means of following up specific interests. However, the authority of the works referred to varies. For example, Sharon Turner's *The Anglo-Saxons* (London, 1828) is cited in support of the claim that the Anglo-Saxons may have cooked their victuals in pits, 'since *seathan* (to seethe, simmer, boil) was derived from *seath* (a pit)'. A glance at the *Oxford English Dictionary*, of which even the first edition postdates Turner's book, shows that such an assertion cannot be seriously entertained. Conversely, the detailed analyses of animal bones and human skeletal remains in the later volume are vastly more authoritative. Useful, too, are the no-nonsense descriptions of the technical processes involved in everything from making bread to brewing ale, and in this respect the author has cast her net wide in seeking advice from sources other than books, as shown by the list of 'personal communications' appended to the bibliography.

The two books are described as 'companion volumes' by the author, and they do indeed complement each other; but they also overlap in such things as the lengthy bibliography, of which the earlier is reproduced wholesale in the later volume with only about ten additional titles. The dedication is the same as before, the acknowledgements practically identical, and the wording of the introduction reproduced verbatim in places – all giving the impression of a 'cut-and-paste' job on a word processor. However, there is more discussion of the nature of the sources in the later volume, with a readier acknowledgement of the limitations of the evidence.

These are two readable books. It is unfortunate that the inherent interest of the subject and the considerable industry and scholarship of the author are undermined by the unevenness of the material.

G A LESTER

MICHAEL ASTON and CARENZA LEWIS, eds, *The Medieval Landscape of Wessex*, Oxbow Books, Oxford, 1994. vii+280 pp. Illus. £28.

The Wessex region has several attractions for the student of medieval topography. The chalk downlands in particular have preserved good evidence of former sites, settlements and land use, the medieval dominance by the estates of the Crown and the Church provides documentation on the exploitation of the land, place-names have been studied in some detail, the Royal Commission on Historic Monuments has made a full study of Dorset and has done a good deal of work in Wiltshire, the *Victoria County History* is well advanced in Wiltshire and is in progress in Somerset, there are numerous studies of specific topics and a long tradition of archaeological and antiquarian research. Hitherto, however, there have been few attempts to produce a general account of the medieval landscape development of this remarkably diverse region. This volume brings together the recent research of more than a dozen scholars on the area between the English Channel and the Bristol Channel, stretching from Dartmoor to the Cotswolds and eastwards to the Sussex Downs.

No doubt reflecting the interests of the editors, the essays concentrate on settlement patterns, village plans, growth and desertion and less on industry, communications, ports or urban developments, but there are good, clear accounts of the subjects considered, with copious references to recent research. Between them Bruce Eagles and David Hinton survey the archaeological evidence from the fifth to the eleventh centuries, while Patrick Hase provides an important and informative account of the coming of Christianity and the development of the system of dioceses, minsters, parishes and chapelries with case-studies illustrating the creation of the parish structure which was to continue with such remarkable tenacity from the twelfth century. Della Hooke examines the emergence of the administrative framework of the region and reflects on the early creation of estate, manor, township and parish boundaries, some on the downlands possibly pre-Roman, and on the persistence of these units through the centuries. Michael Costen analyses the evidence for settlement and land-use provided by early charters, while Carenza Lewis in a closely-argued and well-researched paper outlines the patterns and processes in the medieval settlement of Wiltshire, using a combination of archaeological evidence, field-work and documentary sources. Of particular interest to agricultural historians will be James Bond's wide-ranging discussion of forests, chases, warrens and parks, and John Hare's account of agriculture and rural settlement in the chalklands of Wiltshire and Hampshire. Both of these essays

provide an immense amount of information firmly based on detailed research, both archaeological and documentary. James Bond gives an authoritative account of the origin, administration and management of the royal forests which covered so much of medieval Wessex, as well as discussing the rapid growth of private deer parks and rabbit warrens, their commercial value and the surviving landscape evidence of forest boundaries, park walls, fences, pillow mounds for rabbits, royal residences, hunting lodges and warreners' dwellings. John Hare examines the changing relationship of lords and tenants, the development of commercial exploitation of estates, and the ways in which changes in farming practice are reflected in landscape features such as sheep houses, strip lynchets, rabbit warrens or deserted villages. The volume also includes chapters on the growth or decline of towns and villages in Hampshire by Michael Hughes, on village plans in Dorset by Christopher Taylor, complementing and revising his earlier work on the landscape of the county, as well as contributions on medieval settlements in Somerset, wetland reclamation and on the problems of protecting medieval sites from destruction or damage by development, modern farming methods and even erosion by visitors.

The book is attractively produced with numerous maps, plans and illustrations, and as Professor Maurice Beresford writes in his preface to the essays, it provides 'a significant step forward in the context of English landscape studies'.

J H BETTEY

SARAH PEARSON, *The Medieval Houses of Kent. An Historical Analysis*, HMSO for the Royal Commission on the Historical Monuments of England, 1994. x+196 pp. 158 figs. £19.95.

P S BARNWELL and A T ADAMS, *The House Within*, HMSO for RCHM(E), 1994. xii+163 pp. 166 figs; 4 tables. £12.95.

SARAH PEARSON, P S BARNWELL and A T ADAMS, *A Gazetteer of Medieval Houses in Kent*, HMSO for RCHM(E), 1994. xii+145 pp. 184 figs. £14.95.

Over the past twenty years, RCHM(E) has published highly-regarded regional studies of vernacular housing, largely of the post-medieval period, covering contrasting areas, Hertfordshire, Lancashire and Yorkshire. This series, to our great loss, has been discontinued, and the volumes on Kent reviewed here have a different purpose. Not only do they sample the stock of minor domestic buildings surviving in Kent from the Middle Ages, emphasizing the need for new research in this field over the rest of the country, but Sarah Pearson, in the first of the set, *Medieval Houses*, introduces to medieval studies concepts which have come to be central to work on later buildings. The new publication differs from the post-medieval series in being divided into three volumes, the first analysing changes in house-design in their economic and social contexts, the second emphasising structural details and the third comprising a gazetteer. Houses with surviving medieval elements were sought and studied in 60 of the 319 parishes (or other administrative units) in Kent. The sample parishes were rural in the sense that they excluded those which had possessed urban characteristics in the middle ages. Nor were they a random group within the total of rural parishes, for the choice was shaped by the need to cover a range of geographical and historic influences. The result was the survey of 380 houses in the 60 parishes, with another 70 structures from elsewhere in the county, which were known to possess characteristics which would give as full a range of features as possible. The research programme made full use of dendrochronology, samples being taken from 74 buildings. Table 5 (p 148) in *Medieval Houses* sets out the 53 houses to which precise dates were given.

Medieval Houses begins with a brief account of aspects of geology, land-use and tenure which have influenced the distribution of wealth in the region. The following six chapters survey changes in structural design from the thirteenth century to the end of the middle ages. They deal with the few survivors built in stone dating from the early to mid thirteenth century, containing evidence for first-floor halls, the timber ground-floor halls of the late-thirteenth and fourteenth centuries, the subsidiary accommodation and the construction of roofs in the latter period, and the evolution and construction of the late-medieval house. The trends in design and use of materials are well illustrated and are placed in their social context. The shift from the aisled to the un-aisled hall is an example: the former is shown to be archaic by the middle of the fourteenth century and to be concentrated to the north of the Downs on lands of families at the bottom end of the knight or esquire class, while the un-aisled halls of the period survive in greater numbers to the south, in areas where more land was held by the fore-runners of the post-medieval yeomanry.

The last six chapters of the book comprise an analysis of changes in form and function. The theme is the enhancement of comfort and privacy, which has been a key element in the study of the post-medieval vernacular, and is here shown to be central to our understanding of the earlier period. The difficulty of conducting an analysis of function comparable with work on the sixteenth or seventeenth centuries arises from the lack of probate inventories. Certain medieval inventories do in fact survive, but their number is small, and emphasis has to be placed on physical survivals. There is an excellent survey of evidence for what in Kent

appears to be relatively restrained decoration of walls and roof structures of high-status rooms, the open halls, and of the use of and access to the dais end of the hall. A major theme is evidence for the construction and use of wings beyond the upper and lower ends of the hall in the fourteenth and fifteenth centuries. Evidence is examined for the movement of the parlour from the first floor to the ground floor of the upper end of the house, and of changes in location of the kitchen from a separate structure to the lower end of the main house. In Kent, the unaisled hall house, with cross-wings or end-in-line private and service rooms, developed from the end of the fourteenth century into the Wealden house, with jettied end-bays. The emergence and development of this house-type took place over a century and more, and the changes include the ceiling of the halls of early examples and the building of later Wealdens with ceiled bays throughout. The improvement of heating was significant, and the evolution from open fires to smoke hoods and thence to brick chimneys is well analysed and illustrated.

The author of *Medieval Houses* was faced with the problem of how large a sample of the contemporary housing stock survives. She calculates that over the county as a whole there exist at least fragments of the buildings occupied by about 14 per cent of the population of *c.* 1500. Given that in certain parts of the county, of which Romney Marsh is a striking example, very little survives, in many of the Wealden parishes up to 40 per cent of contemporary accommodation must still exist in some form. A figure as high as this shows that the survivors are not just the houses of the gentry or yeomanry, but that the smaller buildings would be occupied by a class of families who in many districts would be expected to occupy short-life houses. This suggests that multiple sources of income, from textiles and forest-related industries and trades, as well as from stock and arable farming, provided disposable incomes sufficient for the better-off husbandman to build to a good standard by the second half of the fifteenth century.

The three volumes are produced to the standard which we have come to expect from the Royal Commission, and the prices of the individual parts have been set at a level which will give a wide circulation. The one reservation concerns the threefold split. A separate gazetteer is entirely justified, given the number of houses to be described and the quantity of plans and elevations which deserve publication. It should be noted that the gazetteer contains no half-tones, which are placed in the other two volumes. It is the function of *The House Within* that is in question. The sub-title is 'Interpeting medieval houses in Kent' and the text contains plentiful and excellent figures, showing details of construction and adaptation. The phase-drawings, with colour-rendering of features added during rebuilding, are particularly fine. However, there is a good deal of duplication with the structural content of *Medieval Houses*, and what is unique to *The House Within* could well have been used in the analytical chapters of the other part without making the latter unwieldly. As it is, the reader has to search the indexes, the text and the illustrations of both for a full view of particular themes and buildings.

DAVID CROSSLEY

CORD OESTMANN, *Lordship and Community: the Lestrange Family and the Village of Hunstanton, Norfolk, in the First Half of the Sixteenth Century*, The Boydell Press, Woodbridge, Suffolk, and the Centre for East Anglian Studies, 1994. 289 pp. 33 tables; 5 maps; 2 graphs. £35.

A picture has been built up of medieval East Anglia as a region of precocious economic development characterized by high agricultural productivity, an active market in tenant landholdings, high geographical mobility, and large numbers of hired workers. This book provides a marked contrast, describing a stable, gentry-dominated community in early sixteenth-century north-west Norfolk. Oestmann's two primary aims are to illuminate the relationship between a resident manorial lord and a village community, and to undertake a *mentalité* type study of an English village. He is aided by a rich variety of documentary sources, characteristic of Norfolk in this period, including manorial surveys, court books, wills and a parish register, as well as the household accounts and family papers of a gentry family, the Lestranges, manorial lords of Hunstanton. Armed with this material Oestmann examines a wide variety of topics under the broad headings of economic, social, and religious structures. Aspects considered include the Lestranges' family history and commercial farming activities, but the main concern is with the lives of Hunstanton's tenants: the size of landholdings, farming practices, non-agricultural occupations, demographic variables, family structures and relationships, and religious attitudes are all examined.

The range of topics considered necessarily limits the geographical and chronological scope of the study. This is certainly not a fault in itself, however it does increase the need for context within which to place the experiences of Hunstanton, and unfortunately this is only partially provided. Both the chronological and regional context are largely absent. Oestmann does not consider how the early sixteenth-century situation grew out of that of the

medieval period, and barely refers to the rich literature of manorial studies on the medieval village. The fact that *Lordship and Community* provides no information about neighbouring villages makes it impossible to distinguish between local social and economic peculiarities and the effect of the Lestranges' residency and ownership of Hunstanton. Despite the centrality of this issue to the study, Oestmann does not consider this as problematic, making the assumption that Hunstanton's social and economic peculiarities (such as the lack of copyhold tenancies, the stagnant land market, and low geographical mobility) resulted from Lestrange policies. A brief examination of the court rolls of neighbouring manors could have cleared up this confusion and strengthened his argument. It is also remarkable that a study concerned with the lord/tenant relationship in early sixteenth-century Norfolk contains no entry for Kett's rebellion in its index. The rebellion receives a passing mention in the chapter on the Lestranges' family history, when we are told that Sir Nicholas Lestrange was accused of conspiring with the rebels, while his brother and son were held hostage in 1549. Elsewhere in the book the rebellion is absent. A discussion of the non-participation of the tenants, if this was the case, or even of the lack of documentary evidence, would have been worthy of inclusion, especially as Oestmann argues strongly in the conclusion that lord/tenant relationships were harmonious and supportive.

The failure to provide context within which to set the experiences of Hunstanton might be excused if the local study itself was undertaken in a rigorous manner. However, this is not the case. The interpretation of documentary sources is often naive: there is a failure to consider possible biases and omissions of information, sweeping conclusions are drawn from quite commonplace findings, while it is often difficult to ascertain what evidence Oestmann actually has to support controversial assertions. To take a few examples: we are told that the communal regulation of agriculture via by-laws discouraged outsiders from settling in the village (p 74), that the absence of church court cases relating to Hunstanton indicates that there was little marital strife (p 204), that most children did not leave the village before their late twenties when they married (p 196), despite the fact that servants were numerous in Hunstanton's taxation returns (p 222), and that children often lived with their spouse in their parents' household for a number of years after marriage (p 196). We are left uncertain whether Hunstanton really was a peculiarly uncommercial, self-contained, stable community with unusually strong kinship links, or whether this is a vision imposed on the documentary evidence by Oestmann's preconceptions of what a pre-capitalist village community should be like.

Lordship and Community tackles many topics that are worthy of greater attention, and indicates the potential of early sixteenth-century documents which, if treated with care, can illuminate many facets of life in this crucial period of transition from the medieval to the modern. Regrettably, it does justice neither to the richness of the documentation available nor to many of the interesting and important topics that it touches upon.

JANE WHITTLE

MAURO PITTERI, *Mestrina: proprietà, conduzione, colture nella prima metà del secolo XVI*, Edizioni Canova Treviso, Treviso, 1994. xviii + 230 pp. np.

ANNA BELLAVITIS, *Noale: struttura sociale e regime fondiario di una podesteria della prima metà del secolo XVI*, Edizioni Canova Treviso, Treviso, 1994. xvi + 218 pp. np.

ANNA PIZZATI, *Conegliano: una 'quasi città' e il suo territorio nel secolo XVI*, Edizioni Canova Treviso, Treviso, 1994. xvii + 282 pp. np.

MARIA TERESA TODESCO, *Oderzo e Motta: paesaggio agrario, proprietà e conduzione di due podesterie nella prima metà del secolo XVI*, Edizioni Canova Treviso, Treviso, 1995. xx + 253 pp. np.

GIULIANO GALLETTI, *Bocche e biade: popolazione e famiglie nelle campagne trevigiane dei secoli XV e XVI*, Edizioni Canova Treviso, Treviso, 1994. 166 pp. np.

These five volumes, published within months of each other, and all concerned with the agrarian history of territory of the city of Treviso in the sixteenth century, have been published with the support of the Fondazione Benetton in a series entitled *Ricerca sulla campagne trevigiane in età moderna (secoli XV e XVI)*. The area in question is in the eastern part of the modern Veneto. Mestrina (Upper and Lower) and Noale, the subjects of two of these volumes, were separate administrative districts south of Treviso, while Conegliano, Oderzo, and Motta, the subjects of two others, were administrative districts to the north and west. This research, completed under the guidance of Gaetano Cozzi and Danilo Gasparini, is based chiefly upon sets of tax registers for the years 1518–22 and 1537–42. Each assessment records, in four separate sections for each administrative district, the assessments of (1) inhabitants of the chief town, (2) the remaining inhabitants of the district, (3) taxpayers living outside the district, and (4) the clergy. Each administrative district contained two or three dozen villages. In order to compile these registers, assessors went from village to village recording details of the occupation and use of the land, so that where the books survive they make possible a detailed agrarian

survey. Another principal source for the period is a series of registers of 'mouths and grains' which surveyed available grain resources on behalf of the authorities at Treviso, who worked on the assumption that food supply was a chronic problem. The nature of the sources accounts for the relationship between the five volumes and for the scope of the studies they contain. A further source of information of great potential value is a collection of the declarations that heads of families had to make for taxation purposes concerning their personal circumstances. As a result of the aerial bombardment of Treviso in 1944 these records are at present broken up into some 50,000 loose and largely unsorted pages. Galletti uses a sample of 582 declarations of the years 1456, 1486, and 1532 to make some interesting observations about family structures, age of marriage and fertility rates, but it is clear that the thorough analysis of this source awaits a major task of archival reconstruction.

The population history of the region has its lacunae and ambiguities, but Galletti provides a reasoned survey. It is interesting to see his stress on the slowness of later fifteenth-century recovery from the crises of the fourteenth century up to about 1520; the Italian Wars are blamed for hampering growth in the later decades of this period. Rapid population growth around Treviso was restricted to the period *c.* 1520–60, culminating in a famine of 1559–60, after which repeated crises of mortality greatly reduced the rate of increase. The population of Venice, which was supplied in part from this region, is estimated to have increased from about 130,000 in 1540 to 170,000 in 1563.

This was a highly commercialized part of Europe whose characteristics are only partly captured by studies of landownership. However, this feature of the rural economy is reflected in the inequality of units of ownership – at the one extreme those too small to ensure a livelihood, and at the other those geared towards commercial exploitation. There were many miniscule holdings; in Conegliano 60 per cent of proprietors had fewer than two hectares. Although many units of production were in the hands of owner-occupiers, these were characteristically the smallest holdings, so that by far the greater part of the land was under various types of lease, and that proportion grew within the period under observation. Leases were commonly for rents in kind, or for a mixture of produce and money. The growth of landownership by townsmen at the expense of country-dwellers was marked throughout the region, and townsmen owned a large proportion of the larger units of exploitation. A recurrent theme is the growing importance of landholding by Venetians, both noble and non-noble, notably in Mestrina, Noale and Oderzo. Their holdings were amongst the largest, especially in Oderzo, where in 1542 five Venetian proprietors each had over 100 hectares. In years of crisis countrymen starved as grain left the villages for Treviso and Venice.

The records do not permit the close observation of agricultural methods and productivity, but the authors supply a number of reasoned observations. The most closely described arable husbandry is that of Mestrina, where a three-course rotation was the most usual, but where a two-course scheme was employed on less fertile soils and a more intensive five-course rotation (spring-sown crops, legumes, two courses of winter-sown crops, fallow) or the better ones. Wheat yields of about five or six times the seed were apparently normal in the period 1474–1525. Cattle-rearing was an important part of the rural economy, and notarial contracts by which animals were leased for periods of years were numerous. There were also some sheep, though these were proportionately less significant a source of income. Today much of the country around Treviso is devoted to intensive wine production, and this is also a feature of the sixteenth-century scene. After wheat, wine was the product most commonly required by the landlords of Mestrina as a component of rent. Noale supplied wine to dealers in Mestre and its environs.

Though these volumes are not written to a common formula they have elements of closely related design, and they complement each other admirably in giving a detailed portrait of this interesting part of the world. They are attractively published with detailed bibliographies and indexes.

RICHARD BRITNELL

FRANCIS BRUMONT, *Paysans de Vieille-Castille aux XVIe et XVIIe Siècles*, Bibliothèque de la Casa de Velázquez, no 9, Ciudad Universitaria, Madrid, 1994. 501 pp. np.

This is a most instructive and thought-provoking study of Spanish agriculture in Old Castile, written by a French historian who is sensitive to local differences, and investigates his region in the way favoured by English historians for the same period. Francis Brumont's territory lies east and west of Burgos, the ancient capital of Castile, and embraces barren mountainous country, intersected by valleys with vines on the hillsides and cereals on the chalk floors.

The variety of landscape can readily be matched in parts of northern England, but the differences in rainfall introduce a strong contrast in the use of the natural resources. Virtually none of the land was irrigated, watermills could only work for three or four months in the year, and a two-course rotation of crops was more or less obligatory. Pasture was

not available all the year round, generous common pastures were unknown, and so the integration of grass-fed livestock and arable husbandry, which we take for granted in Britain, was impossible. Animals and crops were competitors, and the only essential livestock which could be supported were draught animals. In many places in the sixteenth century, when the demand for grain was rising (as population increased), sheepkeeping was restricted to just a few animals supplying milk, cheese, and wool for household needs, lambs were killed at twelve days old, and in one village peasants were forbidden to keep sheep altogether. Those owning any had to arrange for villages elsewhere to take their animals 'to halves'. This leasing of livestock, and vineyards too, 'to halves', a familiar practice in both Spain and France, reminds us how little interest the system arouses among English historians, though references occur in our documents (sometimes in inventories), and doubtless the system fluctuated in favour in different economic circumstances.

The whole territory studied here was dominated by peasant farms, few lords seem to have resided, and none of the documents used here shows them at the centre of events. Maintaining a sustained interest in local differences throughout, the author traces general trends in agricultural production and social differentiation through the sixteenth and seventeenth centuries. Farmers experienced cyclical changes similar to, and often almost simultaneous with, those in England. Some of the worst disasters caused by bad harvest and epidemics occurred in the same decades in both countries, for example, in the 1560s, 1590s, and 1620s, and a striking similarity emerges in the consequences for people, and the alternative ways in which they sought other sources of livelihood. Larger farmers grew more grain, took more land and consolidated at the expense of a growing number of poor landless families. Oxen were the main draught beasts, but the use of mules, which also hastened assarting, took hold in the most fertile areas. By rearing mules, bought in young, and kept for two to three years till they were ready for work, rich farmers made use of the oat crop which they increased accordingly. The main cereal was wheat, barley coming well behind. The pastoral country of the hills preserved longest a more egalitarian social structure, supported by pastoral pursuits, and adhering to old ways. Industrial crops did not play much of a role, apart from flax which was a large crop and hemp a small one, but in suitable places vines rose to prominence in the seventeenth century as an alternative activity when cereals paid less. Cattle-rearing was the speciality of the mountains, and pig-keeping of the woodlands. Industrial occupations became an increasingly valued secondary pursuit, seen in modest leather and textile centres, while a notable surge of steel-making was reflected at Santibanez in the 1580s and 1590s in the making of fish-hooks and needles. This is the moment when the excellence of Spanish needles was recognised in England too.

In the final discussion, Francis Brumont integrates the many factors which he has explored along the way, in an attempt to explain why this area did not receive sufficiently strong commercializing stimuli to transform its economy. It lay on a through route from the northern coast at Bilbao and Santander to major cities, and, indeed, at Burgos the large packs of goods arriving at the ports were here broken down into smaller units for the muleteers to carry onwards. But trade and industry worked their way only gently through the economy, and peasants remained content to keep their capital locked up in land through bad and good times. The author offers thoughtful observations on the effects of partible inheritance in curtailing speculative ventures; family assets had to be guarded to fulfil obligations towards all heirs. And he shows how the largest agricultural income was obtained from direct farming with family members. So the region did not display the driving energy of Catalonia, impelled by colonial ventures, but it did avoid extreme social polarization. This is a deeply-researched study, offering English historians much food for thought on general trends in the early modern economy and how to weigh the most significant operative factors.

JOAN THIRSK

XAVIER DE PLANHOL, *An Historical Geography of France*, CUP and Editions de la Maison des Sciences de L'Homme (Cambridge and Paris), 1994. xxiii + 563 pp. 92 figs. £55.

This impressive volume, originally published in French as *Geographie Histoique de la France* in 1988, is based upon a series of lectures given at the Universite de Paris-Sorbonne with the addition of a final chapter by Paul Claval on 'The France of Large Organisations'. The volume is translated by Janet Lloyd and becomes number 21 in the Cambridge studies in Historical Geography series. Sweeping time-spans characterize the three main sections of the book: 'The genesis of France', 'The traditional organisation of the territory of France' and 'The centralisation and diversification of the French space'.

The text is generally clear, and has been simply and boldly translated. The language is occasionally cryptic and foreshortened, but always dense and full of empirical examples. Diagrams are plentifully employed, although they are often rather small and have minor editorial slips (for example, Figure 35

is printed upside down!), and there is an excellent index. At times the listings of examples threatens to become too overpowering but the cultural and social insights rescue the text from what might otherwise have become too pedestrian. As it is, we gain sparkling insights into the evolution of French life and landscapes – both rural and urban. The transition from Gaul and the origins of France itself are handled sensitively and carefully, with ideas being drawn together in a most useful synthesis. The fundamental distinctiveness between the north-east and south-west is elaborated in great detail: the roof-types, the horizontal *vs* vertical water mills, the indoor *vs* outdoor threshing, and above all the open-field nucleated village of the north and east *vs* the scattered hamlets and farms of the bocage of the west and south. These variations are handled not in a static way, but through the dynamism of changes wrought by factors such as cerealisation which ushered in communal organization and large open fields. The St Malo–Geneva divide is a major organising concept throughout the volume. The north and east becomes more prosperous, better educated, better cared for, and with open fields; the south and west is poorer, less literate (at least in French) and pastoral despite the 'maize revolution' of the relatively more wealthy Aquitaine.

Spatial variation, at different scales, is thus at the heart of this text. The emergence of areas of specialized agriculture, for example, is dealt with thoroughly more than once: the intensive productivity of Flanders, for example, or the emergence of commercial vineyards or Parisian-led intensification of market gardens or dairying. Such intensification is dealt with in both the second and the third sections of the text, and one has to pick up the threads and start again to connect the themes to pursue agricultural change from the Middle Ages through to the present. Spatial variations in the spread of social mores or culture also receive detailed treatment – not only the spread of Parisian culture to the peripheries but also the reaction of the regions by reinforcing their own cultural distinctiveness in furniture, costume or dance. Here de Planhol uncovers a fascinating mixture of archaic survival, regional adaptation and innovation. Nothing, he continuously assures us, is simple when dealing with the historical geography of France. For one thing, both Paris and France itself are both referred to as concepts rather than material realities. Paris, we are told, existed as a concept and creation of high culture rather than as an entity in the normal life of the *paysan*. France 'was a creation of the mind'.

Whilst not everyone might agree with such conclusions, we could certainly all agree with the author that an understanding of his country can only be gained through 'the light of its past', and to that end, this thoughtful volume offers English-speaking scholars the opportunity to obtain greater insights than hitherto available to us. The final chapter, written by Paul Claval with a quite different conception of sub-headings (his tend to be whole sentences), is primarily concerned with the twentieth century and the spatial impact of modernization. This has brought a uniformity to culture and landscape which ensured that France was perhaps at its most diverse between 1875 and 1914, a fact which surely helps to explain the great flowering of the French regional academic tradition in the early twentieth century.

BRIAN SHORT

LOUISE DECHÊNE, *Habitants and Merchants in Seventeenth-Century Montreal*, McGill-Queen's UP, 1993. xxii + 428 pp. £52.25 (hbk); £21 (pbk).

Today, the word Montreal conjures up images of a bustling city, the seat of no fewer than four universities and the home and workplace of more than a million people. This study of seventeenth-century Montreal deals with a wholly different world. The fledgling town, with its modest merchant community supplying furs to metropolitan France, is not ignored, but the book's concern is the entire island of Montreal, much of which was rural in character. The countryside was the home of the habitants of the book's title, the town the milieu of the merchants. The two worlds, Professor Dechêne demonstrates, were surprisingly unconnected: few merchants invested in land and there was little desire on the part of the habitants to move from their peasant holdings into town, or even to profit by exploiting urban markets.

The various aspects of this divided world are superbly and systematically analysed by the author. Population, trade, agriculture and society are all scrutinized in great detail and in measured fashion. The techniques employed in the study will be familiar to readers of journals like *Past and Present* and *Annales*. The sources used – parish registers, wills, judicial records of various sorts, deeds, seigneurial papers, tax assessments, account books and so on – also have a familiar ring to those working on European society. Occasionally, however, Professor Dechêne has at her disposal records not available to the historian of the old world. Certainly, English historians would give their eye teeth for the series of late seventeenth- and early eighteenth-century censuses on which the author's analysis of the population and the social structure of the island draws so heavily.

Habitants and Merchants is not, one should stress, a new book. It was first published in French as

long ago as 1974. This English edition, however, is proof positive that the volume has not dated in the intervening twenty years. The work remains one of the finest studies of seventeenth-century colonial society that we have. Doubtless – as Professor Dechêne would be the first to admit – had the volume been written today the author's perspective would have been somewhat different. In particular, native society would not have been so lightly passed over, while the cultural outlook and the customs and rituals of the colonists – their 'mentalité' – would also have been explored. But what is here – an impeccable survey of the economy and society of the emerging colony – is of the very highest order. *Habitants and Merchants* is a study that has, without question, stood the test of time.

Of course, no book is entirely flawless, and this volume, good though it is, is no exception. Two failings in particular rather mar the study. One of these is the lack of an index. In a work that runs to more than 400 pages this is an unfortunate omission, and one that is not wholly compensated for by the exemplary and informative table of contents. The other blemish is the price. £52.25 for a volume without illustrations and printed on ordinary paper seems excessive – as does £21 for the unstitched paperback edition.

ANGUS MCINNES

MARGARET SPUFFORD, ed, *The World of Rural Dissenters, 1520–1725*, CUP, 1995. xx+459 pp. 8 illus. £50.

This collection of ten essays, which are based on the postgraduate researches of a group of Cambridge historians gathered around Margaret Spufford, are introduced by a preface and a long chapter on the importance of religion in the sixteenth and seventeenth centuries, written by the editor, and are appraised at the end by Patrick Collinson, Regius Professor and leading authority on ecclesiastical matters for much of this period, in a final chapter to which the editor occasionally responds in footnotes. The reviewer is left wondering what else there is to say.

His first task is undoubtedly to praise the group for their achievement. In particular, their empirical approach has settled some arguments that have been central to the study of early-modern local societies since the 1970s. First, social historians will no longer be able to claim that class concepts can explain the incidence of religious dissent. Nonconformity was not confined to the wealthiest groups, nor to the poorest, but was attractive to a cross-section of society. Second, dissenters were not outsiders, but were full participants in the life of their local societies. Third, the case for the continued tradition of religious dissent in certain places over the centuries is a strong one.

Bill Stevenson's study of the four contiguous counties of Cambridgeshire, Huntingdonshire, Bedfordshire, and Buckinghamshire, where a large variety of sectarian types flourished during the period 1660–1725, is crucial for the conclusion that religious dissent was not confined to certain social groups. He has painstakingly compared membership lists with hearth tax returns (which fortunately list the exempted poor) in order to demonstrate that a significant proportion of the nonconformist rank and file consisted of poor husbandmen, lowly shepherds and farm labourers, humble artisans and small retail tradesmen. The so-called 'bourgeois' nature of dissenting congregations does not stand up to close scrutiny. Post-Reformation dissenters were drawn from a very wide cross-section of society. Moreover, the vast majority of dissenters (like the population at large) lived and worked in the countryside. In Patrick Collinson's words, it seems that almost anyone could be a dissenter.

Being a dissenter did not necessarily mean that neighbouring, conforming families were hostile. Bill Stevenson's nonconformists are compared in this volume with earlier dissenters. Derek Plumb has studied the later Lollards of the Chiltern Hundreds, and Christopher Marsh has examined the Elizabethan family of Love, especially those members who lived in the Cambridgeshire village of Balsham. They arrive at the same conclusion: that not only were dissenting groups mutually supportive, their members were not ostracised by their conforming neighbours. Dissenters witnessed the wills and attended the funerals of conformists, and served the parish and manorial offices in their turn. They were members of a particular group, but they were not alienated from the rest of local society.

The third area of research re-examines claims about the continuity of dissent in certain types of societies. This is not a new idea, of course; readers of this journal will remember Alan Everitt's paper in the Finberg Festschrift of 1970. The achievement here is, again, that of empirical studies which use surname evidence and genealogical methods to demonstrate that certain families continued to hold similar religious beliefs over the generations. Nesta Evans's chapter on 'The descent of dissenters in the Chiltern Hundreds' is central to this argument. She shows an 'astonishingly high degree of stability amongst the surnames of late Lollards and post-Reformation dissenters' in the Chilterns, which is quite different from that of local society in general in the region, and unexpected given the excellent

communications of south Buckinghamshire. She reasonably concludes that 'radical dissent was a family affair'.

In his 'Critical conclusion', Patrick Collinson notes that this particular area of research is the one which remains debatable, given the large gap in the available evidence for the Chiltern Hundreds during the period between the Elizabethan Settlement and the eve of the Civil War. He points out that 'We simply do not know enough about the religious dispositions of the three or four intervening generations'. He nevertheless accepts that a case for 'a consistency and continuity of religious voluntarism, neither wholly in nor entirely out of the church, perhaps connected with particular regions, economies, occupations, and even tribes' has been made.

This book is of far wider importance than its title might suggest to readers who are not particularly interested in the history of religion. It is concerned with the nature of local societies and with comparisons between different forms of societies. The approach is that of the empiricist who uses careful, detailed investigations to answer key questions and pose new ones. As such, it is a model of its kind. The volume also shows the value of a group approach to research. The subject is too big for a single person to attempt, but the co-ordinated researches of fellow-enthusiasts have proved remarkably fruitful.

Some of the essays are peripheral to the main thrust of the book, but nevertheless contain much of interest: on the office of churchwarden, the contents of a pedlar's pack, and communications. Peter Spufford's piece on 'The comparative mobility of Lollard descendants in early modern England' is the best essay in print on mobility and stability in sixteenth- and seventeenth-century England. It surveys the recent literature on the subject and emphasizes the importance to local societies of the stable families that formed the core group. In certain areas, succeeding generations of these core families were religious dissenters. As Peter Spufford concludes, 'They did not need to be tolerated, for they ... were so integrated into the fabric of society that they themselves could set the tone of what and who was or was not tolerated.'

The World of Rural Dissenters is of central importance not only to historians of religion but to all who are interested in the nature of early modern societies and in how to investigate them. The group directed by Margaret Spufford have settled many an old argument and through their expertise and enthusiasm have produced a challenging agenda for new research.

DAVID HEY

T M DEVINE, *The Transformation of Rural Scotland. Social Change and the Agrarian Economy, 1660–1815*, Edinburgh UP, 1994. xiv+275 pp. £45.

The debate over the rural transformation of the Scottish Lowlands lacks good syntheses. Tom Devine's new study of agrarian change, 1660–1815, seeks to redress this deficiency. It does so admirably. In approach, it offers a systematic treatment. Not only does it structure the analysis geographically so as to highlight regional variations in the experience of agrarian change, but it also exploits fresh documentary data to full effect, reproducing a fair sample of it in detailed appendices. Overall, the analysis emphasizes the social dimensions of change. Inevitably, this means that those aspects of rural change which had social consequences, such as the removal of runrig by tenant reduction and the treatment of cottars, find a larger place in the discussion than changes in husbandry or farming systems.

Following others, Devine 'rehabilitates' the performance of the Scottish rural economy between 1660 and the Act of Union, though his overall verdict is that the forces of continuity were still greater than the forces of change. As well as noting a greater reliability of farm output, he highlights the increasing proportion of farms in the hands of single tenants, especially in the south-east. Because this was brought about by tenant reduction rather than by the division of runrig townships, the appearance of such farms differentiated a class of farmer whose size of holding made them more dependent on hired labour and the marketing of produce. Devine's systematic analysis of these changing tenurial structures is valuable, but his text would have benefited from an equally searching analysis of regional patterns of production and marketing over the late seventeenth century.

For the period between the Act of Union and 1760, Devine uses a wide range of tabulated rental data to show how the spread of single tenancy continued and how other equally vital changes in tenure gathered momentum. Longer, written leases became more widespread whilst rents in kind were converted to cash. The latter occurred in a wide range of farming environments, and by forcing tenants to confront the market directly it produced what Devine calls a change in mentality. These were vital preparatory changes, but as he goes on to argue, they were not accompanied by adjustments in husbandry or capital-intensive improvements like enclosure or drainage. These required capital which the rural community did not yet have access to before 1760.

Though there is a sense in which Devine takes a Brenner-type view, seeing changes in the social

context of production as running ahead of the switch from a subsistence-based to a commercial system, he does not downplay the role of the market. The rapid spread of enclosure and new husbandries are seen as a response to the acceleration of market demand from the 1760s onwards. The suddenness with which these capital intensive changes began is rightly presented as a hallmark of Scottish rural change. So too is the role played by Scottish landowners in directing and encouraging change. These various themes are explored through a detailed analysis of the Hamilton Estate, for which excellent documentary data are available. There is much valuable comment here, but overall, the text needed a more extended review of the way in which farm output generally was transformed.

Devine is concerned to establish the social consequences of rural change, particularly the degree of displacement caused by the reduction of runrig townships to single tenancies. He sees it as a process without social protest, partly because it was long-drawn out and partly because reduction was achieved by 'stealth', tenants not being re-instated at the end of their lease. Though it replaced relatively small working units with large farms, he is careful to note that it did not remove small farms altogether from the farming ladder. The social group that experienced most change were the cottars, the traditional source of labour. Through well researched case-studies, he shows how many were relocated into villages, a process that freed up the farm land used by them without losing their labour. Their relocation and the rise of rural employment are seen as the reasons why cottars did not turn to social protest. In this respect, the Scottish Lowlands was a remarkably passive region. Despite being a 'grossly unequal society' (p 159), it had no tradition of social protest.

The Transformation of Rural Scotland is undoubtedly an important book. Its strong documentary basis and quality of discussion make it the most searching analysis yet of rural change in Scottish Lowlands over the late seventeenth and eighteenth centuries. Past interpretations of this transformation are divided between those who see it as a short revolutionary phase and those who see it as a more drawn out affair. Devine is better placed than anyone to resolve this dispute but his verdict is not wholly clear. In the main body of the text, he charts both the slowly-unfolding changes in tenure and landholding that were in progress long before 1760 and the critical changes in enclosure, husbandry and technique that swept dramatically across the Scottish Lowlands after 1760. When it comes to his concluding remarks, though, he declares pre-1760 change as 'social' and contrasts it with what he declares to be the essential phase of 'agrarian' change after 1760. In response, some will argue that the preparatory nature of the structural changes that occurred before 1760 are being understated, though I would not disagree with the importance which he places on the scale or sharpness of changes in husbandry and output after 1760. Arguably, what is needed is a reading that treats both as necessary parts of a single model of transformation, the one early and slow-acting and the other, late and quick-acting.

ROBERT A DODGSHON

JOHN HABAKKUK, *Marriage, Debt and the Estate System: English Landownership 1650–1950*, Oxford, Clarendon Press, 1994. xviii + 786 pp. £65.

F M L THOMPSON, ed, *Landowners, Capitalists, and Entrepreneurs: Essays for Sir John Habakkuk*, Oxford, Clarendon Press, 1994. xiii + 312. £35.

Both these books were published at the same time, in the autumn of 1994, although they began life in 1985. In that year Sir John Habakkuk gave the Ford lectures at Oxford which, rewritten, form the larger of the two volumes reviewed here; in the same year he reached his seventieth birthday, and a group of his friends and former students convened a conference in London, and there discussed with him a number of papers to mark that occasion, now edited for publication by F M L Thompson. The two volumes demonstrate the enormous influence that Habakkuk has exerted over scholars of his time. First there is the massive book on English landownership, a summation of more than fifty years of work that he has carried out, in a field that he first discovered and subsequently dominated: and second the Festschrift, which demonstrates that he is not only the historian of landownership, but has also broken new ground in other fields, having written, for instance, on the Atlantic economy and on contrasting American and British technology.

The link between the two books is Habakkuk himself. The eleven essays in the Festschrift are in several different fields: five are related to landownership; three are related to Anglo-colonial or Anglo-American financial relationships; one is on the growth of government in nineteenth-century Britain (although a Celt might remark that the author treats Britain as synonymous with England); one, difficult to categorize, is J R T Hughes's article on 'The importance of starting English', which discusses the extent to which English institutions were exported to the North America colonies; the final article is on the reception of advanced technology ('The reaper and the robot'). Some of these articles arise directly from Habakkuk's own work, and test hypotheses advanced in his writings: some are less obviously linked, and three of the contri-

butions do not, even in passing, mention Habakkuk. There is an elegant introduction by F M L Thompson, recording Habakkuk's lifetime of distinguished achievement, and endeavouring to knit together the separate themes of the essays. There is nevertheless an overall impression, all too common in the vastly increased number of volumes of collective essays published on widely assorted topics, that some authors offer papers on their current preoccupations, whatever the occasion, rather than write pieces designed for a special purpose.

The essays on landownership will be the principal interest to agricultural historians. P K O'Brien and D Heath develop their enquiries into whether the large landowners of Britain or of France made the most of the particular opportunities for agricultural development open to them. On balance they conclude that the French nobility, through the centuries, have been wrongly criticized, because their initial position was much less favourable. J V Beckett's article develops that of Habakkuk on the disappearance of the English peasantry (1965), and gathers an impressive range of statistics (adding an intelligent use of directories to the *Return of Owners of Land*) to cast doubt on the extent to which the numbers of small landowners declined by *c.* 1873.

C G A Clay's article analyses the position of the sort of man who moved in county society and yet maintained his role in the City, an example of what Habakkuk ingeniously calls an 'amphibian' – the second Henry Hoare ('Henry the Magnificent'). Hoare created a famous garden on his inherited estate at Stourhead, but also maintained his commercial role 'with one foot placed firmly in Fleet Street, at the sign of the Golden Bottle'. This is an excellent analysis, fitting neatly into Habakkuk's discussion of the movement between merchant wealth and land. Clay's article also provides a detailed case study to illustrate F M L Thompson's theme in 'Business and landed élites in the nineteenth century', which opens with a very useful summary of the current debate (leading players being the Stones, W D Rubinstein and Thompson himself) on the 'propensity of new wealth to seek landed status'. Thompson has used a very intractable source, the Legacy and Succession Duty Registers (IR26), to provide a considerable advance in this debate, allowing us once more to believe that very rich businessmen bought quantities of land and, sooner or later, built country estates. This is an outstanding contribution to the Festschrift.

R J Morris examines the married women's property act of 1870; asking why, at that time, did legislators who had for centuries been content with the long decline in women's property rights come to accept change? He concludes that the main reason was the realization that middle-class women needed separate capital to sustain respectability (in the event of the husbands becoming bankrupt): he does not discuss women in the landed classes, who were already protected by strict settlement from bankruptcy and destitution. Perhaps the determining factor was that around 1870 middle-class preoccupations had more impact on the law-makers. R M Hartwell provides an interesting analysis of the historians' and social scientists' view of government in nineteenth-century England, suggesting that government growth came from the pressure of individuals. P J Cain investigates some of the consequences of colonial dependence on capital supply from Britain after 1850; C Knick Harley analyses international capital movements and the gold standard; and Peter Temin writes on labour scarcity and capital markets in America in the 1880s. Finally Paul A David discusses the impact of automation, and specifically the robot, drawing parallels with older technologies such as that of the agricultural reaper.

The Festschrift is handsomely produced, but with a thin index: Coke of Holkham is indexed as such, with no additional gloss, and there is no separate reference to Holkham: of the proper names scattered down page 189, chosen at random, only one is indexed. It would be helpful to the reader if both the volumes reviewed here had bibliographies: now that most works are submitted to editors on disk, bibliographies are simple to construct.

After the assortment of the hors d'oeuvre, the main course of *Marriage, Debt and the Estate System: English Landownership 1650–1950*. The title may have survived from the earliest days of composition: for the completed volume is less about marriage than about strict settlement, the subject of the first 150 pages of the book. Marriage settlement is not synonymous with strict settlement: as Habakkuk writes, a strict settlement might be made on any number of occasions, the three most likely being coming of age of the heir, marriage, or at the making of a will. For nearly 800 pages Habakkuk traces the ramifications of these settlements: through provision for the family, marriage, debt, sales of land, the land market, and finally the decline of the landed interest. Why was this legal device, the strict settlement, of such importance as to justify a full length study with a wealth of detail? To agricultural historians the answer must be that for three hundred years or more, much land, perhaps half to three-quarters of English land, was settled in this way: it was 'the standard form of settlement' from around 1650 to around 1882 (pp 47–8,1). Settlements hindered or helped the advance of the economy, distorted the land market, determined leases, allowed, or prevented, investment in local infrastructures, in canals, turnpikes, enclosures, drainage

and railways. The system of land ownership by which much of England was held affected agricultural progress at every point. This book underlines in every section the great significance of the strict settlement in English history.

New aspects of landed estates will undoubtedly continue to attract historians, and some developments are here already or can be foreseen. A field that is virtually untouched is that of settlement policy in the royal family. Kings and queens too had estates to settle, marriage contracts to construct, dower, jointure and portion to assign; yet in the writings on landownership so far, the position of the royals has been overlooked. Some historians are already seeking for a more balanced view of the position of women in settlement practice. Eileen Spring, in her 1993 *Law, Land and Family*, remarked on K B McFarlane's loaded descriptions of 'obstinately surviving' dowagers, of women's succession as 'a sad prospect' or 'disaster'. Habakkuk too has subliminally absorbed from his sources this view of women's inheritance: too many daughters, too long-lived mothers were disasters, as was 'the widow who survived a long time and made a bomb at the expense of the dead husband's estate' (pp 158, 259). Eileen Spring, however, has calculated that the money paid to widows as jointures was generally below the money they had brought into the family. Surely widowed mothers were not always just an infernal nuisance? They were not given to the extravagances of their menfolk, did not build mansions, keep racehorses or mistresses. Within the family circle – a circle, we are increasingly being told, of family affection – must it be assumed that the mother of the heir would insist on her rights at the expense of bankrupting her son? Some dowagers had to raise their young families after their fathers' deaths, and conserve the estate until the heirs came of age. On at least one occasion, a dowager was eulogised by the Hotham family for having saved the estates in their family's late seventeenth-century difficulties: her aim was the 'support and preservation of the family and name of Hotham' (P Roebuck, *Yorkshire Baronets 1640–1760*, 1980, p 73). Perhaps this was not unique: the role of the dowager needs further investigation.

Habakkuk's book shows the importance of settlement in more than agricultural terms; there is much here on the family, on debt, on the interchange of business and agricultural capital, and on the decline of the landed interest. It is a book containing a mass of information and detail, setting out in the clearest language the 'estate system' with all its ramifications, and illustrating the great varieties in practice by a myriad of examples. The author has, for instance, looked at all private parliamentary estate acts, the only way by which a properly constructed settlement could be altered before it reached its allotted end; dozens of family and county histories; a wide trawl of unpublished papers in county record offices. It is difficult to see how the book could have been done better: it will provide a quarry for decades to come, and should be required reading for agricultural and indeed all English historians.

BARBARA ENGLISH

G E MINGAY, *Land and Society in England, 1750–1980*, Longman, Harlow, Essex, 1994. vii+278 pp. £11.99 (pbk).

Any attempt which is made to cover 230 years of a major slice of English social history within the confines of one modest volume will inevitably fall short of the expectations of some at least of its readership. In this case, it is students of nineteenth-century England who are likely to find this book of most interest and value.

After a brief five-page Introduction, chapters one and two deal mainly with the eighteenth century, under the titles, 'Landed society in the eighteenth century' and 'The landowner and the village'. Chapter three, however, on 'The politics of land' moves very swiftly into the nineteenth century, and there, chronologically, the focus of the book remains for the following six chapters as well, with titles such as 'The landowners', 'Down on the farm', 'The other villagers', and 'The decline of agriculture'. Chapter five is devoted to 'Poverty and the poor law', but readers will find that very little attention is paid to the poor of England after the year 1850: in fact, consideration of the entire topic between 1850 and 1980 is briskly wrapped up in the last two pages of this chapter, with even the Union Chargeability Act of 1865 being referred to only obliquely, and not by name. Similarly, chapter four on 'The clergyman and his parish' pursues this topic only as far as the end of the nineteenth century, and indeed this chronological limitation applies to all of the first nine chapters. It is only the last two chapters, ten and eleven, which deal with the twentieth century proper, at least from 1914, with the titles, 'War and peace' and 'The Second World War and after'. But the approach taken here is very different from that adopted in the earlier chapters. In these sections the emphasis is very much on economics and statistics, and there is no return to the earlier, more socially orientated themes. The poor, the 'other villagers', and 'the clergyman and his parish' are not re-adopted here, while landowners, farmers, and laborers become pieces, moved about on an economic chessboard by the fickle hand of free market forces, until rescued by post-1945 interventionist policies.

In a broad survey such as this it is not, of course,

possible to incorporate references to all of the latest research, but even so, academic readers may be disappointed by the thinness of the footnoting here. For example in chapter three, 'The politics of land', Mingay declares, 'Taking the hundred years from 1750 to 1850 as a whole, the most recent estimates suggest that agricultural output in general at least doubled, while rents rather more than doubled' (pp 48–9). Now a good deal of recent work has indeed been done on rent movements over those years, some of it by the present reviewer, but none of it was referred to in the footnote reference that concluded the paragraph in which the above statement was made. Instead there was a reference only to our old friends Deane and Cole. *British Economic Growth, 1688–1959*, and Mitchell and Deane, *Abstract of British Historical Statistics*, with Mingay citing the publication dates of the first editions, 1962 in both cases: hardly 'the most recent estimates'. Again, in chapter five on 'Poverty and the poor law', 13 of Mingay's 31 footnote references which conclude the chapter are to the works of J P Huzel, and 11 of these indeed to just one work by Huzel, his chapter on 'The labourer and the poor law' which appears in volume VI of *The Agrarian History of England and Wales*.

This book was clearly intended to be nothing more than a broad and impressionistic survey of one major tranche of English social history over a long period of time. Perhaps the time period selected was too long – these were after all years of very rapid and hectic change, which totally transformed the face of the countryside and the lives of its inhabitants – but if the work was overambitious, it is perhaps Longman rather than Mingay who should be blamed for that. At its best, it is a profound distillation of Professor Mingay's many years of study and scholarship, and a sure-footed treatment of those themes selected for his attention. For example, his general contention that 'rents rather more than doubled' between 1750 and 1850 is an entirely viable one with which most scholars working in this field would agree, even although Mingay does not cite their work in his support. The strength of this book will lie in its value as an introduction to the topic for the general reader and for undergraduates who are approaching the subject of rural history for the first time. They will find much of interest within these packed pages.

J R WORDIE

DAVID B DANBOM, *Born in the Country. A History of Rural America*, John Hopkins UP, Baltimore and London, 1995. 306 pp. £12.50 (pbk) and £35 (hbk).

This is a history book written by a man who admires rural 'survivors' yet resolutely refuses to sentimentalize their lives. He has no time either for Hollywood representations of ranchers nor of literary caricatures of the American hick, rube, or yokel. Even the rural equivalent of 'wonder women' who raised children, managed farms, and established themselves as centres of domestic manufacture, are firmly contextualized. As a textbook in rural American history from pre-Columbian times to the present, it is exemplary.

This is not to say that it will not give readers a number of frustrating moments. The introductory potted history of rural Europe might be better skipped; statements about rural women will cause some readers to flush; and the occasional lack of precision will certainly not satisfy others. Generalizations such as 'women were always subordinate to men' will raise the rankles of many historians, even those who shun political correctness. While appreciating the difficulties of doing justice to the ambiguous complexities of gender, ethnicity, and class, more subtle differentiations could have been made. At times, the category of 'rural people' masks important socio-economic divisions. British students might also expect more about the relationships between native Americans and immigrants. We also miss any real explanation of *who* emigrated to rural America. *What* proportion of colonists were labourers and *how* did this change over the centuries? Such questions remain unanswered in this book.

What does he tell us? The book is chronological in approach. When the book begins, fewer than 5 per cent of Americans lived in places with more than 2500 people. By the end of the period, 95 per cent lived in cities. We are told how European agricultural practices changed the face of rural America. Their ploughed fields exacerbated erosion; the introduction of new plants and animals seriously affected native growth; the imposition of a completely new social system permanently altered the lives of everyone living in the continent. Danbom examines at the way early Americans benefited from the 'mercantile system' whereby the British Parliament regulated the sale of goods – and the effect of the collapse of this system after the war of independence. He carefully sets out the relative value of indentured servants and slaves. The contribution to American agricultural practices made by slaves is nicely delineated, especially with regards the cultivation of rice and indigo. Slavery had repercussions for all of agriculture – socially, politically, agriculturally, and technologically. These aspects are discussed systematically and clearly. The great disruption of the Civil War – a war mainly about slavery – is one of the most interesting in the book. Reconstruction after the war was a delicate and desperate task. There is a

clear discussion of the role of rural society in the war of independence (much later, he does a similarly thorough job with regards the First and Second World Wars). He convincingly shows how early agrarianism was crucial in the development of an American national consciousness. Between 1870 and 1900, the rural community was faced with the challenges provided by industrialization, urbanization, startling improvements in the infrastructure, and the expansion of consumer society. The prosperity of the first two decades of the twentieth century was crushed by the high level of physical mobility from the First World War and the interwar depression. It was in the early twentieth century that the image of rural American society that we are familiar with begins to emerge with the introduction of trucks, catalogue buying, massive migration, and the substitution of huge harvesters in place of hired men. A further dramatic shift occurred with the inauguration of President Franklin D Roosevelt and his New Deal programme of 1933. This chapter was the only one which caused my interest to flag – but, then, by this stage in the book, two hundred pages of fascinating narrative had been consumed. Throughout the book, political movements and technological developments are given their due.

Danbom has a lively literary style. British students who might be superbly ignorant of American geography, culture and politics will not experience any difficulties with this text. One of the great strengths of this book is its clear exposition of regional patterns. After reading it, no British student could be excused for confusing the Virginian colonies with those established in New England. It is to be regretted that because these differences are so obvious to American students, Danbom has not seen it necessary to include a map.

This is a balanced economic, social, political, and technological history of rural America. Despite the broad subject matter, Danbom's explanations are never mechanistic (although there is an annoying tendency to account for women's choices primarily in terms of emotional factors while men's choices are more frequently explained in terms of economic rationality). The book suffers from the usual problems inherent in writing textbooks – it is difficult to identify a coherent thesis throughout the book and many readers will respond by crying out 'but why?' and 'more please!'. But this is a job for others. This is a splendid book, rich with detail and complex in argument, and – with the British student in mind – a superb introduction to American history.

JOANNA BOURKE

SALLY MCMURRY, *Transforming Rural Life: Dairying Families and Agricultural Change 1820–1885*, Johns Hopkins UP, Baltimore and London, 1995, xii + 291 pp. Illus. £33.

MARY NETH, *Preserving the Family Farm: Women, Community and the Foundations of Agribusiness in the Midwest, 1900–1940*, Johns Hopkins UP, Baltimore and London, 1995. xiii + 347 pp. Illus. £33.

These two substantial volumes are the first of a series entitled *Revisiting Rural America*, edited by Pete Daniel and Deborah K Fitzgerald. Judging by these offerings it appears that the series will move away from interpretations of agricultural change couched in economic terms and depending mainly on the influence of markets, transport developments, and new technology. The authors here prefer to emphasize the role of the family, and especially that of women, and how their role was transformed by the changing conditions of the time.

Sally McMurry's study of dairying families is pitched in the central decades of the nineteenth century. It is highly detailed, and based on an intensive examination of dairying, particularly cheese making, in Oneida county of New York state. Of course, cheese making spread more widely over that state and over New England and Ohio, to grow subsequently in areas of the Midwest. Production was based originally on the farmhouse and family labour. The first cheese factory was begun by Jesse Williams, a large farmer in Oneida county, who in 1850 was producing from home, with the help of his wife, so large a quantity as 25,000 lbs of high-quality cheese. In the following year the scale of his business, and related family matters, encouraged him to set up a factory. By the mid-1870s the crossroads cheese factory was commonplace throughout the county, and by 1885 over 90 per cent of cheese was factory made. The typical factory of this time was small, processing the milk of some 300–600 cows, and employing between two and half-a-dozen employees. The factory paid for the milk, marketed the cheese, and returned the profits to the farmer-patrons.

Total USA production of cheese mounted rapidly from 103 million lbs in 1860 to 243 million lbs in 1880, and cheese became increasingly the product of factories. Farm women often welcomed, rather than resented, the change, since it removed a burdensome daily duty and gave them greater freedom in their family and social lives. Eventually, even those women who worked in cheese factories were squeezed out in favour of men. For these women, it is true, the rise of the factory did mean, in the end, a loss of opportunity and of earning power. In the farmhouse, the wife of a dairy farmer, liberated from cheese making, was by no means at

a loss for remunerative occupation. She might still milk cows and sell the milk, keep poultry and sell the eggs. But butter making declined, and there was less need for outside help in the farmhouse. Young women moved from farms into textile and clothing factories, or to boots and shoes, teaching and other non-farm occupations. Overall, the rise of the factory, as the author believes, may have improved women's lives 'wonderfully'.

This is where the argument is at its weakest. It is impossible to come to a conclusion of this kind without knowing much more about the availability of alternative sources of employment and the conditions of work. Was factory work, in cheese making or other kinds of manufacture, necessarily a superior environment to that of an admittedly laborious occupation in the security of the home? From the evidence here we are not able to judge.

Mary Neth deals with a bigger subject in a more recent period, and the scene shifts from New York state to the Midwest. Her approach, however, is basically similar. She concentrates on three northern Midwest states, Wisconsin, Iowa and North Dakota, which specialized in dairying, corn, livestock, and wheat. Farming was market oriented and was already becoming mechanized. For the farm family, home-produced food was still important in 1900 but new consumer goods were appearing, making for better living standards and an easier life. At the same time government policies were encouraging over-production, farm costs were outstripping small farmers' means, and rural depopulation was already under way. Government agencies helped to improve efficiency by encouraging greater use of new technology and enlarged farm units. Farm consolidation hit small farmers, both owners and tenants, and affected also hired workers as well as women and youths. The role of women and children in production was reduced, while that as consumers expanded. Small family farms existed in 1940, but their way of life had been much changed.

In particular, diversity of production, and use of family labour in order to save money, were crucial to survival in hard times, but this kind of farming ran counter to the trends of specialization and large-scale production. Before 1940, however, the rate of change was slow, consolidation was limited, and few farm people had succumbed to the lure of the city. The most prominent change was a decline in farm population, the consequence of mechanization and the abandonment of home production. And in the depression of the 1930s government policies did more for capital-intensive agriculture than it did to help small farmers to survive. Farm families were under pressure to raise their incomes so as to afford new machines, new consumer goods, and more opportunities for recreation. First farm daughters, and then sons, sought work in nearby towns, followed after the Second World War by the wives – the crucial element in small farm survival.

Preserving the Family Farm describes small farmers' attempts to adapt to the changes, or increasingly, their failure to do so. The author's argument is that it was in the forty years after 1900, when farm consolidation and large-scale production were as yet still limited, that the basis for increased post-Second World War rural depopulation was created. In her wide-ranging study she elaborates her thesis with discussions of farm policies and the attitudes of farmers' movements, as well as with accounts of individual farm families and their experience. She also throws interesting light on the changing educational and social environment – on the influence, for example, of extension work, the literature read by farm families, the model T, radio, cinema, and even the dance hall and modern dance music. Perhaps more statistics of the trends she discusses, for example of farm consolidation and rural depopulation, would give greater solidity to the thesis, but the book is an admirable social study of a kind that has not yet appeared in this country.

G E MINGAY

JAMES R LEHNING, *Peasant and French. Cultural Contact in Rural France during the Nineteenth Century*, CUP, 1995. 240 pp. £14.95; £30.

James Lehning is known for his earlier monograph *The Peasants of Marlhes* (1980), which dealt with economic development and family organization in a village in the Massif Central during the nineteenth century, and for a suite of articles analysing demographic behaviour in the *département* of Loire. Now, after fifteen years of preparation, he has set his detailed work into a wider context by exploring a range of evidence on the transformation of peasant life and by critically examining numerous scholarly interpretations. The central argument of *Peasant and French* is that the modern nation of France has, in part, defined itself as different from its peasant ancestry. Rather than insisting that countryfolk simply lost their earlier identities and became 'French', Lehning argues that a complex and protracted process of cultural contact and negotiation took place.

The book is articulated around sets of information that are formulated at three spatial scales, namely wide representations and interpretations of peasant society in France, more closely focused documentation on socio-economic changes in Loire (on the eastern fringe of the Massif Central), and detailed qualitative and quantitative information for selected settlements within that *département*. After setting the study in its broad methodological framework,

Lehning offers a complex and highly referenced review of depictions of peasant life by novelists, artists, political scientists, historians, and film makers, with examples running – perhaps predictably – from Zola, through Emile Guillaumin and Eugène Le Roy (the so-called peasant authors), to Marcel Pagnol and the films *Jean de Florette* and *Manon des sources*. Then follows a lengthy discussion of socio-economic conditions in the countryside of Loire, deceptively entitled 'the landscape of the early nineteenth century' since visual elements are rarely discussed nor are sources restricted to the early nineteenth century. Much attention is devoted to demographic circumstances, which are Lehning's forte. Subsequent changes in the landscape (to use the author's terminology) are then portrayed from a wide range of published and often quite general information, rather than from a detailed analysis of Loire-specific statistics. I wondered, for example, why figures on agricultural production for 1902 were compared with those for 1852, but not with the results of intervening decennial surveys or those of 1838–40, and why incomplete statistical totals were compared with those for which all data sets had been obtained (pp 84–85). Matters of gender, schooling, religious life and electoral behaviour make up the substance of four chapters which draw on quite different types of information. Thus, the discussion of gender is a broad, general review which is repackaged into the framework of Loire; by contrast, the presentation of educational issues is enhanced by detailed evidence from school inspectors, and that of religious activity is strengthened by information on pastoral visits held in the archives of the archdiocese of Lyons. The chapter on electoral matters juxtaposes archival material with a distillation of argument from historians and political scientists. A brief conclusion emphasizes the case for rural studies to be undertaken in a wide, theoretically-informed multi-disciplinary framework.

My reactions to *Peasant and French* are frankly mixed. On the positive side, the book provides some valuable appraisals of perceptions of peasant life and offers an excellent bibliography. It also conveys further empirical information on rural conditions in the rather curious *département* of Loire, which is composed of emphatically rural territory on the edge of the Massif Central but also parts of the expanding economic region based on the metropolis of Lyons and the industrial newcomer of Saint-Etienne. On the negative side, the book fails to provide some essential contextual information which any agricultural historian or historical geographer would demand, and displays some particularly bizarre examples of graphical depiction. For example, the environmental resources of this geographically complex part of France are discussed in only a cursory way and no attempt is made to map the pattern of upland and lowland, rivers, trade routes or emerging transport systems, all of which were so vital during the transitional nineteenth century when sections of Loire, and in particularly elements of its society, entered into a new set of commercial relations but others remained relatively immobile in their traditional mould. Readers are treated to complex and detailed demographic calculations, but no mention is made of the total population of Loire or of how it changed through either time or space during the nineteenth century. Some good, detailed maps of physiography, land use and population density would have been most welcome additions. The maps which are included are downright strange, being composed of *canton* boundaries with numerical values typed into the intervening spaces. Their visual impact is zero; the data could have been shown more effectively in tables. Agricultural historians will be frustrated by the relative paucity of discussion of technique, production, land use and productivity, each of which could have been explored far more thoroughly from sources in the *archives départementales*; on the other hand, socio-economic and cultural historians may be more satisfied. James Lehning acknowledges sustained contacts with American non-historians which enabled him to transform this work 'from a monograph on population history' (p xi). I can only presume that he did not interact with geographers or agricultural historians since they would have been able to advise him on how to produce a more rounded work. In conclusion: *Peasant and French* is well priced in paperback and contains much that will inform students and will stimulate some academics, but will irritate others.

HUGH CLOUT

KAREN SAYER, *Women of the Fields. Representations of Rural Women in the Nineteenth Century*, Manchester UP, 1995. 201 pp. £45.

'Man for the field and woman for the hearth'. Karen Sayer begins her book with these words of Alfred Lord Tennyson. She then sets out to examine the ways such assertions about gender changed in the course of the nineteenth century. Regrettably, Sayer is uninterested in the masculine gender, so we hear very little about rural manliness (and its relationship to the feminine). Her particular focus is on women in the fields and the reasons for the major flurries of middle-class anxiety about the extent of their labour and its nature. The level of middle-class concern was out of all proportion to the number of female labourers. Although women's employment on the land grew from the 1830s to the 1850s, from then onwards it was in decline and,

by the turn of the century, was numerically insignificant.

In subject matter and time frame, this book follows Ivy Pinchbeck's *Women Workers and the Industrial Revolution*, published more than sixty years ago and still the most detailed examination of women's rural labour in England, despite the brilliant work of scholars such as Keith Snell. However, the tone of the book is very different from Pinchbeck's. Unlike many academic texts in what has been unfairly called the 'narrow specialism of rural history', this analysis has been heavily influenced by Michel Foucault, Michele Barrett and Roland Barthes. This should not discourage any readers: theory is applied sensibly and with a light touch. Furthermore, like a good empiricist historian, the book is focused around three main texts: the reports of the Special Assistant Poor Law Commissioners on Women and Children's Work in Agriculture (1843), the Royal Commission on the Employment of Children, Young Persons and Women in Agriculture (1867), and the Royal Commission on Labour (1893). If this seems heavy going, it is not. Sayer knows what can be done with unpromising material, she wields a deft hand with visual images, and her dissection of literary texts is always lively.

This book places itself within a familiar discourse. Along with many feminist and social historians, Sayer asserts that poor women were not merely passive victims of a middle-class hegemonic culture but were active agents in the production and reproduction of their lives. Despite this, most of the book is concerned not with establishing 'realities' or even attempting to understand the way rural women themselves understood their lives, but in the construction of rural narratives of femininity by middle-class commentators. This need not sound a sour note: the words of poor women are generally silenced and (as Sayer points out in her perceptive introduction) there is no identifiable 'reality' against which 'representations' may be compared. Despite the fact that rural women themselves are only rarely heard, Sayer never lets her readers forget their presence. More impressively, Sayer discusses representations of rural women in broad terms, particularly in the context of debates about the urban versus the rural, the nature of Englishness, and the potency of evangelical religion.

According to Sayer, the English rural idyll which emerged from the mid-eighteenth century, was part of the way middling groups within society created an identity of themselves as a separate class. By linking the English countryside with peace, prosperity and tradition, the new middle class legitimated their claim to power. The mid-nineteenth century shock of discovering that the rural community was not an innocent playground for children, a secure domestic haven for women, and a site of 'honest labour' for men had dramatic repercussions. When poor law commissioners, medical officers, and journalists began probing into the 'realities' of rural life, they stimulated intense public concern which had contributed to tensions between the growth of political *laissez-faire* and state intervention into the lives of poor people. Within this political discourse, Sayer shows how the dominant middle-class images of rural women changed through the century from seeing them as children, then as prostitutes, and finally as mothers. This process was parallelled by a decline in women's economic power within rural communities as they lost most of their skilled, well-paid work once new technologies and agricultural depression rendered their traditional occupations redundant. It is the way this book negotiates discussions of 'representations' within their economic, social, and political contexts that makes it such a valuable study.

At the risk of sounding pedantic, discrepancies between the footnotes and the bibliography were disturbing and the proof-reading was careless. However, these frustrations were minor when set against the beautiful reproduction of images and the delightfully clear way Sayer has of expressing herself. The book must be added to any course in labour history and in the history of women in nineteenth-century England.

JOANNA BOURKE

RODERICK FLOUD and DONALD MCCLOSKEY, eds, *The Economic History of Britain since 1700*, second edition, CUP, 1994. 3 vols: xxiv+484 pp; xxix+510 pp; xxvii+427 pp. Each vol £50 hbk; £17.95 pbk.

The first collection of essays on the economic history of Britain, edited by Floud and McCloskey, appeared in 1981. After two decades of the 'new economic history' spreading tentacles across the Atlantic, the collection, which took economic theory and model building as axiomatic, was hailed as an important turning point in the historiography of British economic history. Many British economic historians anticipated that the two volumes of the first edition would condition the approach and perception of a new generation of economic history students. Our then Head of Department at Liverpool, for example, insisted on a bulk purchase, distributed the volumes to the staff and maintained that they would revolutionise the way in which we taught. In practice, as we now know, many of the essays proved too dense and intractable for most undergraduate students. Although there was a strained attempt to link some social history to the generally economic and econometric analyses by

including three chronologically sequenced essays on social history, students missed that close integration of economic with social and cultural history which had characterised earlier British historiography in the work of historians such as, and as varied as, J H Clapham, T S Ashton, E J Hobsbawm and Sidney Pollard. Furthermore, the essays did not always knit well together in providing an overall or clear perspective on economic change. The exigencies of a multi-authored work inevitably resulted in overlaps, omissions and inconsistencies. Wide insistence upon the use of the collection as a central text may have contributed to the declining popularity of economic history courses at undergraduate level in Britain.

This new collection is hardly a second edition in the common sense of the term as there is no repetition or simple updates of the earlier pieces. Several of the 39 authors wrote in the first edition, but most wrote on different subjects or have now produced entirely different accounts. The authors are British and North American, but many new names have replaced those who wrote 15 years ago. There are now three volumes with a major expansion in content for the period from 1860 to 1992. Comparison with the earlier work is inevitable. The new edition is generally more readable and more appealing to a wider readership, though the claim in the preface that the collection is written in straight forward and jargon-free English is likely to be questioned by many. Some of the best features of the first edition are retained, such as the excellent (and necessary) glossary of technical terms included in the index in all three volumes and the survey pieces on the economy which provide a context for the more specialist essays and help to tie the volumes together into an overall account.

Some problems which attended the first edition are, however, sometimes magnified. The coverage of social, cultural and even institutional aspects of economic history is, if anything, less than in the first edition. The social history essays of the earlier work which always appeared awkwardly tagged on have been rightly abandoned, but this has not been matched by any sustained effort on the part of contributors to look at economic issues from a broad cultural perspective. Again, there is no separate bibliography for each essay and no simple guide to further reading for students on particular themes. The essays are generally of a high standard, with clear presentation of evidence and thorough, lucid discussion of, often very technical, debates. Joel Mokyr's piece on invention and innovation, Patrick O'Brien's essay on the state, Barry Supple on economic decline and Jim Tomlinson's contribution on economic policy since 1945 are models in this respect: complex yet accessible. Other essays do, however, suffer from a somewhat elliptical approach to their subject and would be more at home in a specialist journal than in a volume directed at the student market: Larry Neal on business finance, Mark Thomas on the macro-economics of the inter-war years and Michael Edelstein on imperialism, for example. Other pieces such as the two by Alec Cairncross on twentieth-century economic performance include dense chronological accounts, very useful as a reference for the professional historian but likely to discourage student readership.

An innovation in the new edition is a list of geographic landmarks which is repeated in all three volumes. It contains very brief descriptions of British counties, economic regions and selected towns and cities which will be especially useful for overseas readers, but the omission of many important urban centres and the prominence given to Sandown Park Racecourse, to Heathrow airport and to Soho is disconcerting. Another new feature is the series of chronologies of major events for the period covered in each volume. These do assist in contextualizing the essays and provide a useful and easy reference but they are no substitute for the uneven coverage of many aspects of economic change which is to a degree inevitable in a multi-authored, essay-structured work. It is, for example, difficult to trace the fortunes of any single economic sector through the three volumes and impossible to learn much about the long-term trajectory of particular industries even with careful use of the index.

The coverage of agricultural change highlights some of the patchiness which accompanies this edition as it dogged the first. Robert Allen provides a useful survey of agriculture and the industrial revolution which relies heavily but not exclusively on his own work and interpretation and which entirely ignores the distinctive experience of Scotland, Wales and northern pastoral districts. It is, however, one of the few essays in the whole book to make a conscious effort to include the impact of changes in the lives of women and children as well as, more easily quantifiable, adult males. Cormac Ó Gráda takes up the analysis of British agriculture for the period 1860–1914, placing emphasis upon regional contrasts and surveying a range of recent and older research on the issue of agricultural decline. In the third volume there is no separate treatment of agriculture after 1914 and only one minor reference in the index. The index has no reference to the Common Agricultural Policy despite the importance of agricultural issues to Britain's EC membership and relations with the Commonwealth. Students interested in twentieth-century agricultural history will have to look elsewhere.

These volumes are essential reading for all those who wish to keep abreast of recent research and theorizing largely, though not exclusively, within a particular paradigmatic approach to economic history. As a text with wide appeal to a student readership it has serious limitations arising from the technical and theoretical nature of many of the essays, the dense empirical foundation of others and the patchy coverage of particular key themes which is inevitable in a work of this kind. According to the dust jackets these volumes provide *The Economic History of Britain since 1700* with *The* underlined! It has been superseded once by its own progeny after only 13 years and, monumental though it is as a current reference and text for the professional, it is likely to be succeeded again by new results and estimations, new debates and by new approaches.

PAT HUDSON

TIM ROOTH, *British Protectionism and the International Economy*, CUP, 1992. 346 pp. £42.50.

Britain's pre-eminence in the nineteenth-century international economy sprang from export-led growth in a free trade regime, initiated in its classical form by the cotton industry with the import of raw cotton from the USA, and the subsequent export of manufactured cotton textiles. Free trade also brought with it problems for British agriculture in the later part of that century, creating a dependency on imported basic foodstuffs which the Second World War did a great deal to reverse, a reversal actively pursued by the government in the early postwar years. Not until the 1980s, however, did the Common Agricultural Policy finally undo the direct consequences of the abolition of the Corn Laws in 1846.

The long agricultural crisis of the 1870s and 1880s, which was a consequence of the adoption of free trade, did not lead to a clear demand for protection, promoting instead a renewed interest in the reform of landholding and tenancy. When Tariff Reform did become a national issue in the 1890s it was linked to a preceived crisis of international industrial competition, a condition which had barely existed hitherto, since British manufactures had dominated world export markets. Britain's share of world exports in manufactures declined from 40.7 per cent in 1890 to 29.9 per cent in 1913; in an expanding market of course. This downward trend was a perfectly natural and predictable outcome for an early industrializer which embraced free trade in a world economy of industrialised and industrializing economies which might, or might not, share a faith in the benefits of open economies. British exporters responded by shifting their sights towards less industrial economies, but in the long-run it was the composition, rather than scale or direction, of exports that was the chief problem. The export of capital might stimulate demand in new markets, but the reliance upon staples, especially cotton goods, coal and steel, made the volume of exports vulnerable to shifts in demand deriving from changes in technology and the diffusion of industrial processes to developing economies.

No unambiguous conclusion can be drawn from the pre-1914 relation of UK export performance to domestic growth and economic welfare, but the fact that the highest interwar level of exports was still 20 per cent below that of 1913, despite a growth in world trade estimated at 37.5 per cent for the period 1913–29, indicates a structural problem in the demand for British manufactures, since, unlike the prewar period, Britain's share of world trade was now declining relatively and absolutely – from 30.2 per cent of world trade in 1913 to 20.4 per cent in 1929 at 1913 prices, selling the wrong commodities in weak markets. Rooth's story is detailed and complex, piecing together major trends from the assessment of markets, product flows and the comparative manufacturing advantages deriving from international variations in location, skills and capital investment. The later 1920s, for example, saw a general improvement in world manufacturing output, an improvement in which Britain shared. Against this, however, should be placed the impact of the return to the Gold Standard in 1925, an impact which was often indirect. Rooth describes, for example, the loss of markets for British coal in the Baltic to Polish producers. This followed on from the interruption of supply brought about by the coal strike of 1926, itself an indirect consequence of the return to gold, which coincided with the exclusion of Polish producers from the German market, largely on political grounds since the coal originated in the Silesian coalfields ceded to the new Polish state in 1920.

In the Tariff Reform campaign of 1904 the most prominent British economists had favoured free trade. This was no longer true in 1930, as indicated by the cautious endorsement of protection given by a sub-committee of the Economic Advisory Council, whose members included Maynard Keynes, Hubert Henderson and Josiah Stamp. Among its recommendations was the suggestion that a reduction in imports rather than a reduction in costs was the only feasible strategy in the achievement of a trade balance; and Imperial Preference was also proposed as a possible option. The following year Britain went off the Gold Standard, and the Import Duties Act came into effect on 1 March 1932, ending the era of free trade.

The trade negotiations which followed on from this were complex, and the principal virtue of

Rooth's account is to demonstrate in detail both the strategies pursued by the negotiating parties, and the trade flows over which they bargained. Here we can see prefigured arguments over the Empire, North America, new markets and Europe which recurred after the war; although these strategic lessons of the 1930s seem to have passed by British policymakers of the 1950s.

KEITH TRIBE

SUSANNA WADE MARTINS, *Farms and Fields*, B T Batsford Ltd, London, 1995. 160 pp. Illus. £15.99.

This volume in Batsford's 'Know the Landscape' series is intended to give the general reader a broad picture of the evolution and changes to the British farming landscape from Neolithic times to the present. This is quite a tall order; although this study must concentrate on the surviving visual record, it also requires the author to give a brief survey of the underlying economic forces that lay behind the physical changes to the structure and appearance of British farms. Both tasks are fairly well accomplished even though there is an inevitable concentration on the more imposing and enduring work carried out by the large estates. The volume is divided into two parts, one covering the evolved landscape and the other the reclaimed landscape. The part on the evolved landscape contains ten chapters, each around ten pages long and with between five and ten illustrations. These are taken from modern and contemporary maps, aerial and terrestrial photographs, archaeological plans, and artists' impressions based on excavations. Some of the pictures are also taken from exhibits at farm parks and museums – establishments which will also provide important retail outlets for this volume. One of the strengths of the book is that particular attention is given to documentary sources, together with a warning on page 76 that some of them do not always mean what they say, for instance where estate maps show archaic field structures for legal purposes, whereas the land itself was actually farmed differently. The part devoted to the reclaimed landscape is much shorter, with a national listing of important reclamations followed by two case studies. One of these is the duke of Bedford's work on the Thorney Level in Cambridgeshire, and the other is the Leveson-Gower family's transformation of the county of Sutherland.

The coverage is truly a national one with sections on Wales and Scotland, including a specific chapter on them for the eighteenth century. However, for Scotland this is somewhat marred by the use for one of its sources of R J Brien's *The Shaping of Scotland*, which is footnoted a number of times in the text but does not appear in the bibliography. In fact, Brien's study is rather amateurish and the author seems to lean rather too heavily on his simplistic cause and effect relationship between the suppression of the 1745 rebellion and the initiation of improvement. But some use is made of the best part of Brien's book, which is the reproduction on page 94 of William Panton's 1773 map of the runrigs of the ferm-toun of Craigyloch in Angus, although unfortunately the reproduction here is too small to be easily deciphered and the caption is changed to 'Pant's map of Crigyloach, Perthshire' (*sic*). Usually the text and illustrations are well matched, although the discussion of aisled barns and cruck barns on pages 44–47 is accompanied by three illustrations of the former but the reader has to wait until page 60 for a picture of a cruck barn. However, these are relatively small faults and, taken as a whole, the volume can be recommended as a useful introduction for the uninitiated.

RICHARD PERREN

G K NELSON, *Over the Farmyard Gate: Country Life in the 1930s*, Alan Sutton, Stroud, 1995. viii + 168 pp. Illus. £14.99.

This is the latest in a series of books drawn from the author's archive of reminiscences from rural people across the country. While it is true that the 1930s are probably the years that occur most often, the book is in no sense restricted to that decade, or even particularly focussed on it, and contributions range over the whole of the first two thirds of this century.

Over the Farmyard Gate is not an academic study, but it has value as evidence. A few of the contributions are excellent and very thought provoking, especially those on Norfolk and Lancashire. The organization of the harvest in Norfolk is intricately delineated and reveals many fascinating features, especially the strong remnants of yearly hiring for the horsemen despite contracts that apparently had abandoned the practice. The Lancastrian cattle dealer gives by far the best and most detailed account I have seen of how the 'flying' dairy herds of the small Pennine farms were kept stocked with cows in milk, by an intricate exchange of newly-calved cattle from Ireland and North Lancashire for dry cows, many of them in calf but not wanted until their output returned to high levels, and others who were past milking and which were slaughtered by the dealer. More generally, insider accounts of the actual transition from horses to tractors are few, and these are the more valuable for the range of views they present. A sense of loss is always balanced by an enthusiasm for the new.

On the other hand, several accounts are too short and unfocused to be of any real value, especially the one on Suffolk which opens the book and

which has little to do with ordinary farming. The extensive use of photographs is interesting, but too many towards the end are of dubious value either because of lack of adequate provenance or from being evidently posed. Even so, the number of images of early tractor work is exceptional, and this is a subject given very inadequate coverage in most books. Generally, there is no index, no attempt to set the accounts in a realistic context, and no indication of whether they are written or oral in origin, or of what editing has been done. The general standard of proof-reading is not high, but more importantly, there seems to have been a disaster during the preparation of the text for the book is plagued at page breaks by duplications of lines, and even worse, the omission of unknown amounts of text. An interesting short contribution on dairy farming in Somerset is nearly destroyed by a series of such errors.

S A CAUNCE

EDWARD HART, *Heavy Horses: An Anthology*, Alan Sutton, Stroud, 1994. x+214 pp. £14.99.

This book is exactly what the title says, a collection of short pieces about breeding and working heavy horses. A few take us back to the sixteenth century, but most cover the period from the late nineteenth century through to the present day, during which the famous breeds have been created and guarded by their breed societies. Edward Hart himself is the largest contributor through introductory pieces and fragments, but a variety of authors have contributed reminiscences and poems as well as descriptive sections. Photographs and other illustrations are interspersed through the text.

Considering the fascination these majestic animals exercise at heavy horse centres, at agricultural shows, and delivering beer, it is strange how little of general interest has been written about them. Considering the importance of draught horses as the more flexible half of a vital partnership with the steam engine until about 1930, it is remarkable how little has been written about them by historians. This book is obviously aimed at the enthusiast and the general reader, many of whom will doubtless be led to the more detailed work that lies behind the fragments. It is not intended to fill the second, though for anyone interested there are plenty of thought-provoking elements that suggest lines of enquiry worth pursuing.

Although there are elegiac pieces, it also gives some indication of the dangers and discomforts of working with horses that are easily overlooked by the nostalgic. It also covers the macabre 1950s when the horse population collapsed as mechanization finally exploded in agriculture. However, whereas a book of twenty years ago would have ended gloomily, this records a dramatic revival, and even if the Shires and Clydesdales are much altered from their glory days, there is no longer a danger of actual extinction. This is of course almost entirely a hobby boom, an odd end for working horses, but at least survival seems assured.

S A CAUNCE

R A OTTER, ed, *Civil Engineering Heritage: Southern England*, and E A LABRUM, ed, *Civil Engineering Heritage: Eastern and Central England*, Telford Services Ltd, London, 1994. each 256 pp. Illus. £12.50 pbk.

These two volumes are part of four covering England and Wales on a regional basis. Each dips into the comprehensive archives which have been developed over the past twenty-five years or so by members of the Institution of Civil Engineers' Panel for Historical Engineering Works. The archive itself, which covers the whole of the British Isles, is maintained in the Library of the Institution's headquarters at Westminster. The selected site reports are presented in a clear and readable way, and are geographically related in simple numerical succession on local maps. The system as such is suitable for the armchair browser, the student and the tourist.

In the preface to the *Southern England* volume civil engineering is described as 'the design, construction and maintenance of a nation's infrastructure', and (perhaps unexpectedly) as including the 'construction of a very wide range of industrial and domestic buildings'. This is reflected in the wide range of material presented in both volumes, including prehistoric and medieval sites and monuments. The site reports themselves are generally adequate, and sometimes excellent, when describing 'mainstream' and well-understood civil engineering subjects such as lighthouses, bridges, canals and railway viaducts, but the coverage of what may be broadly described as industrial archaeology monuments and sites is much less assured, and the selection of what to include and exclude in this field appears to be quite haphazard.

In Hampshire, section 6, *Southern England*, Eling Tide Mill is featured, but the reader searches in vain for reference to Whitchurch Silk Mill, Bursledon Windmill, Twyford Waterworks or the Bursledon Brickworks Project. This is not to suggest that these require separate entries, but they are sufficiently important regionally to warrant a mention. More seriously, there appears to be no rationale for the list of windpowered grain mills featured in the *Eastern and Central England* volume. Inexplicable exclusions in Humberside, Lincolnshire and Nottinghamshire include Skidby Windmill near Hull, the only working windmill

north of the river Humber, Wrawby postmill near Brigg, Ellis' Mill, Lincoln, a small three-storey tower mill set between two terraces of dwellings on Lincoln Edge, and Green's Mill, Sneinton, Nottingham, which is a dynamic, avowedly-educational, 'working' flour mill. Inexplicably included is Cley towermill, North Norfolk, which is at best a picturesque house-conversion. Though externally complete with sails and a 'dummy' fantail, it is bereft of internal machinery and cannot be visited by the public. In short, the page-space occupied by this windmill would have been better taken up with something more appropriate. Generally, these windmill reports are derivative and based on secondary and out-of-date sources. In most cases more accurate historical information could have been gained from a perusal of recent editions of individual windmill guides.

In conclusion the two volumes are generally interesting and readable as a source for 'mainstream' and well-understood civil engineering subjects, and are recommended to those who wish to find out more about these in the two regions concerned. However, they are less useful for those interested in both a selective and a comprehensive view of the history of a region's built environment.

GAVIN BOWIE

LYNDON R SHEARMAN, *Portable Steam Engines*, Shire Publications, Shire Album No 163, 1995. 32 pp. Illus. £2.25 pbk.

This book is a reprint of the volume first published in 1986. It has worn well, providing a succinct description of what portable engines were and how they worked. For the uninitiated, a 'portable' is a steam engine mounted on wheels, which can be pulled or pushed to different locations. It thus differs from the traction engine or steam tractor, both of which are self-propelling.

Shearman is concerned mainly with the technical development of these engines, which is described well and simply; this book is designed to be read by a wider audience than just the steam enthusiasts. For the agricultural historian, there is a section on the historical use of the portable, acknowledging that most of them were used for threshing. Steam threshing is included amongst the illustrations, which are a strong point in the Shire series. There is an excellent selection of illustrations (37 in all), chiefly old photographs. For the industrial historian, there is a reminder of the long history of the portable. The first intended for agricultural use (by Trevithick, in 1811) was a premature development, and the portable did not achieve popularity until the 1840s. But it was still being made in some quantity in the late 1930s, and a few were still being made in the 1960s. Since then, they (including the author's own machine) have been the subject of the steam preservationist movement, for which the historian can only be grateful. Finally, attention may be drawn to the excellent value for money offered by this book and by the Shire series as a whole.

PETER DEWEY

Notes and Comments

DR RAINE MORGAN (1945–1996)

It is with deep regret that we report the death of Raine Morgan. A graduate in Social Sciences from the University of Leicester, Raine Morgan joined the staff of the Institute of Agricultural History as Bibliographer in 1974. Inside five years she had created an original and extremely efficient subject classification system and collected some 25,000 references on British and Irish rural history. She made an important and highly valued contribution to the work of the Society through her bibliographical lists and surveys in the *Review*. From 1976 she was responsible for the Annual List of Periodical Literature, taking over from David Hey. Her last list, her twentieth, for 1994, will be published in this issue of the *Review*. She produced, in addition, two specialized bibliographies under the Institute imprint: *Farm Tools, Implements and Machines in Britain* (1984), and *Dissertations on British Agrarian History* (1981). Regular updates of the latter were published in the *Review*.

Her most ambitious project, so near completion, and her major preoccupation since 1989, has been the Rural History Database, a computerized bibliography of over 50,000 references, to be made available to the wider academic community through the Bath Information Data Services (BIDS), the premier British Universities' networking agency.

Raine Morgan will be missed not just for her unrivalled knowledge and skills in this field of bibliography but also because she has shown how dedication and enthusiasm can compensate for a shortage of resources.

Raine was an accomplished historian in her own right, having completed a University of Reading doctorate under the supervision of Dr Ted Collins on *The root crop in English agriculture 1650–1870* in 1978, and possessed a detailed knowledge of agricultural techniques and landscape in the Agricultural Revolution period. Her most recent article, on the work of Robert Bakewell, was published in the *Journal of the Royal Agricultural Society of England*, for 1995.

Raine died at her home in Reading, after a long struggle against cancer, on 7 January 1996, leaving a husband and two small sons.

JONATHAN BROWN

DAVID L FARMER

Readers of this journal, and all students of English agricultural history, will have learned with deep regret of the sudden death of David Farmer. It was characteristic of him that he died at work at his desk, for especially in recent years his contributions to the history of medieval English agriculture have been formidable in every sense of that word and have increasingly provided a framework for investigations of the rural history of medieval England. The beginnings of the enquiries which engaged him, of course, take us back a long way: to his researches into agricultural prices in the late twelfth and thirteenth centuries, on which he reported in articles in the *Economic History Review* in the 1950s and which won him a D Phil at Oxford in 1958. A busy schoolmaster's life thereafter, much of it at Sedbergh, slowed down his further progress in these enquiries, and his move to Canada, as Professor of History at St Thomas More College in the University of Saskatchewan in the 1970s made more difficult the prolonged archival studies upon which his results were founded. These were problems, however, with which he learned to cope: photocopies of manuscripts upon which he could work during the Saskatchewan winter represented one way, and another came to be his annual pilgrimage to English record repositories, planned with all the thoroughness of a military operation. One came to look forward to a letter from him around Christmas time announcing a visit from him at 6.30 pm on some date in the following May. On that date and at that time he would duly arrive, fresh from the Ely records in the Cambridge University Library, and at 8.30 the following morning he would be ready to leave for the West Suffolk Record Office or the Norfolk Record Office.

The results of these labours are to be read in a series of articles which David published from the late 1970s onwards and, most particularly, in the chapters on prices and wages from the late twelfth century to the end of the Middle Ages which he contributed to the second and third volumes of *The Agrarian History of England and Wales*. These chapters derive an essential unity from the use which David was able to make of the stores of data preserved in the incomparable run of Winchester pipe rolls from 1208 to the mid-fifteenth century, but to this core material he progressively added further information drawn from most parts of the country. This evidence enabled him to construct annual price series on a national basis for the various grains and categories of livestock, and for wool, cheese and salt, and also the piece-rates earned by labourers engaged in some of the principal agricultural operations or by the craftsmen whom farmers needed to employ. These basic statistics he also digested into decennial national rates, providing some sort of measure of the longer-term trends in medieval

agriculture, and also into indications of some of the regional disparities which characterized the medieval countryside. These statistics are accompanied by a wide-ranging commentary seeking explanations for what the figures reveal, and including calculations of grain yields and attempts to establish a measure of the standards of living of labourers. In all this, of course, David drew upon the work of others: of Thorold Rogers and of Lord Beveridges's pre-war team of researchers, of J Z Titow on Winchester harvests and of Maryanne Kowaleski on Exeter markets among others; but essentially this was the fruit of one man's researches, much of it conducted in the remoter reaches of what used to be Yorkshire or in still remoter middle-Western Canada. It represents an achievement which by any standard must be regarded as remarkable.

In more recent years, too, he extended his field of enquiry in a significant direction. At a late stage in the preparation of the second and third volumes of *The Agrarian History and Wales* it became clear that the plans for chapters on the marketing of agricultural produce in these volumes had broken down. In response to editorial appeals he undertook to produce a marketing chapter, covering the period *c* 1200–1500, which was published in the third volume. This task was one which he felt 'had to be completed in haste and without adequate library resources', but as was David's way completed it was. It drew, of course, upon specialist studies of markets and fairs like Richard Britnell's and Ellen Wedermeyer Moore's, but like his work on prices and wages its solid foundation is to be found in David's familiarity with an extraordinary range of medieval manorial accounts. Despite his reservation that this chapter was 'not a definitive study' it advances significantly our knowledge and understanding of the commercial relationships of medieval rural communities. Its coverage, too, is remarkably comprehensive. The Winchester pipe rolls once again provide much of his evidence, but so do the records of Westminster and Glastonbury abbeys and of Merton College in Oxford, and we also hear of the dealings of Exeter cathedral and in the markets of the city of Norwich, of the transactions of small men in the sprawling manor of Wakefield, and of buying and selling in northern livestock fairs like those at Northallerton and Corbridge. If, in his own view, his results were 'tentative', that was to measure them by his own high standards; but, like his longer-term labours on the history of wages and prices his study of marketing represents a body of evidence and of ideas in which future students of medieval agriculture will need to find points of departure. As readers of this journal will know he had continued to work on some of the problems raised by his researches. We can only regret that the opportunity to carry his explorations further has been denied to him.

EDWARD MILLER

NEWS ON CONFERENCES

The BAHS holds three conferences a year. The first is its annual residential Spring Conference held at a different location each year in early April. The second is a one-day conference on a local history theme on a Saturday in September/October, again at a different location each year. Members of the Society who feel they would like to attend a conference at this time of the year, and can suggest either local themes and venues, or strategies, which they believe would tap an existing market and draw in a significant audience are invited to contact the Autumn Conference organizer, Richard Hoyle of the University of Central Lancashire at his home address, 37 Lower Bank Road, Fulwood, Preston PR2 4NS. This year's conference will beheld in Winchester in conjunction with the Hampshire Record Office on the theme of medieval Hampshire. The final conference is also a one-day conference which is held at the Institute of Historical Research, Senate House, University of London on the first Saturday in December. These conferences are organized by John Broad, Department of History, University of North London.

Looking ahead to 1996 the Spring Conference then will be held at Roehampton, Surrey. The local organizer is Peter Edwards, Department of History, Roehampton Institute of Higher Education, Digby Stuart College, Roehampton Hill, London SW15 5PH. Peter has already arranged a number of speakers whose papers will include, Peter Atkins on the geography of food production, Dorian Gerhold on local landownership patterns, a symposium featuring Sylvia Seeliger, Judy Gielgud and Wendy Thwaites on women in agriculture, Malcolm Thick on market gardening and Terry Gourvish on the brewing industry. As an added attraction and reward for late-stayers after the papers are concluded on Tuesday, the conference will also involve a field trip to Young's Brewery at Wandsworth after breakfast on the final Wednesday morning! The dates that you should keep free in your 1996 diary are Monday 1 April to Wednesday 3 April, and further details can be obtained either from Dr Edwards or the BAHS Secretary.

Incidentally, this conference will follow the Economic History Society's Spring Conference held at the University of Lancaster from 29 to 31 March 1996. Those who would like further details of this should contact Mr Oliver Westall, Economic History Society 1996 Conference Secretary, Department of Economics, School of

Management, University of Lancaster, Bailrigg, Lancaster LA1 4YX.

The British Agricultural History Society's 1997 Spring Conference will be held at the University of Portsmouth from Monday 7 to Wednesday 9 April and Dr John Chapman, University of Portsmouth, Buckingham Building, Lion Terrace, Portsmouth, PO1 3HE, will be the local organizer. Further details of the this conference can be obtained from him.

This conference follows the Economic History Society's 1997 Spring Conference which will be held at the University of Sussex from 4 to 6 April. The Economic History Society 1997 Conference Secretary is Professor P Thane, School of Humanities, University of Sussex, Falmer, Brighton BN1 9QN.

CALL FOR CONFERENCE PAPERS

The Society is always glad to hear from those willing to offer papers at conferences. If you have one to offer you can either contact one of the conference organizers, or the BAHS Secretary who acts as an overall conference co-ordinator. You should supply a title for your paper and some details, preferably in the form of a short synopsis, together with an indication of which conference(s) you will be available to deliver it to. The addresses of the organizers of the forthcoming conference are given above. The BAHS Secretary is Dr Richard Perren who can be contacted at the Department of History and Economic History, Taylor Building, University of Aberdeen, Old Aberdeen AB9 2UB, Fax 0224 272300.

REQUESTS FOR HELP

As part of our service to readers Notes and Comments now includes a section under this heading. This is designed for all members of the BAHS, but particularly those who are not attached to an academic institution. We hope this will provide assistance for two types of problem. Firstly, those thinking of carrying out research and who have chosen a topic, but are not too sure where to begin, or want to know who else has worked on that particular subject. And secondly, those who are well into a project but need further information to fill in gaps, or require advice on methodology. From time to time we have published lists of research in progress, but as there are intervals of some time between their appearance it is hoped this spot will fill the gap where someone wants information in the short term. This service is open to all members and if you feel it might be of some help to yourself, you are urged to send your name and address, along with your request, to the Secretary of the BAHS, Dr Richard Perren, Department of History and Economic History, Taylor Building, University of Aberdeen, Old Aberdeen, AB9 2UB.

A REQUEST FOR HELP

William P L Thompson of The South Manse, Burray, Kirkwall KW17 2SS is working on the break-up of big estates in Orkney in the 1920s. The trends in Orkney are similar to those in other areas but some features are more pronounced. Owner-occupancy was in decline until 1919, when the trend was reversed, and by 1930 the majority of farmers owned their own land. He is using the Valuation Roll to analyse landownership in 1919, and hopes to follow these sales through subsequent rolls and other sources such as newspaper accounts. However, he is having problems in locating one of his background sources, J P Maxton, Landownership in Scotland in its Relations to the Economic Development of Agriculture in the Period 1871–1921, unpublished B Litt thesis, Oxford University, 1930. Oxford B Litt theses are notoriously difficult to track down. This volume does not appear in the Society's *Dissertations on British Agrarian History* by Raine Morgan (1981), nor does it appear in any of the supplements containing omissions and additions published since then in the *Review*. If any readers know where this volume can be located, or can furnish any information that might lead to its discovery, are invited to contact William Thompson.

RESEARCH ON WATER MEADOWS IN HAMPSHIRE

The Institute of Irrigation Studies at the University of Southampton is currently researching the history and current use of irrigated water meadows in the Itchen and Test valleys from an engineering point of view. Their historical research will be based on documentary sources and the current use of these meadows will be studied by surveying. After the research is completed it is intended to rehabilitate one of the meadows around Ovington, near Arlesford by undertaking a programme to restore the hatch used to dam the river, re-build the main and lesser ducts and floor and wall them with timber, and also to dig new drains. Further details of this project can be obtained from Dr Martin Burton, Deputy Director, Institute of Irrigation Studies, University of Southampton, Highfield, Southampton SO17 1BJ.

MORE BACK-COPIES OF THE REVIEW WANTED

At present the Secretary has no knowledge of readers with back-sets to dispose of, as all the names he had been given for the last issue have now cleared theirs. But there are two members still looking for copies. One is Richard Hoyle, 37 Lower Bank Road, Fulwood, Preston PR2 4NS, and the other is Paul Stamper, Shropshire County Council

Archaeology Service, Winston Churchill Building, Radbrook Centre, Radbrook Road, Shrewsbury SY3 9BJ. Members with back-copies of the *Review* they want to sell should get in touch with Richard and Paul directly.

SOUTH HAMS LIME KILNS

The South Hams in south Devon contain 26 or so lime kilns around the Salcombe/Kingsbridge Estuary which were one used to supply lime to local agriculture. They are no longer in use for lime-burning and many are in a state of collapse. The South Hams Society has identified two on the shore of Frogmore Creek which are Grade II listed structures and need some work doing to restore and conserve them. It is estimated this will cost £15,000. The South Hams Society is currently seeking financial assistance for this project and any member who feels like assisting is invited to contact Mrs P B Lye, Secretary of the South Hams Society, 1 The Terrace, Loddiswell, Kingsbridge, Devon TQ7 4RH (telephone 01548 550802).

SURVEY OF PLANNED FARMS AND THE BUILDINGS OF HIGH FARMING

English Heritage is setting up a project to look at the planned farms of the eighteenth and early nineteenth century and the buildings of the mid-nineteenth century 'high farming' period. For this help is needed in identifying such farmsteads across England.

Like all old farm buildings, planned and model farmsteads are difficult to adapt for modern use. They are often arranged around a courtyard, the entrance to which is too narrow for modern machinery. As a class of building they are at great risk; yet as a historical source they are of vital importance. We know little about their distribution on a national scale; who built them, or where and why. This information would help answer historical questions about the nature, distribution and extent of landlord influence on improved and 'high' farming.

Because many 'model' farms date from after 1850, they were often not deemed eligible for listing at the time of the resurvey and their industrial/non-vernacular style has not attracted the attention of students of vernacular architecture.

Any attempt to preserve these buildings will have to be very selective and for this reason it is extremely important to choose the right ones. This makes a national survey and the production of a national gazateer essential to the making of informed choices. Dr Wade Martins would be very grateful for any information on planned or model farms that members may know of, whether documentary or from field evidence. Although the project will include a certain element of fieldwork, it will obviously be impossible to visit all sites and so it must rely on the eyes of others to locate examples. Please send information to Dr Susanna Wade Martins (project consultant), The Longhouse, Eastgate Street, North Elmham, Dereham, Norfolk NR20 5HD.

THE AGRICULTURAL HISTORY REVIEW

EDITORS: A D M PHILLIPS AND D G HEY

DEPARTMENT OF GEOGRAPHY, UNIVERSITY OF KEELE,
KEELE, STAFFORDSHIRE ST5 5BG

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Contributions and letters on any aspects of the history of agriculture and rural society and economy should be sent to the Editors. Articles are normally expected to be about 8000 words in length, but manuscripts of up to 15,000 words are also welcomed. Proposals for Supplements of length intermediate between the long article and the book, normally not exceeding 30,000 words should also be sent to the Editors. Intending contributors are advised first to obtain a copy of the *Review's* 'Notes for Authors and Reviewers' from the Editors. The Society does not accept responsibility for the opinions expressed by contributors, or for the accidental loss of manuscripts, or for their return if they are not accompanied by a stamped addressed envelope.

Correspondence about conferences and meetings of the Society, and about more general matters, should be sent to Dr R Hoyle, Secretary, BAHS, Department of Historical and Critical Studies, University of Central Lancashire, Preston PR1 2HE.

Correspondence on matters relating to membership, subscriptions, details of change of address, sale of publications, and exchange publications should be addressed to Dr E J T Collins, Treasurer, BAHS, Rural History Centre, The University, PO Box 229, Reading RG6 2AG.

Enquiries and correspondence relating to advertising should be sent to Dr J R Walton, Department of Geography, University College of Wales, Aberystwyth SY23 3RA.

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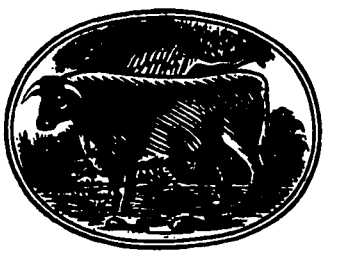
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THE AGRICULTURAL HISTORY REVIEW



a journal of agricultural and rural history

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1996

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The Society aims to promote the study of agricultural history and the history of rural economy and society, amongst other ways, through (a) the publication of the *Agricultural History Review* together with supplements and other appropriate items (b) the holding of conferences in its own right and in conjunction with other organizations (c) the promotion of the conservation of historically significant landscapes and the rural environment (d) the promotion of the teaching of the history of agriculture, the rural economy and society, and the environment, at all levels of education (e) the promotion of links with societies and institutions in Europe and world-wide which have similar aims and objects.

Membership is open to all who are interested in the subject and the subscription is £15 due on 1 February in each year. There is a reduced rate of £5 for students and those not in full time employment and those registered unemployed. Full details may be obtained from the Treasurer, BAHS, Rural History Centre, The University, PO Box 229, Reading, RG6 2AG.

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The Demesne-Farming Systems of Post-Black Death England: A Classification[1]

By BRUCE M S CAMPBELL, KENNETH C BARTLEY, and JOHN P POWER

Abstract

What was the character of English demesne-farming systems in the half century or so after the Black Death and how does this compare with their character before? Data from three major samples of accounts (representing Norfolk, a ten-county area around London, and the country as a whole) are analysed in an attempt to answer this question. To clarify developments demesnes are classified into seven basic types, replicating the methodology used to develop an equivalent typology for the earlier period. The same methodology is also used to test the relative merits of regionally- versus nationally-derived classifications, with the latter being shown to possess significant advantages over the former. Each of the resultant seven national farming types is both mapped and described and the paper concludes with a consideration of what their configuration reveals about the changing agricultural geography of England in this post-plague era of population decline and economic contraction.

In few periods have farmers had to contend with demand shifts as dramatic as those of the fourteenth century.[2] Between 1315 and 1375 the country's population, along with that of much of north-west Europe, was reduced by at least half.[3] Suddenly there were significantly fewer mouths to be fed and, relatively, more land from which to feed them. Concomitant shifts in factor prices rendered land far cheaper than it had been at the peak of rural congestion at the beginning of the century, and labour much dearer (although the immediate post-Black Death labour laws endeavoured to restrain the inflationary wage rise).[4] Higher land to labour ratios and rising wage rates meant improved living standards and better diets for the majority. Christopher Dyer's analysis of harvest diets, for instance, demonstrates that by the close of the century workers were eating less bread and consuming more meat and ale.[5] Moreover, the food and drink were of a higher quality: wheaten

[1] The research for this paper was undertaken in conjunction with the project 'The Geography of Seignorial Land-ownership and Land-use, 1270–1349', funded by the Leverhulme Trust and based in the Department of Economic and Social History, The Queen's University of Belfast. We are also grateful for assistance and cooperation received from Dr James Galloway, Dr Derek Keene, Professor John Langdon, Dr Margaret Murphy, Miss Olwen Myhil, Miss Jenitha Orr, and Professor Mark Overton. Responsibility for any errors, of course, remains our own.

[2] The much discussed late seventeenth-century demand shift was much smaller: see E L Jones, 'Agriculture and economic growth in England, 1660–1750: agricultural change', *J Econ Hist*, XXV, 1965, pp 1–18 (reprinted in E L Jones, *Agriculture and the Industrial Revolution*, Oxford, 1974, 1–18); A Kussmaul, 'Agrarian change in seventeenth-century England: the economic historian as paleontologist', *J Econ Hist*, XLV, 1985, pp 1–30; H J Habakkuk, 'The agrarian history of England and Wales: regional farming systems and agrarian change, 1640–1750', *Econ Hist Rev*, 2nd series, XL, 1987, pp 281–96. Not until the revolution in world food markets of the late nineteenth century was a comparable shock experienced, although on that occasion its origin lay with supply rather than demand.

[3] Evidence of the English demographic experience is reviewed in R M Smith, 'Human resources', in G Astill and A Grant, eds, *The Countryside of Medieval England*, Oxford, 1988, pp 188–212; R M Smith, 'Demographic developments in rural England, 1300–48: a survey', in B M S Campbell, ed, *Before the Black Death: Studies in the 'Crisis' of the Early Fourteenth Century*, Manchester, 1991, pp 25–77.

[4] A crude comparison of demesne land values in a ten-county area around London for the periods 1270–1339 and 1375–1400 (using valuations given in extents attached to *Inquisitiones post mortem*) indicates a 27 per cent decline in the unit value of arable, a 19 per cent decline in the unit value of meadow, and an 18 per cent decline in the unit value of pasture (Feeding the City I, IPM database; Feeding the City II, IPM database). Over the same period the real wage rate of a building craftsman rose by 33 per cent (E H Phelps Brown and Sheila V Hopkins, 'Seven centuries of the prices of consumables, compared with builders' wage-rates', *Economica*, XXII, 1956, pp 296–314, Appendix B (reprinted in E M Carus-Wilson, ed, *Essays in Economic History*, 1962, pp 179–96). For rural wage rates and the impact of the Statutes of Labourers, see D L Farmer, 'Prices and wages, 1350–1500', in E Miller, ed, *The Agrarian History of England and Wales, III, 1348–1500*, (hereafter *Ag Hist III*) 1991, pp 467–90.

[5] C Dyer, 'Changes in diet in the late Middle Ages: the case of harvest workers', *AHR*, 36, 1988, pp 21–37; *idem*, *Standards of Living in the Later Middle Ages: Social Change in England c 1200–1520*, 1989.

bread replaced that baked from rye and barley, beef displaced bacon, and ale supplanted cider. These demographic and dietary changes imply an agriculture in which animals assumed an enhanced importance and in which the calorifically extravagant brewing-grains occupied an enlarged share of a reduced cropped acreage as the imperative to maximize the area devoted to the vital bread grains was relaxed.[6] It also implies an agriculture in which farmers traded down to less labour intensive and more land extensive systems of production, a development which should further have favoured livestock over crops and will have had important implications for land and labour productivity.[7] To what extent are these agricultural developments borne out by the evidence?

Systematic, quantifiable data of agricultural production are solely available for the demesne sector. At the opening of the fourteenth century, when direct demesne management was at its height, this sector probably comprised just under a third of the total arable area, but by the close of the century that share had undoubtedly shrunk as narrowing profit margins and greater economic uncertainty encouraged growing numbers of landlords to lease out their demesnes.[8] It is the accounts rendered annually for those manors whose demesnes landlords kept in hand which are medieval historians' principal source of agricultural information.[9] Patterns of documentary creation and survival mean that a wider cross-section of estates is documented at the end of the fourteenth century than the beginning, although after 1375 the actual number of documented demesnes progressively diminishes as direct management more and more became the exception rather than the rule, increasingly confined to the home farms of lay and ecclesiastical households. Reconstructing the composition of demesne production from a national sample of accounts must therefore, perforce, draw upon a smaller potential sample for the post-Black Death period than is available before, in the heyday of direct demesne management.

Two national samples of accounts, one comprising 389 documented demesnes for the period 1250–1349 the other comprising 297 demesnes for the period 1350–1449, provide a basis for quantifying the main changes in demesne production which occurred between the opening and close of the fourteenth century (Table 1).[10]

[6] The conversion of raw barley to ale resulted in a loss in available kilocalories of approximately 70 per cent: B M S Campbell, J A Galloway, D Keene, and M Murphy, *A Medieval Capital and its Grain Supply: Agrarian Production and Distribution in the London Region c 1300*, (hereafter *A Medieval Capital*) Historical Geography Research Series, 30, 1993, p 34.

[7] Livestock and their products required less labour per unit of output than crops. By 1851 Gregory Clark reckons that 'output per worker in animal husbandry was about 80 per cent greater than in arable cultivation': 'Labour productivity in English agriculture, 1300–1860', in B M S Campbell and M Overton, eds, *Land, Labour and Livestock: Historical Studies in European Agricultural Productivity*, Manchester, 1991, p 231. For the relationship between land, labour, and other forms of productivity, see M Overton and B M S Campbell, 'Productivity change in European agricultural development', in Campbell and Overton, *Land, Labour and Livestock*, pp 1–50.

[8] The proportion of a third is based on the evidence of the surviving 1279 Hundred Rolls: E A Kosminsky, *Studies in the Agrarian History of England in the Thirteenth Century*, 1956, pp 87–95. The priors of Norwich, for instance, slashed by half the area which they cultivated directly between the 1340s and 1390s, and by 1430 had abandoned direct management entirely: Bodleian Library, Oxford, Ms Rolls, Norfolk 20–47; Norfolk Record Office (hereafter NRO), DCN 1/1, 40/13, 60/4, 60/8, 60/10, 60/13, 60/14, 60/15, 60/18, 60/20, 60/23, 60/26, 60/28, 60/29, 60/33, 60/35, 60/37, 61/35–6, 62/1–2; DCN R233 B 4626, L'Estrange IB 1/4, 3/4, 4/4, NNAS 5890–918 20 D1–3; Raynham Hall, Norfolk, Townshend Mss. On the farming out of manors see, B F Harvey, 'The leasing of the Abbot of Westminster's demesnes in the later Middle Ages', *Econ Hist Rev*, 2nd series, XXII, 1969, pp 17–27; R A Lomas, 'The Priory of Durham and its demesnes in the fourteenth and fifteenth centuries', *Econ Hist Rev*, 2nd series, XXXI, 1978, pp 339–53; R R Davies, *Lordship and Society in the March of Wales 1282–1400*, 1978, p 113; J N Hare, 'The demesne lessees of fifteenth-century Wiltshire', *AHR*, XXIX, 1981, pp 1–15; M Mate, 'The farming out of manors: a new look at the evidence from Canterbury Cathedral Priory', *J Med Hist*, 9, 1983, pp 331–44.

[9] R H Hilton, 'The contents and sources of English agrarian history before 1500', *AHR*, III, 1955, 3–19; P D A Harvey, ed, *Manorial Records of Cuxham, Oxfordshire*, Oxfordshire Record Society, 50, and Royal Commission on Historical Manuscripts joint publication, 23, 1976; *idem*, *Manorial Records*, Archives and the User, 5, 1984.

[10] The national samples of manorial accounts were generously made available by Professor John Langdon of the Department of History, University of Edmonton. The bulk of these accounts are listed in Appendix C, part 2, of his unpublished PhD thesis, 'Horses, oxen, and technological innovation: the use of draught animals in English farming from 1066 to 1500', University of Birmingham, 1983. Data for some additional demesnes have also been incorporated. The crop and livestock profiles of each demesne, which provide the building blocks of these aggregate estimates, comprise the

Comparison of these two samples confirms that demesnes curtailed the scale of their arable operations and devoted more of their resources to pastoral husbandry. The mean cropped acreages of demesnes retained in hand were reduced by approximately a fifth. This was achieved partly by withdrawing land from cultivation and converting it to grass, partly by lengthening or increasing fallows and thereby cropping land less frequently, and partly by leasing portions of demesne arable to tenants.[11] Within the arable sector demesnes maintained the relative share of the cropped acreage devoted to wheat – the premier bread grain regularly consumed by a growing proportion of the population – but cut back on that devoted to the cheaper and coarser bread grains, notably rye and the various winter mixtures which commonly included rye. Oats, too, declined in both relative and absolute importance, possibly because of the withdrawal of cultivation from poorer soils and the shortening of some of the more intensive rotations (in which oats had often been the final course) but also because of its substitution with other spring-sown grains.[12] Barley and dredge, for instance, both gained in their relative and absolute shares of the cropped acreage. Although oats had long been used for brewing, ale manufactured from barley and dredge was increasingly favoured by a population whose thirst for quantity combined with quality was steadily rising.[13] If the cultivation of brewing grains was on the increase so too was that of legumes, although here the connection with rising living standards and improving diets is less obvious.

Legumes – collectively beans, peas and vetches – almost doubled their share of the sown acreage; a greater relative gain than that of any other crop. Hitherto large-scale legume cultivation had been mainly restricted to the most intensive of husbandry systems, where they provided a partial substitute for fallows, helped restore nitrogen levels within the soil, and provided a nutritious source of human and animal food.[14] Nevertheless, healthy as they were, legumes were not held in high dietary esteem due to their strong association with the pottages and coarse breads of the poor and fodder for animals.[15] Higher living standards are, therefore, hardly likely to have encouraged greater per capita consumption of legumes. Nor can their wider cultivation be attributed to a general adoption of more intensive methods of cultivation, for, on the whole, the opposite was the case.[16] Rather, legumes benefited from the expansion of pastoral farming (and especially heightened demesne investment in cart horses) with its correspondingly greater demand for fodder crops.[17] In effect, sowing land with legumes represented an alternative to converting it to grass and was especially attractive to those who wished to keep their arable options open. Indeed, in areas of entrenched commonfield agriculture, where there were institutional obstacles to the conversion of

mean of each individual variable calculated across the sampled accounts for that demesne. The relationships between variables have been calculated using these meaned values.

[11] All three strategies were employed on the bishop of Ely's demesne at Brandon, Suffolk, where the accounts record the areas *friscus* (ie unsown for more than one year), farmed out, and sown: Chicago University Library, Bacon Roll 643, 650–60.

[12] M M Postan, *The Medieval Economy and Society: An Economic History of Britain in the Middle Ages*, 1972, p 52.

[13] J A Galloway, D J Keene, M Murphy, and B M S Campbell, 'Changes in grain production and distribution in the London region over the fourteenth century', unpublished manuscript.

[14] B M S Campbell, 'Agricultural progress in medieval England: some evidence from eastern Norfolk', *Econ Hist Rev*, 2nd series, XXXVI, 1983, pp 26–46; *idem*, 'The diffusion of vetches in medieval England', *Econ Hist Rev*, 2nd series, XLI, 1988, pp 193–208.

[15] '... what had been baked for Bayard was boon to many hungry, And many a beggar for beans obediently laboured, And every poor man was well pleased to have peas for his wages': *William Langland: Will's Vision of Piers Plowman*, trans E Talbot Donaldson, ed by E D Kirk and J H Anderson, New York, 1990, lines 193–5, pp 65–6.

[16] See below, p 148.

[17] On the connection between legumes and the use of horses see, Campbell, 'Diffusion of vetches', pp 205–6; L W Hepple and A M Doggett, *The Chilterns*, Chichester, 1992, pp 94–5; *Ag Hist III*, p 271. On the considerable fodder requirements of cart horses see K Biddick, *The Other Economy: Pastoral Husbandry on a Medieval Estate*, Berkeley and Los Angeles, 1989, pp 116–21. On the increasing use of horses post 1349 see, J L Langdon, *Horses, Oxen and Technological Innovation: The Use of Draught Animals in English Farming, 1066–1500*, 1986, pp 95–7; B M S Campbell, 'Towards an agricultural geography of medieval England', *AHR*, 36, 1988, pp 91–3.

TABLE 1

The changing composition of seigneurial agricultural production *c* 1300–*c* 1400

Mean per demesne	*National samples of demesnes*						*Feeding the City samples of demesnes*[a]		
	Core demesnes only			*All demesnes*					
	1250–1349	*1350–1449*	*% change*	*1250–1349*	*1350–1449*	*% change*	*1288–1315*	*1375–1400*	*% change*
Percentage of sown acreage:									
wheat	31.0	30.4	−2	31.7	30.9	−3	32.8	32.3	−2
	16.3	*14.9*		*16.0*	*14.5*		*14.2*	*14.0*	
rye	4.7	2.0	−57	5.2	2.9	−44	6.4	2.2	−66
	9.4	*5.5*		*9.5*	*7.5*		*11.3*	*6.5*	
winter mixtures	2.1	1.3	−38	2.3	1.9	−17	3.9	2.1	−46
	6.7	*4.1*		*6.7*	*5.4*		*8.8*	*5.4*	
barley	16.0	23.0	+44	15.7	22.2	+41	11.2	18.3	+63
	17.3	*19.4*		*16.0*	*18.0*		*11.1*	*14.8*	
oats	33.6	23.8	−29	31.1	22.8	−27	30.0	22.6	−25
	20.0	*17.3*		*19.2*	*16.7*		*15.7*	*17.1*	
spring mixtures	3.7	5.0	+35	3.8	4.9	+29	6.6	8.2	+24
	10.0	*11.6*		*9.5*	*11.3*		*10.6*	*14.8*	
legumes	7.9	13.9	+76	9.5	13.9	+46	9.2	14.4	+57
	8.6	*12.0*		*9.4*	*11.5*		*8.9*	*10.5*	
Sown acreage	184.9	147.8	−20	193.1	151.7	−21	224.9	171.0	−24
	112.9	*82.5*		*118.5*	*85.9*		*127.7*	*81.5*	
Percentage of livestock units[b]:									
horses	15.5	14.3	−8	15.5	13.1	−15	18.3	16.1	−12
	12.3	*17.6*		*11.6*	*14.7*		*13.1*	*13.9*	
oxen	42.5	27.3	−36	40.4	24.9	−38	28.3	17.5	−38
	29.6	*26.2*		*28.0*	*23.4*		*18.8*	*15.5*	
adult cattle	14.3	16.6	+16	15.4	20.4	+32	19.8	23.9	+20
	16.4	*19.6*		*15.8*	*18.6*		*15.6*	*21.0*	
immature cattle	8.1	7.5	−7	9.1	9.1	±0	8.6	6.7	−22
	9.4	*9.3*		*9.8*	*9.4*		*7.6*	*7.6*	
sheep	16.6	31.1	+87	16.3	29.2	+79	20.8	31.2	+50
	21.6	*28.5*		*20.3*	*25.1*		*19.2*	*21.2*	
swine	3.0	3.1	+3	3.3	3.3	±0	4.2	4.6	+10
	5.7	*4.7*		*5.2*	*4.4*		*4.6*	*5.8*	
Livestock units[b]	59.3	73.1	+23	62.7	79.2	+26	66.8	80.3	+20
	51.0	*54.6*		*50.4*	*56.8*		*47.7*	*50.8*	
Stocking density[c]	34.5	56.2	+63	35.4	61.2	+73	35.3	57.9	+64
	25.1	*56.5*		*25.9*	*58.8*		*35.1*	*49.0*	
Number of demesnes	261	182	−30	389	297	−24	183	125	−32

Means in roman; standard deviations in italic.

[a] Covering Beds, Berks, Bucks, Essex, Herts, Kent, Middx, N'hants, Oxon, and Surrey.

[b] [horses × 1.0] + [(oxen + adult cattle) × 1.2] + [immature cattle × 0.8] + [(sheep + swine) × 0.1].

[c] livestock units per 100 sown acres.

Source: National samples of accounts, 1250–1349 and 1350–1449; Feeding the City I, accounts database; Feeding the City II, accounts database.

arable to grassland, increased fodder cropping offered the readiest means of raising livestock numbers.[18]

Whereas arable cultivation contracted in scale and shifted in focus pastoral husbandry underwent a wholesale expansion. On the face of it the 25 per cent rise in the number of livestock units stocked per demesne was roughly commensurate with the 20 per cent contraction in cropped acreage, but the magnitude of this rise is almost certainly understated, for the growing practice of leasing out dairy herds masks many of the younger cattle from view, in much the same way that sheep disappear from accounts on those estates – and the number was growing – which managed their flocks on an intermanorial basis and accounted for them separately.[19] Since with less land under the plough draught requirements were if anything contracting (that contraction being more pronounced in the case of oxen than of horses), the gain in livestock units principally represented an increase in the number of non-working animals being stocked.[20] The latter's share of total livestock units rose from 42 per cent to 58 per cent, with the bulk of that gain being accounted for by a marked rise in the number and size of sheep flocks. Whereas non-working cattle and swine more-or-less maintained their existing importance, sheep – notwithstanding serious outbreaks of murrain in the 1360s and depressed wool prices from the late 1370s – almost doubled their share of livestock units.[21] Sheep, significantly, were managed by predominantly extensive methods and their rising numbers probably reflect a corresponding expansion in temporary and permanent pasture.[22]

The net effect of these developments was to render the pastoral sector less subservient to the arable and ensure that demesne agriculture in general became more mixed. By the end of the fourteenth century stocking densities, as measured by the number of livestock units per sown acre, were at least 60 per cent higher than they had been at the beginning.[23]

How reliable and representative are these trends? Spatial and institutional bias in the creation and preservation of manorial accounts means that a truly random sample of all demesnes is unattainable. Nor are the samples which underlie Table 1 as large, comprehensive, and sharply focused as might have been possible given unlimited research time and resources and adequate

[18] B M S Campbell, 'A fair field once full of folk: agrarian change in an era of population decline, 1348–1500', *AHR*, 41, 1993, p 63; *Ag Hist III*, pp 216, 229. The post-1349 rise in fodder cropping is analogous to that which occurred post 1640, B M S Campbell and M Overton, 'A new perspective on medieval and early modern agriculture: six centuries of Norfolk farming *c* 1240–*c.* 1850', *Past and Present*, 141, 1993, pp 59–60, 87–8, 90–2.

[19] The livestock units employed are as follows: horses, 1.0; oxen, bulls, cows, 1.2; immature cattle, 0.8; sheep, 0.1; swine, 0.1 (see B M S Campbell, 'Land, labour, livestock, and productivity trends in English seignorial agriculture, 1208–1450', in Campbell and Overton, *Land, Labour and Livestock*, pp 156–7). The two Feeding the City samples of accounts (see below note 28) indicate a rise in the proportion of demesnes farming dairies from 13 per cent in the period 1288–1315 to 34 per cent in the period 1375–1400. For examples of centralized sheep accounting see F M Page, '"Bidentes Hoylandie": a medieval sheep farm', *Econ Hist*, 1, 1929, pp 603–5; R A L Smith, 'The estates of Pershore Abbey', unpublished MA thesis, University of London, 1939, pp 215–16; R H Hilton, 'Winchcombe Abbey and the manor of Sherborne', *Univ Birmingham Hist Jnl*, 2, 1949–50, pp 50–2; Davies, *Lordship and Society*, p 119; NRO, L'Estrange Collection IB 3/4.

[20] On the ratio of oxen to horses post 1350 see Langdon, *Horses, Oxen and Technological Innovation*, pp 95–7; Campbell, 'Towards an agricultural geography', pp 91–3.

[21] T H Lloyd, 'The movement of wool prices in medieval England', *Econ Hist Rev, Supplement VI*, 1973, pp 19–20. For associated changes in the relative price of sheep see Farmer, 'Prices and wages', pp 458, 508–12.

[22] B M S Campbell, 'The livestock of Chaucer's reeve: fact or fiction?', in E B Dewindt, ed, *The Salt of Common Life: Individuality and Choice in the Medieval Town, Countryside and Church. Essays presented to J Ambrose Raftis on the Occasion of his 70th Birthday*, Kalamazoo, 1995, pp 271–305. For direct evidence of the expansion of pasture see E Miller, ed, 'The occupation of the land', in *Ag Hist III*, pp 34–174.

[23] The rise in stocking densities was to be sustained until well into the fifteenth century: Campbell, 'Land, labour, livestock, and productivity trends', pp 153–8; *Ag Hist III*, p 314; M Overton and B M S Campbell, 'Norfolk livestock farming 1250–1740: a comparative study of manorial accounts and probate inventories', *J Hist Geog*, 18, 1992, pp 386–92.

calendaring of manorial records.[24] As it is, a broad geographical coverage was in both cases only achieved by casting a wide chronological net. This poses greatest problems in the later period, since the agricultural changes which occurred between 1350 and 1449 were more profound than those between 1250 and 1349. It was after 1375 in particular that changing factor and commodity prices really began to bite, accelerating the landlords' retreat both from the more intensive forms of production and, ultimately, from direct management. From this date, therefore, it becomes increasingly difficult to find usable accounts for many parts of the country. A third of sampled demesnes have a mean date of account from before this critical economic watershed and two-thirds from after, although most of the latter bunch into the final quarter of the fourteenth century. After 1400 there is a significant tailing off in documented demesnes as direct management increasingly became the exception rather than the rule. The sampled demesnes are therefore chronologically weighted towards the late fourteenth century with the 1380s both the modal and median decade. The corresponding modal and median decades in the earlier sample are the 1280s and 1290s. In their average characteristics the two samples therefore broadly encapsulate conditions roughly a century apart. The changes that emerge from comparison of these two samples are consequently those which took place primarily between the late thirteenth and the late fourteenth centuries.

Even with such a wide chronological net the geographical coverage of both samples remains patchy, and would have become unacceptably so had comparison been restricted to demesnes common to both periods. Not only do these amount to less than half the total but almost all belonged to perpetual institutions and are consequently especially atypical of the demesne sector at large.[25] To insist upon continuity of documentation would exclude much of the west and north-west of the country, where direct demesne management was never as widely and firmly established as in the south and east. As it is, the many demesne vaccaries and bercaries of these upland margins are largely masked from view and it is the mixed-husbandry of the more favoured lowland areas that tends to be best documented.[26] Nevertheless, even within the arable and lowland south and east, and especially after 1349, there are some remarkable inconsistencies in the pattern of account roll survival. Norfolk, for instance, is exceptionally well covered (as it is in the earlier period) whereas neighbouring Lincolnshire is barely represented at all. In many counties – Huntingdonshire, Middlesex, Somerset, Suffolk, Wiltshire, and Worcestershire – the sampled manors are decidedly bunched according to the location of estates with extant documentation, but in Devon and Cornwall, the Welsh borders, and the whole of the north-west such estates are few and far between and much less representative both of the broad spectrum of ownership types and the general character of husbandry in these regions.[27] Some of these deficiencies might be rectified by a more systematic archival search for extant

[24] Tracking down manorial accounts for demesnes still in hand is no simple task, even within a single repository. The starting point for any search is the National Register of Archives, Quality House, Quality Court, Chancery Lane, London. Listings of accounts by geographical area are especially rare. For a recent list of all known pre-1350 Kentish manorial accounts, see J A Galloway, M Murphy, and O Myhill, *Kentish Demesne Accounts up to 1350: A Catalogue*, 1993.

[25] See, for example, B M S Campbell, 'Measuring the commercialisation of seigneurial agriculture *c* 1300', in R H Britnell and B M S Campbell, eds, *A Commercialising Economy: England 1086–1300*, Manchester, 1994, pp 132–93.

[26] M A Atkin, 'Land use and management in the upland demesne of the De Lacy estate of Blackburnshire, *c* 1300', *AHR*, 42, 1994, pp 1–19; H P R Finberg, *Tavistock Abbey: a Study in the Social and Economic History of Devon*, 1951; I Kershaw, *Bolton Priory: the Economy of a Northern Monastery 1286–1325*, 1973, pp 30–112.

[27] H S A Fox has tracked down most of the post-1349 grange accounts for Devon and Cornwall: for his list see *Ag Hist III*, p 305.

accounts but many are irremediable due to the inherent patchiness of account survival.

Considerable comfort may therefore be taken in the evidence of two independent and chronologically and geographically more sharply focused samples of demesnes for the ten counties of Bedfordshire, Berkshire, Buckinghamshire, Essex, Hertfordshire, Kent, Middlesex, Northamptonshire, Oxfordshire, and Surrey, which confirm the nature and magnitude of virtually all the changes that have been described (Table 1). The earlier of these two samples embraces some 183 demesnes and relates to the period 1288–1315 at the climax of thirteenth-century demographic and commercial expansion; the later sample (hereafter referred to as the Feeding the City II sample) comprises some 125 demesnes and focuses on the years 1375–1400 when demesne producers were contending with price deflation and wage inflation. Both samples are the best that surviving documentation allows, with the individual manor means being based upon up to three annual accounts whenever possible.[28] Particular confidence can therefore be placed in the aggregate trends that they reveal, the more so as these are borne out by a comparison of 57 demesnes common to both samples. Overall, demesnes within these 'metropolitan counties' cropped 24 per cent less arable, stocked 20 per cent more livestock units, and registered a 64 per cent improvement in stocking densities (proportions remarkable close to those obtained from the national samples – Table 1) at the end of the fourteenth century than at the beginning.[29] Within the arable sector – as was the case nationally – wheat maintained its share of the cropped acreage while the respective shares of rye and rye mixtures fell and those of barley and dredge rose. Legumes again expanded in importance, increasing their share of the cropped acreage by over half. Their expansion is probably linked to the greater relative importance attached to horse power in these counties after 1349. Nevertheless, it was the non-working animals that were the principal beneficiaries of the general growth in flocks and herds. Their share of livestock units rose from 53 to 66 per cent. The bulk of this gain came from the increase in sheep numbers. Whereas cattle and swine registered virtually no change in importance sheep expanded from 21 to 31 per cent of livestock units.

It is improbable that such far-reaching changes affected all demesnes equally. What effect did they have upon the types and distributions of farming systems?

I

There is no simple or perfect method of classifying temperate agricultural systems, where the enterprise of individual farms is subject to almost infinite variation within the narrow bounds set by the limited available range of crops and animals. Yet without classification generalization is impossible and the pattern of farming systems too kaleidoscopic to comprehend. These inherent problems are greatly com-

[28] The two Feeding the City accounts databases were created by Dr James A Galloway and Dr Margaret Murphy (with some assistance from Miss Olwen Myhil) and derive from the projects 'Feeding the City (I)', funded by the Leverhulme Trust, and 'Feeding the City II', funded by the Economic and Social Research Council (Award No R000233157). Both were collaborative projects between the Centre for Metropolitan History, Institute of Historical Research, University of London and the Department of Economic and Social History, The Queen's University of Belfast, the former codirected by Dr Derek Keene and Dr Bruce Campbell, the latter by Drs Keene, Campbell, Galloway, and Murphy. The Feeding the City I accounts are listed in Appendix I of *A Medieval Capital*; a handlist of the Feeding the City II accounts is available from the Centre for Metropolitan History. Both accounts databases have been incorporated within the Pre-Black Death England Database being created at the Department of Economic and Social History, The Queen's University of Belfast. The Feeding the City II accounts database has been deposited at the ESRC Data Archive, Essex University.

[29] An alternative system of livestock units, graded to take account of the age and sex of animals and based on the internal evidence of sale and purchase prices, indicates an 18 per cent gain in livestock units and 63 per cent improvement in stocking densities. Limiting comparison to the 57 demesnes common to both Feeding the City databases yields more modest gains of 7 per cent and 48 per cent respectively.

pounded when the variables upon which classification is to be based are constrained by available historical evidence. Hence the ingenuity and effort displayed by British agricultural historians over the past thirty years, commencing with the major early modern contributions of Joan Thirsk and Eric Kerridge, in their endeavour to identify and describe farming types and farming regions.[30] Hitherto the problem has mostly been tackled at a county or regional level, these different regional solutions then being aggregated to provide an overall national picture, as in the case of volumes II, III, IV, and V of the *Agrarian History of England and Wales*.[31] This has obvious limitations, for national systems of classification should ideally be based upon the systematic application of a consistent set of criteria at a national scale. Moreover, the units of classification should be the fundamental units of agricultural production – that is, farms not farming regions – and the resultant typologies should reflect properties inherent to those farms, independent of such external forces as soils, climate, or distance from the market, which may have influenced the type of farming.[32] Whether or not specific farming types were associated with, or exclusive to, particular regions can then be established by mapping the resultant typology. That is the method adopted here, building upon the procedure already developed and employed to classify the pre-1350 national sample of demesnes.[33]

Using a common method to derive independent classifications from similarly structured sets of data is the best way to analyse the changing geography of agriculture. Even so, comparison between the two periods 1250–1349 and 1350–1449 is far from unproblematic since, for the reasons already given, the data on which the classifications rest are not the product of random sampling. Indeed, such sampling is inappropriate where it is known that the available documentation is shot through with geographical, institutional and temporal bias.[34] Tests of statistical significance have therefore been rejected as a valid comparative technique in favour of the more intuitive and exploratory approach elaborated in this paper.[35] Used in this way, the results do nevertheless point to the more important changes which probably occurred and offer a simplified typology of the principal farming systems in operation at the time.

The literature on the derivation of agricultural typologies is considerable.[36] The range of criteria which ought ideally to be included comprise the crop and livestock association, the methods used to grow the crops and produce the stock, the intensity of labour, capital, and organizational inputs and associated rates of output, and whether or not production was for consumption or

[30] Systematic regional description of past farming systems really begins in 1967 with the simultaneous publication of J Thirsk, 'The farming regions of England', in J Thirsk, ed, *The Agrarian History of England and Wales, IV, 1500–1640*, 1967, pp 1–112, and E Kerridge, *The Agricultural Revolution*, 1967, pp 41–180.

[31] H E Hallam, ed, *The Agrarian History of England and Wales, II, 1042–1350*, 1988, pp 272–496; *Ag Hist III*, pp 175–323; Thirsk, *Agrarian History, IV*, pp xxi, 1–112; J Thirsk, ed, *The Agrarian History of England and Wales, VI, 1640–1750: Regional Farming Systems*, 1984. For critiques see, respectively, B M S Campbell, 'Laying foundations: the Agrarian History of England and Wales, 1042–1350', *AHR*, 37, 1989, pp 190–1; Campbell, 'A fair field', pp 62–3; E L Jones, 'The condition of English agriculture, 1500–1640', *Econ Hist Rev*, 2nd series, XXI, 1968, pp 615–16; M Overton, 'Depression or revolution? English agriculture, 1640–1750', *J Brit Studies*, 25, 1986, pp 345–7.

[32] D B Grigg, *The Agricultural Systems of the World: An Evolutionary Approach*, 1974, pp 2–3.

[33] J P Power and B M S Campbell, 'Cluster analysis and the classification of medieval demesne-farming systems', *Trans Inst Brit Geogr*, new series, 17, 1992, pp 227–45. The classifications yielded by this method represent an improvement upon those offered in B M S Campbell and J P Power, 'Mapping the agricultural geography of medieval England', *J Hist Geog*, 15, 1989, pp 24–39. Using the pre-1350 classification to classify post-1349 farming systems is obviously inappropriate given the absolute and relative changes in farm enterprise which had taken place.

[34] For the mismatch between the social distribution of landed incomes and the institutional distribution of documented demesnes in the Feeding the City I accounts database, see Campbell, 'Measuring the commercialisation of seigneurial agriculture', p 140.

[35] On the precondition of randomness for the application of significance tests see, D Ebdon, *Statistics in Geography: a Practical Approach*, 1977, pp 12–19.

[36] Grigg, *Agricultural Systems*, pp 2–4.

exchange. Here, however, classification is based exclusively upon the crops grown, the livestock reared, and the ratio of the latter to the former since these are the most readily available quantifiable criteria for the majority of documented demesnes. They also provide an indirect index of the character and intensity of production and convey some impression of the nature and degree of economic specialization. In this context it would have been a great advantage to be able to include some index of the proportion of the total arable area that was actually cropped, but too few accounts contain this information.[37] Better recorded are seeding rates, plough type, and size of plough team; had they been included a more subtly differentiated classification might have resulted.[38]

Since the aim is to produce a classification based upon demesne enterprise rather than demesne size it is necessary to express each of the four crop and five livestock variables in relative rather than absolute terms, taking care to calculate these relative measures in such a way that closed numbers are not a problem.[39] (Percentages have merely been used in Tables 2 and 3 to summarize the final results.) This also has the merit of controlling for customary acres. Only the tenth variable – the number of livestock units per 100 cropped acres – is susceptible to variations in acre size. As a further safeguard, a principal components analysis was conducted to remove correlations between variables and eliminate any bias arising from the uneven representation of crop and livestock variables. It is the scores derived from that that have been employed as the basis of classification. The choice of the number of principal component scores used proved to be critical. In the case of the pre-1350 classification it was the scores of the first six components that were used; these accounted for 83 per cent of the variance across the ten variables and yielded a 'stable' classification comprising eight basic farming types.[40] Post-1349, however, using the first six component scores (which account for 82 per cent of variance) yielded a 'stable' classification containing only three basic farming types, with the vast majority of all demesnes falling into a single mixed-farming category. Yet, while this result broadly supports the general observation that in this later period farming systems were less differentiated than they had been before, from a historical point of view a fuller break down of farming types is plainly desirable. The decision was therefore taken to eliminate the sixth and least significant principal component score and to use only the first five components, accounting for 74 per cent of total variance and yielding a 'stable' classification comprising seven basic farming types. The classification itself was derived using the statistical technique known as cluster analysis and, in fact, it has long been observed of cluster analysis that its operation can be ineffective if variables of relatively small significance (in this case the sixth component score) generate intermediate points between cluster groupings.[41] To ensure that the resultant classification reflected real differences within the data rather than the type of clustering technique chosen three separate clustering techniques were applied – Ward's,

[37] *A Medieval Capital*, pp 129–33, 139–41.

[38] On seeding rates, see *A Medieval Capital*, pp 131, 136–8. On ploughs, plough teams, and farm vehicles, see Langdon, *Horses, Oxen and Technological Innovation*.

[39] All crops are specified in acres; all livestock are specified in livestock units (see above note 19). The variables are: R1 = Log (winter grains/spring grains); R2 = Proportion (wheat/winter grains); R3 = Proportion (oats/spring grains); R4 = Log (legumes/total grain); R5 = Log (horses/oxen); R6 = Log (non-working animals [horses + oxen]/working animals); R7 = Log (immature cattle/adult cattle [omitting oxen]); R8 = Percentage (sheep/non-working animals); R9 = Percentage (swine/livestock units); R10 = Log (livestock units/total sown). All zero values have been replaced with 0.01. Note, R10 is incorrectly specified as Log(livestock units x 100/sown) in Power and Campbell, 'Cluster analysis', p 230.

[40] Power and Campbell, 'Cluster analysis', pp 230–2.

[41] B S Everitt, *Cluster Analysis*, SSRC Reviews of Current Research, 11, 2nd ed, 1980.

TABLE 2

National farming types 1350–1449: mean characteristics of core demesnes

Mean per demesne	*Farming type/cluster group*							*All core demesnes*
	1	*2*	*3*	*4*	*5*	*6*	*7*	
Percentage of sown acreage:								
wheat	12.1	2.8	30.7	30.1	34.3	39.0	33.7	30.4
	5.6	*5.2*	*8.5*	*9.2*	*15.5*	*10.9*	*14.4*	*14.9*
rye	4.2	18.3	0.6	0.1	0.5	1.3	2.1	2.0
	5.2	*13.8*	*2.1*	*0.4*	*2.3*	*3.5*	*5.1*	*5.5*
winter mixtures	0.3	5.1	1.0	4.0	1.3	1.1	0.7	1.3
	0.7	*10.5*	*2.6*	*8.1*	*3.2*	*3.3*	*3.5*	*4.1*
barley	56.8	38.7	28.6	19.8	18.5	4.8	16.6	23.0
	9.3	*19.7*	*13.7*	*12.1*	*10.4*	*9.7*	*17.0*	*19.4*
oats	12.7	17.4	12.4	7.1	29.9	42.0	24.6	23.8
	5.0	*9.1*	*9.6*	*7.1*	*16.9*	*11.2*	*19.3*	*17.3*
spring mixtures	0.1	2.0	5.3	12.4	6.8	1.3	7.8	5.0
	0.4	*4.6*	*11.0*	*14.5*	*13.5*	*3.1*	*16.0*	*11.6*
legumes	13.7	1.5	21.2	26.5	8.8	10.5	14.5	13.9
	4.5	*1.2*	*13.2*	*17.2*	*7.7*	*8.5*	*12.8*	*12.0*
Sown acreage	146.0	109.4	186.1	134.8	123.0	157.7	136.3	147.8
	86.1	*105.5*	*81.2*	*72.3*	*74.0*	*80.8*	*69.2*	*82.5*
Percentage of livestock units[a]								
horses	16.5	11.9	7.7	32.4	9.4	10.1	29.9	14.3
	12.0	*4.5*	*5.8*	*26.7*	*8.8*	*5.7*	*31.7*	*17.6*
oxen	2.6	1.6	20.1	36.3	24.4	24.2	68.3	27.3
	2.8	*3.9*	*13.2*	*28.7*	*12.2*	*17.2*	*31.5*	*26.2*
adult cattle	48.1	29.9	12.3	6.0	2.9	35.0	0.7	16.6
	16.0	*22.6*	*7.4*	*11.1*	*8.4*	*12.5*	*2.4*	*19.6*
immature cattle	15.3	5.0	12.2	0.4	0.0	16.2	0.0	7.5
	6.7	*5.2*	*9.0*	*0.7*	*0.0*	*8.4*	*0.0*	*9.3*
sheep	13.6	51.4	44.3	7.0	62.0	12.2	0.0	31.1
	17.7	*29.5*	*15.7*	*14.1*	*17.5*	*14.8*	*0.0*	*28.5*
swine	3.9	0.3	3.5	17.8	1.3	2.3	1.1	3.1
	3.2	*0.6*	*2.7*	*7.9*	*1.8*	*2.2*	*1.9*	*4.7*
Livestock units[a]	51.3	71.2	118.4	26.4	73.9	85.9	22.5	73.1
	33.9	*58.4*	*64.6*	*19.0*	*45.5*	*35.0*	*12.1*	*54.6*
Stocking density[b]	38.3	59.9	69.3	20.0	77.2	63.7	18.3	56.2
	16.7	*42.5*	*36.6*	*7.8*	*92.3*	*32.5*	*9.1*	*56.5*
Number of demesnes	20	7	40	10	45	33	27	182

Means in roman; standard deviations in italic.

1 = intensive mixed-farming; 2 = light-land intensive; 3 = mixed-farming with sheep; 4 = arable husbandry with swine; 5 = sheep-corn husbandry; 6 = extensive mixed-farming; 7 = extensive arable husbandry.

[a] [horses × 1.0] + [(oxen + adult cattle) × 1.2] + [immature cattle × 0.8] + [(sheep + swine) × 0.1].

[b] livestock units per 100 sown acres.

Source: National sample of accounts, 1350–1449.

K-means, and Normix. Each farming system was then defined on the basis of those demesnes identically classified by all three cluster techniques (Table 2). In effect, this identified an unambiguous *core* of 182 clearly differentiated demesnes. This is a smaller proportion of the total sample (61.3 per cent compared with 67.1 per cent) than the core of 261 pre-1350 demesnes and is consistent with the smaller number of principal

TABLE 3

National farming types 1350–1449: mean characteristics of core and peripheral demesnes

Mean per demesne	*Farming type/cluster group*							*All*
	1	*2*	*3*	*4*	*5*	*6*	*7*	*demesnes*
Percentage of sown acreage:								
wheat	15.1	6.3	32.2	32.0	34.8	36.6	33.7	30.9
	7.1	*6.6*	*9.5*	*10.6*	*15.0*	*13.3*	*14.4*	*14.5*
rye	3.9	19.3	1.3	0.1	1.0	3.3	2.0	2.9
	6.0	*15.6*	*4.4*	*0.4*	*3.5*	*6.9*	*5.1*	*7.1*
winter mixtures	1.8	6.8	1.6	3.3	1.6	1.9	0.7	1.9
	4.5	*13.1*	*4.5*	*7.9*	*3.9*	*4.9*	*3.5*	*5.4*
barley	50.9	27.8	25.5	19.3	19.3	10.8	16.6	22.2
	12.3	*25.9*	*14.0*	*11.6*	*11.3*	*12.4*	*17.0*	*18.0*
oats	12.2	25.1	15.2	7.2	27.0	33.1	24.4	22.8
	6.5	*18.7*	*11.8*	*7.5*	*17.1*	*15.6*	*19.4*	*16.7*
spring mixtures	2.1	2.6	5.5	12.5	6.1	2.6	7.5	4.9
	6.4	*6.9*	*12.1*	*14.9*	*12.6*	*6.9*	*16.0*	*11.3*
legumes	13.9	3.4	18.6	25.6	10.3	11.5	15.1	13.9
	5.4	*6.3*	*12.5*	*16.5*	*8.8*	*10.0*	*13.2*	*11.5*
Sown acreage	155.4	120.2	185.1	132.3	129.5	147.6	135.6	151.7
	88.1	*87.4*	*96.7*	*70.9*	*73.9*	*81.1*	*69.3*	*85.9*
Percentage of livestock units[a]:								
horses	16.5	10.1	7.5	29.6	10.4	11.1	29.9	13.1
	10.5	*4.1*	*5.2*	*26.2*	*9.0*	*7.1*	*31.7*	*14.7*
oxen	7.3	5.6	19.0	39.4	23.9	24.3	68.1	24.9
	10.1	*8.2*	*12.6*	*29.5*	*12.2*	*19.2*	*31.5*	*23.4*
adult cattle	43.3	29.0	18.4	5.0	5.7	31.5	0.7	20.4
	16.1	*18.0*	*11.4*	*10.9*	*13.6*	*20.0*	*2.4*	*18.6*
immature cattle	16.1	8.0	12.3	0.3	<0.1	14.5	0.0	9.1
	7.7	*7.7*	*8.4*	*0.7*	*0.2*	*8.5*	*0.0*	*9.4*
sheep	11.6	45.9	39.3	9.0	57.8	16.6	0.0	29.2
	16.0	*25.8*	*15.8*	*16.3*	*18.9*	*16.1*	*0.0*	*25.1*
swine	5.3	1.3	3.6	16.6	2.1	2.1	1.4	3.3
	4.3	*2.2*	*3.0*	*8.0*	*2.9*	*2.2*	*2.4*	*4.4*
Livestock units[a]	50.2	88.2	119.2	27.4	72.6	82.7	23.0	79.2
	30.7	*64.1*	*68.8*	*14.9*	*43.1*	*40.7*	*12.3*	*56.8*
Stocking density[b]	36.4	72.5	76.8	21.3	71.7	68.0	18.7	61.2
	18.1	*40.3*	*58.6*	*8.0*	*84.8*	*52.3*	*9.4*	*58.8*
Number of demesnes	32	14	77	12	56	78	28	297

Means in roman; standard deviations in italic.

1 = intensive mixed-farming; 2 = light-land intensive; 3 = mixed-farming with sheep; 4 = arable husbandry with swine; 5 = sheep-corn husbandry; 6 = extensive mixed-farming; 7 = extensive arable husbandry.

[a] [horses × 1.0] + [(oxen + adult cattle) × 1.2] + [immature cattle × 0.8] + [(sheep + swine) × 0.1].

[b] livestock units per 100 sown acres.

Source: National sample of accounts, 1350–1449.

component scores employed and greater difficulty of distinguishing real differences in farm enterprise.

The common denominator of the residuum of 115 non-core or *peripheral* demesnes is that there is a measure of disagreement between the three cluster techniques over their precise cluster mem-

bership.[42] This disagreement is most effectively resolved using discriminant functions calculated from the core demesnes to determine which core group each peripheral demesne has the highest probability of membership (Table 3).[43] The discriminant functions serve three further useful purposes. First, they allow the second-choice classification of each demesne to be determined, in terms of the farming type to which it bears the next closest resemblance (Figs 6–12). This is helpful in determining the degree of similarity or dissimilarity between farming types. Second, direct comparison can be made between the pre-1350 and post-1349 classifications, using the pre-1350 discriminant functions to determine which pre-1350 farming type each post-1349 farming type most closely resembled, and vice versa (Table 4).[44] Third, they may be used to allocate additional demesnes to their appropriate cluster grouping, as more data become available.[45] Here they have been used to classify the independent samples of 125 demesnes within a ten-county area around London and 106 Norfolk demesnes (Table 5 and Figs 3 and 4), thereby lending a much sharper spatial focus to the analysis of variations in farming type. Independent classification of the Norfolk demesnes, replicating at county level the methodology employed at a national scale (Table 6 and Fig 5), provides a further insight into the appropriateness of the national typology.

[42] In 182 cases (the core demesnes) there is agreement between three clustering methods, in 108 cases there is agreement between two, and in seven cases there is no agreement at all.

[43] Power and Campbell, 'Cluster analysis', p 232. When applied to the 182 core demesnes the discriminant functions were 100 per cent successful at reclassifying them correctly.

[44] In fact, the discriminant functions published in Power and Campbell, 'Cluster analysis', p 232, for the period 1250–1349 have been revised marginally on account of the addition of Hemsby, Norfolk (the most intensively cultivated and highest yielding of all known medieval English demesnes) to the original sample of 388 demesnes. Needless to say, Hemsby emerges as a core *intensive mixed-farming* demesne.

[45] For the relevant procedure and program see, K C Bartley, 'Classifying the past: discriminant analysis and its application to medieval farming systems', *History and Computing*, 8.1, 1996, pp. 1–10.

II

Notwithstanding the significant shifts in the general emphasis of farming practice between 1250–1349 and 1350–1449, no fundamentally new demesne-farming systems came into being.[46] Rather, the existing range of farming systems was modified and developed. Eight basic farming types may be identified in the period 1250–1349 and these may be matched by seven in the period 1350–1449. How closely these two sets of farming system resembled one another can be established, as outlined above, by applying their respective discriminant functions to the mean characteristics of each farming type (Table 4). On this basis *arable husbandry with swine, sheep-corn husbandry*, and *extensive arable husbandry* emerge as farming systems common to both periods, with similar if not identical attributes. With the three pre-1350 and three post-1349 mixed-farming systems, however, the correspondence is less exact. The discriminant functions, for instance, reveal the *intensive mixed-farming* system of post-1349 to bear a closer resemblance to the *light-land intensive* system of pre-1350 than the *intensive mixed-farming* system of the same period. In fact, the *intensive mixed-farming* and *light-land intensive* systems of pre-1350 seem to coalesce into a single intensive mixed-farming system after 1349. Insofar as a *light-land intensive* system persisted as a separate system in its own right it was very much as a minority farming type, specific to certain environmental and economic contexts and retaining the more extreme characteristics of the *light-land intensive* system of before 1350. Similarly, the *mixed-farming with cattle* of before 1350

[46] Stock-only demesnes may have developed in certain fresh lowland contexts during the fifteenth century (eg N W Alcock, *Wanwickshire Grazier and London Skinner 1532–155: The Account Book of Peter Temple and Thomas Heritage*, British Academy, Records of Economic and Social History, new series IV, 1981), following the wholesale abandonment of arable cultivation, but there are plenty of upland and marshland precedents for such exclusively pastoral enterprises.

TABLE 4

Match between national farming types 1250–1349 and 1350–1449 (established by applying discriminant functions to the mean characteristics of each farming type)

CORE DEMESNES ONLY

Farming type 1250–1349	*Nearest equivalent farming type 1350–1449*[a]	*Farming type 1350–1449*	*Nearest equivalent farming type 1250–1349*[b]
intensive mixed-farming	intensive mixed-farming	intensive mixed-farming	light-land intensive
light-land intensive	intensive mixed-farming	light-land intensive	light-land intensive
mixed-farming with cattle	extensive mixed-farming	mixed-farming with sheep	extensive mixed-farming
arable husbandry with swine	arable husbandry with swine	arable husbandry with swine	arable husbandry with swine
sheep-corn husbandry	sheep-corn husbandry	sheep-corn husbandry	sheep-corn husbandry
extensive mixed-farming	extensive mixed farming	extensive mixed-farming	extensive mixed-farming
extensive arable husbandry	extensive arable husbandry	extensive arable husbandry	extensive arable husbandry
oats and cattle	light-land intensive		

ALL DEMESNES

Farming type 1250–1349	*Nearest equivalent farming type 1350–1449*[a]	*Farming type 1350–1449*	*Nearest equivalent farming type 1250–1349*[b]
intensive mixed-farming	extensive mixed-farming	intensive mixed-farming	intensive mixed-farming
light-land intensive	intensive mixed-farming	light-land intensive	light-land intensive
mixed-farming with cattle	extensive mixed-farming	mixed-farming with sheep	intensive mixed-farming
arable husbandry with swine	arable husbandry with swine	arable husbandry with swine	arable husbandry with swine
sheep-corn husbandry	sheep-corn husbandry	sheep-corn husbandry	sheep-corn husbandry
extensive mixed-farming	extensive mixed-farming	extensive mixed-farming	extensive mixed-frming
extensive arable husbandry	extensive arable husbandry	extensive arable husbandry	extensive arable husbandry
oats and cattle	light-land intensive		

[a] using post-1349 discriminant functions; [b] using pre-1350 discriminant functions.
Source: J P Power and B M S Campbell, 'Cluster analysis and the classification of medieval demesne-farming systems', *Trans Inst Brit Geogr*, new series, 17, 1992, Tables III, V, and VI; K C Bartley, 'Classifying the past: discriminant analysis and its application to medieval farming systems', *History and Computing*, 8.1, 1996, Tables 2 and 3.

finds its closest counterpart in the *extensive mixed-farming* of post-1349 rather than any more intermediate system. After 1349 it is *mixed-farming with sheep* which seems to fall somewhere between the intensive and extensive extremes of the mixed-farming spectrum since the discriminant functions reveal it to have combined many of the features of *extensive mixed-farming* with some of those of *intensive mixed-farming*. In fact, the discriminant functions identify a closer coincidence between the *extensive mixed-farming* of post 1349 and the *extensive mixed-farming* of pre-1350 than the *mixed-farming with cattle* with which the prominence of cattle within its pastoral profile might have suggested a closer match. Significantly, the only farming system to disappear entirely from view after 1349 is the smallest and least satisfactorily defined pre-1350, namely *oats with cattle*[47].

Cluster One: 'intensive mixed-farming'

This is at once the most intensive and most arable of the three main mixed-farming systems which may be recognized post 1349. Its intensity is apparent from the choice of animals stocked and crops grown, while its strong arable emphasis is manifest in a mean stocking density below the national average and well below the stocking densities of the other mixed-farming systems (Table 2). It is also the most clearly defined of the three mixed-farming systems, insofar as there is a higher degree of

[47] Power and Campbell, 'Cluster analysis', pp 239, 241.

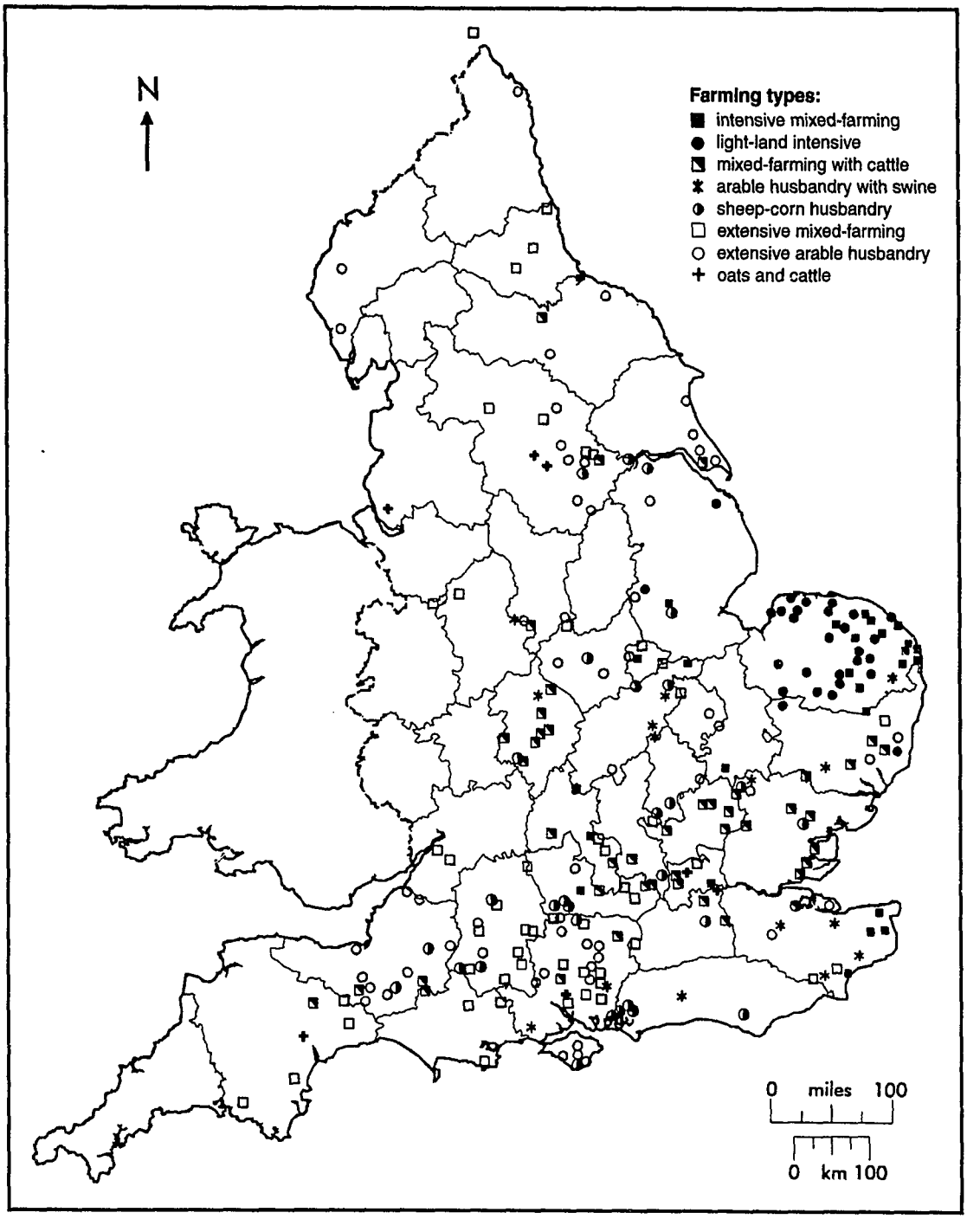


FIGURE 1
National farming types, 1250–1349: core demesnes.

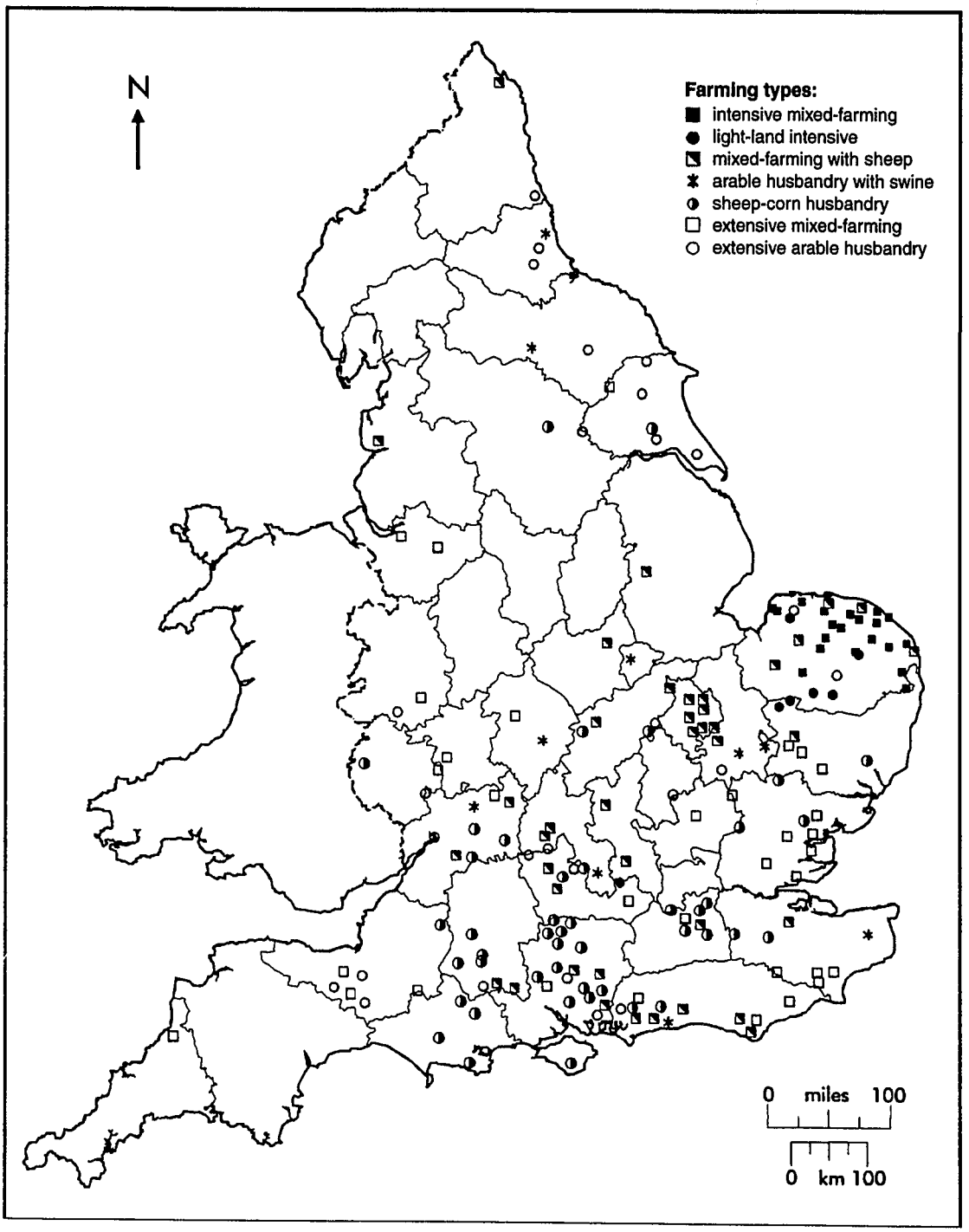


FIGURE 2
National farming types, 1350–1449: core demesnes.

TABLE 5

Farming types in the London region[a] 1375–1400: national classification. Mean characteristics of demesnes

Mean per demesne	*Farming type/cluster group*							*All*
	1	*2*	*3*	*4*	*5*	*6*	*7*	*demesnes*
Percentage of sown acreage:								
wheat	17.4	4.9	32.9	30.8	34.1	37.0	31.2	32.3
	7.2	*9.7*	*10.1*	*14.9*	*16.8*	*8.9*	*14.3*	*14.0*
rye	8.9	8.1	0.3	0.0	3.4	2.0	0.0	2.2
	10.6	*16.1*	*1.3*	*0.0*	*6.7*	*5.7*	*0.0*	*6.5*
winter mixtures	8.7	5.2	1.2	0.8	3.0	1.3	0.0	2.1
	10.6	*10.3*	*3.8*	*1.4*	*6.1*	*3.3*	*0.0*	*5.4*
barley	24.7	18.2	28.3	21.5	19.3	8.2	9.2	18.3
	13.6	*16.6*	*11.0*	*17.5*	*15.2*	*7.6*	*15.1*	*14.8*
oats	17.7	46.6	11.1	4.8	22.9	35.3	17.9	22.6
	6.0	*19.5*	*8.1*	*4.9*	*15.4*	*12.9*	*21.1*	*17.1*
spring mixtures	15.5	4.6	6.8	22.7	5.3	4.3	27.5	8.2
	13.7	*5.8*	*11.9*	*27.3*	*6.6*	*9.1*	*29.4*	*14.8*
legumes	7.1	12.5	19.4	19.6	12.1	12.0	14.2	14.4
	4.5	*17.1*	*9.1*	*15.7*	*8.9*	*8.6*	*9.4*	*10.5*
Sown acreage	201.6	78.5	186.0	175.6	154.1	175.1	183.3	171.0
	114.8	*40.3*	*79.1*	*86.7*	*65.8*	*84.1*	*49.1*	*81.5*
Percentage of livestock units[a]								
horses	13.7	6.8	11.4	34.5	14.9	13.0	50.4	16.1
	6.6	*4.3*	*6.1*	*20.5*	*8.4*	*6.9*	*23.5*	*13.9*
oxen	9.6	9.6	18.8	13.1	20.2	12.3	49.4	17.5
	10.5	*7.9*	*12.5*	*15.1*	*15.1*	*9.6*	*24.0*	*15.5*
adult cattle	35.8	37.7	16.5	7.6	14.5	42.1	0.0	23.9
	20.3	*21.7*	*10.5*	*14.5*	*20.2*	*15.4*	*0.0*	*21.0*
immature cattle	10.3	4.7	8.9	0.5	0.1	12.3	0.0	6.7
	4.9	*6.0*	*5.8*	*1.2*	*0.4*	*8.1*	*0.0*	*7.6*
sheep	27.1	40.1	38.3	25.4	47.0	18.4	0.0	31.2
	18.7	*16.0*	*15.6*	*19.0*	*21.4*	*13.6*	*0.0*	*21.2*
swine	3.6	1.0	6.2	19.0	3.3	2.0	0.3	4.6
	2.7	*1.4*	*3.8*	*8.6*	*3.4*	*2.1*	*0.6*	*5.8*
Livestock units[b]	123.6	77.1	103.5	42.5	59.9	88.0	19.4	80.3
	45.2	*33.5*	*62.0*	*27.2*	*28.3*	*43.1*	*4.3*	*50.8*
Stocking density[c]	76.3	118.5	62.0	24.3	56.5	59.9	10.9	57.9
	37.7	*65.2*	*40.8*	*13.0*	*66.9*	*32.9*	*2.6*	*49.0*
Number of demesnes	6	5	33	9	29	37	6	125

Means in roman; standard deviations in italic.

1 = intensive mixed-farming; 2 = light-land intensive; 3 = mixed-farming with sheep; 4 = arable husbandry with swine; 5 = sheep-corn husbandry; 6 = extensive mixed-farming; 7 = extensive arable husbandry.

[a] Beds, Berks, Bucks, Essex, Herts, Kent, Middx, N'hants, Oxon, and Surrey.

[b] [horses × 1.0] + [(oxen + adult cattle) × 1.2] + [immature cattle × 0.8] + [(sheep + swine) × 0.1].

[c] livestock units per 100 sown acres.

Source: Feeding the City II, accounts database.

concurrence in cluster-group membership for this system than either *mixed-farming with sheep* or *extensive mixed-farming*. The three clustering techniques identify a core of twenty demesnes, to which discriminant functions add a further twelve. The latter are less extreme in their characteristics – non-working animals were slightly less

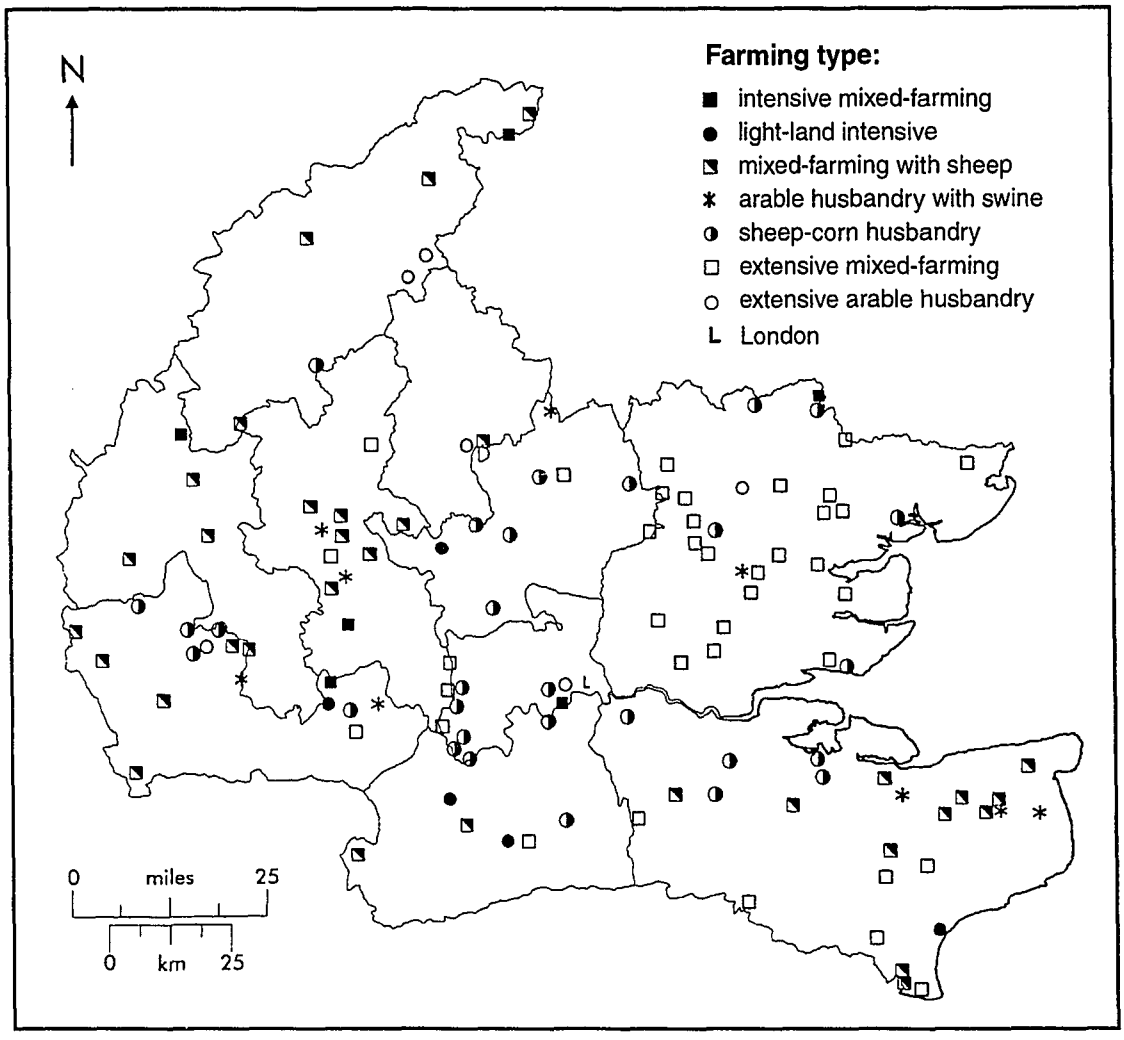


FIGURE 3
Farming types in the London region, 1375–1400: national classification.

important, greater use was made of oxen for draught, and the specialization in barley cultivation was less pronounced (Table 3) – and distributionally mostly peripheral to the main concentration of core demesnes (Figs 2 and 6). By implication, therefore, they were both less specialized and less intensive.

In part this farming system constitutes a modified version of the *intensive mixed-farming* that had evolved during the thirteenth century under the stimulus of rising population and expanding commercial opportunities in areas of fertile and easily cultivated soil, high population density, and good market access (Table 4).[48] Certainly, several of the demesnes that practised *intensive mixed-farming* before 1350 also show up as *intensive mixed-farming* demesnes after 1349 (Figs 1 and 2).[49] Common denominators of both farming

[48] Power and Campbell, 'Cluster analysis', pp 233–6, 240–1; Campbell, 'Agricultural progress'.

[49] For example, Flegg, Halvergate, Hemsby, Martham, and Scratby in east Norfolk, Hindolveston and Hindringham in north-central Norfolk, and Hunstanton in north-west Norfolk.

systems were the priority given to wheat and barley among the winter and spring grains, the disproportionate share of the sown acreage devoted to spring crops, the prominence of horses among working animals, the exceptionally high proportion of non-working animals, and a specific pastoral specialism in cattle-based dairying. These features are all consistent with the relatively intensive use of land, labour, and capital and hence identify this as a comparatively intensive system of husbandry. But whereas before 1350 *intensive mixed-farming* was associated with a fairly equal reliance upon horses and oxen, above average stocking densities, and exceptionally high sowings of legumes (partly to sustain soil fertility and partly to sustain livestock numbers), after 1349 this ceased to be the case. Horses now became the almost exclusive source of draught power; livestock profiles although highly developed were nevertheless associated with stocking densities that were not only below the average for the period 1350–1449 but lower than those associated with pre-1350 versions of *intensive mixed-farming*; and, compared both with other contemporary farming systems and the *intensive mixed-farming* of pre-1350, legumes were no longer cultivated on such an impressive scale.[50] In these respects *intensive mixed-farming* had assumed some of the characteristics of the *light-land intensive* system which occupied a complementary distribution on the light soils of Norfolk in the period 1250–1349 (Table 4 and Fig 1). This light-land system made fuller use of horses for draught power than any other pre-1350 farming system and was also the system in which barley – grown largely for malting – assumed its greatest importance as a crop; both features which became more closely associated with 'intensive mixed-farming' demesnes in the period 1350–1449.

The geographical distribution of demesnes practising *intensive mixed-farming* after 1349 confirms the system's status as a fusion of the *intensive mixed-farming* and *light-land intensive* systems of 1250–1349. Every one of the core demesnes is in Norfolk (Fig 2). Applying discriminant functions to the peripheral demesnes within the national sample adds six more demesnes within the county together with a further six elsewhere, four of them with a strong East Anglian focus (Fig 6).[51] Five others are identified by the application of discriminant functions to the Feeding the City II sample of demesnes (Fig 3).[52] No other post-1349 farming system is spatially so sharply focused, with a marked concentration of demesnes in a single region and only a thin scatter of isolated examples elsewhere (Fig 2). Nor before 1350 was *intensive mixed-farming* so geographically specific in distribution or clearly defined in character (Fig 1). In the earlier period its association with Norfolk is strong but by no means exclusive, with Kent in particular showing up as a second important focus of *intensive mixed-farming*.[53] But after 1349 nowhere went further than Norfolk in the substitution of horses for oxen and reliance upon barley as the principal cash crop. It is these two features which identify the post-1349 version of *intensive mixed-farming* as a more-or-less exclusively Norfolk system (with just a hint of a secondary and far lesser focus in the Soke of Peterborough).

Norfolk is a county particularly well

[50] The advance of horses and retreat of legumes constitute a striking dichotomy. The former represents the continuation of a diffusion process which had begun in the late twelfth century (Campbell, 'Towards an agricultural geography', pp 91–4), the latter, a general throttling back in the intensity of husbandry (Campbell and Overton, 'A new perspective', pp 58–9, 74, 95–6).

[51] Melton (Suffolk), Borley (Essex), Soham (Cambridgeshire), and Longthorpe in the Soke of Peterborough (Northamptonshire).

[52] Adderbury (Oxfordshire) – *a light-land intensive* demesne in the national classification, Boroughbury (Northamptonshire), Culham (Berkshire), Ebury (Middlesex), and West Wycombe (Buckinghamshire) – an *extensive mixed-farming* demesne in the national classification.

[53] Power and Campbell, 'Cluster analysis', pp 233–6, 240–1; *A Medieval Capital*, pp 126, 132–3, 135–8, 140–1; P F Brandon, 'Farming techniques. South-eastern England', in Hallam, *Agrarian History, II*, pp 317–25.

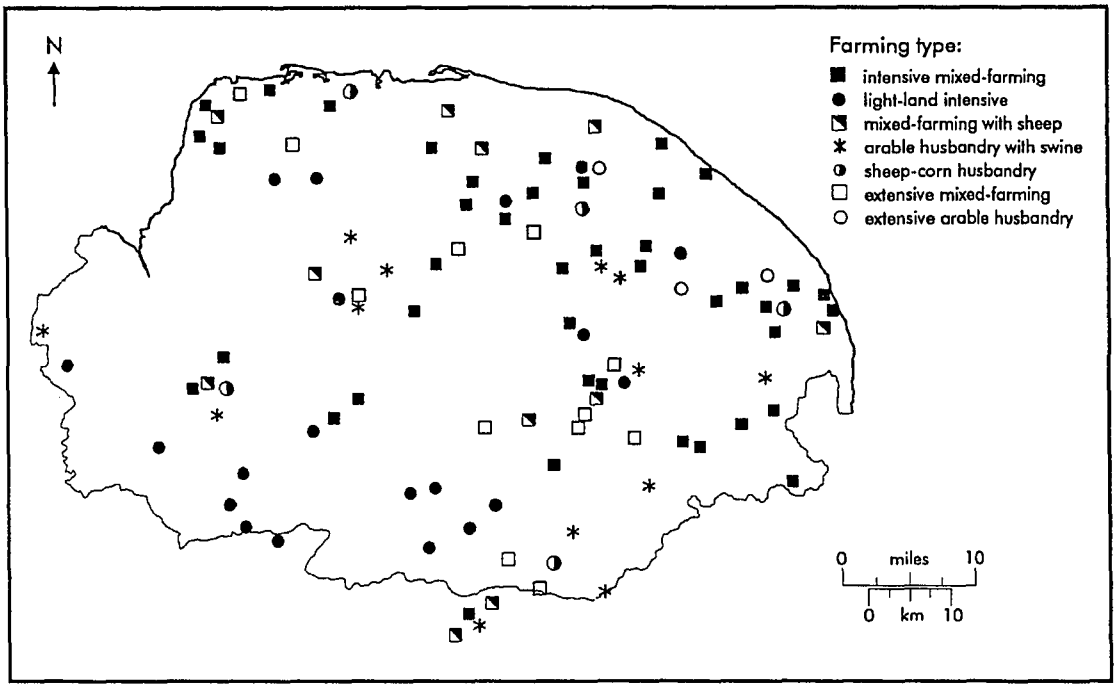


FIGURE 4
Norfolk farming types, 1350–1449: national classification.

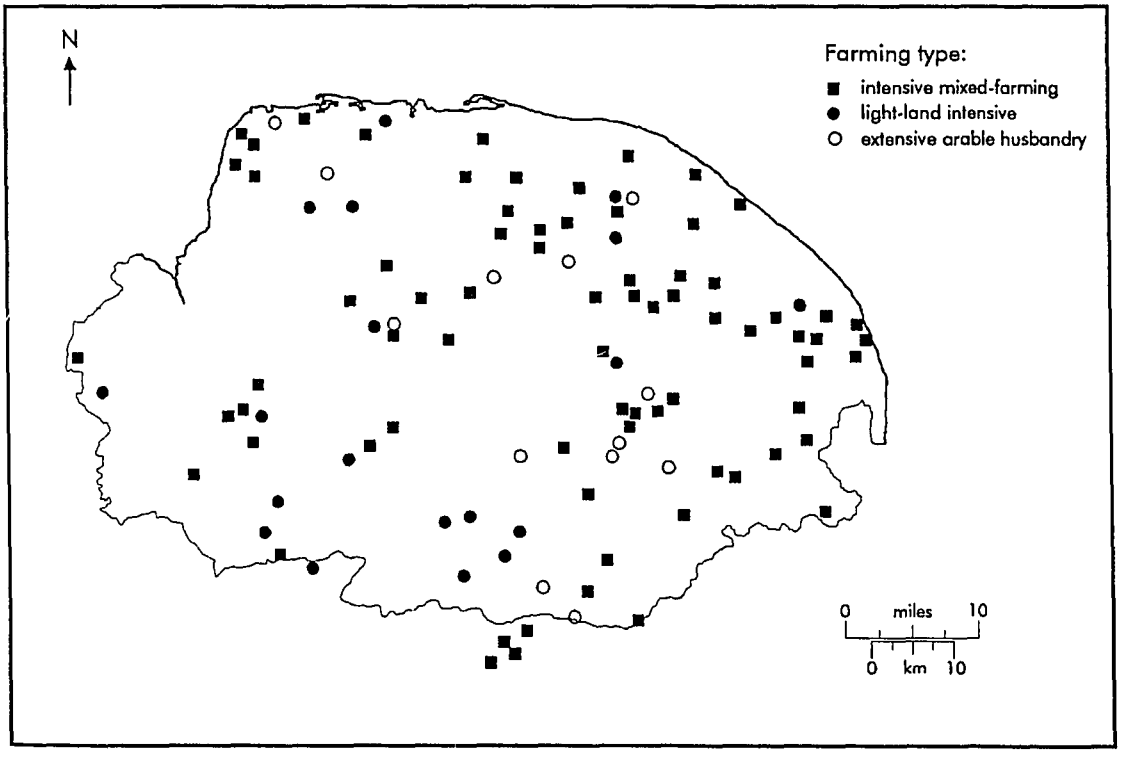


FIGURE 5
Norfolk farming types, 1350–1449: county classification.

served by manorial accounts, with 106 separately documented demesnes in the period 1350–1449 (in fact, five of these – Brandon, Hinderclay, Redgrave, Rickinghall, and Wattisfield – being just across the county boundary into Suffolk).[54] These allow the county's agriculture to be explored in almost greater detail than that of any other part of the country, which is of some advantage given Norfolk's apparent agricultural distinctiveness. Independent classification of these 106 Norfolk demesnes, replicating the method applied at national level, provides an additional perspective on the county's farming systems (Table 6 and Fig 5). At a county scale of analysis the only stable cluster solution is a three-cluster solution which assigns 73 of the 99 core demesnes to a single farming type (to which discriminant functions add one more). So dominant is this single farming system – with three out of four demesnes practising it – that it constitutes a veritable 'Norfolk system'; a medieval precursor of the 'Norfolk system' for which the county was to become so renowned from the late eighteenth century on.[55] Like that more celebrated later system it was a mixed-farming system of above average intensity. The intensity of the system is apparent in its strong arable emphasis (attested by mean stocking densities 25 per cent below the national average), in the predominance of spring-sown crops, and in the primacy accorded barley within the spring course and wheat within the winter. This marked imbalance in the spring and winter courses, coupled with moderate sowings of legumes, is consistent with the flexible and relatively intensive rotations and irregular and infrequent fallowing which may be independently documented from the accounts.[56] That, notwithstanding below average stocking densities, it is rightly regarded as a particularly highly developed form of mixed farming is borne out by the exceptionally developed character of its pastoral sector. This was dominated by non-working rather than working animals, especially dairy cattle, plus some sheep and swine. Cattle-based dairying is one of the most intensive and productive forms of pastoralism and its development was plainly facilitated by the heavy reliance upon horses for draught, for this helped reduce the number of animals it was necessary to keep for ploughing and carting, and horses, by consuming fodder crops, helped free-up scarce meadow and pasture for the cattle.[57] Geographically, examples of this farming system were to be found in virtually all parts of the county, with the conspicuous exception of the sandy Breckland and its margins in the south-west, but it was especially characteristic of an arc of country extending from the richly fertile deep loam soils of Flegg in the east to the shallower and sandier soils in the vicinity of Hunstanton on the north-west coast (Fig 5). This is the self-same area in

[54] The Norfolk accounts database was finalized by Dr Bruce M S Campbell whilst in receipt of a personal research grant from the Social Science Research Council. It contains information on crops and livestock extracted from all known extant grange accounts for the county. Unlike the national and Feeding the City accounts databases, therefore, the mean crop and livestock profiles of individual demesnes are based on all available surviving records. For the period 1350–1449 the database contains information extracted from accounts in the following public and private archives: Bodleian Library, Oxford, British Library, Cambridge University Library, Canterbury Cathedral Library, Chicago University Library, Elveden Hall (Suffolk), Eton College, Holkham Hall (Norfolk), Lambeth Palace Library, Magdalen College Oxford, Norfolk Record Office, Pomeroy & Sons, Wymondham, Public Record Office, Raynham Hall (Norfolk), and the John Ryland's Library, Manchester. A handlist of these accounts is available from Dr Campbell.

[55] William Marshall, *The Rural Economy of Norfolk*, 2 vols, 1787; Arthur Young, *General View of the Agriculture of the County of Norfolk*, 1804; Campbell and Overton, 'A new perspective', pp 92–4, 105.

[56] B M S Campbell, 'The regional uniqueness of English field systems? Some evidence from eastern Norfolk', *AHR*, XXIX, 1981, pp 16–28; *idem*, 'Agricultural progress', pp 28–9; *idem*, 'Arable productivity in medieval English agriculture', unpublished paper presented to the UC-Caltech conference on Pre-industrial Developments in Peasant Economies: the Transition to Economic Growth, Huntington Library, San Marino, May 1987, pp 31–6, 53–7; *Ag Hist III*, pp 199–202.

[57] Campbell, 'Towards an agricultural geography', pp 95–7; *idem*, 'Commercial dairy production on medieval English demesnes: the case of Norfolk', *Anthropozoologica*, 16, 1992, pp 107–118.

TABLE 6

Norfolk farming types 1350–1449: county classification.[a] Mean characteristics of core demesnes and of core and peripheral demesnes

Mean per demesne	*Core demesnes only*				*All demesnes*			
	Farming type/cluster group			*Overall*	*Farming type/cluster group*			*Overall*
	1	*2*	*3*		*1*	*2*	*3*	
Percentage of sown acreage:								
wheat	17.9	5.5	13.9	15.7	17.8	6.7	13.5	15.3
	9.4	*5.4*	*12.8*	*10.4*	*9.4*	*6.6*	*12.3*	*10.3*
rye	4.6	22.1	2.7	6.9	4.9	18.1	2.5	6.9
	7.4	*10.8*	*5.0*	*10.0*	*7.6*	*12.4*	*4.9*	*9.9*
winter mixtures	0.8	3.2	0.0	1.0	0.7	2.3	0.0	0.9
	2.0	*10.2*	*0.0*	*4.3*	*2.0*	*8.9*	*0.0*	*4.2*
barley	47.0	47.5	49.7	47.4	47.1	45.1	51.2	47.3
	15.2	*16.1*	*9.6*	*15.8*	*15.1*	*18.2*	*10.5*	*15.4*
oats	14.0	19.1	19.8	15.4	14.0	16.8	18.9	15.1
	8.3	*8.9*	*9.7*	*8.9*	*8.2*	*9.0*	*9.8*	*8.8*
spring mixtures	1.2	0.3	0.0	0.9	1.1	1.2	0.0	1.0
	4.0	*0.9*	*0.0*	*3.5*	*4.0*	*4.3*	*0.0*	*3.8*
legumes	14.5	2.3	13.9	12.7	14.5	4.5	14.0	12.6
	6.0	*1.8*	*4.2*	*6.8*	*6.0*	*6.1*	*4.0*	*6.9*
Sown acreage	143.2	139.5	81.7	135.2	143.2	127.2	79.4	132.5
	75.1	*73.9*	*36.5*	*74.1*	*74.5*	*68.2*	*35.9*	*72.8*
Percentage of livestock units[b]:								
horses	15.4	12.0	73.0	21.9	15.3	14.8	73.7	22.4
	8.1	*4.3*	*23.2*	*32.3*	*8.1*	*8.4*	*31.1*	*23.3*
oxen	6.7	1.4	17.3	7.2	6.6	2.8	16.0	7.1
	8.5	*5.2*	*24.0*	*12.3*	*8.5*	*8.5*	*24.5*	*12.3*
adult cattle	41.3	27.9	0.6	34.5	41.3	27.6	0.6	33.8
	17.1	*28.7*	*2.1*	*22.6*	*17.0*	*29.8*	*2.0*	*23.3*
immature cattle	14.0	4.7	0.0	11.0	13.9	4.1	0.0	10.4
	8.0	*6.5*	*0.0*	*9.0*	*8.1*	*6.2*	*0.0*	*9.0*
sheep	19.3	53.0	0.0	21.7	19.6	46.5	0.0	22.0
	22.1	*33.1*	*0.0*	*26.8*	*22.1*	*36.1*	*0.0*	*27.3*
swine	3.4	1.0	0.7	2.7	3.3	4.3	2.1	3.3
	3.9	*1.7*	*1.3*	*3.6*	*3.9*	*13.5*	*5.0*	*6.8*
Livestock units[b]	56.1	55.0	5.8	49.9	56.0	47.8	5.7	48.4
	37.5	*30.0*	*2.6*	*35.7*	*34.3*	*29.1*	*2.5*	*35.2*
Stocking density[c]	42.3	40.7	7.4	37.9	42.2	40.5	7.4	37.6
	20.9	*15.9*	*2.2*	*22.1*	*20.8*	*23.8*	*2.1*	*23.1*
Number of demesnes	73	14	12	99	74	19	13	106

Means in roman; standard deviations in italic.
1 = intensive mixed-farming; 2 = light-land intensive; 3 = extensive arable husbandry.
[a] based upon independent cluster analysis of 106 Norfolk demesnes.
[b] [horses × 1.0] + [(oxen + adult cattle) × 1.2] + [immature cattle × 0.8] + [(sheep + swine) × 0.1].
[c] livestock units per 100 sown acres.
Source: Norfolk accounts database.

which the *intensive mixed-farming* demesnes identified by the national classification of farming systems are most strongly concentrated (Fig 4).

The discriminant functions allow a direct comparison of the national and county classifications of each of these Norfolk demesnes. Significantly, the national classification identifies a wider variety of farming types within this single county, with examples occurring of each of the seven principal farming types (Fig 4). Apart from anything else this exemplifies the superiority of national over regional or local classifications of farming types, at least where the statistical basis of the classification is provided by cluster analysis. This is because minority farming types need to be very strongly differentiated before their distinctive identity is recognized by all three cluster techniques. The wider and more representative the sample, therefore, the greater the prospect of distinguishing between genuine differences in farming system. Numerically, although examples of all seven national farming types may be found in Norfolk it is *intensive mixed-farming* which is by far the best represented. There are 42 examples of this farming system, each of them coinciding with one of the 74 *intensive mixed-farming* demesnes identified by the Norfolk classification. Moreover, the majority of the 42 *intensive mixed-farming* demesnes common to both classifications are concentrated within the same arc of country from Flegg in the east to the north-west coast around Hunstanton, which appears to have been the heartland of this peculiarly Norfolk mixed-farming system (Figs 4 and 5).

Nevertheless, although *intensive mixed-farming* had a stronger affiliation with a single region than any other post-Black Death farming system, it was not so unique that it lacked strong affinities with certain other farming types. Again, the discriminant functions help to identify the systems which these *intensive mixed-farming* demesnes next most closely resembled (Fig 6): in two out of three cases this was *extensive mixed-farming*, and in a further one out of four it was *mixed-farming with sheep*. The same close association between systems at the intensive and extensive ends of the mixed-farming spectrum was evident in the period 1250–1349, and serves as a reminder that the three main mixed-farming systems are best regarded as subsets of a continuum.[58] Both before and after the Black Death intensive and extensive mixed-farming systems were alike in the relatively developed character of their pastoral husbandry (Table 2), the one with strong arable underpinnings, the other with a far greater grassland component. Geographically, the *intensive mixed-farming* demesnes which shared most in common with *extensive mixed-farming* formed a fairly concentrated block, to which demesnes with closer affinities to other systems were mostly peripheral (Fig 6). This was very much the case with the eight demesnes whose second-choice classification was *mixed-farming with sheep*, and even more so with those three demesnes whose second choice was *light-land intensive husbandry*.[59] The one demesne – Aldeby, Norfolk – with a resemblance to *arable husbandry with swine* was a small demesne which served as the home farm to a minor monastic cell with a regular need for fresh pork, but it was also locationally marginal to the main concentration of *intensive mixed-farming* demesnes. Generally, therefore, this analysis of second choices confirms that *intensive mixed-farming* only attained the status of a homogeneous regional farming type in eastern and northern Norfolk and that small but nonetheless real differences existed between the kind of *intensive mixed-farming*

[58] Power and Campbell, 'Cluster analysis', p 239.

[59] Taverham (Norfolk), Melton (Suffolk), and Milton (Oxfordshire) from the national sample and Adderbury (Oxfordshire), Culham (Berkshire), and Ebury (Middlesex) from the Feeding the City II sample.

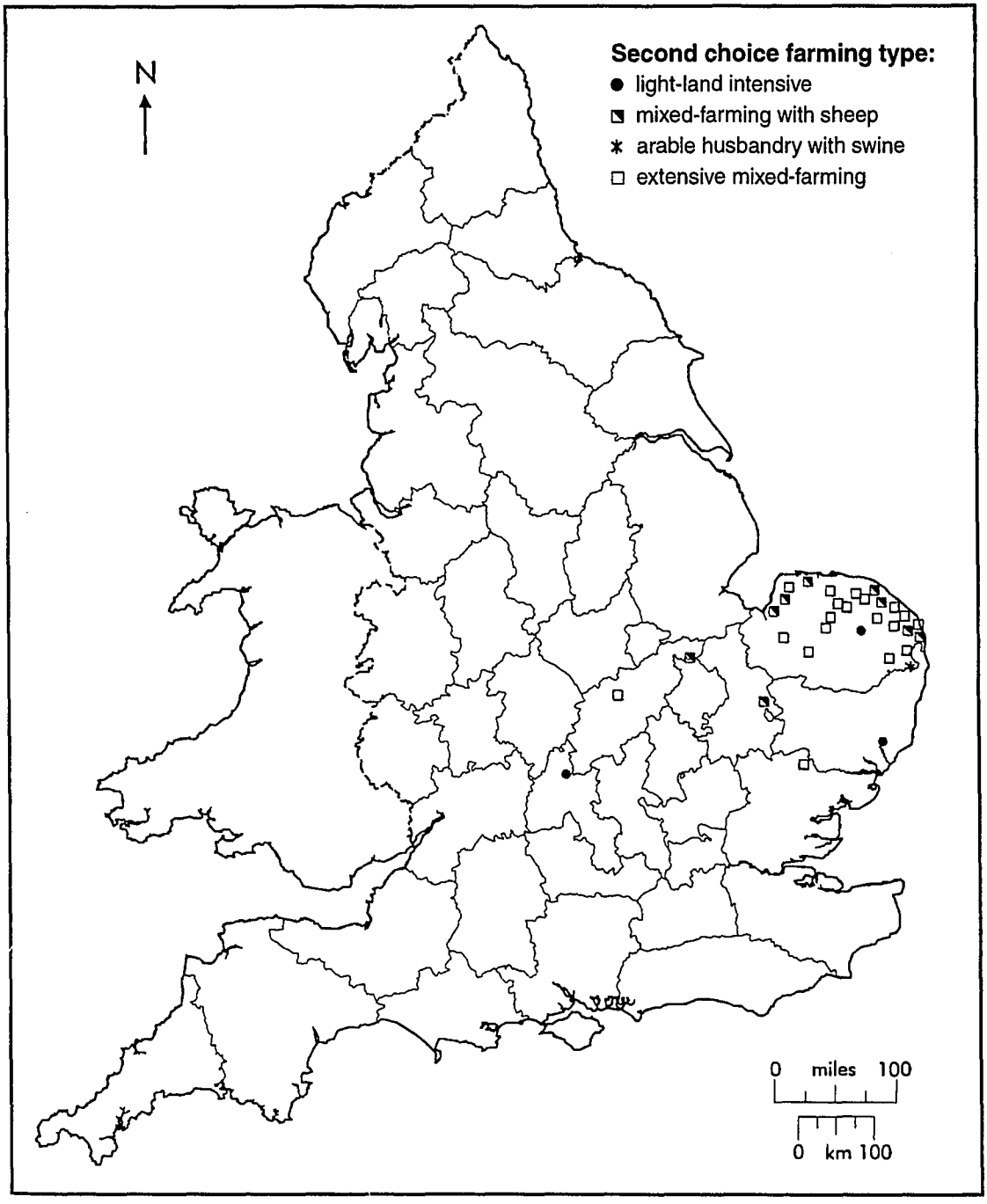


FIGURE 6
Intensive mixed-farming demesnes, 1350–1449 (core and peripheral demesnes indicating second choice).

practised here and that practised apparently in isolation elsewhere.[60]

Cluster Two: 'light-land intensive farming'

Statistically, *intensive mixed-farming* may have been closer to *extensive mixed-farming* than any other farming system (Table 4), but agriculturally it was *light-land intensive* farming which was the next most proximate system both in terms of intensity and distribution (Table 2, Fig 2).[61] Numerically, *light-land intensive* farming was very much a minority system and is represented in the national sample of demesnes by just a handful of examples. In part this is because the three clustering techniques differ most widely in their definition of this farming type with the result that a core of only seven demesnes is common between them, to which a further seven are added on the basis of their discriminant scores. But the comparative rarity of this farming type was also a function of its specialized character (Table 2). In no other system did working animals comprise such a small share of total livestock units and in none was the reliance upon horses for draught power so complete. Among non-working animals dairy cattle were plainly important, but sheep even more so; in fact, only on sheep-corn demesnes did sheep comprise a greater proportion of livestock units. Swine, in contrast, were mostly conspicuous by their absence. Arable husbandry was equally distinctive. This was the only farming system in which the area sown with rye generally matched or exceeded that devoted to wheat (maslin – a wheat-rye mixture – was also of some importance). Nevertheless, as with *intensive mixed-farming*, it was the spring sown grains that predominated, particularly barley but also significant quantities of oats. Such a pronounced winter-spring imbalance again implies irregular and flexible rotations, although in the absence of significant sowings of legumes (which occupied a smaller share of the sown acreage than in any other system) fallows of varying frequency and duration are likely to have retained a prominent role in the maintenance of soil fertility. This was certainly the case at Brandon (Suffolk) and East Wretham and Eccles (Norfolk), which are known to have employed their sheep flocks to fold arable land left uncultivated for several years in succession, the duration of the 'fallow' depending upon the quality of the land.[62]

Everything about this farming system marks it out as a response to the particular environmental problems presented by light land. Light and easily worked loamy and sandy soils, for instance, help explain the preference for small all-horse plough teams implicit in the modest, horse-dominated draught sector. Sheep also did well on light land, especially where there was much heath and rough pasture, and were an indispensable adjunct of arable husbandry since light sandy soils were quickly exhausted unless regularly dunged (the nightly folding of sheep on the arable performing this function admirably). Provided there was sufficient good grassland, especially in the better watered valley bottoms, cattle fared reasonably well, but in open heathy country with neither pannage nor legumes available in any quantity (peas and beans – widely used for feeding swine – did not do well on light soils) there was little basis for keeping swine. Light acidic soils also explain the predominance of rye over wheat at a time when its cultivation elsewhere was in decline as rising living standards allowed consumers to indulge a strong dietary preference for wheaten

[60] Closer examination confirms that these differences were further underscored by differences in productivity: B M S Campbell, 'Arable productivity in medieval England: some evidence from Norfolk', *J Econ Hist*, XLIII, 1983, pp 379–404.

[61] The reference to light land is entirely descriptive: soil type is not a criterion of classification.

[62] PRO, SC 6/1304/28–36; Chicago University Library, Bacon Roll 643, 645–60; Elveden Hall, Suffolk, Iveagh Collection 148 (Phillipps 26523); Eton College Records, Vol 30, 43–9; Raynham Hall, Norfolk, Townshend Mss.

bread. Similarly, barley and oats grew relatively well on light soils, whose low nitrogen content yielded a barley peculiarly well suited to brewing.[63] Before 1350 so great had been the commercial imperative to produce grain that stocking densities on *light-land intensive* demesnes had been conspicuously below-average, but thereafter they rose to around the national average as demesne managers lengthened fallows and converted to pasture land whose economic rent was now too low to warrant its continued use as arable.

That it is correct to diagnose this farming system as a light-land system is confirmed by the distribution of demesnes that practised it (Figs 2 and 7). Four of the seven core demesnes lie in or on the margins of the Breckland of East Anglia, a locality with some of the lightest and least fertile soils in the country whose distinctive medieval husbandry practices have been the subject of detailed study by Mark Bailey.[64] The other three are all located on soils of similar type.[65] Five of the seven peripheral demesnes (Fig 7) are also associated with light to medium soils.[66] Only Agney-and-Orgarswick in Romney Marsh and Popinho in the Norfolk Fens deviate from the light-land rule, a rule to which the three *light-land intensive* demesnes within the Feeding the City II sample all comply (Fig 3).[67]

The restriction of every one of these *light-land intensive* demesnes to East Anglia or the south-east of England nevertheless implies that environmental factors were by no means the sole influence upon their distribution. Economic factors were at least as important, for it was these which endowed this light-land system with its relatively intensive character. This intensity is apparent in the overwhelming preference for horses rather than oxen, the developed character of pastoral husbandry, the flexibility of arable rotations, and the importance of barley as a crop.[68] East Anglia, in particular, as John Langdon has demonstrated, was in the vanguard of the substitution of horses for oxen.[69] Along with much of the south-east, it lay outside the bounds of the regular commonfield system which allowed the evolution of more irregular and flexible forms of rotation, and was also early involved in an active regional and inter-regional grain trade which provided a stimulus to the commercial production of malting barley.[70] East Anglia was also the preserve of *intensive mixed-farming* and it was this farming system which was the second-choice classification of over half the *light-land intensive* demesnes (Fig 7). These demesnes formed a reasonably cognate group with a strong but by no means exclusive focus upon Norfolk and were complemented in distribution by seven others – six of them in west Norfolk – whose sheep farming was on such a scale that their second-choice classification was *sheep-corn husbandry*, an altogether more extensive system of farming. The remaining *light-land intensive* demesnes were also less intensive in character – two of them with a close resemblance to *mixed-farming with sheep* and four bearing a strong affin-

[63] M Bailey, *A Marginal Economy? East Anglian Breckland in the Later Middle Ages*, 1989, p 140.

[64] Brandon and Lakenheath (Suffolk) and East Wretham and Eccles (Norfolk); Bailey, *A Marginal Economy?*

[65] Bircham on the coarse loamy soils of the 'good-sands' region of north-west Norfolk, Costessey, a few miles west of Norwich, on free-draining acidic sandy soils formed from glacial outwash sands and gravels, and Culham in Berkshire on the coarse loamy and sandy soils that are a feature of the gravel terraces of the middle Thames valley.

[66] Feltwell (Norfolk) on the western edge of Breckland; Wrabness on the coarse sandy and loamy soils of north-east Essex, Pyrford (Surrey) on the light soils of the Wey valley, Petworth on the inferior sandy soils of the Sussex Weald, and Adderbury on the light loams of the wold country of north Oxfordshire.

[67] Wargrave, a near neighbour of Culham, Berkshire, on almost identical coarse loamy and sandy soils; Dorking, on broadly equivalent soils in the Surrey Weald; and Great Gaddesden in the Hertfordshire Chilterns, on loamy and clayey soils overlying chalk.

[68] The Feeding the City II accounts database indicates that barley was one of the most 'commercialized' of crops, with 41 per cent of net receipts sold (including sales of malted barley). Only dredge – a barley/oats mixture – was sold in greater proportions (58 per cent of net receipts).

[69] Langdon; *Horses, Oxen and Technological Innovation*, p 43; Campbell, 'Towards an agricultural geography', pp 91–3.

[70] H L Gray, *English Field Systems*, Cambridge, Mass, 1915, pp 305–402; Bailey, *A Marginal Economy?*, pp 140–3, 145–50.

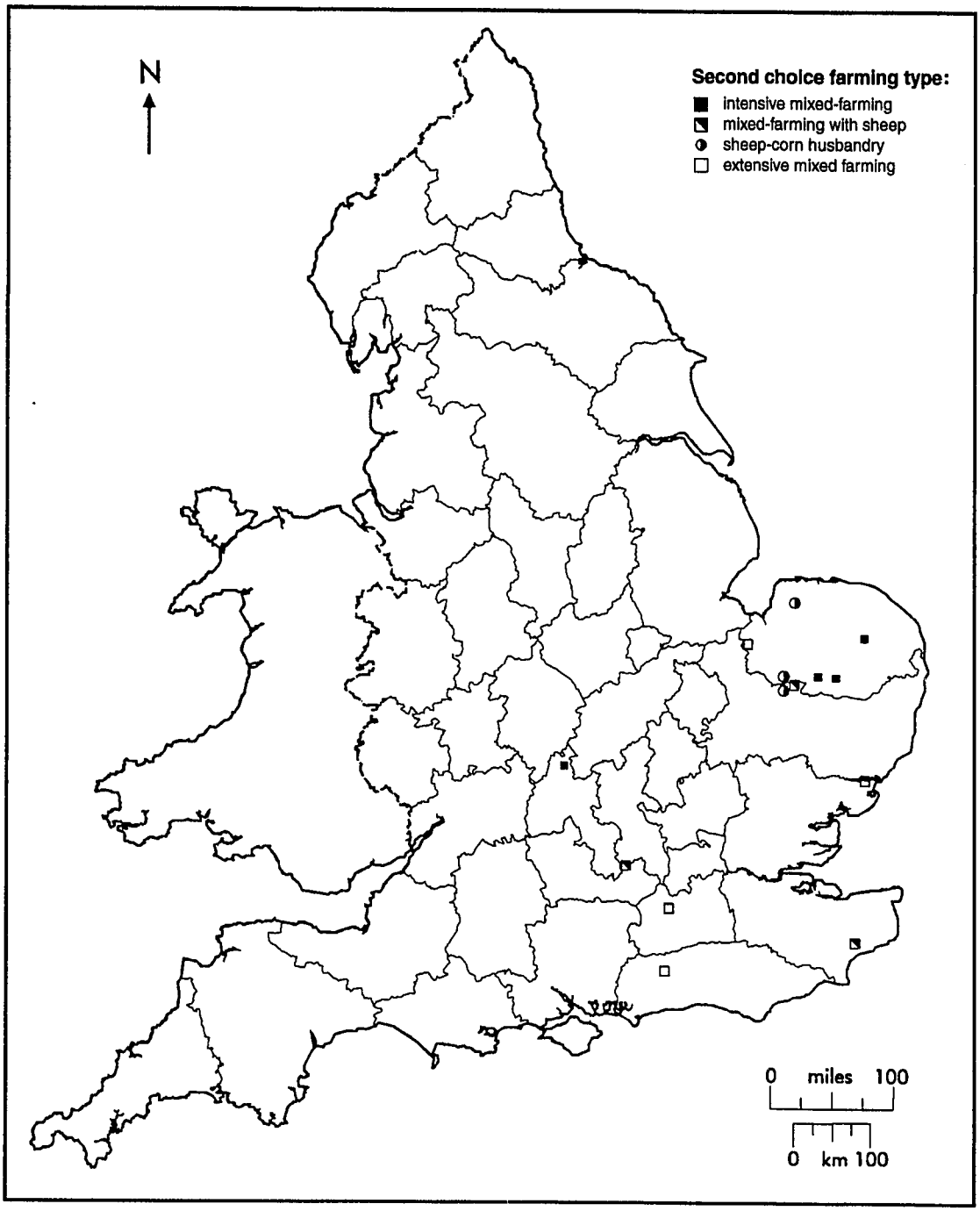


FIGURE 7
Light-land intensive demesnes, 1350–1449 (core and peripheral demesnes indicating second choice).

ity with *extensive mixed-farming* – and were distributionally peripheral to the main concentration of demesnes belonging to this farming type (Fig 7).

The exceptionally detailed Norfolk material brings at least that county's part of this overall picture into sharper focus. Of the 106 documented Norfolk demesnes discriminant functions reveal 20 to have practised some form of *light-land intensive* farming in the period 1350–1449. Half of these demesnes were located in the south-west and west of the county where their dominance was so great as to constitute a sub-regional farming type which clearly extended across the county boundary to embrace the adjoining area of light soils in north-west Suffolk (Fig 4). It is this 'Breckland' system of farming which has been discussed and described in detail by Bailey.[71] Elsewhere examples of *light-land intensive* farming are more scattered, but then so too are patches of light soils in this pedologically most varied of counties. This implies that *light-land intensive* farming mostly occurred as a deviation from prevailing husbandry norms, which points to the paramounce of environmental over economic factors in determining its detailed distribution. Its distinctiveness as a recognizable farming type in its own right is nevertheless confirmed by independent classification of these 106 Norfolk demesnes (Table 6, Fig 5). As already observed, replicating the methodology of the national classification at county level identifies only three basic farming systems: *intensive mixed-farming* is one, *light-land intensive* farming another. The latter system is represented by just 19 demesnes, a number which compares closely with the 20 identified within the county by the national classification. Fifteen demesnes are common to both classifications and consequently represent the most diagnostic examples of this particular farming type. Seven are relatively scattered in distribution and may mostly be explained by localized occurrences of light or poor soil, but eight are located in or near Breckland and thereby confirm the distinctive agricultural character of this small but unique region (Figs 4 and 5).

Cluster Three: 'mixed-farming with sheep'

In contrast to *intensive mixed-farming* and *light-land intensive* farming, which were either regionally or environmentally circumscribed in distribution, *mixed-farming with sheep* was far more widely represented as a husbandry type (Fig 2). Its status as a mixed-farming system is apparent in the number and proportion of non-working animals that were stocked and the above average stocking densities to which these mostly gave rise, notwithstanding sown acreages which themselves were often above average (Table 2). The types and combinations of crops grown imply a relatively intensive agricultural regime, insofar as the acreage of spring-sown crops exceeded that of winter, wheat and barley (respectively, the most valuable and demanding winter and spring grains) were the two most important grains (with oats relegated to a relatively minor role), and roughly a fifth of the cropped acreage was sown with legumes.[72] Nevertheless, such a pattern of cropping is also perfectly compatible with two-course rotations and, hence, relatively extensive systems of crop-

[71] Bailey, *A Marginal Economy?*; *idem*, 'Sand into gold: the evolution of the foldcourse system in west Suffolk, 1200–1600', *AHR*, 38, 1990, pp 40–57.

[72] Core demesnes known to have employed irregular rotations of above average intensity include Holywell (which Raftis believes to have been 'typical of the system on other Huntingdon demesnes') and Wistow, Hunts (J A Raftis, *The Estates of Ramsey Abbey: A Study in Economic Growth and Organization*, Toronto, 1957, pp 184–7; M P Hogan, 'Clays, culturae and the cultivator's wisdom: management efficiency at fourteenth-century Wistow', *AHR*, 36, 1988, pp 117–31); Felbrigg, Langham, and Ormesby, Norfolk (NRO, WKC 2/130/398 × 6, WKC 2/131/398 × 6; Raynham Hall, Townshend Mss; *Ag Hist III*, pp 200–2); and Alciston, Bosham, and Wiston, Sussex (P F Brandon, 'Demesne arable farming in coastal Sussex during the later Middle Ages', *AHR*, 19, 1971, pp 113–34; *Ag Hist III*, pp 273–5).

ping.[73] The latter is certainly more consistent with the intrinsically extensive character of the pastoral side of this farming system. Apart from the relatively high stocking densities, with all that they imply for a higher than average ratio of grassland to arable, there was a strong preference among working animals for oxen rather than horses and among non-working animals for sheep rather than cattle. Oxen and sheep were grassland animals and less labour and capital intensive in their requirements than horses and cattle.[74] Moreover, from the demographic composition of herds it would appear that the emphasis of cattle farming was not primarily upon dairying but upon the less intensive activity of rearing.

Many demesnes possessed these characteristics to some degree with the result that it is one of the least amenable farming systems to precise definition. The three different clustering techniques certainly differ quite considerably in the number of demesnes assigned to this cluster group: Normix assigns 61, Ward's 78, and K-means 128, nevertheless, only 40 demesnes are common between them. To this core group discriminant functions add a further 37 demesnes whose husbandry is less strongly differentiated – their stocking densities were, on average, higher, they kept more cattle and fewer sheep, and sowed more wheat and oats and less barley and legumes – and whose claim to belong to this farming type is correspondingly weaker (Table 3). Together, these core and peripheral demesnes constitute the second most common farming type within the national sample. Coincidentally, *mixed-farming with sheep* is also the second most common farming type within the Feeding the City II sample of demesnes (Table 5).

That this was quintessentially a mixed-farming system and one that lay somewhere between the intensive and extensive extremes of the mixed-farming spectrum is confirmed by an analysis of second choices (Fig 8). Twenty-two of the 77 core and peripheral demesnes more closely resembled *intensive mixed-farming* than any other system, compared with 51 which bore a closer similarity to *extensive mixed-farming*. Of the remaining four, three had a second choice of *light-land intensive* husbandry, and one only a second choice of *sheep-corn husbandry*. The greatest problem of definition is therefore knowing where to draw the line between this and other more or less intensive mixed-farming systems. It is because there is such a continuous gradation from intensive, to semi-intensive/extensive, and ultimately to extensive mixed-farming systems that there is such limited congruence in how the three different clustering techniques define this intermediate category.

Geographically, demesnes practising *mixed-farming with sheep* were found in a wide variety of environmental, economic, and institutional contexts (Fig 2). They occur in the extreme north of the country, as at Holy Island off the Northumberland coast, and in the extreme south, as at Alciston and Bosham on the Sussex coast.[75] They show up in areas of fertile soil, such as Ormesby in the Broadland district of east Norfolk and a group of Ramsey Abbey demesnes in Huntingdonshire, and on thinner and lighter soils of far lower potential productivity, as at Felbrigg and Rougham in north Norfolk and Downton in south Wiltshire. The great majority are in the more developed and commercialized parts of the south and east, but outlying core demesnes also occur on the Fylde coast of

[73] Among core demesnes, those of the bishopric of Winchester at Hambledon, Hants, Witney, Oxon, and Downton, Wilts, appear to have practised three-course rotations, while the demesne at Bishopstone, Wilts, adhered to a two-course system: J Z Titow, 'Land and population on the Bishop of Winchester's estates 1209–1350', unpublished PhD thesis, University of Cambridge, 1962, pp 17–18.

[74] Campbell, 'The livestock of Chaucer's reeve'.

[75] For a case study of Alciston see *Ag Hist III*, pp 272, 273–5, 278, 281, 282.

Lancashire and on the Gloucestershire Cotswolds above Stroud. Peripheral demesnes extend this distribution north-east as far as Coldingham in Berwickshire, west into Worcestershire, and south-west into Somerset and Devon. In distribution they transcend the division between regular and irregular commonfield systems and insofar as there tends to be a common denominator it is accessibility to substantial permanent grazings. Those grazings, however, were of many types – fenland, coastal marsh, heathland, rough pasture, and, above all, the limestone pastures of downland and wold. *Mixed-farming with sheep* is therefore a national rather than regional farming type, although it was more characteristic of some regions and localities than others (Fig 2).

Mixed-farming with sheep assumed its most intensive form in Norfolk and Suffolk and immediately adjacent parts of the east midlands, for it was here that *intensive mixed-farming* comprised the predominant second-choice farming type (Fig 8). Six of the 22 demesnes with this second choice were in Norfolk, plus one each in Suffolk and Lincolnshire, two in Cambridgeshire, and seven in Huntingdonshire. They are thus complementary in distribution to *intensive mixed-farming* demesnes (Fig 6). Like the latter they were characterized by below average stocking densities and hence a stronger bias towards arable husbandry than was otherwise typical of this farming type. That bias was reinforced by a greater reliance upon horses than was normally the case. On the arable side these demesnes grew more barley than wheat and devoted a quarter of their sown acreage on average to legumes.[76] This implies relatively intensive and often quite irregular systems of cropping. Felbrigg in north-east Norfolk, for instance, is known to have operated a convertible-husbandry system whereby land was cropped for three or four years and then left uncultivated for a corresponding period of time.[77] At Ormesby, however, in the same county – on some of the country's most fertile soils – land was cropped for six or more years in succession before being fallowed for one year only.[78] The group of Huntingdonshire demesnes belonging to Ramsey Abbey are also known to have been evolving towards more flexible and intensive systems of rotation during the middle years of the fourteenth century, as was the Crowland Abbey demesne of Oakington, Cambridgeshire.[79] At a further remove, Aylesbury and Water Eaton in Buckinghamshire, Cliffe and Ickham in Kent, and Chaceley in Gloucestershire all shared intensive features (Fig 8). Classification of all 106 documented Norfolk demesnes using the national discriminant functions identifies a total of ten *mixed-farming with sheep* demesnes within the county, plus Redgrave just over the county boundary into Suffolk. Distributionally they form a relatively light scatter and mostly seem to represent less intensive versions of the *intensive mixed-farming* which, as has been shown, was the county's dominant farming system (Fig 4). Corresponding classification of the Feeding the City II demesnes likewise brings the pattern within the ten counties around London into sharper focus (Fig 3). Particularly significant here is the group of four east Kent demesnes – Barton, Bekesbourne, Chartham, and Ickham – all located in an area with a strong tradition of more intensive husbandry.[80] Much the

[76] *Ag Hist III*, pp 214–16.

[77] Campbell, 'Arable productivity in medieval English agriculture'; NRO, WKC 2/130/398 × 6, WKC 2/131/398 × 6.

[78] *Ag Hist III*, p 202; PRO, SC 6/939/1–8.

[79] Raftis, *The Estates of Ramsey Abbey*, pp 184–90; *Ag Hist III*, pp 214–16; F M Page, *The Estates of Crowland Abbey: A Study in Manorial Organisation*, 1934, p 119; J R Ravensdale, *Liable to Floods: Village Landscape on the Edge of the Fens AD 450–1850*, 1974, pp 115–20. For developments at Wistow, Hunts, see Hogan, 'Clays, culturae and the cultivator's wisdom'.

[80] *A Medieval Capital*, pp 131, 140–1; *Ag Hist III*, p 271, 272, 275–8, 282, 283.

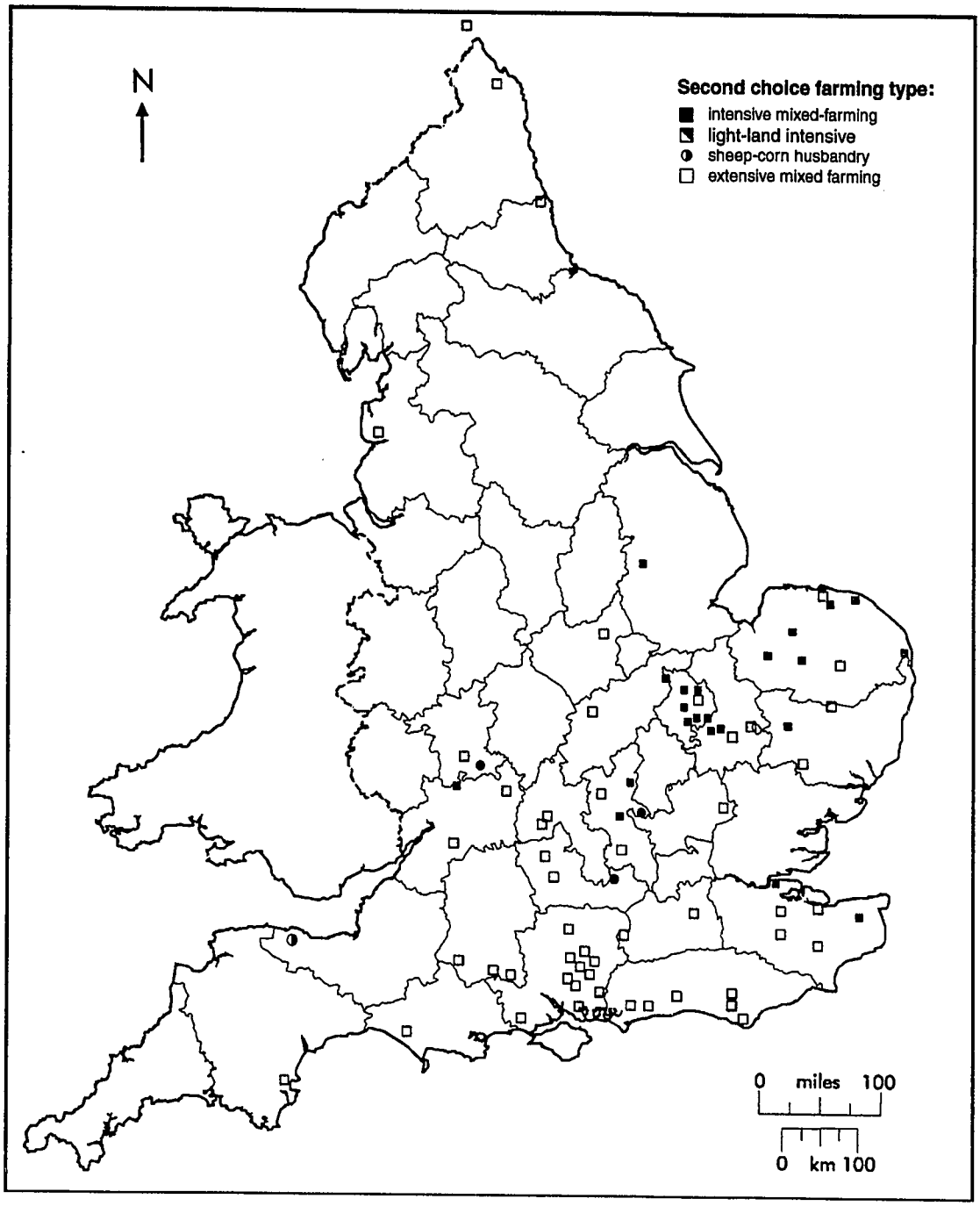


FIGURE 8
Mixed-farming with sheep demesnes, 1350–1449 (core and peripheral demesnes indicating second choice).

same applies to Eye and Maidwell in Northamptonshire.[81]

The majority of *mixed-farming with sheep* demesnes were, however, more extensive in their traits and closer in character to *extensive mixed-farming* (Fig 8). These demesnes stocked more animals and cropped fewer acres and hence supported stocking densities which were well above the national average. Oxen remained the fundamental source of most draught power and cattle herds appear to have been geared primarily to the breeding of replacement work animals. On the arable side these demesnes grew more wheat and oats and less barley and legumes and hence probably employed less intensive types of rotation.[82] Demesnes of this type are particularly well represented in the south midlands and in southern England, with a string of examples extending along the chalkland belt from East Sussex through Hampshire into southern Wiltshire and beyond into Dorset and Devon. A scatter of examples even appears in East Anglia.[83] The Norfolk sample adds two further examples within this most intensively cultivated of counties (Fig 4) while the Feeding the City II sample confirms that a loose string of demesnes of this type followed the North Downs in Surrey and Kent (Fig 3). The same sample also yields further examples of *mixed-farming with sheep* in the wold and vale country north and west of the Chilterns.

Cluster Four: 'arable husbandry with swine'

This is another minority farming type, represented in the national sample by a comparatively small number of demesnes (Table 2). Normix identifies only ten demesnes of this type, K-means 21, and Ward's 23. A core of only 10 demesnes is therefore common to all three cluster solutions to which only two further peripheral demesnes are added on the basis of the discriminant functions (Table 3). What sets these demesnes apart and justifies a separate farming classification are their absolutely low stocking densities, borne of the small numbers of animals kept, the predominance of working animals within the pastoral sector (with horses and oxen of almost equal importance), the dominance of the limited number of non-working animals by swine, and the devotion of a substantial proportion of the sown acreage to legumes (an important source of fodder for both horses and hogs).[84] This is also the farming system in which, on average, oats occupied their smallest, and dredge its largest, share of the sown acreage (the latter being very much a direct substitute for the former).

In the smallness of their livestock sector and consequent lowness of their stocking densities demesnes practising *arable husbandry with swine* bore their closest resemblance to the *extensive arable husbandry* of Cluster Seven; indeed, for six of the twelve the latter is their second-choice farming classification (Fig 9). But four demesnes displayed a stronger affinity with the *sheep-corn husbandry* of Cluster Five (the four which carried most sheep), and two had as their second choice the *mixed-farming with sheep* of Cluster Three. Significantly, these last six demesnes were those which grew legumes on the largest scale. Hardwicke (Gloucestershire) and Angmering (Sussex), for instance, devoted over a third of their sown acreage to this crop and it can be no coincidence that on both demesnes swine accounted for a greater proportion of livestock units than on any others in this cluster group.[85]

Distributionally, this is the most dis-

[81] The other isolated east midland demesnes of this type are Shillington (Bedfordshire) and Horsenden (Buckinghamshire).

[82] *Ag Hist III*, pp 286–7.

[83] Langham and Wymondham (Norfolk), Acton and Redgrave (Suffolk), Burwell and Ditton Valence (Cambridgeshire), and Much Wymondley (Hertfordshire).

[84] On the use of legumes as fodder for horses and/or hogs see note 17 above; Biddick, *The Other Economy*, pp 122–3, 132, 202; *Ag Hist III*, pp 191, 270.

[85] See *Ag Hist III*, p 387, for the droving of swine from Hardwicke to Islip, Denham, and Westminster Abbey's kitchens.

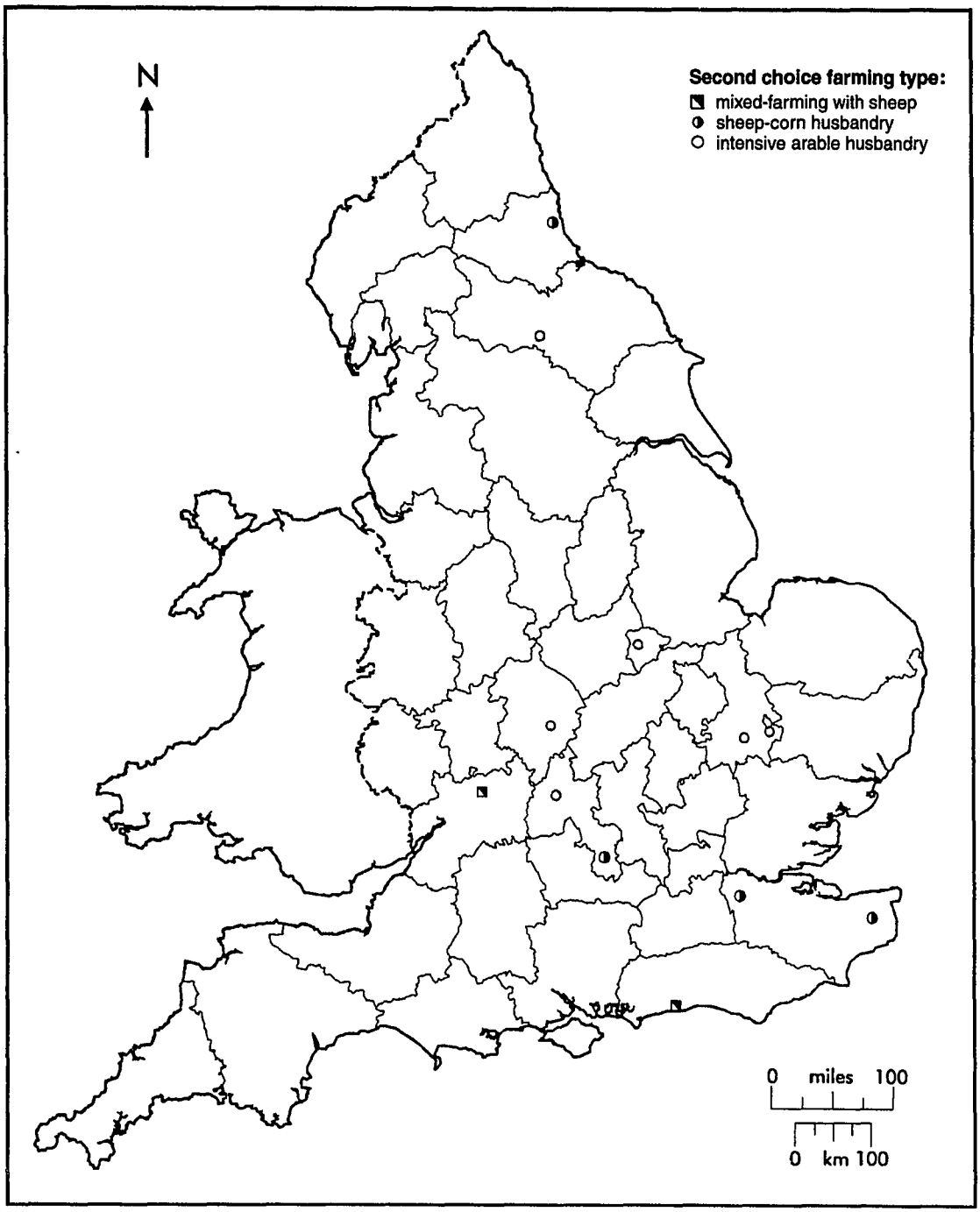


FIGURE 9
Arable husbandry with swine demesnes, 1350–1449 (core and peripheral demesnes indicating second choice).

persed of the seven farming types. The ten core and two peripheral demesnes are widely separate in space with the result that in no single locality was this the predominant farming type (Figs 2 and 9). The much fuller sample of demesnes for Norfolk and the ten-county area around London corroborate this conclusion (Figs 4 and 3), the former furnishing two and the latter eight examples.[86] It is possible that in some of these instances *arable husbandry with swine* represented a residual, and therefore somewhat artificial, farming system on demesnes which had opted to let their dairy herds at farm. But there were others – Potter Heigham and Hoveton in Norfolk are good examples – where it undoubtedly constituted a genuine specialism.

Swine were the only animal reared exclusively for their meat.[87] Permanent households with large numbers of mouths to feed consumed pork and bacon in significant quantities.[88] At Potter Heigham and Hoveton, both home farms of the Benedictine abbey of St Benet at Holme some three miles away, swine were stocked in large numbers and sty fed on the legumes grown on a correspondingly large scale.[89] Monkwearmouth (Durham), Oakham (Rutland), and Exning (Suffolk) probably similarly functioned as home farms to resident households, rearing pork for the table.[90] Sty-feeding swine in this way was a comparatively intensive activity, but swine could also be reared extensively on woodland pannage.[91] The latter is probably the method by which swine were fed at Monks Risborough, on the edge of Chiltern woodlands, and at West Tanfield in the North Riding of Yorkshire. More than any other farming type *arable husbandry with swine* is therefore to be explained by a combination of local and institutional factors.

Cluster Five: 'sheep-corn husbandry'

This is one of the most clearly differentiated of all the farming systems with the result that there is a remarkably close congruence in the result obtained from each of the three clustering techniques. The 45 core demesnes make this the largest of any of the core groups, but to these only a further 11 peripheral demesnes are added with the result that *mixed-farming with sheep* and *extensive mixed-farming* eventually emerge as more common farming types (Tables 2 and 3). The single most striking feature of this farming system is the exceptionally high proportion of livestock units – on average well over half – accounted for by sheep. Sheep, in fact, were kept to the virtual exclusion of other nonworking animals with the result that demesnes must have relied upon market purchase or intermanorial transfer to obtain replacement draught animals, which in the majority of cases were predominantly oxen.[92] The combination of sheep and oxen immediately identifies the pastoral component of this farming system as grass-based and essentially extensive and implies a heavy reliance upon permanent pasture. Since demesnes were themselves very unequally endowed with several and communal pastures, stocking densities, although on average well above the national mean, were highly variable. The sheep-farming component of this husbandry system therefore tended to attain its fullest development in localities with, for whatever reason, a high

[86] Bray (Berkshire), Monks Risborough (Buckinghamshire), Writtle Rectory (Essex), Ashwell (Hertfordshire), Adisham, Copton, and Eastry (Kent), and South Stoke (Oxfordshire).

[87] Campbell, 'Measuring the commercialisation of seigneurial agriculture', pp 164, 168.

[88] Biddick, *The Other Economy*, pp 37–40, 121; Dyer, *Standards of Living*, pp 59–60.

[89] NRO, Diocesan Est/11; Church Commissioners 101426 7/13, 2/13, 11/13.

[90] *Ag Hist III*, p 213.

[91] Biddick, *The Other Economy*, p 45; *Ag Hist III*, pp 190, 243, 267, 417–18; D L Farmer, 'Woodland and pasture sales on the Winchester manors in the thirteenth century: disposing of a surplus or producing for the market?', in Britnell and Campbell, *A Commercialising Economy*, pp 105–7, 112–13.

[92] *Ag Hist III*, p 298.

ratio of grassland to arable. As was consistent with a forage- rather than fodder-based pastoral sector, legumes – a key fodder crop – were grown on only a modest scale. True, oats, an alternative fodder crop, occupied a significant share of the sown acreage, but since these were only occasionally fed to sheep, and horses (which consumed them in greater quantity) were stocked in only modest numbers, it is probable that most of the oats harvest was destined for human consumption. In other respects there was little that was particularly distinctive about the cropping regime of these demesnes, which approximated remarkably closely to the national average (Table 2).

Not surprisingly, *sheep-corn husbandry* bore much in common with *mixed-farming with sheep* and in 22 cases this was the second-choice farming type (Fig 10). These were the demesnes with the smallest proportions of non-working animals, greatest proportions of sheep, and highest stocking densities. Eleven further demesnes had *extensive mixed-farming* as their second choice. These supported far lower stocking densities, carried smaller flocks, kept modest cattle herds, and made the greatest relative use of horses. They also grew the least barley and legumes and most oats. Fourteen others bore their closest resemblance to *arable husbandry with swine*. These were the only demesnes on which swine were of any significance and were also those which grew legumes on the largest and oats on the smallest scale. Other second choices were *extensive arable husbandry* (six demesnes), *light-land intensive* farming (two demesnes), and *intensive mixed-farming* (one demesne). This wide diversity of second choices, wider than that of any other farming system, testifies both to the variety of cropping regimes with which *sheep-corn husbandry* was associated (it is this that the regional distribution of second choices largely reflects – Fig 10) and the range of stocking densities by which *sheep-corn* demesnes were characterized. What endowed this farming system with the unity that enabled it to transcend this diversity were two overwhelming common denominators, namely retention of the ox as the predominant working animal and the domination of non-working animals by sheep.

Sheep-corn husbandry was already well established as a farming system before 1350, at which time stocking densities on sheep-corn demesnes were mostly lower and the emphasis upon sheep less overwhelming. After 1349 there was a real increase in both the sheep-farming component of this husbandry system and the number of sheep-corn demesnes (Figs 1 and 2). Geographically, it remained one of the more far-flung farming types, with core demesnes occurring in such widely separate locations as the East and West Ridings of Yorkshire, the Welsh border, the Sandlings of East Suffolk, east Kent, the Isle of Wight, and Somerset (Fig 2). But as *sheep-corn husbandry* became more common so it began to become the characteristic demesne-farming system of certain localities. This was most conspicuously the case in the downland and woodland country of southern England, especially in Hampshire and Wiltshire and adjoining portions of neighbouring counties.[93] Twelve of the 27 sampled Hampshire demesnes (many of them properties of the bishops of Winchester on which, as Martin Stephenson has shown, sheep numbers more than doubled between the beginning and end of the fourteenth century) practised some form of *sheep-corn husbandry*, as did five of the ten sampled Wiltshire demesnes, and four of the five sampled Dorset demesnes.[94] Moreover, the majority of the

[93] R Scott, 'Medieval agriculture', in R B Pugh, ed, *Victoria History of the County of Wiltshire, IV*, 1959, pp 19–21; J N Hare, 'Change and continuity in Wiltshire agriculture in the later Middle Ages', in W Minchinton, ed, *Agricultural Improvement: Medieval and Modern*, Exeter Papers in Economic History, 14, 1981, pp 4–9; *Ag Hist III*, pp 144, 292–8.

[94] M J Stephenson, 'Wool yields in the medieval economy', *Econ Hist Rev*, 2nd series, XLI, 1988, pp 368–91.

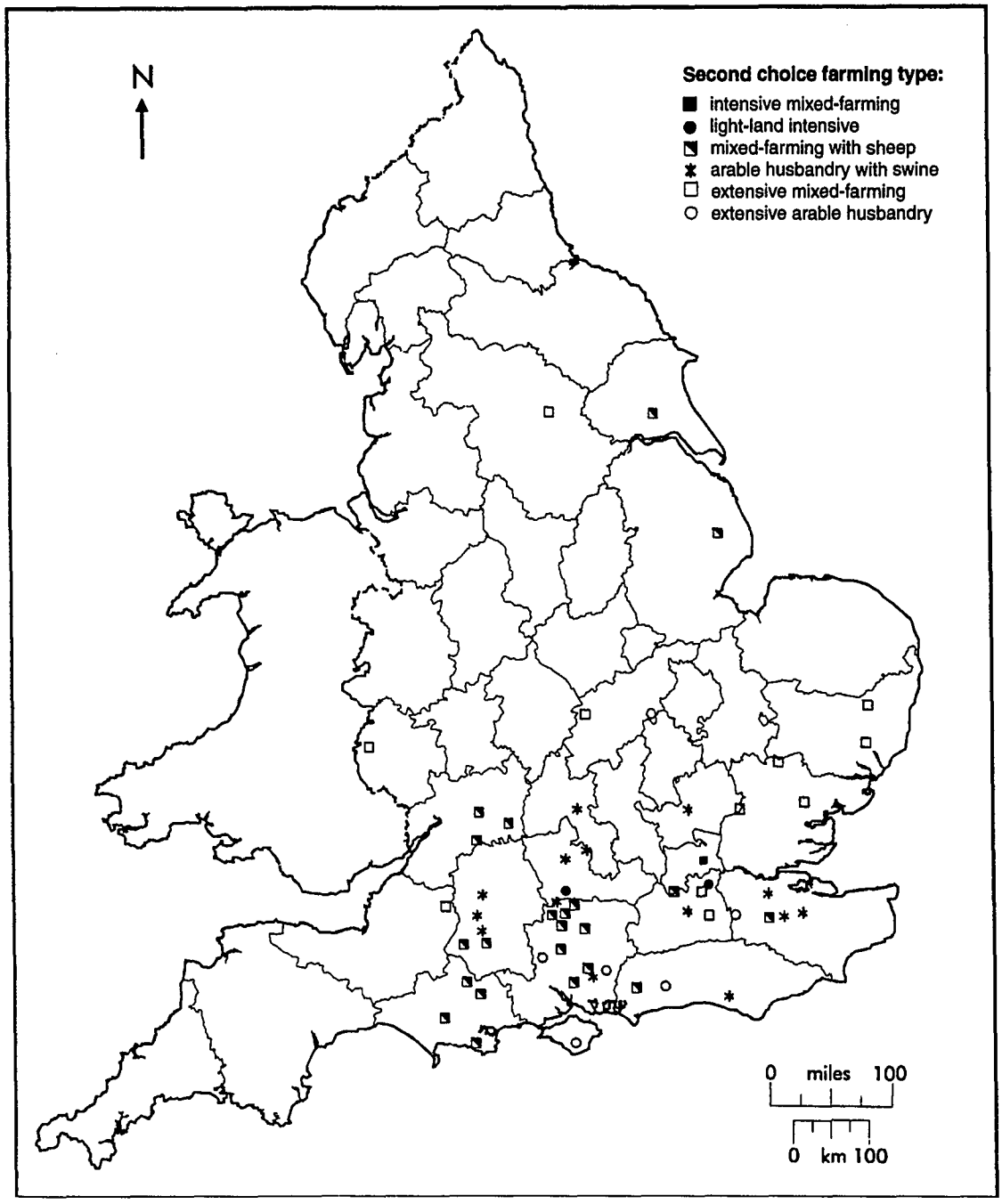


FIGURE 10
Sheep-corn husbandry demesnes, 1350–1449 (core and peripheral demesnes indicating second choice).

remaining sampled demesnes in these three counties practised *mixed-farming with sheep* (Fig 2). Other localities where *sheep-corn husbandry* was firmly established are the Gloucestershire Cotswolds and Sussex Downs.[95]

Sheep-corn husbandry is also well represented among the Feeding the City II sample of demesnes, with no less than 29 examples (Table 5 and Fig 3). Thus, several demesnes in the Hertfordshire Chilterns appear to have developed this specialism, as did a group of demesnes in the Vale of the White Horse in north-west Berkshire and a scatter of demesnes on or accessible to the North Downs of Kent and Surrey.[96] In contrast, at Langenhoe and Southchurch (Essex) and Sharpness and Ham (Kent) *sheep-corn husbandry* appears to have been a response to the pastoral potential provided by extensive areas of coastal marsh. Most notable of all, however, is the concentration of sheep-corn demesnes near London; at Eltham a few miles to the south-west in Kent, at Wandsworth just across the Thames in northern Surrey, at Hyde immediately west of the city in Middlesex, and at a string of demesnes in the Colne and Thames valleys. There are intimations of this metropolitan grouping at the beginning of the fourteenth century but by the end of that century it had evidently become much more pronounced. Whether *sheep-corn husbandry* developed here as a response to the capital's demand for wool, for mutton, or for the grain produced from fields dunged by the flocks nevertheless awaits investigation.[97]

Although an intrinsically extensive system of farming most typical of areas of comparatively low economic rent, the presence of so many sheep-corn demesnes so close to London does demonstrate that it could and did develop in areas of strong commercial demand. Yet with certain exceptions the immediate hinterland of the capital had never been noted for the intensity and productivity of its demesne agriculture, mainly because of the unrewarding character of the soils with which, for the most part, cultivators had to contend.[98] Instead, it was at some distance from the city that medieval agriculture attained its greatest intensity, in north-eastern Kent, and above all in Norfolk and adjacent portions of the east midlands. At the end of the fourteenth century it was here that the most intensive farming systems were still to be found with the result that *sheep-corn husbandry* was conspicuous by its virtual absence. There is not a single core or peripheral sheep-corn demesne in Norfolk, Cambridgeshire, Huntingdonshire, or the Soke of Peterborough, and only two in Suffolk (Figs 2 and 10). Putting Norfolk under the microscope using the entire available sample of 106 documented demesnes identifies just five that practised *sheep-corn husbandry* (Fig 4).[99] Each was widely separate from the others and appears to have developed its sheep-corn regime in response to essentially local circumstances that were either or both environmental (the availability of fenland, marshland, or heathland pastures) and institutional (seignorial rights of foldcourse over the fallow arable and associated permanent pastures).[100] Rather than adopt *sheep-corn husbandry per se*, Norfolk demesnes tended to develop their sheep farming within the context provided by either *mixed-farming with sheep* (12 demesnes) or *light-land intensive* farming (20 demesnes). Apart from

[95] *Ag Hist III*, pp 264–5.
[96] *Ibid.*
[97] In the Dutch province of Drenthe, for instance, an expansion in arable production after 1650 was associated with declining numbers of cattle and rising numbers of sheep kept primarily for manuring: J Bieleman, 'Changing manuring techniques in open field farming in the Dutch province of Drenthe 1650–1850', in *I Jornadas Internacionales sobre Technologie Agraria Tradicional*, Museo Nacional del Pueblo Español, Madrid, 1992, pp 251–6.
[98] *A Medieval Capital*, pp 138–40.
[99] Barton Bendish, Blickling, Burgh in Flegg, Burston, and Holkham.
[100] Campbell, 'Regional uniqueness'; Bailey, 'Sand into gold'; *Ag Hist III*, p 200; Campbell and Overton, 'A new perspective', pp 77–80; W Hassall and J Beauroy, eds, *Lordship and Landscape in Norfolk 1250–1350: The Early Records of Holkham*, 1993, pp 35–7, 52.

anything else the early replacement of the ox by the horse on the light soils of the county eliminated one of the most fundamental components of classic *sheep-corn husbandry*, which shows up better as the second-choice rather than first-choice farming type of a string of sheep-dominated mixed-farming demesnes on the light soils of the west of the county.

Cluster Six: 'extensive mixed-farming'

This is at once effectively the least well defined and most widely distributed farming type. Each of the three cluster techniques defines it differently, with the result that although K-means allocates 48 demesnes to this group, Ward's 71, and Normix 92, only 33 demesnes are common between them (Table 2). This core group is more than doubled in size by the addition of no less than 45 peripheral demesnes, thereby making *extensive mixed-farming* the single most common farming type (Table 3). The problem of definition derives in the main from the difficulty of distinguishing *extensive mixed-farming* from the other mixed-farming systems, particularly the *intensive mixed-farming* of Cluster One and *mixed-farming with sheep* of Cluster Three. This is highlighted by the fact that one or other of these alternative mixed-farming systems is the second-choice classification of all but three of these 78 demesnes (Fig 11). Moreover, the three exceptions are all peripheral demesnes (*sheep-corn husbandry* is the second choice of two, *extensive arable husbandry* the second choice of one). Numerically the pattern of second choices implies that *extensive mixed-farming* demesnes had most in common with *mixed-farming with sheep* but also a good deal in common with *intensive mixed-farming*. For this reason they show up in areas of both relatively intensive and extensive agriculture, in some of the economically most developed and economically most remote parts of the country, with the result that *extensive mixed-farming* is the most truly 'national' of all the farming systems (Figs 2 and 11). Nevertheless, as the pattern of second choices makes plain, it was a national system with important regional variations.

Overall, the core demesnes most diagnostic of this farming type were characterized by higher than average stocking densities, significantly above those of *intensive mixed-farming* demesnes but below those of *mixed-farming with sheep* demesnes (Table 2). Working animals tended to comprise a higher proportion of livestock units than in either of these other two systems, with oxen mostly of far greater importance than horses (although this was subject to quite wide variation). Among non-working animals it was cattle that predominated, and demesnes of this type generally carried quite well developed cattle herds which served the dual functions of dairying and rearing replacement oxen. Sheep were often kept but very much took second place to cattle. On the arable front these demesnes were characterized by a more equal balance between the winter- and spring-sown grains than in any other farming system. Moreover, this was the system in which wheat and oats both respectively assumed their greatest relative importance. By comparison, rye, barley, and the various winter and spring mixtures were of little significance. Legumes, too, occupied a smaller than average share of the sown acreage. Such a combination of crops is strongly suggestive of a three-course system of rotation of a fairly unimproved and unintensive nature.[101] It is also consistent with the cultivation of medium to heavy

[101] In Essex and Suffolk, for instance (the location of ten of the core demesnes), 'arable was usually fallowed one year in three in preparation for a winter-sown crop, to be followed the next year by a spring-sown crop': *Ag Hist III*, p 195. Three-course cropping also prevailed on the core demesne at Rimpton, Somerset: C C Thornton, 'The determinants of land productivity on the Bishop of Winchester's demesne of Rimpton, 1208 to 1403', in Campbell and Overton, *Land, Labour and Livestock*, pp 183–210. At Broadway, Worcs, however, two-course cropping appears to have been the norm: Gray, *English Field Systems*, p 503.

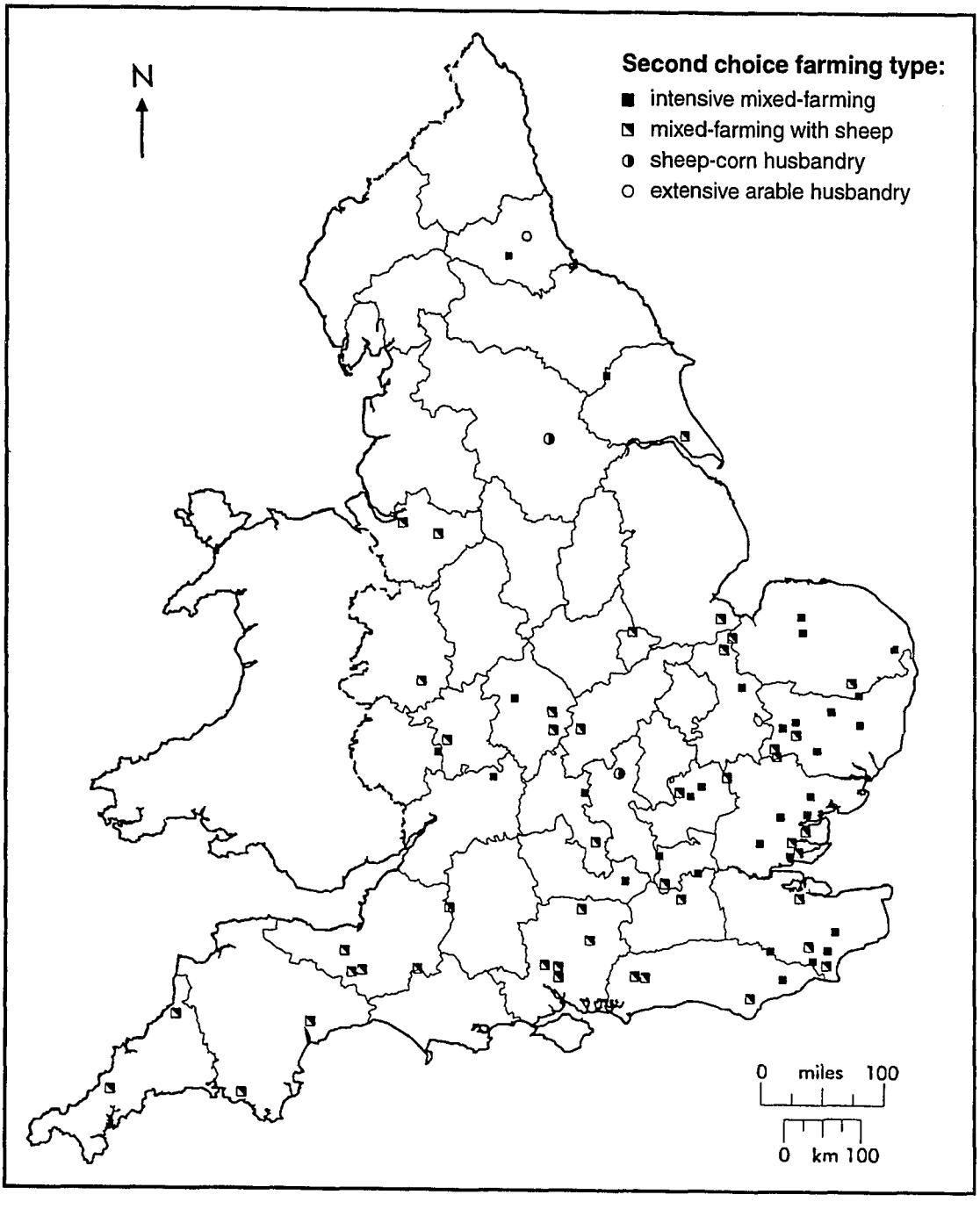


FIGURE 11
Extensive mixed-farming demesnes, 1350–1449 (core and peripheral demesnes indicating second choice).

soils, an impression reinforced by the strong pastoral emphasis upon cattle.[102] In many of these respects there is a strong affinity between this farming system and the *mixed-farming with cattle* of the pre-Black Death period whose association with the heavier lowland soils of counties such as Essex and Warwickshire was especially marked (Fig 1).[103]

The arable component of *extensive mixed-farming* was in a very real sense its most consistent feature. Both the core and the peripheral demesnes, those whose second choice was *intensive mixed-farming* and those for which it was *mixed-farming with sheep*, sowed the same basic combination of crops. On all of them wheat and oats were the two leading crops, all maintained a fairly equal balance between the winter and spring grains, and none differed greatly in the share of the cropped acreage devoted to legumes. Those demesnes which departed furthest from this general pattern of cropping were those peripheral demesnes which most resembled *intensive mixed-farming*. The latter are the demesnes with the strongest bias towards spring grains and which grew legumes on the largest scale. Nevertheless, the winter grains still occupied at least a third of the sown acreage and legumes only an eighth. Differences of cropping regime between *extensive mixed-farming* demesnes were therefore remarkably slight. Of far greater moment were the differences which existed in the pastoral component of husbandry.

Extensive mixed-farming demesnes varied first and foremost in the relative size of their arable and pastoral sectors as measured by the ratio of livestock units to cropped acres. Stocking densities were lowest of all, and the bias towards arable husbandry consequently greatest, on those peripheral demesnes with the closest resemblance to *intensive mixed-farming*. Conversely, they were highest on those peripheral demesnes whose closest affinity was with *mixed-farming with sheep*. On the former group of demesnes stocking densities were generally well below the national average, on the latter they were well above. Somewhat paradoxically, working animals – horses and oxen – accounted for a smaller share of total livestock units on demesnes with a second choice of *intensive mixed-farming* than on those with a second choice of *mixed-farming with sheep*, the reason being that horses made their greatest relative contribution to draught power on the former. The more intensive demesnes were also those with the most developed cattle herds, as manifest in a demographic structure strongly biased towards mature females and a far greater relative importance attached to cattle than other categories of animal. Where pastoral husbandry was more extensive, for instance, the specialist interest in cattle-based dairying was less developed and sheep comprised a larger share of livestock units. Even so, it was these more extensive forms of pastoral regime which were associated with the greatest numbers of livestock units.

The core demesnes whose traits most embody this husbandry system are geographically to be found in some of both the most and least economically developed parts of the country (Fig 2). Two-thirds were located in the counties of the south and east of England, with particularly notable concentrations in Essex (seven examples) and southern Kent/East Sussex (six examples). This south-eastern distribution of *extensive mixed-farming* demesnes is consistent with the distribution of demesnes practising *mixed-farming with cattle* in the period 1250–1349 and implies considerable continuity of farming system on

[102] At Marley, Sussex, on heavy clay, cattle farming was Battle Abbey's prime concern, underpinned, apparently, by a system of convertible husbandry: E Searle, *Lordship and Community: Battle Abbey and its Banlieu, 1066–1538*, Toronto, 1974, pp 272–303. Pastoral farming also loomed large on the Romney Marsh manors of Appledore, Ebony, and Ruckinge, Kent, where oats were typically sown on reclaimed marshland: *Ag Hist III*, p 131; R A L Smith, *Canterbury Cathedral Priory: A Study in Monastic Administration*, 1943, pp 181–3, 188.

[103] Power and Campbell, 'Cluster analysis', pp 236–7, 240–1.

many demesnes in this area (Fig 1).[104] Similar continuity appears to have prevailed in parts of the west midlands, for here too a loose concentration of *extensive mixed-farming* demesnes is present in an area where *mixed-farming with cattle* had been well represented in the earlier period. The spatial coverage of the sample is unfortunately thinner in the period 1350–1449, but five *extensive mixed-farming* demesnes do nevertheless show up at Mathon (Herefordshire), Knowle (Warwickshire), Broadway and Leigh (Worcestershire), and Cleobury Barnes (Shropshire), the first three more intensive than extensive in character. Elsewhere, *extensive mixed-farming* shows up on a loose scatter of demesnes in southern England – all of them more extensive than intensive in character – including three in south Somerset. The only two recorded Cheshire demesnes were also both of this type, as was Howsham in the East Riding of Yorkshire. Core demesnes of this type are, however, absent from Norfolk, the east midlands, and much of south central England.

Adding the peripheral demesnes greatly extends and amplifies this picture (Fig 11). Not only are the existing concentrations in the south-east and the west midlands, reinforced, but several further examples are added both in Somerset and in the north-east.[105] *Extensive mixed-farming* also shows up in areas where it is otherwise unrepresented by core demesnes, most notably in Devon and Cornwall (where there are four peripheral demesnes) and Norfolk (where there are six). The combined distribution of core and peripheral demesnes reveals a spatially significant pattern of second choices (Fig 11). In southern and south-western England, for example, *extensive mixed-farming* was most closely related to *mixed-farming with sheep*. East Anglian examples of *extensive mixed-farming* demesnes, in contrast, mostly bore a closer resemblance to *intensive mixed-farming*. Exceptions to the latter rule are mostly explicable in terms of local circumstances. Wisbech, Gedney and West Walton in the East Anglian Fens, for instance, all have the more extensive *mixed-farming with sheep* as their second choice, a reflection, no doubt, of the opportunities for extensive pastoral husbandry offered by the abundance of marshland grazing which each enjoyed. A superabundance of pasture may explain why similarly extensive versions of *extensive mixed-farming* also prevailed at Burstwick in Holderness, adjacent to the Humberside marshes, at Eastwood, Lawling, and Milton in Essex, with access to coastal marshes, and at Appledore and Barksore in Kent, both strategically placed to take advantage of the lush alluvial grazings available in Romney Marsh.

Analysis of the Feeding the City II sample of demesnes brings the distribution of *extensive mixed-farming* demesnes within the south-east into sharper focus (Fig 3). Although represented in greater numbers than demesnes of any other farming type, the 37 examples of *extensive mixed-farming* – 30 per cent of the total – are geographically highly specific in their distribution. No less than 22 are concentrated in Essex (plus Sawbridgeworth just across the county boundary into Hertfordshire) and six in Kent. In Essex *extensive mixed-farming*, generally in its more intensive form, was plainly the dominant farming type, practised by three out of four documented demesnes. Examples occur throughout most parts of the county and are particularly well represented on the heavy boulder clay soils which dominate so much of its centre.[106] Here, if further proof were

[104] Power and Campbell, 'Cluster analysis', pp 236–7, 240–1; *Ag Hist III*, pp 195–6, 206–7, 282–3.

[105] Elvethall and Witton (Durham), Burstwick and Methley (East and West Ridings of Yorkshire).

[106] R H Britnell, 'Agriculture in a region of ancient enclosure, 1185–1500', *Nottingham Medieval Studies*, XXVII, 1983, pp 37–55. For a case study of one Essex manor see, R H Britnell, 'Agricultural technology and the margin of cultivation in the fourteenth century', *Econ Hist Rev*, 2nd series, XXX, 1977, pp 53–66.

wanted, is clear evidence of a direct association between *extensive mixed-farming* and heavy clay soils. It is this same association which accounts for the distribution of this farming type in Kent, where it is exclusively confined to the wealden clays of the southern half of the county and the immediate environs of Romney Marsh. Elsewhere, apart from three examples in the Colne valley, *extensive mixed-farming* is not a particularly common farming type.[107] Nor is it well represented in Norfolk, where the application of discriminant functions identifies only 13 of the 106 documented demesnes as belonging to this farming type (Fig 4). These demesnes are more scattered than concentrated in distribution but do display a general bias towards localities of heavier soil or extensive alluvial grazings which coincidentally also tended to be those localities where oxen remained of significance longest.[108]

Cluster Seven: 'extensive arable farming'

By the end of the fourteenth century pastoral farming had grown in importance on most demesnes with the result that there were relatively few on which arable husbandry remained the almost exclusive focus of attention. Whereas before 1350 one in five of all sampled demesnes carried virtually no livestock other than essential working animals, after 1349 the equivalent proportion is only one in ten.[109] These are the most 'arable' of all demesnes and, as a farming type, are immediately recognizable. No other group of demesnes is more consistently identified by all three clustering methods. Ward's, K-means, and Normix all identify a common core of 27 demesnes, which only in the case of Normix is enlarged by the inclusion of two others. The net result is a group of 28 demesnes with a core membership of 27 and a peripheral membership of one (Tables 2 and 3). This group is defined less by the combination of crops which it grew – which differed in no significant respect from the mean pattern prevailing in the country as a whole – than by the scale and composition of its pastoral sector. The latter was small and composed almost exclusively of working animals – horses and oxen (with, on average, twice as many of the latter as the former). Stocking densities, consequently, were the lowest of any farming type. Arable production may have been everything but with such a deficiency of livestock high levels of productivity were unattainable. Production was perforce extensive.

One reason why patterns of cropping on *extensive arable husbandry* demesnes approximated so closely to the national average is that like *sheep-corn* demesnes (the other farming type of which this is true) they occurred in a wide variety of farming contexts. The 28 demesnes in question were scattered through 17 different counties ranging from Durham in the north to Hampshire in the south, from Norfolk in the east to Somerset in the west (Figs 2 and 12). As with *arable husbandry with swine* the explanation for this wide dispersal lies partly with institutional factors.

Rather than manage their flocks and herds directly some landlords chose to lease them out and keep only their arable land in hand. Others organized their sheep flocks on an intermanorial basis and accounted for them separately. The result in both cases is that some or all of the non-working animals disappear from the manorial accounts. Twelve of Norfolk's 106 documented demesnes fall into the *extensive arable husbandry* category and most probably do so for this reason (Fig 4). So conspicuously different from other demesnes are they in this otherwise intensively farmed

[107] Denham and Iver (Buckinghamshire) and Yeoveney (Middlesex).
[108] Especially Thorpe Abbotts, Tivetshall, Topcroft, and Rickinghall (Suffolk) on the heavy soils of south-east Norfolk and north Suffolk, Kempstone and Mileham on the boulder-clay soils of mid-Norfolk, West Walton in the Fens and Boughton on the Fen edge, and Halvergate in the Broadland marshes.
[109] Power and Campbell, 'Cluster analysis', p 238.

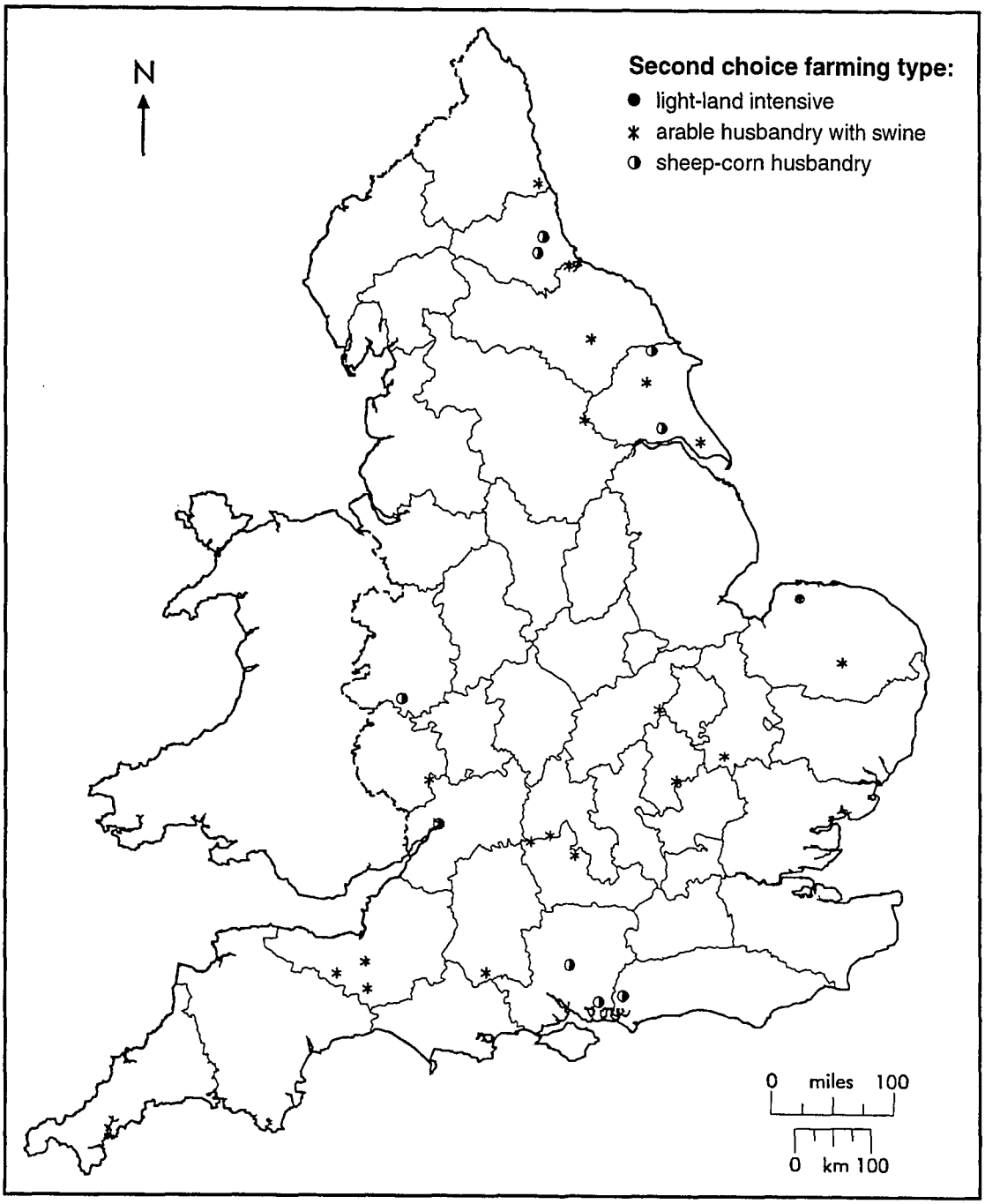


FIGURE 12
Extensive arable husbandry demesnes, 1350–1449 (core and peripheral demesnes indicating second choice).

county that they retain their distinctive identity even at a county level of analysis as the third of Norfolk's three basic farming types, the others being versions of *intensive mixed-farming* and *light-land intensive* farming (Table 6, Fig 5). The same explanation probably applies to the six examples of this farming type within the Feeding the City

II sample of demesnes (Table 5, Fig 3). Nevertheless, in parts of the north-east of England *extensive arable husbandry* more probably represents a genuine economic preference.

Ten of the 28 *extensive arable-husbandry* demesnes are located in Durham and Yorkshire where they comprise just over half of all sampled demesnes (Fig 12). This is a significant concentration, the more so since an equivalent concentration of *extensive arable-husbandry* demesnes is apparent in this self-same part of the country in the period 1250–1349 (Fig 1). As before, a spatial division of production appears to have prevailed with pastoral production concentrated in the main on the uplands and upland margins, often on specialist vaccaries and bercaries, and lowland demesnes, particularly on the larger estates, only carrying enough animals to satisfy the draught requirements of the arable in which branch of production they in turn specialized.[110] This was especially the case on estates which combined properties in both locations since replacement draught animals could simply be transferred in from the reservoir of animals maintained on the stock farms. Whereas demesnes elsewhere in England were becoming more mixed, many of those in the north-east maintained their traditional specialism in one or other branch of production with the result that the swing towards pastoralism is less apparent than might otherwise have been expected of an area naturally so well endowed with pastures. *Extensive arable-husbandry* demesnes at Stanton Lacy, Shropshire and Durneford, Herefordshire may possibly reflect a similar upland/lowland separation of pastoral and arable production in the counties of the Welsh border.[111]

[110] I S W Blanchard, 'Economic change in Derbyshire in the late Middle Ages, 1272–1540', unpublished PhD thesis, University of London, 1967, pp 168–74; *Ag Hist III*, pp 189–90.

[111] Davies, *Lordship and Society*, pp 112–17; *Ag Hist III*, pp 241–4.

III

Of the seven basic demesne-farming systems that have been identified in the period 1350–1449 some were more distinctive and some more homogeneous than others.[112] Cluster analysis has particular utility here. Not only does it provide a statistical method of classifying farming systems based upon a consistent set of variables and contain a procedure for establishing the number of farming types present (thereby ensuring that classification reflects real similarities and dissimilarities within the data), but it can also be used to establish which farming systems are most alike or unlike each other.

Extensive arable husbandry and *sheep-corn husbandry* are the two farming systems most consistently defined by all three clustering methods. Significantly, the same two farming types are equally clearly defined in the period 1250–1349. After 1349 the K-means, Normix, and Ward's methods approach virtual unanimity in their identification of *extensive arable-husbandry* demesnes. So conspicuously different is this farming type that, as independent classification of the 106 Norfolk demesnes demonstrates, it shows up at a county as well as a national level of analysis. Whereas *extensive arable husbandry* is represented within the national sample by 27 core demesnes, *sheep-corn husbandry* is represented by 45. The larger number obviously provides greater scope for differences between the outcomes obtained from the three chosen clustering methods. Even so, there is a close correspondence between all three solutions. Nor are significant numbers of peripheral demesnes added to either farming category on the basis of their discriminant scores.

Each of these two farming systems is immediately and consistently defined because the demesnes that practised them

[112] This analysis does not, of course, preclude the existence of other demesne-farming types not adequately represented in the available sample of accounts.

display certain features that are markedly atypical. With *extensive arable husbandry* this is its stunted pastoral sector composed almost exclusively of working animals; in the case of *sheep-corn husbandry* it is the predominance of oxen among working, and sheep among non-working animals. By comparison, the arable profiles of these two systems are far less distinctive and actually transcend differences in cropping regime, for geographically both systems occur in a variety of arable contexts; hence the wide range of alternative farming systems with which individual sheep-corn demesnes shared strong affinities. In contrast, *light-land intensive* husbandry was characterized by one of the most distinctive and environmentally specific of all arable regimes. No other system devoted so small an acreage to wheat and legumes and so large an acreage to rye. Yet (and contrary to the situation before 1350), this is the least consistently defined of all farming systems with only a relatively small core of demesnes common to all three cluster solutions. This is partly because of a high degree of variation in the precise form of husbandry practised by each constituent demesne but also because this farming system shared a number of features in common with several other farming systems (as witnessed by the fact that the 14 *light-land intensive* demesnes display three different second choices). Nevertheless, it is sufficiently distinctive to show up at a county as well as a national level of analysis and geographically displays a general association with a particular region and a specific association with a particular type of environment. There is therefore considerable merit distinguishing it as a separate system.

The remaining farming systems, embracing 70 per cent of all sampled demesnes, fall between these two extremes of definition. Apart from *arable husbandry with swine*, whose pastoral component was comparatively small, all these systems are mixed-farming systems of one sort or another and all display strong affinities with each other. Distinguishing between the almost seamless gradation of mixed-farming types is the main challenge to the derivation of an effective classification of farming systems in this period. In fact, a stable cluster solution based on the first six principal component scores lumps all these demesnes into a single mixed-farming category.[113] This is unhelpful. Genuine, if often subtle, differences did exist in the character, intensity, and distribution of mixed-farming systems and it is the task of any effective classification system to draw meaningful distinctions between them. That is why it was found more effective in this instance to base classification upon five rather than six principal component scores. Use of five rather than six component scores focuses upon broader differences which blur when the additional detail of the sixth component is included.

A striking feature of the three main mixed-farming systems identified here – *intensive mixed-farming*, *mixed-farming with sheep*, and *extensive mixed-farming* – is that although each shared certain features in common with the others, commonalties with other farming systems are far less marked. In fact, taking all three mixed-farming systems together, only 3 per cent of the 93 core demesnes and 6 per cent of the 187 core plus peripheral demesnes have a second choice other than one of these mixed-farming systems. *Intensive mixed-farming* stands out as the most clearly and consistently defined of the three systems, with the greatest correspondence in cluster membership between the three cluster solutions. Its intensive character endowed it with several extreme features – the scale of barley cultivation, specialist dairy function of its cattle herds, and majority reliance upon horse power – which help to differentiate it from the other mixed-farming

[113] Above, p 139.

systems. *Mixed-farming with sheep*, in contrast, exhibits fewer exceptional features, constitutes a system of middling intensity, and consequently is far less easily defined. All three clustering techniques identify substantial numbers of demesnes of this type, but the core of demesnes that is common between them is smaller than for any other mixed-farming type. Nor is *extensive mixed-farming* much better defined, for all the distinctiveness of its cropping regime and the large number of demesnes that practised some version of it. Difficult though it is to draw a line between these three mixed-farming systems, the result is nonetheless well worth the effort for these are among the most coherent of farming types in geographical distribution. Of no farming system is this truer than *intensive mixed-farming*, which is more closely associated with a single specific region than any other post-1349 farming type.

Those farming systems which, like *intensive mixed-farming*, were spatially most sharply focused are those which owed most to specific environmental and economic circumstances and which embodied regionally specific forms of technology (most notably a reliance upon horses rather than oxen for draught power, which, as Langdon has observed, was a major source of regional differentiation within medieval agriculture).[114] But farm enterprise was a function of more than environmental, economic, and technological factors. What type of landlord, what size of estate, and the position of the individual demesne within the overall estate production system were also important considerations. Institutional factors such as these all exercised a far greater influence upon the pastoral than the arable sector. As analysis of the Feeding the City II sample of accounts demonstrates, conventual, collegiate, episcopal, lay, and royal estates differed in their capacities and willingness to invest in and maintain flocks and herds.[115] Perpetual institutions, such as convents and colleges, clearly enjoyed an edge over episcopal and lay estates which were vulnerable to asset stripping whenever the current incumbent died. Individual estate policy also exercised a bearing upon the choice of animals stocked and whether or not these were managed directly at demesne level, centralized and accounted for separately, or leased out. Those farming systems which exhibit the strongest imprint of the operation of these kinds of institutional factors – *arable husbandry with swine* and *extensive arable husbandry* – are also those which are geographically for the most part the least specific in distribution. As pastoral farming became more important so institutional factors became of correspondingly greater significance in determining the geographical distribution of farming types.

Under these circumstances it is hardly surprising that when farming systems are viewed collectively rather than individually the picture that emerges is more heterogeneous than homogeneous (Figs 2 and 3). Few types of farm enterprise were unique to a locality or region with the result that many demesnes remote from one another had more in common than those that were neighbouring. There is a lesson here for those who would seek to define and describe farming types in exclusively regional terms. Unfortunately, the national sample of demesnes is mostly too sparse in coverage to reveal local and regional configurations of farming types in sufficiently sharp focus (Fig 2). Only the Norfolk and portions of the Feeding the City II samples of demesnes are adequate for this purpose (Figs 3 and 4). From these it is clear that individual localities were sometimes dominated by particular farming types. On the boulder-clay plateau of central Essex, for instance, few demesnes deviated from some

[114] Langdon, *Horses, Oxen and Technological Innovation*, pp 273–6.

[115] Campbell, 'Measuring the commercialisation of seigneurial agriculture', pp 142–7.

version of *extensive mixed-farming*, and in eastern and northern Norfolk *intensive mixed-farming* was the preferred system of most demesnes. The latter example is particularly instructive for the Norfolk evidence is exceptionally full, allowing the agricultural geography of this one county to be seen more clearly than that of any other part of the country. During the period 1350–1449 a system of intensive mixed farming crystallized here on light to medium soils which was almost unique to this county. Forty-two of the 106 documented demesnes employed this system and 20 of the remainder, mostly on the county's lightest and poorest soils, followed a light-land alternative.[116] Reclassifying Norfolk demesne-farming systems at county level elevates these two farming types to almost complete hegemony, with three out of four demesnes practising a version of *intensive mixed-farming* and one out of five a version of *light-land intensive* farming. Nevertheless, it is the national-level classification which is the more detailed and subtle and captures most fully the range of farm enterprise within the county. It serves to bring home the intrinsically heterogeneous character of late medieval farming systems, for examples of all seven national farming types occur within this one county, often as many as four or five of them within a few miles of each other. As Mark Overton found in the same county at the end of the sixteenth century '[farming] types do not form discrete regions so there is little point in drawing boundaries'.[117] Paradoxically, therefore, although the form of mixed farming practised on most late fourteenth-century Norfolk demesnes stands out as the only truly regional farming type, its distribution is more accurately represented by points than lines on the map. This bears out E L Jones' observation that 'lines drawn on the topographical map ... must arbitrarily bisect interesting zones of overlap and may distract attention from them'.[118] Certain localities and regions, in fact, were distinguished more by the variety than the uniformity of farming systems that existed within them. This was conspicuously true of the Thames valley – one of the country's key economic arteries – and of Kent, a county which presented a range of environmental and economic opportunities (Fig 3).

Norfolk and the counties surrounding London together demonstrate that whereas the more extensive systems of husbandry might be found in almost any part of the country, even, on occasion, in areas of apparently high economic rent, the more intensive systems were much more circumscribed in distribution. Norfolk exhibited the full range of national farming types because it remained relatively populous and there were strong (if albeit waning) economic incentives to maintain more specialized and intensive forms of agriculture. The same, to a degree, was true of the immediate hinterland of London (whose reduced post-plague population nevertheless probably represented a greater share of the national total and continued to constitute a major focus of demand), where a correspondingly wide range of farming types may be identified. In economically less developed and commercialized parts of the country, however, a narrower range of farming types appears to have existed since the forces promoting economic differentiation were much weaker. In particular, the most intensive systems were either rare or absent.

[116] Most of these demesnes also employed wheeled ploughs and sowed their seed relatively thickly.

[117] M Overton, *Agricultural Regions in Early Modern England: An Example from East Anglia*, University of Newcastle upon Tyne, Department of Geography seminar paper, XLII, 1983, p 18.

[118] E L Jones, 'The condition of English agriculture', p 616.

Compared with the situation before 1350 there was certainly a shift in the relative importance of these seven main farming systems. Demesnes practising *light-land intensive* and *extensive arable husbandry* both became relatively less common. *Intensive mixed-farming* lost ground and *arable husbandry with swine* merely maintained its minority status. The more extensive mixed-farming systems, however, became both more numerous and more mixed (insofar as their stocking densities tended to register the greatest increases). *Sheep-corn husbandry* – a particularly extensive system – gained most of all. Nowhere was the growth of mixed farming more pronounced than in central and southern England. It was here, therefore, in the half century or so immediately following the Black Death that farming systems changed most and the greatest gains in demesne stocking densities accrued.[119] These areas stood in the vanguard of the shift from corn to horn – as they were to do again in comparable periods of agrarian change – for the simple reason that they were best placed environmentally and economically to switch resources from arable to pastoral production.[120] Above all this meant converting arable land to pasture. Further east, and especially on the lighter soils of East Anglia, the mixed-farming systems that had developed were traditionally both more intensive and more arable based, insofar as they were underpinned by fodder cropping and temporary grazing/folding on the arable.[121] Demesne producers here lacked an equivalent comparative advantage when it came to substituting more extensive and, consequently, more grass-based mixed-farming systems. They had prospered when the demand for grain was strong and now, as in all subsequent agricultural recessions, suffered as the terms of trade shifted in favour of low-cost pastoral producers.[122] Demesne-farming systems in the west and north were similarly slow to change.[123] Here methods of pastoral farming had always been relatively extensive and an inherent land-use bias towards grass meant that good arable land remained at something of a premium. There was therefore no great incentive to alter the established balance of production.

IV

By the close of the fourteenth century, therefore, the country's agricultural geography had been subtly but profoundly transformed. Underpinning this transformation was a reconfiguration of economic rent, for it was upon this that the pattern and intensity of agricultural land use depended.[124] Economic rent is a function of land quality, of population density (and therefore the demand for land), and of distance from the market, and in all three respects the later fourteenth century witnessed important changes. Changing factor and commodity prices played to the comparative advantage of some regions more than others. Population densities fell but the rate of fall was spatially uneven due undoubtedly to local and regional differen-

[119] Campbell, 'Land, labour, livestock and productivity trends', pp 158–9.

[120] For the expansion of grass at the expense of arable after 1349 in the midlands see, *Ag Hist III*, pp 78–80; C Dyer, *Warwickshire Farming 1349–c 1520: Preparations for Agricultural Revolution*, Dugdale Society Occasional Papers, 27, 1981, pp 9–12. For the shifting frontier between corn and horn in the seventeenth century, see Kussmaul, 'Agrarian change in seventeenth-century England'.

[121] The story on the heavy clay soils of East Anglia was rather different, although it was in the fifteenth century rather than the fourteenth that their conversion to grass made greatest progress. For a case study of land-use trends in Essex over this period see L R Poos, *A Rural Society after the Black Death: Essex 1350–1525*, 1991, pp 46–51.

[122] Cf J D Chambers and G E Mingay, *The Agricultural Revolution 1750–1880*, 1966, p 181; P J Perry, 'Where was the "Great Agricultural Depression"? A geography of agricultural bankruptcy in late Victorian England and Wales', *AHR*, 20, 1972, pp 30–45.

[123] *Ag Hist III*, pp 45–8, 152–63.

[124] P Hall, ed, *Von Thünen's Isolated State: An English Edition of Der Isolierte Staat by Johann Heinrich von Thünen*, trans C M Wartenberg, 1966; M Chisholm, *Rural Settlement and Land-use: An Essay on Location*, 1962, pp 20–32; D Grigg, *The Dynamics of Agricultural Change: The Historical Experience*, 1982, pp 135–40; *A Medieval Capital*, pp 4–7.

tials in fertility and mortality and the redistribution of population by migration.[125] Towns for the most part contracted in size, the composition of urban demand for rural provisions altered, and the extent and orientation of their provisioning hinterlands were redrawn.[126]

If the pattern of farming systems mapped here represents the response to these changes how should it be interpreted? It certainly represents a reversion to more land extensive and especially more pastoral forms of agriculture, and as such was consistent with prevailing economic trends. But as demesne managers increasingly counterbalanced grain production with animal husbandry were they also reverting to a form of agriculture in which estates on the one hand and localities and regions on the other were increasingly self-sufficient in what they produced? Certainly, as pressure eased off the land more localities and regions would have been able to meet their consumption requirements internally from within their own resources. Whereas *c* 1300 it is possible to recognize the clear impact of growing centres of concentrated urban demand, both at home and overseas, upon the pattern of farming systems, by the end of the fourteenth century such centripetal influences had diminished in scale and their impact is far less self-evident.[127] The very fact that demesne agriculture became less differentiated suggests that incentives to specialize and intensify had weakened. The new agricultural landscape that emerged therefore appears more Ricardian then Thünenesque, its configuration influenced more by land quality and local demand for the land and its products than by distance from major markets.[128] The latent patterns of specialization and intensification that may be detected at the climax of medieval economic expansion *c* 1300 had mostly fallen into abeyance in an agrarian world seemingly reoriented along more local and regional lines. This, however, is almost certainly to underestimate the commercial potential of animals and animal products, both of which were capable of being marketed at a far greater range than grain.[129]

If the orbit of grain markets became more circumscribed it does not necessarily follow that the same applied to the markets for live animals, for dairy products, hides, skins, and wool.[130] In fact, an active trade in live animals undoubtedly helped sustain the expansion of flocks and herds that was such a feature of this period. Most demesnes relied upon the market for replacement work horses, for the plough and especially for the cart, and the same often applied to oxen. The conduct of pastoral husbandry also regularly generated surplus animals for sale: redundant, decrepit, and sickly animals requiring replacement, surplus calves and lambs from specialist herds and flocks, animals purpose-bred for sale and others fattened for meat. On what scale that trade was conducted and over what distances remains to be established, but neither is likely to have

[125] The changing distribution of population is implicit in the changing distribution of taxable wealth: R S Schofield, 'The geographical distribution of wealth in England, 1334–1649', *Econ Hist Rev*, 2nd series, XVIII, 1965, pp 483–510; H C Darby, R E Glasscock, J Sheail, and G R Versey, 'The changing geographical distribution of wealth in England 1086–1334–1525', *J Hist Geog*, 5, 1979, pp 257–61; A Dyer, *Decline and Growth in English Towns, 1400–1640*, 1991, pp 40–2.

[126] Dyer, *Decline and Growth in English Towns*, pp 20–4; D Keene, *Cheapside before the Great Fire*, 1985, pp 19–20; Dyer, *Standards of Living*, pp 199–202; Galloway *et al*, 'Changes in grain production and distribution'; *Ag Hist III*, pp 372–3.

[127] Power and Campbell, 'Cluster analysis', pp 242; *A Medieval Capital*, pp 172–83.

[128] For the difference between Ricardian and von Thünen economic rent see, Grigg, *The Dynamics of Agricultural Change*, pp 50–1, 135–40.

[129] T H Lloyd, *The English Wool Trade in the Middle Ages*, 1977; D L Farmer, 'Marketing the produce of the countryside, 1200–1500', in *Ag Hist III*, pp 377–408; Overton and Campbell, 'Norfolk livestock farming', pp 377–8, 393–4.

[130] Lloyd, *The English Wool Trade*; M Kowaleski, 'Town and country in late medieval England: the hide and leather trade', in P J Corfield and D Keene, eds, *Work in Towns 850–1850*, Leicester, 1990, pp 57–73.

been inconsiderable.[131] Whether it was sufficient to maintain established levels of commercialization within the demesne sector is another matter.[132] Nevertheless, in the ongoing debate about the character and trend of the late medieval economy the classification of demesne-farming systems outlined here should provide an appropriate framework for a more critical evaluation of these and other issues.[133]

[131] Campbell, 'Measuring the commercialisation of seigneurial agriculture', pp 142–3, 148–9, 152–3, 163–74; I Blanchard, 'The Continental European cattle trade, 1400–1600', *Econ Hist Rev*, 2nd series, 39, 1986, pp 428–31; M K McIntosh, *Autonomy and Community: The Royal Manor of Havering, 1200–1500*, 1986, pp 141–3.

[132] Campbell, 'A fair field', pp 68–9.

[133] For recent contrasting views of the period compare R H Britnell, *The Commercialisation of English Society 1000–1500*, 1993, pp 179–203; S R Epstein, 'Regional fairs, institutional innovation, and economic growth in late medieval Europe', *Econ Hist Rev*, 2nd series, XLVII, 1994, pp 441–58.

A Contrast in Style: An Appreciation of Two Victorian Agricultural Journalists*

By NICHOLAS GODDARD

Abstract

Henry Corbet (1820–1878) and John Chalmers Morton (1821–1888) were two of the leading agricultural journalists of early and mid-Victorian England. They held influential positions as, respectively, editors of the *Mark Lane Express* and the *Agricultural Gazette*, and both men participated in a diverse range of additional agricultural activities. While they shared some common objectives and beliefs, their writing and agricultural stances exhibited a marked contrast in style and of values. This article examines the viewpoints that they presented to their readers and reviews some of the issues which dominated their careers and positions within the Victorian agricultural community.

JOHN CHALMERS MORTON'S first piece of agricultural writing was an account of Smith of Deanston's method of deep draining and subsoil ploughing, which he completed in 1836 at the age of sixteen while still a pupil at Merchiston Castle School, Edinburgh. In the course of finishing his education, Morton attended some of Professor David Low's classes for agricultural students at Edinburgh University, and he later recalled these lectures as having had particular significance in shaping his career. When only nineteen years of age, he was requested by his father, John Morton (agent to the earls of Ducie and himself the author of a book on soils) to take charge of the Whitfield example farm which the second earl of Ducie had established on his estate at Tortworth, Gloucestershire. In the year 1843 the young Morton was selected by Sir Charles Wentworth Dilke, who had founded the *Gardener's Chronicle* two years previously, to edit the *Agricultural Gazette* which he planned as an addition to the *Chronicle*. Morton occupied the editorship of the *Gazette* from its inception in 1844 until his death forty-four years later.[1]

Whereas Morton has received recognition as a leading nineteenth-century agricultural commentator, Henry Corbet is unjustifiably much less well known. Despite his twenty years' tenure of the editorship of the weekly *Mark Lane Express and Agricultural Journal*, unlike Morton he does not, for example, receive notice in J A Scott Watson's and M E Hobbs's survey of 'The press and the pilgrims'.[2] Corbet was educated at Bedford School and came to agricultural prominence when he was elected to the secretaryship of the London (or 'Central', as it was often styled) Farmers' Club in 1846. Between the years 1846 and 1849 Corbet edited the *Steeplechase Calendar*, and also at this time collaborated with William Shaw (the editor of the *Mark Lane Express* since its establishment in 1832) and Philip Pusey in an investigation into the tenant right question. This work provided Corbet with material which was awarded a prize by the Wenlock Farmers' Club in 1847. The following year, with

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[1] For outlines of Morton's life see *Agricultural Gazette*, 7, 14 and 21 May 1888 ('Mr. Morton's schooldays'). Ernest Clarke, the RASE secretary, contributed a memoir of Morton to the society's *journal*: 'Some late contributors to the journal', *JRASE*, 2nd ser, XXIV, 1888, pp 691–96. There is a short notice of Morton by G E Fussell in *Agricultural Progress*, 58, 1983, pp 52–4. For a memoir of John Morton see *Agricultural Gazette*, 4 Oct 1873.

[2] J A Scott Watson and M E Hobbs, *Great Farmers*, 1937, pp 246–62.

Shaw, he produced an extensive *Digest of Evidence on the Agricultural Customs of England and Wales* which together with the prize essay became a standard reference text on the subject.[3] Corbet also wrote for the *Mark Lane Express* and he succeeded to its editorship shortly after Shaw fled from England to the Australian goldfields in 1852 in order to escape bankruptcy. He spent the rest of his working life at the *Express*, retiring from its editorship, and the secretaryship of the London Farmers' Club, at the end of 1875 owing to ill-health.[4]

Thus both men had lengthy careers as editors of the two leading farming newspapers of their day,[5] and they also maintained extensive additional interests. Morton, for example, was a Land Commissioner, a member of the Royal Commission on River Pollution between 1868 and 1874, and lectured at Edinburgh in 1855 immediately after Low's death. In addition to his secretaryship of the London Farmers' Club, Corbet was closely involved with the activities of the Total Repeal Malt-Tax Association and in the early 1860s helped to reform the affairs of the Smithfield Club. He was appointed an auditor for the Royal Agricultural Society of England (RASE) in 1859 after it had been discovered that the secretary, James Hudson, had embezzled some £2000 of the year's show receipts.[6] His lifelong regard and respect for the horse led him to campaign, with some success, against the over-exploitation of two-year-olds on the Turf[7] and in conjunction with his brother, Edward Corbet, in 1871 founded the Alexandra Park Horse Show.

Apart from writing for the papers which they edited, Morton and Corbet also made numerous other contributions to agricultural literature. Morton wrote extensively for the *Journal of the Royal Agricultural Society of England (JRASE)*, the *Journal of the Society of Arts*, and the *Journal of the Bath and West of England Society*, as well as editing the 2200 page *Cyclopaedia of Agriculture* (1855–6) which at the time of his death was 'still the most complete work of its kind extant'.[8] In 1864 Morton brought out a revised and updated edition of Young's *Farmer's Calendar* and later he edited the nine-volume *Book of the Farm* series of instructional works on various aspects of farm practice. He was largely responsible for the editions which dealt with the *Soil of the Farm* (1882), *Equipment* (1884), *Dairy* (1885), and *Labour* (1887), and these books were indicative of Morton's commitment to the improvement of agricultural education. Corbet gave a number of addresses to the London Farmers' Club which were published in its *journal* and elsewhere, and he contributed to a range of sporting papers and magazines such as the *Field*, *Bell's Life*, *All the Year Round*, and the *New Sporting Magazine*. Some of his writings were gathered together and published in 1864 as *Tales and Traits of Sporting Life*.

I

The differing outlets chosen by Morton and Corbet for their agricultural writing reflected their varied outlooks and interests,

[3] For Corbet's reminiscences of this work see 'The Central Farmers' Club. English tenant-right', *Farmer's Magazine*, 3rd ser, XXXVII, 1870, pp 518–19.

[4] For a memoir of Corbet, see 'Noteworthy agriculturists. Mr Henry Corbet', *Agricultural Gazette*, 15 May 1876 (reprinted in *Farmer's Magazine*, 3rd ser, LIII, 1878, pp 253–4). On Shaw see N Goddard, 'William Shaw "of the Strand" and the foundation of the Royal Agricultural Society of England', *JRASE*, 143, 1982, pp 98–104. On the London Farmers' Club see K Fitzgerald, *Ahead of their Time: A Short History of the London Farmers' Club*, 1967, which affords Corbet only passing mention.

[5] For assessments of the nineteenth-century farming press see N Goddard, 'The development and influence of agricultural newspapers and periodicals 1780–1880', *AHR*, 31, 1983, pp 176–31 and *idem*, 'Agricultural institutions', in E J T Collins, ed, *Agrarian History of England and Wales, VII, 1850–1914*, forthcoming.

[6] N Goddard, 'The Royal Agricultural Society of England and agricultural progress 1838–1880', unpublished PhD thesis, University of Kent at Canterbury, 1981, p 112; *Mark Lane Express*, 17 Dec 1859.

[7] Corbet claimed credit for the instigation of a Jockey Club rule which prohibited the running of 2-y-o horses before May: see *Mark Lane Express*, 7 June 1869.

[8] Clarke, 'Some late contributors', p 692.

and it is the distinct 'contrast in style' of their work, noted in an earlier contribution to this *Review*,[9] that forms the focus of the present essay. Morton's writing was typically densely written, carefully researched, and highly authoritative but rather 'dry' in its treatment of topics which usually related to agricultural practice, experience, theory, or education. Corbet's output, in contrast, was characteristically concerned with livestock, rural sport, or a range of 'political' issues and was more provocative and combative in style than Morton's work. Morton regularly gave papers to the rather august meetings of the Society of Arts or RASE council, whereas Corbet was happiest when addressing tenant farmers or reporting livestock exhibitions. Morton, while by no means bland or uncritical in his writing, was nevertheless invariably courteous and restrained in his tone whereas, as we shall see, Corbet's work had a well-developed acerbity and he could be outspoken 'to the extent sometimes of ungraciousness'. This tendency created personal opposition 'for which he was sometimes himself responsible,'[10] whereas Morton enjoyed universal respect.

Although both men evinced a commitment to agricultural progress, Morton had a particularly steadfast belief in what could be accomplished by the application of science to farming and the improved education of the farmer. His first communication to the *JRASE* detailed the large yields of Belgian carrots achieved on the earl of Ducie's farm[11] while an early essay, published in 1846 on the maintenance of fertility in new arable land, demonstrated his characteristic earnestness of purpose:

> Population increases rapidly – an imperative demand exists for an increased production of food, for an increased supply of well-paid employment – yet more than one-half of the cultivable land in this country is now yielding grass! The co-existence of these facts is a strange thing. Surely it is possible to grow something better, more nutritive, more remunerating than grass – something involving the profitable employment of more labour in its cultivation.[12]

The need to expand agricultural output, and the means by which this could be brought about, was a constant theme in Morton's work. He contributed a prize essay on 'Increasing our supplies of animal food' to the *JRASE* in 1849 and ten years later reviewed 'Agricultural maxima'; in 1863 he presented a detailed paper on the 'helps and hindrances' to agricultural progress to the Society of Arts where he maintained that 'agricultural progress, if of any interest or value whatever, simply means more food produced per acre'.[13] Morton was particularly interested in agricultural machinery and as early as 1842 he wrote in the *JRASE* of the improvements to which he thought it was susceptible. Later in his career he compiled detailed expositions on the cost of horse power, the 'forces used in agriculture', and in 1868 published his *Handbook of Farm Labour*.[14] The dairy industry, and the ways in which supplies of milk for the urban consumer could be increased, were also particular concerns of Morton's before this sector of farming became fashionable.[15] He campaigned for an improved system of agricultural education,[16] and his writing characteristically stressed the importance

[9] Goddard, 'The development and influence', pp 127–8.

[10] *Agricultural Gazette*, 18 Feb 1878.

[11] J C Morton, 'On the white, or Belgian carrot', *JRASE*, II, 1841, pp 40–1.

[12] *Idem*, 'On the maintenance of fertility in new arable land', *JRASE*, VII, 1846, p 283.

[13] *Idem*, 'On increasing our supplies of animal food', *JRASE*, X, 1849, pp 341–79; 'Agricultural maxima', *JRASE*, XX, 1859, pp 442–53; 'Agricultural progress; its helps and hindrances', *J Society of Arts*, XII, 1863–4, p 54.

[14] *Idem*, 'On the present state of agricultural mechanics and the improvement of which the various implements now in use may be susceptible', *JRASE*, III, 1842, pp 100–25; 'On the cost of horse power', *JRASE*, XIX, 1858, pp 437–67; 'The forces used in agriculture', *J Society of Arts*, VIII, 1859–60, pp 53–61.

[15] *Idem*, 'Town milk', *JRASE*, 2nd ser, IV, 1868, pp 69–98.

[16] *Idem*, 'Agricultural education', *JRASE*, 2nd ser, I, 1865, pp 436–64. For a discussion of the slow progress of formal agricultural education in the nineteenth century see N Goddard, *Harvests of Change. The Royal Agricultural Society of England 1838–1988*, 1989, pp 122–4.

of learning from direct agricultural experience.[17]

Corbet was similarly interested in the ways in which agricultural progress could be achieved by the application of science but generally adopted a much more sceptical viewpoint than Morton. Under his editorship the *Mark Lane Express* and the associated monthly *Farmers' Magazine* gave extensive coverage to all aspects of agricultural innovation, and Morton himself recognized that throughout his lifelong literary work Corbet was 'among the first to recognise the agricultural bearing and importance of every fresh discovery for the benefit of farm practice'.[18] While Morton was an authority on agricultural mechanics, Corbet specialized in the appraisal of livestock and his report on the animals exhibited at the RASE's Cardiff Show in 1872 is a good example of his expertise in this area, as is his essay on 'Heads' written for the Bath and West Society.[19]

II

An important contrast in the outlook of the two men is, however, that whereas Morton typically viewed the 'hindrances' to agricultural progress in terms of a lack of agricultural communication and education, Corbet held that the 'alliance of science and practice' that both wished to see was retarded by a range of 'political' factors. Foremost among these was, Corbet maintained, the lack of a formal system of tenant right for the 'absence of security to the outlay incurred in permanent improvement, or even that necessary for the maintenance of the ordinary fertility of the soil' meant that the tenant farmer 'could not make the most of the land which the nature of his occupation morally enjoined him to do'.[20] The commitment of the *Express* to the perceived interests of the tenant farmer was symbolized by the embellishment above the weekly leader column of a rustic scene which carried the inscriptions 'Tenant Right' and 'Live and Let Live'.[21] For Corbet, the tenant right issue, after his work with Pusey and Shaw in the 1840s failed to yield legislative reform, was a lifelong crusade. In contrast, Morton, in common with many other adherents of progressive farming, opposed statutory tenant right as an inferior substitute for leases and an infringement of the principles of freedom of contract which, as J R Fisher has pointed out, they viewed as an essential basis of economic progress.[22]

Unlike Corbet, Morton did not normally dwell on 'political' issues in his published work. Early in his career he was convinced that the potential of science to raise agricultural productivity was such that protection could be surrendered without damage to the farming and rural interest. Thus the first advertisements for the *Gazette* quoted Peel's 1842 exhortation that 'all must learn how, in the shortest time and at the least expense, to produce the greatest quantity of food, vegetable or animal, without permanent injury to the land'. His relative political indifference is illustrated by the fact that the *Gazette* index for 1846 has only three entries on the Corn Laws. Two of these referred to pieces written by Morton's close associate, Chandos Wren Hoskyns, who contributed regular leaders to the paper during its early years. The viewpoint that he expounded

[17] J C Morton, 'Some recent lessons of agricultural experience', *J Bath and West Society*, 2nd ser, IX, 1861, pp 213–66; *idem*, 'Some of the agricultural lessons of 1868', *JRASE*, 2nd ser, V, 1869, pp 27–73.

[18] 'Noteworthy Agriculturists. Mr Henry Corbet'.

[19] H Corbet, 'Report on the exhibition of live stock at Cardiff', *JRASE*, 2nd ser, VIII, 1872, pp 373–404; *idem*, 'Heads', *J Bath and West Society*, 3rd ser, II, 1871, pp 98–116.

[20] *Mark Lane Express* 30 Dec 1867. See also Corbet's address to the London Farmers' Club on 'English tenant-right' for a statement of his views on the issue.

[21] Also noted by J R McQuiston, 'Tenant right: farmer against landlord in Victorian England 1847–1883', *Ag Hist*, 47, 1973, p 100.

[22] J R Fisher, 'Tenural deficiences in the English land system: the mid-nineteenth century debate', *University of Newcastle NSW Dept of Economics Research Report or Occasional Paper*, 58, 1980, pp 18–19; *idem*, 'Landowners and English tenant right 1845–1852', *AHR*, 31, 1983, p 20.

was that agricultural producers gave too much attention to the *price* which could be achieved for agricultural products rather than the *quantity* that could be obtained from a given unit of land. When it was predictably complained that Hoskyns's view, that 'unfettered trade' would allow England to become the 'corn mart' as she already was 'the money-mart of the world', was diametrically opposed to the 'feelings and opinions' of the great majority of the *Gazette's* readers,[23] Morton published a defence in terms of a remembrance of the time when

> ... a drunken farmer would propose as a toast 'a bloody war and a wet harvest' by which he really meant nothing more than high prices. But what was the consequence of 'bloody wars and wet harvests' to the farmers of the country except utter ruin? We express no opinion about the Corn-Laws, either one way or the other; that is a question which landlords and tenants, the chief disputants in the present instance, must arrange with each other.[24]

Morton later recalled Hoskyns as having been instrumental in bringing about the gradual acceptance of free trade views among agriculturists,[25] but it is important to note that during the early 1840s many influential leaders of farming opinion evinced no great commitment to agricultural protection. The third earl Spencer, for example, in 1843 publicly followed the earlier example of his neighbour, earl Fitzwilliam, when he declared against continued protection[26] while the following year Morton's mentor, the second earl of Ducie, spoke in support of the aims of the Anti-Corn Law League.[27] Morton's later memoirs of 'noteworthy agriculturists', such as Edward Holland, Hewitt Davis, and Sir Thomas Dyke Acland stressed their free-trade leanings,[28] and even William Shaw at the *Express* – who in 1850 was hailed as the 'Cobden of Agriculture' – by no means unquestioningly supported protection.[29] By the time that Corbet had succeeded Shaw, the Corn Laws were a dead issue and it was not until the late 1870s that protection again surfaced as a subject for debate. In contrast to the *Gazette*, however, Corbet gave much more extensive coverage to other 'political' matters which, apart from the perennial issue of the malt-tax included leases, tenant right, the game laws, and cattle disease policy. Some of Corbet's most notable contributions to agricultural discussions were made on these topics.

It was the arrival and rapid spread of rinderpest – 'cattle plague' – in 1865 which particularly demonstrated to Corbet the need for agriculture to have a more effective political voice. The only means of containing the disease was by compulsory slaughter but this was a highly controversial remedy which required legislation before it could be implemented. The RASE was the leading national agricultural organization which might have been expected to campaign for action but its charter, which had been granted in 1840, contained a provision which prohibited it from addressing 'political' issues – a legacy of the divisiveness of the Corn Law debate. This meant that the RASE was precluded from giving a lead in the formulation of cattle disease policy, a situation which was denounced by Corbet in a paper delivered with characteristic vigour to the London Farmers' Club on the 'Cattle plague and the government measures':

[23] *Agricultural Gazette*, 3 Jan, 7 and 14 Feb 1846.
[24] *Ibid*, 14 Feb 1846.
[25] For memoirs of Hoskyns see *Agricultural Gazette*, 7 Jan and 9 April 1877. See also J S Arkwright's 'Introduction' to C W Hoskyns, *Talpa; or the Chronicles of a Clay Farm. An Agricultural Fragment*, 1903 edn.
[26] N Goddard, '"A sensation almost without parallel": reflections on the third earl Spencer's Northampton speech, November 1843', *Northants Past and Present*, forthcoming; Earl Fitzwilliam, *First, Second, and Third Addresses to the Landowners of England on the Corn Laws*, 1839. See also D Spring, 'Earl Fitzwilliam and the Corn Laws', *Am Hist Rev*, LIX, 1954, pp 287–304.
[27] *Mark Lane Express*, 3 June 1844. For Morton's memoirs of Ducie see *Agricultural Gazette*, 4 June and 31 Dec 1853.
[28] *Agricultural Gazette*, 10 Dec 1870, 4 Feb 1871, 8 June 1872.
[29] Goddard, 'William Shaw', p 98. During the passage of the Repeal Bill through the Lords the question was raised in the *Mark Lane Express* (1 June 1846) as to whether agriculturists had been correct to uphold the principle of protection.

The idea of a number of influential agriculturists gathered together to talk over the cattle plague without, however, venturing to touch upon the means employed to subdue it is so sorry a joke that I do not believe after-years will ever credit its occurrence.[30]

Because of widespread dissatisfaction with the inability of the RASE to act on political issues in 1866, the Central Chamber of Agriculture was formed to give the political articulation to the agricultural interest that Corbet and others believed was needed. However, Corbet soon criticized the Central Chamber for being too dominated by landlords, and for thus failing to address the concerns of tenant farmers. With typical outspokeness he complained of the chamber's 'second-hand sayings and doings', its 'burlesque airs of importance', and its 'egregious system of puffing'.[31] Charles Clay, the original proposer of the chamber, later recalled Corbet's antipathy as being inimical to its early progress.[32]

Despite Corbet's numerous calls for reform of the English system of landlord-tenant relations, he can hardly be characterized as radical in his social and political outlook. Indeed, there was much in his view of the countryside and rural life which was highly traditional. His commitment to country sport – in which Morton appears to have had no interest whatever – led him to speak out against trends of which he disapproved: 'No man, unless he shut his eyes very close indeed, can ever rank the battue as sport' he wrote in 1868, for example.[33] He praised hunting for promoting a better understanding between landlord and tenant, and his perspective was typified in the 1869 paper on 'Foxes *versus* rabbits'. Here he claimed that there was 'hardly a black sheep in a red coat' and extolled the virtues of the great landholding and hunting families of England: 'the Grafhams, the Spencers, the Yarboroughs, the Knightleys, the Lane-Foxes ...'[34] In concluding his case that rabbits and hares should be treated as vermin in model landlord-tenant agreements, he stated that:

> The Turf is getting more and more to be a matter of business, and a bad business too; there is a growing practice of making bets and books on boat races and cricket matches and noblemen have turned hagglers and dealers in pheasants and hares. But as a man can hardly make wagers or make money by fox-hunting, let us try our best to keep one old English pastime amongst us pure and undefiled. We have scared the wolf from our woods and forests, we have banished the bustard from our plains, and the very grouse fly before the shepherd and his flock; but it will be a bad day for this country when a fox can no longer be routed from his lair to
>
> 'Die in the open as good'un should do!'[35]

III

If Corbet's writing was often controversial, Morton was by no means immune from controversy. While Morton's long editorship of the *Gazette* (in the course of which it was recorded that he brought out 1300 consecutive weekly editions of the paper before taking a short holiday) is seen as an outstanding achievement, his career would have taken a very different course had he been appointed editor of the *JRASE*, a post that he particularly coveted when, in 1859, it became available. The background to this episode needs a little explanation.

Philip Pusey, the first – and unpaid – editor of the *JRASE*, continued in the position until 1854 when indisposition caused him to retire from public life. The *JRASE* was then edited by a triumvirate consisting of H S Thompson (later Sir Harry Meysey Thompson), Chandos Wren Hoskyns and Thomas Dyke Acland. The contrasting personalities of these figures meant that this editorial arrangement did

[30] Reported in *Farmer's Magazine*, 3rd ser, XXIX, 1866, p 304.
[31] *Mark Lane Express*, 11 Oct 1869.
[32] Fitzgerald, *Ahead of their Time*, pp 103–4.
[33] *Mark Lane Express*, 6 Jan 1868.
[34] H Corbet, 'Foxes *versus* rabbits', *Farmer's Magazine*, 3rd ser, XXXV, 1869, p 513.
[35] *Ibid*, p 516. See also Corbet's earlier paper on 'The overpreservation of game', *Farmer's Magazine*, 3rd ser, XVII, 1860, pp 336–43, for a statement of his views on the question of the game laws.

not function effectively and towards the end of 1858, Hoskyns and Acland resigned. This left Thompson in overall control, but at the time he received a great deal of editorial assistance from Morton himself. While there was considerable opposition within the society's council to the proposal to recruit a salaried editor, when in 1859 Thompson entered Parliament the RASE advertised for a 'literary and scientific editor' for its *journal*. It was confidently expected that Morton, already the *de facto* editor, would be appointed to the position; instead, the society's editorship committee chose the agriculturally unknown P H Frere, bursar of Downing College, Cambridge.[36]

This decision was greeted with considerable outrage by agriculturists. As John Girdwood, a land agent and a contributor to the Highland Society's *journal* expressed it: 'when the committee made its selection, it had before it in the list of candidates the name of John Morton ... a feeling of the greatest astonishment was created among the agriculturists of England when such a man was passed by'.[37] Protests about Frere's appointment reverberated throughout the agricultural community; there was something 'strange and inexplicable' about the affair and Morton's non-selection was an 'unwarrantable blow to the cause of scientific agriculture'.[38] It seems likely that the reason why Morton was passed over for the editorship of the *JRASE* included the hostility felt by some council members towards the appointment of a professional journalist to the position – Frere's 'literary and academic' qualifications were stressed in the face of widespread criticism – coupled with Thompson's desire, as chairman of the RASE's *journal* committee, to maintain a high degree of editorial control.

Frere died in May, 1868, at which time the RASE council determined to combine the posts of secretary and editor. This decision was deplored by Morton, among others, who considered that the administrative and editorial abilities required in the new combined post were incompatible and unlikely to be satisfactorily discharged by one person, and this deterred many strong candidates – including Morton – from applying for the position. When it was announced that out of forty-six candidates H M Jenkins – then secretary and editor at the London Geological Society – had been appointed, the announcement was greeted with even more incredulity than that which had attended the news of Frere's editorship eight years previously.[39]

According to Morton, this selection demonstrated a 'heroic disregard of commonsense' on the part of the RASE council although he was characteristically anxious to stress that his opposition to Jenkins' appointment was not based upon personal animosity. Rather, he held that the very nature of the combined post was misguided, and as Jenkins apparently knew nothing of agriculture it was a 'ludicrously absurd' appointment, even a 'farce' to elect an 'entire outsider' as a 'teacher and leader' within a special department of instruction.[40] At the December general meeting of the RASE in 1868, Morton led the attack on Jenkins' appointment but having somewhat untypically mislaid his notes, his full intended condemnatory speech to the meeting was curtailed.[41]

Morton was supported by numerous other of the RASE's critics but most notably by Samuel Sidney. Sidney (the *nom-de-plume* of Samuel Solomons, 1813–1883) had been a candidate for the editorship of the *JRASE* in 1859 and during the 1860s had made a series of outspoken

[36] Goddard, *Harvests of Change*, pp 111–12.
[37] *Agricultural Gazette*, 28 Sept 1861; *Farmer's Magazine*, 3rd ser, XVIII, 1860, pp 482–3.
[38] *Agricultural Gazette*, 26 May and 9 June 1860: *Farmer's Magazine*, 3rd ser, XVIII, 1860, p 484.
[39] Goddard, *Harvests of Change*, pp 114–15.
[40] *Agricultural Gazette*, 7, 14, 21 Nov and 12 Dec 1868.
[41] From a report of the meeting in *Mark Lane Express, Supplement*, 14 Dec 1868.

attacks on the society's management which certainly did not lack support. However, on this occasion, in the course of a lengthy speech, he turned his attention beyond the affairs of the RASE to a condemnation of the agricultural press as a whole:

> The journal which was edited by Mr Morton did not live by agriculture – it was obliged to depend on the *Gardener's Chronicle*; it could not live by agriculture alone. Again, let him take the case of *Bell's Messenger*: that was a political newspaper, affording a large quantity of news and upon this it lived. It backed agriculture, and therefore it went among agriculturists. To be sure, there was one other paper, but even that was not purely agricultural. It depended very much upon the corn markets, and besides that it had a considerable circulation, because it somewhat resembled the little boys who frightened away the crows. The *Mark Lane Express* was a sort of literary scarecrow; what it could not do by means of information it did by pitching into them all round. It made a living partly by that sort of thing.[42]

This, of course, brought in Corbet, who had not joined in the protests about Jenkins' appointment as he had come to the conclusion that 'a good man had been got in a bad way'.[43] Corbet felt a great deal of antipathy towards Sidney because of his dislike of the conduct of the horse events promoted by the Islington Agricultural Hall Company to which Sidney had the position of secretary. Corbet condemned the emphasis on trotting, 'leaping', and the 'circus character' of the entertainment promoted by the 'Islington mountebanks'.[44] His reply to Sidney in the *Mark Lane Express* is worth quoting at length as it demonstrates Corbet's capacity for invective. After some highly disparaging comments about Sidney's own qualifications as an agricultural author, he wrote that:

> And yet the thing is amusing if not altogether original; but then many a famous author suffers from such almost unconscious plagiarism of style. Just thirty years since, Thackeray, with a modesty that we are sure Mr Sidney will appreciate, not likeing to see his name placarded on every wall, wrote a romance for *Frazer* under the signature of Ikey Solomons jun, Esq. Mr Sidney may not, perhaps, have caught quite the refined sarcasm or genial humour of this, but he has succeeded admirably in reproducing that air of importance and dignity which the late lamented Ikey Solomons jun, Esq. so delighted to assume; and it seems a thousand pities, as they say at the Herald Office, that the title should ever have died out. Would Mr Sidney object to taking it up again? We are rather the more induced to suggest this from he himself being apparently rather prone to provide other people with an alias; as at the other morning, so far as we could follow his rather peculiar vernacular, he styled this Journal a 'scarecrow'. And then, as people looked at a remarkable figure before them, tricked out with a halfpennyworth of riband or some such tawdry tinsel they roared! But is this fair or generous of Mr Sidney, for a man so lavishly favoured by Nature, of so noble a presence, and with his ancient lineage so indelibly stamped upon him, to gibe at other people as scarecrows?[45]

Warming to the theme, the piece concluded:

> ... we cheerfully undertake the duty thus implied or asked of us. When the carrion-hunter, the disgusting scavenger, and the noisy quack for whose wide heavy jaws no filth is too unsavoury – when these come waddling on to the fair fields of agriculture we will scare them away. Eu! all up! When the jabbering magpie, with his caddish almost human assurance and swaggering gait comes prying and picking about the grounds of gentlemen we will scare him off again. Or, should he, in his greedy impudence, venture within range, we will gibbet him forthwith and let the much-wondering farmer look for a moment on the gorged carcass of the foul bird with whose husky ropy note he has been so familiar. We will scare the crows away. Eu! all up![46]

Jenkins proved to be much more successful at the RASE than the critics of his appointment had anticipated. This was fully acknowledged, with typical magnaminity, by Morton when he came to write Jenkins' obituary in 1887:

> I had opposed his original appointment to the offices which he held with such signal advantage and ability ... I know that for years he imagined

[42] *Ibid.*
[43] *Mark Lane Express*, 9 Dec 1868.
[44] *Ibid*, 1 June 1868; 7 June, 13 Sept 1869.
[45] *Ibid, Supplement*, 14 Dec 1868.
[46] *Ibid.*

that scant justice was dealt out to him in the weekly journal that I edited ... the members of the great society of which our late friend was Secretary may, however, be assured that no one could bring to the duty which has been conferred to me a keener sense of the great loss we have all sustained, a more earnest desire to do justice to the example of career, or a warmer loyalty to his memory.[47]

IV

Morton has been termed a 'perennial optimist',[48] and nowhere was the optimism that pervaded much of his outlook better demonstrated than in his enthusiasm for the potential of sewage as a valuable fertilizer, and the subject demonstrates well the contrast between his and Corbet's general perspective. The worth of sewage was extensively investigated in the 1850s and the 1860s, for the interests of town and country seemed to be united in its economic exploitation. It was considered by many that the sale of sewage to farmers could relieve urban ratepayers of the financial burden of paying for extensive sewerage systems in towns, while it was believed that the agriculturists would also benefit from the ready availability of valuable fertilizing material which would otherwise go to waste. Further, sewage irrigation, it was thought, would be a mode of disposal which would obviate the rapidly growing nuisance of river pollution. By the early 1860s, after numerous investigations and reports, optimism about the agricultural efficacy of sewage was by no means restricted to enthusiasts such as Morton, J J Mechi, and William Hope.[49] As Morton expressed the point in 1865:

I suppose that if a sober view of the agricultural value of sewage manure were anywhere to be expected it would have been in the columns of the *Mark Lane Express*. But what does the clever editor of that agricultural paper say? He declares that recent experiments, discussions, and discoveries have thrown so much light upon it, and made us all so much more sanguine of a profitable issue, that an altogether new leaf in the book of agricultural progress has in fact been turned.[50]

In the early 1860s the Metropolis Sewage Company formulated elaborate plans to utilize the north London sewage, which was to be discharged from the northern outfall (completed in 1865) into the Thames at Barking Creek,[51] in a project to irrigate south Essex and reclaim the Maplin Sands at Foulness.[52] Morton was invited to take personal charge of the company's sewage trials at its Lodge Farm, situated near to Barking, which he did for a period of two years. On the basis of his 'agricultural experience' of '300,000 tons of London sewage' Morton wrote a number of encouraging reports of successes achieved with sewage irrigation on a range of crops, although Italian rye-grass appeared to be the most responsive subject.[53] The merits of town sewage were extolled in the *Gazette*:

And not only is the valuable, the filthy part of town drainage thus extracted and made harmless, it is converted into wholesome food more directly and more quickly than any other fertilizer. While it is being disseminated uniformly through the substance of the soil, the sun is shining on a transformation scene above more beautiful than any known to pantomime. Leaves are spreading upwards, roots are swelling outwards, characteristic juices, essences, aromas, are being secreted. Grain, Wurzel, Cabbages, Strawberries, Potatoes, Wheat, Oats, Rye etc, are hastening onwards towards maturity more rapidly than is known under any other plan of cultivation.[54]

By this time, however, Corbet had lost patience with such exaggerated views of the value of sewage:

[47] J C Morton, 'The late Mr H M Jenkins FGS, a memoir', *JRASE*, 2nd ser, XXIII, 1887, p 169.
[48] F M L Thompson, 'The second agricultural revoltuion 1815–1880', *Econ Hist Rev*, 2nd ser, XXI, 1968, p 68.
[49] N Goddard, '"A mine of wealth?"; The Victorians and the agricultural value of sewage', *J Hist Geog*, 22, 1996, pp 274–90.
[50] J C Morton, 'London sewage from the agricultural point of view', *J Society of Arts*, XIII, 1864–5, p 185.
[51] L B Wood, *The Restoration of the Tidal Thames*, 1982, pp 34–5.
[52] W Hope and W Napier, *The Sewage of the Metropolis*, 1865.
[53] J C Morton, 'Agricultural experience of town sewage in 1867', *J Bath and West Society*, 2nd ser, XV, 1867, pp 22–46; *idem*, *Experience with 300,000 tons of London Sewage at the Lodge Farm, Barking*, 1868.
[54] *Agricultural Gazette*, 30 Jan 1869.

Is not this a delightful picture of pastoral life? With the leaves spreading, and the roots swelling, and the 'characteristic' essences and aromas, and the strawberries, the wurzels, with the inconceivable *et caetera*, as the sewage is being disseminated by swains and shepherdesses in very pink silk stockings and very smart hats, who break out gleefully into a chorus of 'How brightly, brightly, breaks the morning!' And in the midst of all this rural felicity in rushes a terribly crusty curmudgeon, one Farmer Smith from the Croydon Club, at the sight of whom the shepherdesses fly off with a prolonged shriek, the leaves cease spreading, the roots are contracting, and the 'characteristic' aromas alone linger about the scene ... There should be another scene in the pantomime where the thunder roars and the clouds travel, as when, at a crack of a harlequin's baton, the pipes burst, the tank overflows, and the 'characteristic' aromas come out stronger than ever. *Tableau* – Mr Mechi puts up his umbrella.[55]

In response, Morton published a rather pained reply where it was claimed that the *Mark Lane Express* had been unable to resist the temptation to make a thousand readers laugh rather than objectively report the issue, and that a leading agricultural paper had an obligation to set an example in seeking to halt the waste of fertilizer that the ejection of sewage into watercourses represented. The 'aromas', it was maintained, were bad enough in the ordinary market gardens around London and that

> we would rather be of those who are seeking anxiously for the remedy, which one day must be found – or even bear the laugh which over-sanguine enthusiasm sometimes excites – than copy the example of the writer in the *Mark Lane Express*, who sits giggling while both land and city suffer.[56]

By the end of 1869 it was still held in the *Gazette* that it was 'impossible to doubt that Lodge Farm must ultimately give confidence to those who would speculate on the value of town sewage',[57] but the truth was that the goal of the general profitable exploitation of town sewage by irrigation on agricultural land was always a chimera, for as leading agricultural chemists such as J B Lawes[58] and Augustus Voelcker[59] concluded, sewage was a very dilute fertilizer of little monetary value which would not generally recoup the cost of its distribution for agricultural purposes. Thus in a review of sewage farming in 1877, Morton was forced to 'notice how ludicrously experience hitherto has almost everywhere upset the anticipations of the sanguine sewage agriculturist'.[60]

V

In contrast to Morton's usual optimism, the sense of frustration that is expressed in this observation is applicable to a range of aspects of both his and Corbet's careers. While the latter, for example, did not live long enough to see the repeal of the malt-tax, its abolition in 1880 was more due to budgetary expediency than a concern for the agricultural interest. The permissive Agricultural Holdings Act of 1875 fell well short of his demands, repeated over a period of nearly thirty years, for a comprehensive system of tenant right. Its compulsory extension in 1883 – partly brought about by a campaign orchestrated by W E Bear, Corbet's successor at the *Express* – is a major landmark in the development of the laws governing landlord-tenant relations but it has also been concluded that 'the concern expressed by a few contemporary agriculturists, and some later historians, on the inadequacy of the land-tenure arrangements in England in the late nineteenth century was hardly of great relevance to the great changes affecting agriculture'.[61] Above all, 'science' contributed less to overall agricultural productivity and pros-

[55] *Mark Lane Express*, 1 Feb 1869.
[56] *Agricultural Gazette*, 6 Feb 1869.
[57] *Ibid*, 20 Nov 1869.
[58] J B Lawes, 'On the utilisation of town sewage', *JRASE*, XXIV, 1863, pp 65–90; *idem*, 'On town sewage', *JRASE*, 2nd ser, I, 1865, pp 226–38.
[59] A Voelcker, 'Lecture on town sewage', *JRASE*, XXIII, 1862, pp 462–9; *idem*, 'Influence of chemical discoveries on the progress of English agriculture', *JRASE*, 2nd ser, XIV, 1878, pp 830–4.
[60] J C Morton, 'Half-a-dozen sewage farms', *JRASE*, XIII, 1877, p 438.
[61] J R Fisher, 'The Farmer's Alliance: an agricultural protest movement of the 1880s', *AHR*, 26, 1978, p 25.

perity than both men had confidently expected in the 1840s and 1850s.[62] Thus in a retrospective view of agricultural change since the start of his career written in 1877, Morton did not recall a 'golden age' but, rather, the agriculturist's 'rough education', a history of which, Morton thought, would include chapters on 'anticipations' and 'expectations' which had never come to full fruition.[63]

If Morton over-estimated the amount of 'agricultural progress' that could be achieved on the basis of contemporary scientific knowledge, he also over-estimated the capacity of his audience. In the year 1845, for example, he listed 150 topics suitable for local farmers' club discussions – model rules for which, he considered, should preclude smoking or drinking at meetings. The subjects advocated were highly ambitious and included 'The benefits of which science has been to agriculture', 'The *professional* education of the agricultural labourer', 'The influence which railroads may be expected to exert on our agriculture', 'Hybridising as a means of improving plants', and 'The relative value of manures, natural and artificial' (with an instruction to consult Boussingault and others on the 'Theory of agriculture').[64] As a *Gazette* reader commented in response, 'If a scientific subject is brought forward at one meeting, it is, I fancy, a pretty sure antidote to attendance at the next on the part of many',[65] but nearly forty years later we find Morton disappointed that an intelligent working-farmer friend preferred the equivalent of an agricultural 'gossip column' to the more weighty matter which was still the mainstay of the *Gazette's* content. Despite the high regard that Morton personally commanded, the *Gazette* appears not to have been a profitable enterprise for its proprietors yet, in a plea for more readers to ensure its continuation, Morton could not understand why in the early 1880s, papers which concentrated on country sport could build up profitable circulations in contrast to those with purely agricultural concerns.[66]

VI

After his retirement Corbet suffered from continual ill-health and the last years of his life were spent in obscurity. While it was recognized that under his editorship the *Mark Lane Express* achieved 'an individuality and a reputation for thoroughness and independence that none of its competitors achieved' it is clear that, in contrast to Morton, in the course of his career Corbet engendered considerable personal animosity and he 'necessarily made some enemies as well as many friends' as has been demonstrated in this article. A testimonial was launched for him after he lost his retirement investments but this only very slowly reached the sum of £350 a few months before his death in December 1878.[67]

Morton died suddenly ten years later and his obituary notices uniformly recorded his good-will, energy, kindness, and receptiveness: 'fewer had made more friends and fewer enemies'. Yet given the conditions of English agriculture in the 1880s, the final note of Morton's career must be a reflection of unfulfilled optimism and unachieved purpose. As it was put in the *Gazette's* own assessment:

> ...he was only a farm editor, we admit; and this means being an editor of a section of the Press which has never had much recognition from the public, and still less from the State.[68]

[62] For a general overview of science and agriculture before 1870 see S Wilmot, *The Business of Improvement: Agriculture and Scientific Culture in Britain, c1700–1870*, Cheltenham, 1990.
[63] *Agricultural Gazette*, 9 and 30 July 1877.
[64] *Ibid*, 13 Dec 1845.
[65] *Ibid*, 27 Dec 1845.
[66] Goddard, 'The development and influence', p 124.
[67] *Agricultural Gazette*, 15 May 1876, 18 Feb 1878; *Farmer's Magazine*, 3rd ser, LII, 1877, pp 345, 400; LIII, 1878, p 495; LV, 1879, p 105.
[68] *Agricultural Gazette*, 7 May 1888.

The Great Agricultural Depression on the English Chalklands: The Hampshire Experience

By BETHANIE AFTON

Abstract

This paper considers the response of those farming one of the more vulnerable ecosystems, the English chalklands, to the dramatic fall in prices during the Great Agricultural Depression of the late nineteenth century. It particularly looks at the Hampshire Downs where the regime which had evolved over the previous decades provides an example of mixed farming at its best. By fully realizing the potential of the system, farmers successfully shifted production to target a number of protected, high-value, marketing niches. At the same time, the integrity of the land was maintained through sustainable, husbandlike cultivation. While this system has been all but ignored by modern historians, it was amongst the most intensive of all English mixed farming regimes.

THE notion of a pervasive depression in English agriculture during the last quarter of the nineteenth century has been widely challenged since the publication of the seminal article, 'The Great Depression in English agriculture, 1873–96', by T W Fletcher in 1961. Fletcher argued that the impact of falling prices and increased imports was sectoral with livestock production sheltered and corn growing badly hit. More recent research by F M L Thompson supports this view. British agriculture at the time was in relative decline, and consequently needed to be restructured in order to reflect changing marketing opportunities. Thompson noted, 'The notion that there was a general or chronic depression in English agriculture throughout this period, or even between mid-seventies and mid-nineties, must be abandoned ...'[1] However, he urged more investigation of individual farming regions '...with a view to constructing a new geography of farming in England as it adjusted to, or was buffeted by, the marketing conditions of the period'.[2]

Along with the arable clays, the light lands of southern England have been cited as having been particularly afflicted during the period known as the Great Agricultural Depression. In part, this was because mixed farming was so closely associated with the principles expounded during the high farming/high feeding era immediately preceeding the fall in prices.[3] Within the mixed farming system intensive livestock feeding increased fertility of the soil so improving the yield of grains. The arable produced a variety of animal feeds to encourage heavier stocking, leading again to greater yields from the arable. Both these processes were aided by the use of purchased feeds and fertilizers which became more widely available from the 1850s onwards. The farmer was protected against disastrous seasons by splitting his production between the two sectors. From the mid-1870s, with the fall first in wheat and then, to a lesser extent, in meat prices,

[1] T W Fletcher, 'The Great Depression in English agriculture, 1873–96', *Econ Hist Rev*, 2nd ser. XIII, 1961, pp 417–32; F M L Thompson, 'An anatomy of English agriculture, 1870–1914', in B A Holderness and M E Turner, eds, *Land, Labour and Agriculture, 1700–1920: Essays for Gordon Mingay*, 1991, pp 235 and 240.

[2] Thompson, 'English agriculture', p 211.

[3] See J Caird, *English Agriculture in 1850–51*, 1852, p 59; P Pusey, 'On the progress of agricultural knowledge during the last four years', *JRASE*, III, 1842, pp 204–5; J J Mechi, *How to Farm Profitably*, 4th ed, 1864, pp 17–19.

the balance of the regime was upset, and, it is argued, agricultural output fell drastically on the Hampshire Downs. Thompson calculated that between 1873 and 1911 England as a whole had no increase or decrease in gross farm output at constant 1911 prices. In Hampshire the decline for the county as a whole was 13 per cent between 1873 and 1894 with a further fall of 1 per cent between 1893 and 1911.[4]

The chalk formation in Hampshire formed approximately half the county, stretching from east to west through the centre. To both the north and south were regions of inherently more fertile, but difficult to work, clay and of poor sandy soils. In Thompson's league of counties, Hampshire ranked in twenty-eighth place. Interestingly both Dorset (+1 per cent) and Wiltshire (−0 per cent) appear to have fared considerably better than the neighbouring county of Hampshire. However, of the remaining eight southern counties which contain a reasonably large area of chalkland, none was above the average for the country as a whole. More detailed examination indicates, however, that the situation on the Hampshire Downs was less extreme than the figures would suggest. There were pivotal changes in the system which were only in an embryonic phase during the high farming period, but which blossomed during the crisis years of the depression. The transformation resulted in a faster turnover of commodities targeting a luxury, high value market which helped to shield the farmer from the extremes of economic hardship. This article will examine this development.

I

According to the research of E L Jones, a decline in output from light-land agriculture was predictable, indeed, almost inevitable. Shortly after Fletcher noted the regional effect of the depression, Jones explored agricultural trends between 1853 and 1873 in order to identify those regimes which had responded to what he called 'the changing basis of agricultural prosperity', that is the need to shift out of grain into livestock. The shift in profitability towards the animal sector, he argued, began early in the high farming period. Mixed farming systems did not adequately restructure. They were, according to Jones, both too flexible and at the same time too rigid. The ability to respond to short-term fluctuations in prices prevented the farmer from recognizing the long-term shift in profitability away from grain production. When, eventually, farmers did attempt to change they were prevented from doing so by rigid, strictly enforced lease covenants. Jones argued that these prevented farmers from abandoning the use of turnips and planting permanent pastures. The availability of purchased feeds, he argued, meant it was no longer viable to feed livestock from the arable.[5]

Farmers on the Hampshire chalks responded in precisely the manner criticized by Jones, that is by maintaining an intensive arable-livestock production system. With 86 per cent of the agricultural land in arable production in 1874, the area was perhaps the most totally arable of the mixed light-land regions.[6] The physical arrangement of the chalkland parishes in Hampshire suggest that this was a long-standing situation. Mixed farming areas ranging from Lincolnshire to Wiltshire are generally typified by long narrow attenuated parishes running from the top of the hill down into the valley. Farms are structured to contain a share of each type of land. On the Hampshire Downs this was rarely the case. Pre-parliamentary enclosure of atypically large areas of the downland sheepwalk for arable use again suggests a

[4] Thompson, 'English agriculture', pp 232–33.

[5] E L Jones, 'The changing basis of English agricultural prosperity, 1853–1873', *AHR*, 10, 1962, pp 102–19.

[6] BPP, 1874, LXIX, *Agricultural Returns for Great Britain, 1874*.

relatively early shift in the region into some form of essentially arable farming.[7] The long-established sparsity of pasture would have increased the hesitancy of farmers to make the conversion from a mixed system to an essentially pastoral regime. Because this shift was seen as essential for survival by Jones, the Hampshire chalklands should have been especially devastated by the agricultural depression. However, it was during and immediately after the depression that the region was cited, indeed praised, by numerous contemporary authors as the quintessential mixed farming system of the period.[8]

II

One of the most dynamic features of mixed farming systems was the manner in which new crops and techniques could be incorporated into the regime with little disruption to production. Consequently, the better systems were constantly evolving. This was true of the system on the chalks of Hampshire. Between 1700 and 1850 the emphasis of the Hampshire system was essentially focused on grain production. Sheep were kept principally to maintain the fertility of the land. However, within this broadly arable mixed farming system changes occurred which were of major significance to the system which was eventually to develop in response to the depressed state of agriculture in the final quarter of the nineteenth century.

By the beginning of the eighteenth century the emphasis of the system was already on the production of grain. Edward Lisle, a farmer from Crux Easton on the Hampshire Downs, recorded a very loose rotational system containing a mixture of grain crops and grass and clover leys with some vetches and peas. Generally wheat was followed by a spring corn until the land began to fall out of condition when only oats could be grown. When the land could no longer sustain even oats it was returned to a grass and clover ley for a number of years until deemed to be again ready for wheat. Sheep were principally kept to maintain the fertility of the arable land. They fed on the sheepwalk during the day and were then folded on the arable at night. In all but the most fertile parts of the region wether flocks were kept. Ewe flocks were considered more profitable because they were believed to produce better manure as well as wool and a crop of lambs. However, they were less able to withstand the harsh conditions on the downs, required higher quality winter and spring feeds, had a high mortality rate amongst the lambs if the ewes were folded on the land being prepared for spring corn, and needed more shepherding.[9]

By the 1750s, although the emphasis remained on the arable, the system was altering. More land had been taken into arable, often in conjunction with enclosure. The rotation became more systematic. On all but the most infertile arable land the wheat crop was followed by a spring corn then grass and clover ley. Ideally the ley remained down for two years, being mown for hay in the first year and then grazed. Often, however, this was too intense a regime for the soil and it was necessary to extend the ley. As the use of arable feeds for the sheep was extended it became increasingly common to convert to ewe flocks.[10] By the late 1790s Hampshire was well established as a sheep breeding region. This indicates an import-

[7] I wish to thank S Seeliger and J Chapman for this information from their research on enclosures in Hampshire.

[8] See, for example, J Wrightson, *Sheep: Breeds and Management*, 2nd ed, 1895, pp 142–3; W Fream, *The Complete Grazier*, 14th ed, 1900, pp 510–11; W J Malden, *British Sheep and Shepherding*, 1899, p 154; J A Clarke, 'Practical agriculture', *JRASE*, XIV, 1878, p 521; BPP, 1881, XVI, *Report on Hampshire by W C Little to the Royal Commission on ... the Agricultural Interest.*

[9] E Lisle, *Observations in Husbandry*, 2nd ed, 1757, I, pp 30–1, 291; II, pp 157, 179, 191.

[10] G G S Bowie, 'Northern Wolds and Wessex Downlands: contrasts in sheep husbandry and farming practices, 1770–1850', *AHR*, 38, 1990, p 119.

ant improvement, associated with arable feeding, in the ability to feed ewes and lambs during the winter and spring months. However, the foremost concern of most farmers remained the production of corn. The rotation grew few feed crops apart from grass and clover leys and some vetches and peas.[11]

During the Napoleonic Wars and the following years of depression much of the remaining 'virgin' downland was enclosed and ploughed, first in response to the high wheat prices of the war and then in an attempt to maintain income as the prices fell. Because the grazing areas available for sheep were diminished, large numbers of the animals were sold.[12] By the time of the investigations related to the commutation of the tithes in the late 1830s and '40s, it was recognized that this move towards monoculture had left extensive areas exhausted. The tithe commissioners noted a more balanced farming regime with greater numbers of sheep and a more mixed rotation. Turnips were widely introduced into the rotation creating a five course of wheat, turnips, spring corn and two years of ley.[13] With the more extensive supply of feeds from the arable combined with the scarcity of open downs, sheep were folded on the arable both day and night.

Farming on the downs by the mid-century had undergone considerable change from a largely pragmatic, relatively primitive, extensive system to a more standardized rotation which guaranteed a better supply of feed, and led to a more intensive system of corn and sheep production. The rate of transformation escalated after 1850. Contrary to the assertions made by Jones, lease restrictions did not prevent this. Almost universally the leases on the Hampshire Downs contained covenants restricting the tenant in four important ways. First, they were not allowed to plough up pasture without permission and with a penalty. Since the region was already very heavily weighted towards arable land use, the strict enforcement of this covenant is hardly surprising. Secondly, leases almost always stipulated that hay, straw, stubble, chaff, haulm, dung, compost, or soil were to be used on the farm. This was a well-considered covenant. The light soils needed all available humus. As purchased feeds and fertilizers became increasingly available the restrictions were altered to allow the sale of these products in return for their replacement with given quantities of fertilizers or feeds. This policy increased the options of the farmer. However, if the landowner or agent who agreed to the equivalents was not aware of the science behind the substitution, the fertility of the soil was threatened. Unless some means of supplying the humus was instituted on the farm, the reliance on artificials could eventually lead to soil exhaustion. Indeed in evidence relating to the Salisbury Plain district in Wiltshire given to the Royal Commission on agriculture in 1895 it was suggested that 'for some reason or other which is difficult to discover, the quality [of produce] does show signs of deterioration'. Amongst the explanations given for this was the 'gradual exhaustion of the fertility of the soil by 'whipping' it with artificial manures'.[14] The third typical covenant related to animal stocking rates. Leases were not used to prevent overgrazing. Instead they stipulated the *minimum* number of sheep to be kept on the farm. These covenants appear to have been regularly enforced. In evidence to the Richmond Commission in 1881 W C Little

[11] W and A Driver, *A General View of the Agriculture of Hampshire*, 1794, pp 15–7; G G S Bowie, 'New sheep for old – changes in sheep farming in Hampshire, 1792–1879', *AHR*, 35, 1987, pp 19–20; Bowie, 'Contrasts in sheep husbandry', pp 119–20.

[12] C Vancouver, *A General View of the Agriculture of Hampshire*, 1810, pp 266–7; BPP, 1833, V, *Select Committee on the State of Agriculture*, pp 3798–3805; B Afton, 'Mixed farming on the Hampshire Downs, 1837–1914', unpublished PhD thesis, Reading University, 1993, pp 122, 203.

[13] PRO, IR/18/8716, 8873–9228, 9714, 14807–8, Tithe files for Hampshire.

[14] BPP, 1895, XVI, *Royal Commission on Agricultural Depression*, p 9.

spoke of the common occurrence of tenant farmers taking sheep belonging to others, often dealers, at essentially their own expense, in order to comply with these covenants.[15] The fourth type of covenant dealt with cropping. Unlike some areas where the rotation was carefully stipulated, in Hampshire this element of the lease was liberally worded and loosely enforced.[16] Tenants were prevented by lease from producing more than two white corn crops in succession and occasionally the total proportion of grain in a rotation was limited. Furthermore, sainfoin and other crops grown for seed production were also limited, although the same crop if to be grazed or mown generally was not.[17] The object of lease covenants on the Hampshire Downs would appear to have been concerned with protecting the land from unhusbandlike practices. They do not provide evidence to support the suggestion that the restrictions would prevent a shift out of any course of the rotation or even out of arable farming altogether. On the contrary, owners appear to have been willing to alter lease covenants in response to changes taking place on their estate farms.

During the period from the 1840s through the early 1870s the most intensive capital expenditure by the farming community was directed towards the creation of an essentially new agricultural regime on the Hampshire Downs. While the high farming period is nationally associated with the increased utilization of off-farm inputs such as fertilizers and animal feeds, on the Hampshire Downs, and in some of the neighbouring areas of the southern chalklands, this was not the case. Expenditure centred around the development of a new sheep breed and a much modified rotational system. The key elements were the evolution of the Wiltshire eight-course rotation and the introduction of the Hampshire Down sheep.

Converting a flock to the new Hampshire Down breed was costly. This was in spite of the fact that it was not viewed as an elitist breed like the Leicester or the Southdown. Instead the 'Hamp' was regarded as the 'tenant farmers' sheep'.[18] In the 1850s only a minority of flockmasters had changed to the breed being developed by crossing the local Old Wiltshire and Old Hampshire sheep with the Southdown. By the early 1860s, the Hampshire Down sheep breed was fixed. The resultant animal was both large and hardy; could lamb early and fold in all weathers on the arable. In addition it had two other vital traits. If fed intensively the lambs would be fat for slaughter at between seven and fifteen months. Again with intensive feeding, the young ram lamb was ready for service at seven months. The ability of the ewe to take the ram early meant that the sheep could lamb in December or January while most other sheep were not producing until the spring. This combined with rapid fattening and early maturity gave the breed a head start in the rush to market. These characteristics were so fundamental to the role of the sheep during the years of the depressed state of agriculture that in the Ministry of Agriculture survey of 1907, 78 per cent of the sheep in the county were Hampshires.[19] To exploit the advantages offered by the farming system as it was to emerge, farmers

[15] BPP, 1881, *XVII, Royal Commission on ... the Agricultural Interest: Minutes of Evidence*, qq 47096–100.

[16] E L Jones cited the strict enforcement of cropping covenants as inhibiting farmers from changing their farming systems in response to changing economic conditions ('Agricultural prosperity', p 117). This, he believed, also restricted the introduction of catch crops. I have found no evidence that these covenants were enforced except during the final two years of a tenancy or as a means of removing a difficult or unwanted tenant. This conforms with evidence given to the Royal Commission on Agricultural Depression by R Henry Rew: BPP, 1895, XVI, p 19.

[17] See, for example, Hampshire Record Office [HRO], 55M67/T52; 51M89/39, 40, 48; 5M68/2 and 3.

[18] J Darby, 'The breeds of sheep, and their adaptations to different districts in the south and west of England', *Jnl Bath and West of England Society*, 3rd ser, III, 1871, pp 70–7; E P Squarey and J E Rawlence, 'The Hampshire Down sheep', *The Hampshire Down Flock Book*, Salisbury, 1890, I, pp xii–xv.

[19] PRO, MAF 7/20, Livestock returns for the county of Hampshire, 1908.

TABLE 1
Wiltshire eight-course rotation

Year of rotation	*Crops*
1	Catch crop of rye, winter barley, trifolium, or vetches, followed by a main crop of swedes, turnips, or rape
2	Swedes, kale, spring vetches, or mangolds
3	Wheat
4	Catch crop of stubble turnips, rye, winter barley and oats followed by a main crop of barley or oats
5	Ley, sown with the 4th year spring corn, cut for hay
6	Ley, grazed
7	Wheat
8	Catch crop of stubble turnips, rye, winter barley and oats followed by a main crop of barley or oats

found it necessary to invest in a flock, whether it was a top quality pedigree flock or a less prestigious, and less expensive, 'commercial' flock.

Linked with the sheep breed was the need to provide a guaranteed supply of feeds throughout the year, but particularly during the late winter and spring when livestock requirements were most critical. The new Wiltshire eight-course rotation met this need (Table 1). Again, introducing a new rotational system was costly. In the prize essay for Hampshire published in the *Journal of the Royal Agricultural Society* in 1861, John Wilkinson cited expense as one of the principal barriers preventing changes in the rotation.[20] In spite of this, again in the 1860s, the old five-course rotation of wheat, turnips, spring corn, and two years of ley was being replaced by a more complex and intensive eight-course system. The Wiltshire eight-course began its existence as a four course of turnips, swedes, wheat, barley. This was largely in response to the need to extend the period available for feeding on the root crop. Often in a more traditional rotation folding on the root crop had to be rushed in order to plant the spring corn. By following the roots with wheat which was planted in the autumn, this problem was solved. There was some professional hostility amongst surveyors and valuers, particularly those from outside the region, towards the new Wiltshire rotation. Many considered it inappropriate to incorporate two successive grain crops, and fields were often less free of weeds than in some other systems.[21] In Hampshire, however, it appears to have been generally accepted. As early as 1865 the lease for Seagers Farm and Manor Farm in Twyford made specific provision for the incorporation of a nascent Wiltshire-type rotation.[22] Wilkinson praised this new rotation but indicated that it was really only suited for the better quality of land. By the 1870s a solution had been found. Two rotations, the traditional Hampshire rotation – wheat, barley, ley, ley – and the new Wiltshire four course – wheat, barley, turnips, and swedes – were joined together to create the Wiltshire eight course of roots, roots, wheat, spring corn, ley, ley, wheat, spring corn.

A fundamental element which facilitated the level of production in the system was the use made of catch crops. These were fast growing crops planted after the harvest of one main crop and fed, generally *in situ*, before the preparation of land for a second. Neither the plants involved nor the technique was new. Traditionally taking a 'stolen' crop was most often effected when a main crop failed. It was also an occasional practice to steal a crop between wheat, harvested in August, and turnips or swedes, planted in May or June. Generally this was done on an opportunistic basis, a pragmatic farmer planting one or two fields if conditions seemed favourable or if there was a predicted feed shortage. It was the intensity of catch cropping, particularly of

[20] J Wilkinson, 'The farming of Hampshire', *JRASE*, 22, 1861, p 292.

[21] Wiltshire Record Office, Savernake Mss, 9/1/325.
[22] HRO, 51M89/39.

TABLE 2
Animal feed supplies provided by mixed farming on the Hampshire Downs

November–February	*March–April*	*May–August*	*September–October*
Swedes	Mangolds	Clover and seed	White turnips
White turnips	Kale	Grass	Cabbage
Cabbages	Tares	Trifolium	Late rape
Kohl-rabi	Winter rye	Early cabbage	Stubbles
Grass	Winter barley	Early rape	Grass
Turnip tops	Winter oats	Vetches	Young seeds
Hay	Watermeadows	Sainfoin	Hay
	Turnip tops	Kale	Early kale
	Rape		Kohl-rabi
	Hay		Sainfoin
			Mustard

Source: W J Malden, *British Sheep and Shepherding*, 1899, p. 93.

winter crops, which was innovative in the Wessex region. By the late-1870s it had become formalized in the increasingly popular Wiltshire rotation. The range of regularly produced crops and the periods during which they were fed are illustrated in Table 2.

The use of catch crops was limited in Britain by climate, growing season, soil type, and similar other considerations. For the most part, its inclusion as a regular feature of a rotation was consequently limited to the southern light lands. It was also important to select the crops to be sown with care. The plants had to be winter hardy, establish themselves quickly, make early and rapid growth in the spring, be undemanding both of fertilizers and tillage, and produce a large bulk of livestock feed. During the period, white turnips (for leaves and small bulbs), rye, winter barley, winter oats, tares, mustard, rape, and trifolium were regularly planted as winter catch crops. Generally these crops were used with main crop feeds in the late winter and early spring. Thus, the first to be fed, rye, was usually used with the spring bite from watermeadows, turnip tops, swedes, and mangolds. As the rye finished winter barley was introduced. Catch crops helped make the transition between feeds more gradual, ensured a variety of young nutritious feeds, and helped protect the farmer against the fodder shortage a crop failure might cause.

The technique of catch cropping increased the magnitude of cropping. In an eight-year rotational cycle, as many as eleven crops could occupy a single field. Of these, only two of the crops were wheat and two, spring corn. The spring corn, particularly oats, but increasingly barley as well, was often fed to livestock on the farm.[23] Thus, by including catch crops in the rotation, eight or nine plantings of feed crops could be taken in eight years. However, quantifying the output from catch cropping is problematical. The statistical sources available once the technique was widespread, the annual agricultural returns, do not include the majority of catch crops. These were almost invariably planted after, and usually fed before, the June returns were completed. Numerous sources – including valuations, cropping records, farm diaries, and contemporary references to the practice – indicate that during the depression the Wiltshire rotation either in its traditional form or with modifications, but always with catch

[23] Thompson, 'English agriculture', p 234.

cropping, was standard and widespread.[24] For example, John Wrightson, president of the agricultural college at Downton just in Wiltshire from the Hampshire Downs, suggested that the area of catch cropping was 'co-extensive with the entire area under root crops' in both Wiltshire and Hampshire.[25] According to this estimate, an additional 30,000 to 50,000 acres of feed crops were annually grown in the region. Because the crop was fed young, it was particularly nourishing.

The feeds from the rotational arable were supplemented by several other crops. Sainfoin was planted along side the rotation and occupied approximately 15 per cent of the agricultural land.[26] Generally it was anticipated that the crop would last the length of the rotation. However, this was flexible. It was usual to have several fields of sainfoin at different stages of growth on the farm. Watermeadows, established in the region between 1600 and the mid-nineteenth century, were maintained and used for early spring grazing for sheep, summer grazing for cattle, and for hay crops. This was an important source of early spring feeds and a saviour to farmers during periods of drought. However, it can be estimated that only 15 per cent of the sheep on the downs had access to watermeadows, and that the land produced only 8 to 10 per cent of the hay crop.[27] Downland sheepwalk, where it still existed, was principally used as summer exercise grounds for breeding ewe flocks.[28]

Purchased feeds were also an increasingly important source of feed. From the third quarter of the nineteenth century, the prices of these products, like most other agricultural commodities, fell.[29] The amounts available, through both home production and import, increased dramatically. On the Hampshire Downs, cake-and-corn came to be routinely used to supplement the arable feeds for pregnant and lactating ewes as well as lambs, particularly ram and wether lambs, which were being intensively fed as breeding stock or for rapid fattening. Depending on the intensity of the feeding regime and the supply of other feeds, a sheep's daily diet could contain up to 2 lb of cake, or it might contain none.

The intensity of the farming regime on the Hampshire Downs is illustrated by a description published in 1900 of the 'ordinary management for meeting the wants of a Hampshire Down flock on a Hampshire farm':

> The sheep are provided with an endless succession of green fodder and roots throughout the year, and this is aided at the critical period of spring by the water meadows, which constituted an important feature of the farms. In early spring the flock is on roots, and these are seldom pitted, but are left to throw up tops over which the young lambs are allowed to run before their dams. In late March the water meadows are folded, the lambs still being allowed to run forward. Next follow rye and winter barley, trifolium, vetches, rape, clover, cabbage, and early turnips, which bring us once more to August and the first symptoms of winter feeding. Mangel and cabbage are both relied on during the hot months, and are used as a variation from less nutritious diet. The sheep are, indeed, constantly changed from one food to another, and are generally receiving at least two sorts of natural herbage daily...
>
> A Hampshire Down lamb in mid-career is often revelling in ten or eleven changes of food in the course of a long summer day. At early morn he roams over dew-besprinkled vetches, and as the sun rises higher in the heavens he is attracted to mangel by the familiar sound of the cutter. Thus regaled, he is strengthened by an allowance of cake mixed with split peas, malt, and other pleasant and toothsome additions. The shepherd's voice is next heard calling him to cabbage, and perchance as the day

[24] Fortunately farm records, particularly valuations, provide some idea of the frequency with which catch crops were taken. Valuations, often calculated in October, were made both when a successful farmer died or changed to a better tenancy, and when failure forced a farmer to give up his holding. Thus the source reflects the husbandry practices of both.

[25] J Wrightson, *The Principles of Agricultural Practices as an Instructional Subject*, 3rd ed, 1893, p 197.

[26] Afton, 'Mixed farming', p 127.

[27] *Ibid*, p 122.

[28] *Ibid.*

[29] *Statistical Abstract of the United Kingdom*, 1850–1914; *The Economist*, Oct 1850–1914.

declines he rests amidst the grateful and cooling shade of rape leaves towering above his recumbent form, while ever and anon he nibbles playfully at the tenderest and youngest shoots. The ever-watchful shepherd now leads his flock to pastures new in the shape of clover eddish or aftermath, where they 'spread' and amuse themselves for a brief space, and lastly he takes them back to their fold of vetches, which enlists their sated attention until sundown. Such is the enviable day of a Hampshire Down lamb in July.[30]

This system of sheep folded on the arable was to produce the most intensive mixed farming system found in Britain in the nineteenth century.

III

The agricultural regime as practised on the Hampshire Downs had a number of features which made it particularly successful in maintaining and even improving the fertility of the land. First and foremost was the use of the fold on the arable.[31] In addition, there were other less obvious elements which maintained a high degree of sustainability. Because there was always a crop to be planted, the land was rarely left fallow and received the minimum amount of tillage possible. On light chalk, leaching and erosion were serious problems when land was bare. Water loss on land without crop cover was high. Humus quickly blew away. The system of farming helped to reduce this waste. Another beneficial feature was the number of nitrogen fixing plants grown within and alongside the rotation. The effective accumulation of nitrogen increases with the length of time a plant is left in the ground. Thus, sainfoin was especially beneficial. The practice of undersowing spring corn with a grass and clover ley again increased the efficacious value of those legumes. Even the quickly grown vetches and trifolium stolen between main crops helped increase the supply of nitrogen available to the rest of the arable. Disease and pests were more effectively controlled in a cropping system with a wide variety of crops. Multiple plant cropping helped to control infestation of soil borne, species specific, fungal, bacterial, and viral diseases, as well as insect grubs and larvae by denying access to particularly susceptible plants. Physically separating each crop into a number of smaller fields made each unit less likely to be attacked by wind born disease, flying insects, birds, and small mammals. Sheep kept almost entirely on arable land managed under a system of multi-cropped rotational agriculture also receive added protection from disease.[32] One of the most destructive, liver fluke, can be controlled by an arable feeding routine such as that established on the Hampshire Downs. While relatively few sheep in the region were affected by the 1879 outbreak of sheep rot, in Wiltshire where there was more permanent pasture and meadow the incidence was much higher.[33]

The system which became widespread on the Hampshire Downs was not only highly intensive and relatively sustainable, but it was also remarkably flexible. The eight-course rotation was developed to meet the distinctive conditions that existed in the region – a long growing season, the mild winters, and the ease with which the land was worked at almost any time of the year. It could be varied according to the depth and fertility of the soil, the needs of the farm, the state of the weather, and the anticipated marketing conditions. Generally this was done by taking another root crop instead of the second-year ley in the second half of the rotation or by increasing the length of the ley, creating a nine- or ten-course rotation. It was possible to use the flexibility to make major changes

[30] Fream, *The Complete Grazier*, pp 510–11.

[31] See Afton, 'Mixed farming', pp 186–90 for a more complete discussion of the practice and benefits of folding.

[32] C W R Spedding, *Sheep Production and Grazing Management*, 2nd ed, 1970, pp 284–87.

[33] BPP, 1881, XVII, q 46862; F Dun, 'Report on livestock', *JRASE*, 2nd ser, XVII, 1881, p 147; Afton, 'Mixed farming', p 183.

in the emphasis of the rotation. This was a particular advantage as the full impact of the depression began to be felt on the downs. In 1874, immediately before the onset of the depression, 86 per cent of the agricultural land on the Hampshire chalks was in arable. Of this arable land, 20 per cent produced wheat and 10 per cent barley. However, the Hampshire chalks had no particular advantage over other regions in either wheat or barley production. Because barley of higher malting quality could be imported during the years of the depression at a lower cost, less of the locally-grown barley was used for malting and more for livestock feed. When this was the case the use of oats was a more logical choice since it was less susceptible to a high rainfall, it was equally good as a feed, and the undersown ley was more successful planted with oats. The acreage of the arable planted in barley fell from 10 per cent in 1874 to 8 per cent in 1895. The fall in wheat acreage was dramatic. It went from 20 per cent of the arable to 8.5 per cent in 1895.[34] The disastrous harvest of 1892 when the yield dropped to 12.25 bushels per acre, below half the average for the region, induced many farmers to diminish, or even discontinue altogether the area traditionally planted to wheat.[35]

A more significant restructuring of the arable, particularly in light of the changes which were to occur from about 1878, was its escalating use for the production of livestock feeds. As already demonstrated, when farmed in the Wiltshire rotation the arable was able to produce a wide variety of main and stolen crops of livestock feeds in addition to the cash crops grown. The onset of the depression resulted in a number of changes in the proportions of the crops being grown. There was an increasing effort to reduce the overall labour requirement on the farm. Apart from the production of wheat and barley the most important reduction in acreage was that used for main crop roots. The cost, particularly of labour, and the uncertainty of the crop led to a reduction in the proportion of the arable in roots from 18 per cent in 1874 to 15 per cent in 1895.[36] The root break was both input and labour intensive. Were turnips and other roots cultivated in an unchanged manner throughout the period, the cost of roots would have risen markedly. Between 1871 and 1898 the weekly cost of a male farm labourer in Hampshire rose from 10*s* 9*d* to 12*s* 8*d*. However, during the same period the number of labourers to every farmer in the county fell from nine to five.[37] This was largely achieved by economizing on tillage operations. This resulted in considerable savings. In 1850 the tillage for a crop of turnips cost 20*s* per acre. By 1869 this had risen to 59*s*. By 1885, in spite of the increase in labourers' wages, the cost of growing roots had fallen to 34*s*. By the late 1890s this was down to 27*s* 6*d*.[38]

Without the savings in the cost of labour, the reduction in the acreage of roots would have been more extreme. However even with it, turnips and swedes were no longer the mainstay of the winter-spring feeding cycle. As the cost of labour rose and the acreage in roots declined, catch crops were increasingly important as a low cost alternative feed. Many were planted in association with other catch crops to create a number of multi-crop courses in the rotation. Catch crops were extremely economical to grow. Crops like stubble turnips and mustard were simply scarified into the stubble of the previous grain crop. Trefoil and rye grass, when treated as a catch crop, were sown under a corn crop in much the same manner as ley grasses. When ploughing was necessary, catch cropping tended to reduce the culti-

[34] BPP, 1874, LXIX and 1896, XCII, *Agricultural Returns of Great Britain, 1874 and 1895*.
[35] Afton, 'Mixed farming', p 61.
[36] BPP, 1874, LXIX, and 1896, XCII.
[37] Afton, 'Mixed farming', p 217.
[38] *Ibid*, pp 139–40.

vation needed by the main crop both because the ground had been tilled before the catch crop was planted and because the catch crop provided cover to compete with weed growth.[39] As in the case of roots, the operations devoted to the catch crop were reduced as the cost of labour increased. Once it was recognized that less cultivation was essential, what had begun out of expediency became standard practice. By the late nineteenth century, catch cropping increasingly replaced the root break to provide a wide variety of green feeds for livestock.

Planting land down to grass and clover was another cost-saving expediency. This could be done by increasing the number of courses devoted to rotational grasses in the arable rotation or it was possible to convert the arable to permanent pasture. During the depression, between 1874 and 1895, the area in rotational grasses increased from 24 per cent to over 36 per cent of the arable.[40] The process involved little labour. The ley could be sown under a spring corn crop and then simply grazed after the grain was harvested. In this way even the expense of haymaking was avoided. An alternative was to allow the land to revert from arable to pasture. This conversion was done piecemeal with a variety of methods. Often a ley was simply extended indefinitely. This was found to work most successfully on nitrogen-rich, sainfoin leys. It was also believed that a good grass sward could be established by leaving an oat stubble to revert naturally.[41] Many proprietary seed mixes were available both for creating permanent pasture and for renovating a poor sward. Landowners were likely to go to the expense of sowing land to grass. This was done either in an effort to attract new tenants onto farms which had a more limited arable acreage or to restore land which had come in hand. Tenants were more inclined simply to leave land to revert to natural pasture in the least expensive way available.[42] However, in 1895 rough grazing accounted for only 2 per cent of the agricultural land. The area in permanent pasture rose during the depression from 14 to 25 per cent of the total agricultural land. However, when compared with other areas, the Hampshire chalklands continued to retain a high proportion of arable.[43]

IV

The flexibility of the Hampshire system led to another type of response to the changes in marketing conditions from the mid-1870s. This was to diversify the farming regime. The opportunity to do this was somewhat limited on the downs. Cattle, pigs, and poultry, for example, needed both water and housing. Thus, while sheep could be left to wander the hills, these other animals could not. But if the farm were favourably positioned with good land there were many options. Several examples will demonstrate this. E J Dance of Whitchurch regularly sold hay to London and straw to strawberry growers in the Southampton area. In addition, he kept a flock of Hampshire Down sheep, a herd of dairy cows, some pigs, and a large number of hens. His arable was farmed as an eight course but with catch crops replacing much of the root course. Sainfoin was also planted.[44] Henry Chalcraft of Alton kept 600 pedigree Hampshire Down breeding ewes, about 40 Welsh and Devon bullocks, 12 to 20 dairy cows and their calves, 100 to 150 Berkshire/Sussex cross pigs, and 200 to 300 hens. On the arable side he grew wheat, barley, oats, mangolds, swedes, turnips, hay, and various catch crops. In addition, he had a considerable

[39] *Ibid*, p 144.
[40] BPP, 1874, LXIX and 1896, XCII.
[41] BPP, 1881, XVII, qq 300–01.
[42] J A Caird, 'Recent experiences in the laying down of land to grass', *JRASE*, 2nd ser, XXIV, 1888, p 154.
[43] BPP, 1874, LXIX and 1896, XCII.
[44] HRO, 83/M/76/PZ15.

acreage of hops. These and the sheep were his most profitable products. He sold his fat cattle locally but found that 'grazing cattle [was] a very poor game'. On the dairying side he again found that this enterprise was only just worthwhile. He reported: 'Milk is sold to people who come for it, and the butter is retailed as far as possible, the rest going to the grocer with whom we deal'. Hardly the thriving side to farming one would expect.[45]

V

A widespread response to the changes brought about by the fall in prices was to specialize in products which could not easily be produced elsewhere. The conditions on the southern light lands were combined with the sophisticated system developed in Hampshire to create the potential to target extremely specialized, high-value markets.

By the late 1860s, and well before the onset of low prices, the traditional role of the region as a breeding area was enhanced by the widespread use of the pedigree Hampshire Down sheep. Because the supply of early-spring feeds from the arable was almost guaranteed, the hardy Hampshires lambed in folds in the field in January and matured early and fattened rapidly to produce a ram lamb of seven months weighing 160 to 220 lb or a ewe lamb of 120 to 140 lb. As a breed, it was pre-eminently suited to the production of young fat lambs. Pedigree breeders were willing to invest high sums of capital in establishing large, high-quality flocks. Pedigree lambs and draft ewes found a number of markets. Once the breeder had replaced the ewes drafted out of his own flock, the rest of the ewe lambs and the drafted ewes were sold into other pedigree flocks and to commercial breeding flocks. Wether lambs were sold for store or immediate fattening. Ram lamb sales were the breeder's most lucrative product. In 1902 sheep from the pedigree flock of Sir George Judd, a tenant farmer in Hampshire, averaged £8 10*s* 10*d* for ram lambs, £1 14*s* 0*d* for ewe lambs of the same age, and £2 10*s* 0*d* for four-year old pedigree regular draft ewes.[46] The early maturity of the breed made the ram lamb ready to be used for mating at seven months while other breeds still required the winter to mature sufficiently. This greatly enhanced the value of the lamb. Prices varied enormously from mere shillings if the ram lamb was not fit for sale in time for the tupping season to a record price of £1000 paid in 1902. The Hampshire was also particularly valued for cross-breeding. Initially most of the crosses were with similarly large sheep such as the Leicester and the Cotswold. By the turn of the century, however, greater efficiency of production was achieved when large Hampshire Down rams were crossed with small ewes of various other breeds, particularly the Exmoor. As the reputation of the breed spread, Hampshires were increasingly exported to the United States, Canada, and South America. In the United States the 'hardiness of constitution and adaptability to any soil or climate...' made the breed particularly popular for producing range grown lamb, including suckling lamb. It was believed that the market for imports was sufficient to absorb 'all the surplus of Hampshires of Britain for a half century to come'.[47]

By about 1878 a major change in marketing techniques had occurred on the Hampshire Downs. Up until then, most sheep were sold out of the region to be fattened in their second year. However, with the regular and varied supply of feeds produced in the rotation, augmented by

[45] *Farmers Weekly*, 7 May 1898.

[46] *Hampshire Chronicle*, 19 July and 16 Aug 1902.

[47] W W Burch and R Carter, 'The Hampshire in England', *The American Sheep-Breeder and Wool Grower*, 29, no 7, 1909, pp 394 and 404.

oilseed cake and cheap feed-corn, it became increasingly common for commercial breeders to fatten lambs instead of selling them in store or half-fat condition. This resulted in the decline of the annual fairs with a corresponding increase in weekly and monthly fatstock sales.[48] The Hampshire lambed down early in the year and fattened more rapidly than any other sheep at the time. With intensive arable feeding, augmented by many with oilseed cake and corn, a lamb could be fat and ready for slaughter anytime from July or August onward. The value of the fat animal altered with age. In 1902, for example, Hampshire Down sheep at Basingstoke Repository sales were sold at around 50*s* per head when the animals were aged between six and eight months. At this age the sheep was still small, though past the suckling lamb stage. At nine months the value began to rise, reaching 53*s* at eleven to twelve months. Thereafter the price rose dramatically, peaking when the sheep was fourteen months at 63*s*. At fifteen months the animal was meeting competition from a number of other downs breeds which were beginning to come onto the market and the price fell back to between 54 and 59*s* depending on size and quality.[49] If the Hampshire had been intensively fed, he would quite probably be getting overly fat and coarse to qualify as top quality meat. Those destined to be sold as prime wether or young ewe would not have been fed as highly and would thus have less fat. On the national market the downs breeds were generally the most highly priced of the English sheep.[50] Because of the popularity of the Hampshire Down for cross breeding, it is probable that a number of these sheep were also produced on the Hampshire Downs. The high value of the meat from the downs breeds and the ability of the breed to supply high quality meat during periods of scarcity gave those rearing Hampshires a particular marketing advantage. There was a glut of these sheep in prime condition coming onto the national market in the late autumn and winter during which time the breed monopolized the London markets.[51] Because few other home producers were able to provide high quality fat teg during the winter and early spring, competition at national level was limited. Imports only competed with low quality mutton, and were priced well below the lowest quality mutton sold in the Hampshire region. Those farmers able to produce good quality – that is, not overly fat – meat were in a very competitive marketing position.

An even more lucrative marketing niche available to those with a suitable feeding environment was created by the extension of the time three-month old lamb could be made available. Suckling lamb was a luxury commodity generally associated with Christmas and Easter. These animals were slaughtered when they were ready for weaning at around three months. Traditionally suckling lamb was produced by Dorset Horn sheep which were able to lamb extremely early. The lambs were fed indoors and sold at Christmas. The Hampshire Down initially gained a reputation for producing the earliest outdoor fed lamb ready in time for Easter. These lambs attracted very high prices and, since the feed costs were negligible, they were relatively inexpensive to produce. However, it was essential that the ewe was never short of high quality, desirable feed. The system in Hampshire suited this rearing system. By the 1890s, with careful attention to breeding management, the long mating season of the breed was utilized to extend the luxury suckling-lamb season beyond the traditional brief period in spring. The lambs from Hampshire

[48] Market and fair reports, *Hampshire Chronicle*, 1875–1914.
[49] *Ibid*, 1902–03.
[50] BPP, 1904, CV, *Agricultural Returns of Great Britain, 1903*.
[51] *Report on the Marketing of Sheep, Mutton and Lamb in England and Wales*, 1931, pp 44–7.

dominated the London markets in March, April, and May, while the prices were high, and continued to be available until November and December.[52] The popularity of suckling lamb is demonstrated by the rise in the price of frozen imports in the autumn when national supplies were falling in quality and availability. The Hampshire maintained the considerable price difference between itself and the imported frozen meat while the average English lamb was unable to do so. This facility was yet another example of the success Hampshire Down farmers had in meeting the demands of specialist, high-value markets for products which could not easily be reared elsewhere in the United Kingdom, nor satisfied by imports.

VI

In spite of its success in catering for high value, specialist markets, the exceptionally intensive, arable-based mixed farming regime practised on the Hampshire chalks does not appear to have been adopted elsewhere in Britain. The regime found on the Wiltshire Downs came closest. There the Hampshire Down Sheep and the Wiltshire eight-course rotation promoted the creation of capital intensive, highly-renown pedigree breeding flocks of a size which generally far exceeded those found in neighbouring Hampshire. There was poorer quality of land on Salisbury Plain. In addition, the average farm size was greater and there was a smaller proportion of land in arable. Generally, the farms on the Wiltshire Downs required tenants with more capital. Possibly for these reasons, the potential to produce rapidly-fattening lambs associated with the regime in Hampshire does not appear to have been utilized. This gave the farmer in Wiltshire less flexibility and increased his susceptibility to the depression in agriculture.[53] In Dorset, the practice of producing in-house suckling lamb for the Christmas market continued. This procedure was distinct from the custom in Hampshire in that the Dorset Horn sheep gave birth earlier, but required to be housed and many of the lambs hand reared.[54] However, as in Hampshire, those farmers following this technique were able to meet a specialist demand. Another light-land area where farmers were able to specialize, but again not to the extent of the Hampshire farmers, was on the Lincolnshire Wolds. Here farmers met the falling prices of the depression by increasing the production of high-quality malting barley.[55] Other light-land farming systems do not appear to have targeted specialist, thus protected, markets. In Berkshire much of the downland remained in corn production with sheep playing a more traditional subsidiary role.[56] J T Coppock noted that in the Chilterns the distinction between the essentially pastoral claylands and the sheep-corn farming of the light lands greatly diminished during the years of depression. Those areas of the Chilterns with easily worked, reasonably fertile soils remained in arable, while the poorer lands reverted to pasture. This was particularly so where access to markets was at all restricted.[57] Generally farmers on the Hampshire chalklands appear to have been unusual in the degree to which they were willing and able to adapt their agricultural production to the changing conditions, both economic, and more specifically, marketing.

[52] Market and fair reports, *Hampshire Chronicle*, 1902–03; BPP, 1904, CV.

[53] F M L Thompson, 'Farming in Wiltshire', in E Critall, ed, *Victoria County History: A History of Wiltshire*, IV, 1959, pp 92–114.

[54] E Thomas and C Pringle, 'A Dorset sheep and corn farm', *Jnl Ministry of Agriculture*, 1932, pp 814–15.

[55] J H Brown, 'Agriculture in Lincolnshire during the Great Depression', unpublished PhD thesis, Manchester University, 1978, pp 131–32.

[56] J Orr, *Agriculture in Berkshire*, 1918, pp 24–39.

[57] J T Coppock, 'Agricultural changes on the Chilterns 1875–1900', *AHR*, IX, 1961, pp 15–16.

VII

On a superficial level the course advocated by E L Jones to move out of mixed farming into pastoral has merit.[58] This would have created a less labour and capital intensive system. However, it would have also denied the farmers of the region the potential to cater for the high value marketing niches exploited under the mixed farming system. As long as these niches remained available and protected, the farmer willing to target his agriculture towards one of these was likely to withstand the period of instability. This potential is, unfortunately, invisible to the economic historian attempting to measure productivity from statistics alone. There appears to have been a sharp decline in Hampshire Downs agriculture during the depression. Using the simple device of multiplying the number of sheep produced in a system by the value of the slaughtered product – the method generally employed by anyone measuring output on a national scale – would not give an accurate figure for the system at any time between 1850 and 1914. In the 1850s and 1860s such a calculation would overestimate the value of output. The majority of sheep produced in the region were sold to be stored and fattened elsewhere. The value of the meat from those sheep was greater than the value of the lean or half-fat animals. By the 1890s the device would seriously underestimate the output value. Some sheep would still have been sold in the traditional manner into other flocks for finishing. Many more would have been sold either as high value pedigree stock or as above average sized animals ready for slaughter outside the normal season. Jones examined the system up until 1873, that is, before the shift in marketing potential became evident. Unfortunately, the result of such investigations has caused misunderstanding about the chronology of the success of the agriculture in the region. The conventional wisdom – the successful implementation of highly-capitalized agriculture during the high farming period and the devastation during the depression – is unrepresentative of the conditions on the Hampshire Downs. Agriculture on the downs slowly evolved. The high farming period ended just as the system reached maturity. The depression, if indeed it should have been so titled, did not stop those willing to exploit the changes which had, and continued, to occur. These changes did not guarantee success or prosperity for the farmer, but they did provide him with the great advantage of a protected market.

[58] Jones, 'Agricultural prosperity', pp 118–19.

The Nature, History, and Distribution of Lithic Mulch Agriculture: An Ancient Technique of Dryland Agriculture

By DALE R LIGHTFOOT

Abstract

The mulching of agricultural fields and gardens with stones, pebbles, cinder and similar lithic materials is a variant agricultural strategy that has been used to evade drought and increase crop yield for more than a thousand years in the Old and New Worlds. Lithic mulch agriculture (LMA) is uniquely suited to the constraints of dryland environments, yet its use has remained confined both spatially and temporally. Prehistoric and contemporary LMA cases are synthesized and treated as a taxonomically discrete form of agriculture. This serves to alert scholars to the possibility of LMA at other historic sites.

LITHIC mulch agriculture (LMA) is a variant agricultural strategy employing lithic (stone) materials as a mulch for improving crop growth. Lithic mulch on an agricultural plot can increase soil moisture, reduce soil erosion, increase average soil temperature and moderate diurnal extremes, and increase crop biomass and crop yield. This technique allows for an expansion of arable land into regions previously considered unsuitable for agriculture, and (initially) improves the productivity of existing arid and semi-arid cropland.

Lithic mulch has been used to advantage for more than a thousand years in the Old and New Worlds, yet has remained confined both temporally and spatially. This paper will discuss the nature and function of lithic mulch and outline the known history of lithic mulch agriculture. Historic cases will be drawn from the Israeli Negev, Roman Italy/Mediterranean, the Peruvian Atacama, northwest Argentina, northern and southern Arizona, northern New Mexico, New Zealand, the Canary Islands, and central China. Contemporary agronomic experiments with lithic mulch will be framed against this historic experience as a way of assessing the future potential for LMA in arid lands.

This global-historical synthesis allows us to see a commonality in form and function, and forces us to view these features as more than aberrations to more established modes of production. Lithic-mulched plots are a taxonomically discrete field form, analogous to agricultural terraces and raised-fields. Like these more widely distributed agricultural forms, lithic mulch agriculture has ancient origins and is uniquely adapted to site-specific environments. Unlike either terracing or raised fields, however, LMA failed to diffuse beyond the few locales where it was independently invented, was rarely used for any length of time, and generally contributed little to the overall food supply. Because of these limitations, lithic-mulched fields have received little attention in the academic literature. If mentioned at all, gravel, rock, pebble, or ash-mulched plots have often been treated as non-agricultural features, or, at best, as marginal deviations in traditional form. Therein lies the importance of studying this unique agricultural field form: because it has enjoyed only limited success where employed it has remained relatively rare; because it is rare it has been recognized and studied by few scholars; yet a succession of independent experiments has already left its mark on the landscape, and these features are very real.

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I

Lithic mulch agriculture involves the surface mulching of gardens or agricultural plots with pebbles, gravel, stones, volcanic ash and cinder, or any other lithic material, in the same fashion that a gardener or farmer will apply a mulch of bark or straw. These materials are raked or piled into mounds, ridges, terraces or extensive surface layers to improve crop growth, or to buffer against declining yields during periods of drought. Lithic-mulched plots are sometimes found in association with shallow borrow pits, where some of the pebbles or stones were 'mined', and were always sited within, or very near, surface or near-surface deposits of stone, gravel and the like (Fig 1).

Many features exist which might be (mis)interpreted as LMA but do not fit the precise definition of a 'mulch', or are created for non-agricultural purposes. For example, there are many historic and contemporary cases of natural stony or gravelly surfaces being used to grow crops.[1] However, such surfaces remain unaltered, save for the hoe or plough furrows, and lithic materials are not applied to the surface of the soil. In some cases, crops have been planted in soil underlying a thin layer of aeolian sand or volcanic ash.[2] Although such features emulate LMA and offer similar benefits, they rely on a naturally-deposited mineral layer and do not involve the purposeful craft of mulching.

In some cases fields or gardens have been altered by mixing soils of different qualities and textures to improve soil quality (for example, 'liming' with calcium carbonate, 'marling' with clay-carbonate and lime mixes, or mixing sand into the soil),[3] or by working coarse fragments into the soil (for example, stones, gravel, oyster shells, bones, coral).[4] However, these strategies would fall under the category of soil mixing or amendments used to correct soil acidity and liberate plant nutrients; soils or lithic materials, in such cases, are incorporated into the soil horizon and co-mingle with the root mass of crops. In a lithic-mulched field the root mass will grow in the soil beneath a surface layer of stone or gravel.

Another type of garden which might be confused with LMA are the stone gardens built in Japan and China by applying a layer of gravel and stone to the surface of a garden.[5] However, these oriental gardens serve an aesthetic, not an agricultural/horticultural, purpose.

Control of evaporation is one of the most important goals of soil management aimed at improving the supply of water to crops.[6] Lithic mulch can increase crop biomass and crop yield by acting as a one-way water valve to increase the amount of moisture available to plants growing on the mulched plots by reducing soil crust formation, thereby increasing infiltration capacity, and reducing evaporative losses of water from wind and sun.[7] A lithic

[1] Cato, Marcus Porcius, and Censorius, *Roman Farm Management: The Treatises of Cato and Varro*, 1913; E C Semple, *The Geography of the Mediterranean Region: Its Relation to Ancient History*, Henry Holt and Co, 1931; J I Rodale, *Stone Mulching in the Garden*, Rodale Press, 1949.

[2] N H Greenwood, 'North America', in G A Klee, ed, *World Systems of Traditional Resource Management*, 1980, pp 189–215; K L Jones, 'Dune soils and polynesian gardening near Hokianga North Head, North Island, New Zealand', *World Archaeology*, 16, 1984, pp 75–88; H S Colton, 'Sunset Crater: the effect of a volcanic eruption on an ancient Pueblo people', *Geog Rev*, 22, 1932, pp 582–90; *idem*, 'Sunset Crater', *Plateau*, 18, 1945, pp 7–14; *idem*, *Black Sand: Prehistory of Northern Arizona*, Greenwood Press, 1960; P J Pilles Jr, 'Sunset Crater and the Sinagua: a new interpretation', in P D Sheets and D K Grayson, eds, *Volcanic Activity and Human Ecology*, 1979, pp 459–85.

[3] Cato *et al*, *Roman Farm Management*; J W Gent, *Systema Agriculturae*, 1669; J C Loudon, *An Encyclopaedia of Agriculture*, 1844.

[4] Gent, *Systema Agriculturae*, p 65; Loudon, *Encyclopaedia of Agriculture*, p 330; K D White, *Roman Farming*, Cornell UP, 1970.

[5] K Fukuda, *Japanese Stone Gardens*, Charles E Tuttle Co, 1970; E T Morris, *The Gardens of China: History, Art, and Meanings*, Charles Scribner's Sons, 1983.

[6] R Heinonen, *Soil Management and Crop Water Supply*, Swedish University of Agricultural Sciences, 1985, p 57.

[7] A T Corey and W D Kemper, *Conservation of Soil Water by Gravel Mulches*, Hydrology Papers No 30, Colorado State University, 1968; W D Kemper and R E Danielson, 'Gravel mulches, one way to catch and hold rainfall in arid regions', *Crops and Soils*, 21, 1969, p 22; M L Fairbourn and W D Kemper, 'Gravel mulches improve dryland tomato yields', *Colorado Rancher and Farmer*, 24, 1970, pp 64–5; M L Fairbourn, 'Effect of gravel mulch on crop yields', *Agronomy J*, 65, 1973, pp 925–28; J E Adams, 'Influence of mulches on runoff, erosion, and soil moisture depletion', *Proceedings, Soil Science Society of America*, 30, 1966, pp 110–14; J Lamb Jr and J E Chapman, 'Effect of surface stones on erosion, evaporation, soil temperature, and soil moisture', *J American Society of Agronomy*, 35, 1943, pp 567–78.

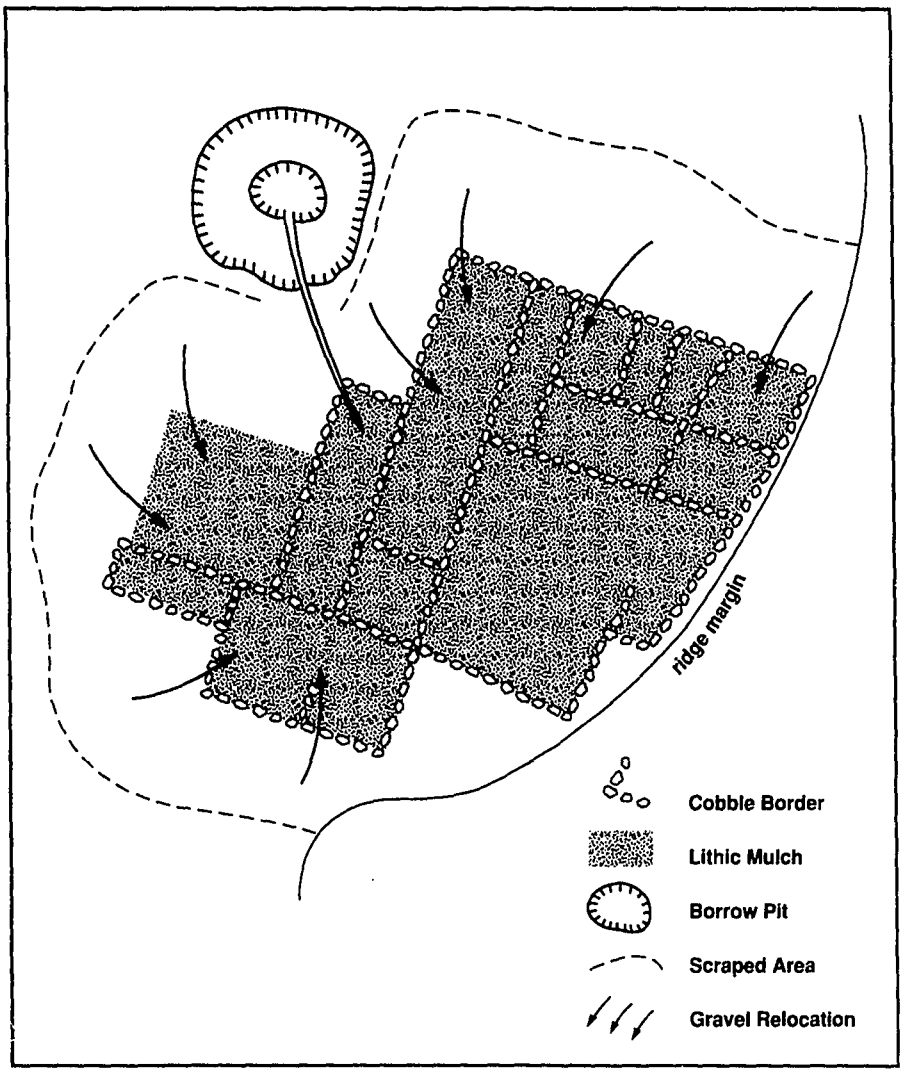


FIGURE 1
A lithic mulch garden (solid pebble mulch) typical of those in northern New Mexico.

mulch also inhibits salinization because the evaporation of salt-laden water at the soil surface is dramatically reduced,[8] and more water will percolate to lower soil and rock layers to recharge local aquifers and help to raise the water-table.[9]

Organic mulch (such as straw), like lithic mulch, can inhibit evaporation and also help to control weeds. However, these mulches also lower the soil temperature, resulting in latent germination and/or a shortened growing season.[10] Lithic mulch, on the other hand, will increase average soil temperature (which may be helpful or harmful, depending on the situation)

[8] P W Unger, 'Soil profile gravel layers: (I) effect on water storage, distribution, and evaporation; (II) effect on growth and water use by a hybrid forage sorghum', *Proceedings, Soil Science Society of America*, 35, 1971, pp 631–34; 980–83.
[9] Corey and Kemper, *Conservation of Soil Water*, p 19.
[10] C O Othieno and P M Ahn, 'Effects of mulches on soil temperature and growth of tea plants in Kenya', *Experimental Agriculture*, 16, 1980, pp 287–94; W R Van Wijk, W E Larson, and W C Burrows, 'Soil temperature and the early growth of corn from mulched and unmulched soil', *Proceedings, Soil Science Society of America*, 23, 1959, pp 428–34.

because the stone, gravel, or ash on the surface of the soil acts as a solar collector to absorb the sun's energy during the day and then re-radiate much of that heat into the soil throughout the day and night.[11]

A lithic mulch also increases surface roughness, generating more turbulent air flow over the garden surface. This has the effect of reducing the hottest day-time temperatures and raising the lowest night-time temperatures, thus providing a more thermally stable and healthy environment for the emergence of seedlings and the growth of crops.[12] The increase in wind turbulence also lowers the velocity of wind, thereby reducing wind erosion. Furthermore, lithic mulch protects the soil surface from runoff to reduce erosion by water on agricultural plots.[13]

In addition to extending the growing season, a warmer soil temperature also increases the rate at which roots can take up water and nutrients from the soil[14] (although published reports on the effects on nitrogen uptake are contradictory, showing both enhanced and depressed nitrification[15]). The combination of increased moisture retention and higher temperature in a lithic-mulched field results in accelerated germination and higher crop yields.[16] Increases in yield serve to utilize available soil moisture even better because the efficiency of water utilization by crops (kg of dryweight biomass produced per cm water consumed) increases with crop yield.[17] A lithic mulch also leads to the development of better distributed roots throughout a greater depth of the soil,[18] which improves crop tolerance to drought (Fig 2).

Although soil structure is not significantly affected by lithic mulch, the organic content of the soil can decrease by as much as 10 per cent after one year of mulching, and may become a detriment to agriculture over a long period of time.[19] A layer of lithic mulch on the surface of a field will hinder the application of fertilizer and discourage the return of crop wastes following harvest. This could disrupt nutrient cycles and lead to the depletion of some essential soil nutrients.

II

The literature on gardens and agricultural fields is vast, yet the sources are sparse which describe stone, gravel, or ash-built forms on arable land, or ascribe an agricultural purpose to these lithic mounds, ridges and fields. Rarer still are reports which describe the morphology, associated crops, and cultural ecology of lithic-mulched fields.

There follows a compilation of cases, listed chronologically, where lithic-mulched forms have been assigned an agricultural role by one or more researchers (Fig 3). Because of the lack of detail presently available on the first four cases, hypotheses regarding their purpose and use are conjectural. The remaining six cases of prehistoric and historic LMA have been better studied through empirical fieldwork and/or are more recent features, and their agricultural function is more convincingly documented. Alternative hypotheses are

[11] Fairbourn, 'Effect of gravel mulch on crop yields', p 928; D R Lightfoot and F W Eddy, 'The agricultural utility of lithic mulch gardens: past and present', *Geojournal*, 34, 1994, pp 425–37; J E Adams, 'Effect of mulches on soil temperature and grain sorghum development', *Agronomy J*, 57, 1965, pp 471–74.

[12] Lamb and Chapman, 'Effect of surface stones', p 575; Yen-hu Chang, *Climate and Agriculture: An Ecological Survey*, Aldine Press, 1968.

[13] Adams, 'Influence of mulches', p 112.

[14] E W Russell, *Soil Conditions and Plant Growth*, 10th ed, 1973.

[15] Adams, 'Effect of mulches', p 474; A H Hakimi and R P Kachru, 'Silage corn responses to different mulch tillage treatments under arid and semiarid climatic conditions', *J Agronomy and Crop Science*, 147, 1978, pp 15–23.

[16] Fairbourn, 'Effect of gravel mulch on crop yields', Hakimi and Kachru, 'Silage corn responses'; D G Barkley, R E Blaser, and R E Schmidt, 'Effect of mulches on microclimate and turf establishment', *Agronomy J*, 57, 1965, pp 189–92; J M Walker, 'One-degree increments in soil temperatures affect maize seedling behavior', *Soil Science Society of America Proceedings*, 33, 1969, pp 729–36.

[17] Chang, *Climate and Agriculture*.

[18] Othieno and Ahn, 'Effects of mulches', p 291.

[19] R B Alderfer and F G Merkle, 'The comparative effects of surface application versus incorporation of various mulching materials on structure, permeability, runoff, and other soil properties', *Soil Science Society of America Proceedings*, 8, 1943, pp 79–86.

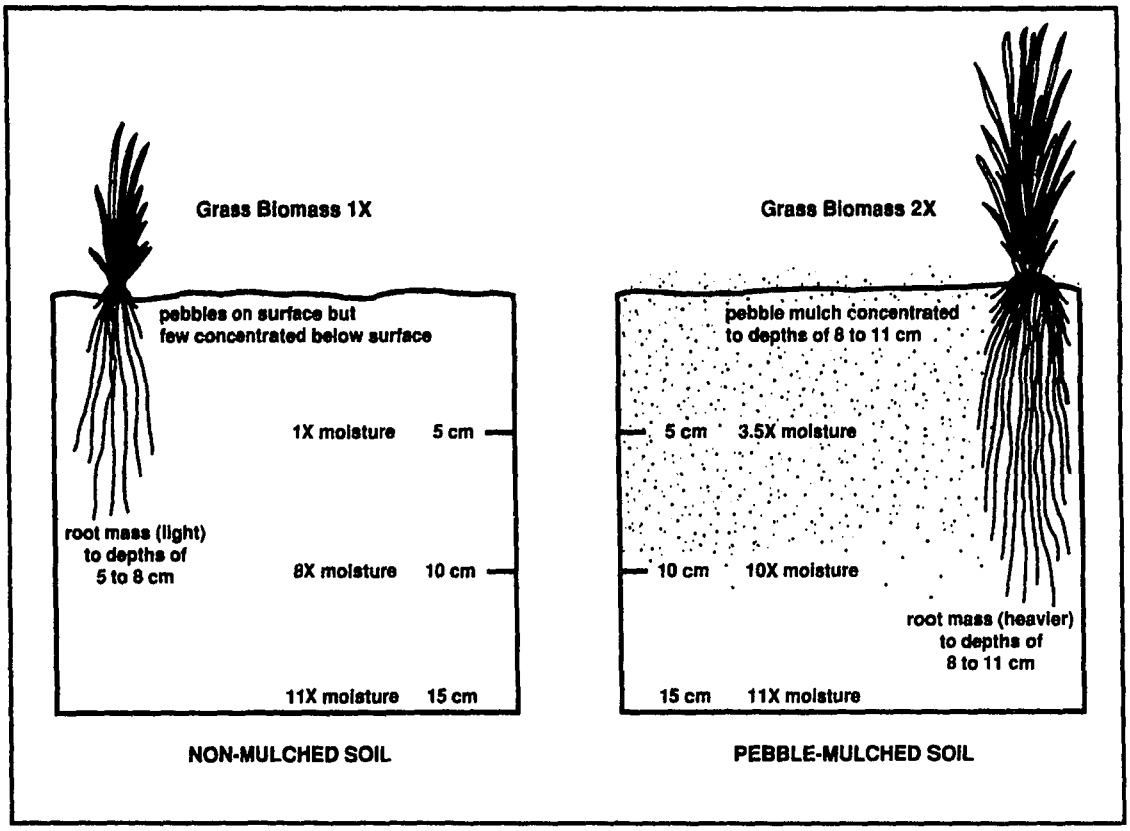


FIGURE 2
Comparative soil moisture and biomass for pebble-mulched and non-mulched soils in the Galisteo Basin, northern New Mexico.

provided where there has been disagreement among scholars over the precise function of these features. The area, number, and morphology of features, crops presumably grown, dates of use, and associated cultural groups are summarized. This compendium is derived (second-hand) from published reports, combined with a personal familiarity with lithic-mulched features gained through a detailed empirical study of pebble mulch gardens in New Mexico, and observation of prehistoric rock mounds in Arizona and Israel and contemporary rock mulching in Syria.

1. Negev Desert, Israel

Many thousands of stone mounds and ridges cover scores to hundreds of hectares around the sites of Shivta-Nitzana (aka Subeita or Esbeita) and Avdat (aka Abda) in the Negev desert of southern Israel.[20] The rock/stone mounds (some with gravel fill) were constructed on hillslopes in sizes ranging from 1 to 5 m in diameter and 15 to 70 cm in height; small mounds are spaced 2–4 m apart while larger mounds may have 20–30 m separation.[21] The 15–25 cm high flintstone and gravel ridges were built in 2–3 m wide rows at 6–10 m intervals, layed out on hillsides parallel to the slope, in perfectly straight rows with canals or raised furrows running between every row.[22]

[20] M Evenari, L Shanan, and N Tadmor, *The Negev: The Challenge of a Desert*, Harvard UP, 1971; Y Kedar, 'Water and soil from the desert: some ancient agricultural achievements in the central Negev', *Geog J*, 123, 1957, pp 179–87; D Zohary, 'Notes on ancient agriculture in the central Negev', *Israel Exploration J*, 4, 1954, pp 17–25.

[21] Evenari *et al*, *The Negev*, pp 129–32.

[22] *Ibid*, pp 129–32; Kedar, 'Water and soil from the desert', p 184.

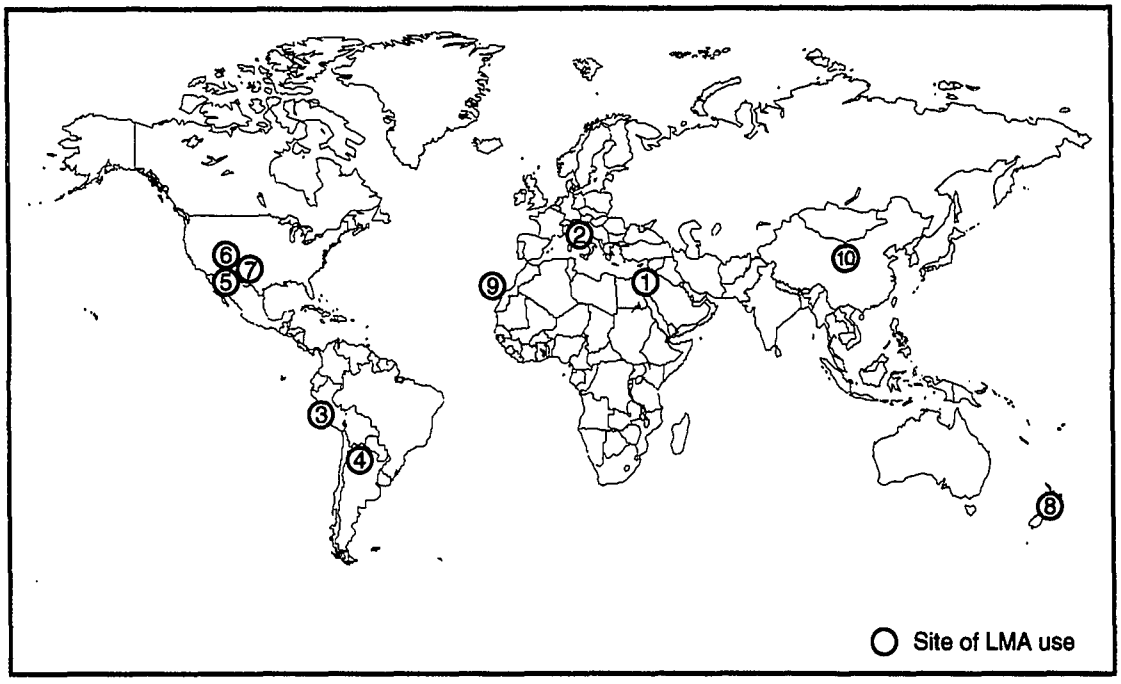


FIGURE 3
Sites of ancient and historic use of lithic mulch agriculture (pre-1900).

All these features are associated with ancient Nabatean sites[23] and were most likely used during the period 200 BC to AD 600,[24] though some may have been used as early as 2000 BC[25] or as late as AD 700.[26] A number of researchers have ascribed to these features an agricultural role.[27] By collecting dew water and transmitting it to the soil[28] or by helping to retain scant rainfall or pot-irrigation water,[29] these stone forms may have been used to grow grape vines[30] or olive trees.[31] The local Arabic name for the stone mounds is 'tuleilat el anab' or 'rujum el kurum', both making reference to 'grape mounds' or 'vine mounds'.[32]

Some scholars remain sceptical of their agricultural functions, arguing that they did not collect dew,[33] and did not improve the water regime of the soil below to any significant degree.[34] Alternative hypotheses

[23] Kedar, 'Water and soil from the desert', p 179; *idem*, 'Ancient agriculture at Shivta in the Negev', *Israel Exploration J*, 7, 1957, pp 178–89; M Evenari and D Koller, 'Ancient masters of the desert', *Scientific American*, 194, 1956, pp 39–45; H Aschmann, 'Historical development of agriculture in semi-arid regions of winter precipitation', *Proceedings, International Symposium on Rainfed Agriculture in Semi-Arid Regions*, Riverside, California, April 17–22, 1977, pp 87–110.

[24] Kedar, 'Water and soil from the desert', p 179, and 'Ancient agriculture at Shivta', p 178.

[25] Evenari *et al*, *The Negev*, p 127.

[26] Kedar, 'Water and soil from the desert', p 179.

[27] Aschmann, 'Historical development of agriculture'; E H Palmer, *The Desert of the Exodus*, 1871; C L Wooley and T E Lawrence, *The Wilderness of Zin: Archaeological Report*, 1914; J E Spencer and G A Hale, 'The origin, nature, and distribution of agricultural terracing', *Pacific Viewpoint*, 2, 1961, pp 1–40; A Reifenberg, *The Struggle Between the Desert and the Sown: Rise and Fall of Agriculture in the Levant*, Government Press, Jerusalem, 1955; P Mayerson, 'Ancient agricultural remains in the central Negeb: The Teleilat el Anab', *Bulletin of the American Schools of Oriental Research*, 153, 1959, pp 19–31.

[28] Reifenberg, *The Struggle Between the Desert and the Sown*, p 45.

[29] Mayerson, 'Ancient agricultural remains in the central Negeb', p 134.

[30] Palmer, *The Desert of the Exodus*; Spencer and Hale, 'The origin, nature, and distribution of agricultural terracing', p 21; Reifenberg, *The Struggle Between the Desert and the Sown*, p 45.

[31] Spencer and Hale, 'The origin, nature, and distribution of agricultural terracing', p 21.

[32] Kedar, 'Water and soil from the desert', p 185; Reifenberg, *The Struggle Between the Desert and the Sown*, p 45; Mayerson, 'Ancient agricultural remains in the central Negeb', p 136.

[33] Evenari *et al*, *The Negev*, pp 132–34; D Hillel, *Negev: Land, Water, and Life in a Desert Environment*, Praeger Scientific, 1982.

[34] Hillel, *Negev: Land, Water, and Life*, p 136.

view these mounds and ridges as water harvesting features, constructed while clearing stones from the hillslopes to increase the runoff of water to the valley below.[35] One scholar suggested that their primary function was to allow sediment, eroded from hillslopes during runoff, to accumulate on arable land in the valley bottom,[36] but this is not likely as slope runoff was also engineered to drain into cisterns; and water, not arable soil, was the limited resource.[37] Other scholars reported that the stones were heaped into mounds in order to prepare the ground between piles for cultivation.[38]

Empirical tests at some of these sites have demonstrated a 30–40 per cent increase in water runoff from surfaces where stones were cleared by rock mounding.[39] However, this does not negate the ability of stone mounds and ridges to increase infiltration and reduce evaporation in the soil underlying each mound or ridge. (The authors of the runoff theory, noted above, have contradicted their own hypothesis, in another section of their book, by praising the role of stones and desert pavement in increasing infiltration and preserving soil moisture under the stones.[40]) Perhaps these features were built primarily to increase runoff to the valley below, and then the heaps of stones that were piled up during clearing were employed to grow grape vines, thereby diversifying planting locations, minimizing subsistence risk, and allowing for an expansion of arable land. Just as plausible is the initial construction of stone mounds for the planting of grape vines, followed by an expansion of this practice after it was discovered that runoff increased from the hillslopes where grape-vine mounds had been built. Besides, these mounds are found not only on slopes but also on hill crests where they could not have contributed much to runoff. These water harvesting and LMA functions would both operate simultaneously and are not mutually exclusive.

2. Roman Italy/Mediterranean

An unknown number of stone mounds were used in Roman Italy and nearby Mediterranean regions for growing grapes and (perhaps) olive trees.[41] Roman LMA was most likely applied in the period 100 BC to AD 400, and perhaps a century on either side of this range.[42] Precise morphological details have not been recorded, but general descriptions of stone mulching have been noted by Roman and modern writers who describe the practice of placing stones on top of the soil and making stone mounds.[43] Far more has been written about the Roman use of naturally stony soil, and their practice of burying 'thirsty stones or rough shells' into the ground to reduce soil seal and maintain infiltration.[44] However, such methods fall short of stone 'mulching' if stones are not purposely layed on top of the soil.

3. Atacama Desert, Peru

Roughly 1500 stone-lined pits, averaging 1 m in depth and diameter, were built by the Lapa Lapa people in the 'lomas' or fog oases around the site of Chilca, south of

[35] Evenari *et al*, *The Negev*, pp 134–47; Hillel, *Negev: Land, Water and Life*, pp 135–44.
[36] Kedar, 'Water and soil from the desert', p 185; Kedar, 'Ancient agriculture at Shivta', p 186.
[37] Hillel, *Negev: Land, Water, and Life*, p 136.
[38] Wooley *et al*, *The Wilderness of Zin*.
[39] Evenari *et al*, *The Negev*, pp 135–47.
[40] *Ibid*, pp 260–61.
[41] Rodale, *Stone Mulching in the Garden*, p 58; J Chilwell, 'Stone mulches increase productivity of soil', *Farmer's Weekly of South Africa*, 84, 1952, pp 41–2.
[42] White, *Roman Farming*; Cato *et al*, *Roman Farm Management*; Rodale, *Stone Mulching in the Garden*.
[43] Rodale, *Stone Mulching in the Garden*, p 58; P W Unger, 'Water conservation: Southern Great Plains', in H E Dregne and W O Willis, eds, *Dryland Agriculture*, Soil Science Society of America, 1983, pp 35–48; G V Jacks, W D Brind, and R Smith, *Mulching*, Farnham Royal, 1955, p 12.
[44] White, *Roman Farming*, pp 229–30; Cato *et al*, *Roman Farm Management*; Rodale, *Stone Mulching in the Garden*, p 58.

Lima, Peru.[45] Estimated dates of use range from 100 BC to AD 200, and perhaps a bit later.[46] Both maize and potatoes have been identified as crops associated with the loma pits.[47] Some scholars believe that these features were used to collect and retain subsurface moisture, which would flow by gravity around these pits.[48] It has also been suggested that they collected dew from fog moisture, the only form of precipitation in this arid region.[49]

Tests of the dew-harvesting principle in the Negev desert of Israel have cast doubt on this latter theory; dew will condense on piles of rock, but not in harvestable or usable quantities.[50] The rocks and gravel in these pits would have been a nuisance to potato cultivation,[51] so they may have been used only as storage pits.[52] Regardless, maize has not been ruled out as a stone-pit cultivar; nor has the possibility that these features increased, even slightly, the moisture content of the soil beneath the stone veneer. Even today, plant growth is seasonally more luxuriant within these pits, compared to plants growing naturally outside of the pits.[53]

4. *Northwest Argentina*

Extensive areas of stone strips, mounds and ridges are found around four prehistoric sites (Coctaca, Cachi, Quilmes, and Angualasto) in northwest Argentina.[54] All these features appear to have been used at least during the period AD 300–700, and possibly as early or late as AD 1 and AD 1500.[55] Cultures associated with these sites include Humahuaca (at Coctaca), Calchaqui (at Cachi and Quilmes), Aimogasta (at Angualasto), and Inca (if these features were still in use by the late 1400s when the Inca occupied the region).[56]

The form of LMA found throughout this region varies from site to site. At Coctaca there are 1.5–3.0 m wide strips of pebbles over a finer soil, laid out between masonry walls less than 75 cm high, as well as longitudinal mounds of small stones (5 m high and 8–10 m across), perhaps built and irrigated to grow maize.[57] It is possible that crops did not grow in the pebble-covered soil, within the low masonry walls, but between these features, which may have served as traditional terraces.[58] In the Cachi area, many stone mounds were built for planting maize, and/or to increase runoff to the valley below.[59] A number of terraces with a sandy and pebbly pavement are found around the Quilmes site.[60] These may be a form of LMA, or possibly a feature of natural deflation; neither hypothesis can be ruled out until these features are examined in greater detail. At the Angualasto site, pebbles were scraped into mounds (50–70 cm wide and 5–10 cm high) or raked into elongated ridges, 20–50 cm across, with alternating bare and pebble-paved soil.[61] These features may have been used to grow maize and/or to increase valley runoff.[62]

[45] F Engel, 'New facts about pre-Columbian life in the Andean Lomas', *Current Anthropology*, 14, 1973, pp 271–80; R A Benfer, G H Weir, and B O Enriquez, 'Early water management technology on the Peruvian coast', in D L Browman, ed, *Arid Land Use Strategies and Risk Management in the Andes*, Westview Press, 1987, pp 195–206.

[46] Engel, 'New facts about pre-Columbian life', p 277.

[47] *Ibid*, pp 275–77.

[48] Benfer *et al*, 'Early water management', p 199.

[49] *Ibid*, p 199.

[50] Hillel, *Negev: Land, Water, and Life*, p 136; National Academy of Sciences, *More Water for Arid Lands: Promising Technologies and Research Opportunities*, National Academy of Sciences, 1974, p 68.

[51] C Field, 'A reconnaissance of southern Andean agricultural terracing', unpublished Ph D thesis, University of California, Los Angeles, 1966, p 512.

[52] Engel, 'New facts about pre-Columbian life', pp 275–77.

[53] Benfer *et al*, 'Early water management', p 199.

[54] Field, 'Reconnaissance of southern Andean agricultural terracing', pp 263–401.

[55] R A Donkin, *Agricultural Terracing in the Aboriginal New World*, Viking Fund Publications in Anthropology No 56, University of Arizona Press, 1979; W C Bennett, E F Bleiler, and F H Sommer, *Northwest Argentine Archaeology*, Yale UP, 1948.

[56] Bennett *et al*, *Northwest Argentine Archaeology*, pp 18, 38–43, 90–98, 112–19.

[57] Field, 'Reconnaissance of southern Andean agricultural terracing', pp 393, 401, 512–13.

[58] *Ibid*, pp 393–99.

[59] *Ibid*, pp 372–74, 512.

[60] *Ibid*, p 362.

[61] *Ibid*, pp 263–64.

[62] *Ibid*, pp 263–64, 512.

5. Southern (Hohokam) Arizona

As many as 42,000 rock mounds, in more than 100 different loci, were piled onto bajadas, talus slopes, and upper flood-plain terraces in the Phoenix-Tucson region of southern Arizona.[63] These features range in size from small clusters with a few fist-sized cobbles to large mounds several metres in diameter, but most are one to two metres in diameter and rarely exceed 75 cm in height.[64] The rock piles occur in clusters, and sometimes in alignments creating more or less rectangular areas; they are most dense around cobbly surfaces where the soil is more than 20 cm deep.[65] All these mounds are associated with the Hohokam culture and were built during the period AD 850–1300.[66]

Some scholars suggest that these mounds were piled up when stones were cleared to increase runoff to canals and fields below,[67] but this is unlikely as most of the mounds are on gently sloping to flat surfaces.[68] Other researchers have speculated that they were built to clear fields so that crops could be planted between the mounds[69] and to control the diversion of water over these planted fields.[70] Still others see no agricultural function to the piles at all, believing that they were used to support upright posts.[71]

In support of the LMA hypothesis, researchers have found clear evidence that these rockpiles were built and used for growing agave (used as a source of both food and fibre).[72] Remains of charred agave have been found in nearby roasting pits, and many steep-edged core tools and knives, similar to Southwest Indian agave and mescal knives, have been found scattered across many of the rockpile fields.[73]

6. Northern (Sinagua) Arizona

Nineteen ash ridges, twenty-five ash/cinder mounds, and several adjacent rockpiles, collectively covering an area greater than 4 ha, may have been used to grow crops in the volcanically-altered Sunset Crater region northeast of Flagstaff, Arizona.[74] These features were built and

[63] P R Fish and S K Fish, 'Agricultural maximation in the Sacred Mountain Basin, Central Arizona', in S K Fish and P R Fish, eds, *Prehistoric Agricultural Strategies in the Southwest*, Arizona State University Anthropological Research Papers No 33, Arizona State University, 1984, pp 147–59; S K Fish, P R Fish, C Miksicek, and J Madsen, 'Prehistoric agave cultivation in southern Arizona', *Desert Plants*, 7, 1985, pp 107–12; S K Fish, P R Fish, and J H Madsen, 'Analyzing regional agriculture: a Hohokam example', in S K Fish and S A Kowaleski, eds, *The Archaeology of Regions: A Case for Full-Coverage Survey*, Smithsonian Institution Press, 1990, pp 189–218; W B Masse, 'An intensive survey of prehistoric dry farming systems near Tumamoc Hill in Tucson, Arizona', *The Kiva*, 45, 1979, pp 141–86; J S Czaplicki and A G Rankin, *A Supplemental Class III Archaeological Survey of the Phase A, Reach 3 Corridor, Tucson Aqueduct, Central Arizona Project*, Supplement to Archaeological Series No. 165, University of Arizona Press, 1984; W H Doelle, 'Hohokam use of nonriverine resources', in P Grebinger, ed, *Discovering Past Behavior: Experiments in the Archaeology of the American Southwest*, Gordon and Breach, 1978, pp 245–74.

[64] Masse, 'An intensive survey of prehistoric dry farming systems', pp 164–66; Fish *et al*, 'Analyzing regional agriculture', p 202.

[65] Masse, 'An intensive survey of prehistoric dry farming systems', pp 164–66.

[66] Fish *et al*, 'Prehistoric agave cultivation', p 110; Fish *et al*, 'Analyzing regional agriculture', p 195; V Canouts, *An Archaeological Survey of the Onne Reservoir*, Report to the Arizona Archaeological Center, University of Arizona Press, 1975, p 284; J S Wood, 'Second foundation: settlement patterns and agriculture in the northeastern Hohokam periphery, central Arizona', in Fish and Fish, *Prehistoric Agricultural Strategies*, pp 271–89; K Rozen, *The Archaeological Survey of the Northern Tucson 138 kV Transmission Line System: The Northern Tucson Basin and Lower Santa Cruz Valley, Arizona*, Archaeological Series No 132, University of Arizona Press, 1979, p 64; P H Stein, *Archaeological Investigations Along the Salt-Gila Aqueduct*, Arizona Projects Office Technical Report, United States Bureau of Reclamation, 1979, p 78.

[67] Doelle, 'Hohokam use of resources', p 266; Canouts, *Archaeological Survey of the Onne Reservoir*, pp 83, 285; Wood, 'Second foundation', p 272; Stein, *Archaeological Investigations Along the Salt-Gila Aqueduct*, p 120.

[68] Fish *et al*, 'Analyzing regional agriculture', p 203; Masse, 'An intensive survey of prehistoric dry farming systems', p 166.

[69] Rozen, *The Archaeological Survey of the Northern Tucson*, pp 59–60, 64.

[70] S K Fish, P R Fish, and J H Madsen, 'A preliminary analysis of Hohokam settlement and agriculture in the northern Tucson Basin', in A E Dittert and D E Dove, eds, *Proceedings of the 1983 Hohokam Symposium, Part 1*, Arizona Archaeological Society, 1985, p 92.

[71] L S Teague and P L Crown, *Hohokam Archaeology Along the Salt-Gila Aqueduct Central Arizona Project*, Archaeological Series No 150, University of Arizona Press, 1982, p 109.

[72] Fish *et al*, 'Prehistoric agave cultivation', pp 107–12; Fish *et al*, 'Analyzing regional agriculture', pp 205, 208; Czaplicki and Rankin, *Supplemental Class III Archaeological Survey*, p 5.

[73] Fish *et al*, 'Prehistoric agave cultivation', p 107.

[74] G L Berlin, J R Ambler, R H Hevly, and G G Schaber, 'Identification of a Sinagua agricultural field by aerial thermography, soil chemistry, pollen/plant analysis, and archaeology', *American Antiquity*, 42, 1977, pp 588–600; G L Berlin, D E Salas, and P R Geib, 'A prehistoric Sinagua agricultural site in the ashfall zone of Sunset Crater, Arizona', *J Field Archaeology*, 17, 1990, pp 1–16.

used by the Sinagua people during the years AD 1150–1250, and possibly as early as AD 1100.[75] At one site, ridges and swales average 265 m in length, 3–4 m in width, and 10–30 cm in height; at an adjacent site the largest ridge is 150 × 20 m and the smallest is 25 × 9 m.[76] All ridges are oriented at an oblique angle to the prevailing wind. The mounds are 10–24 m in diameter and 17–42 cm in height/depth.[77]

One theory maintains that these mounds and ridges represent the piles of ash and cinder cleared from agricultural fields, following the eruption of Sunset Crater in AD 1064–67, in order to replant maize in the soil beneath the fresh layer of ejecta.[78] This view is based on the recovery of maize pollen from soil between ridges. A more recent study counters that this pollen was taken from underneath the ash-mulched features and that it pre-dates the eruption of AD 1064.[79] These scholars have found a different assortment of pollen within the ash/cinder ridges and mounds, leading them to believe that weedy plants, such as amaranthus and chenopodium, were double-cropped with spring and summer greens and other domesticates.[80]

Wind-borne ejecta were spread over an area far larger than the 4 ha covered by ash ridges and mounds. Many other reports discuss farming in this wide-spread ash cover,[81] but do not discuss the raking or surface loading of ash or cinder to build up a mulch.

7. Northern (Anasazi) New Mexico

Extensive areas of terrace and mesa tops are covered by hundreds (perhaps thousands) of pebble mulch gardens around prehistoric Anasazi Pueblo sites in northern New Mexico.[82] Most are believed to have been built and then abandoned within the century spanning AD 1350–1450, with a few possibly in use a decade or two earlier and few decades later.[83] Most of the mulched gardens, covering at least 70,000 m^2 were built around a dozen different pueblos in the lower Chama and Ojo Caliente valleys, northwest of Santa Fe.[84] A further 102 pebble mulch gardens, covering another 41,000 m^2, are found south of Santa Fe, in the Galisteo Basin, around the pueblos of San Marcos (96 gardens) and San Lazaro (6 gardens).[85] At present, only the Galisteo pebble mulch gardens have been completely surveyed. The full extent of gardens in the Chama-

[75] Berlin *et al*, 'A prehistoric Sinagua agricultural site', pp 13–14.
[76] *Ibid*, pp 1–2, 5.
[77] *Ibid*, pp 2, 5.
[78] G G Schaber and G J Gumerman, 'Infrared scanning images: an archaeological application', *Science*, 164, 1969, pp 712–13.
[79] Berlin *et al*, 'A prehistoric Sinagua agricultural site', p 2.
[80] *Ibid*, p 12.
[81] Colton, 'Sunset Crater: the effect of a volcanic eruption', and *Black Sand*; H S Colton, 'The prehistoric population of the Flagstaff area', *Plateau*, 22, 1949, pp 21–25; *idem* 'Experiments in raising corn in the Sunset Crater ashfall area east of Flagstaff, Arizona', *Plateau*, 37, 1965, pp 77–79; Pilles, *Volcanic Activity and Human Ecology*; D A Breternitz, 'The eruption(s) of Sunset Crater: dating and effects', *Plateau*, 40, 1967, pp 72–76; A P Sullivan, 'Sinagua agricultural strategies and Sunset Crater volcanism', in Fish and Fish, *Prehistoric Agricultural Strategies*, pp 85–100; S H Maule, 'Corn growing at Wupatki', *Plateau*, 36, 1963, pp 29–32.

[82] D R Lightfoot, 'The landscape context of Anasazi pebble-mulched fields in the Galisteo Basin, northern New Mexico', *Geoarchaeology*, 8, 1993, pp 349–70; *idem*, 'The cultural ecology of Puebloan pebble mulch', *Human Ecology*, 21, 1993, pp 115–43; Lightfoot and Eddy, 'The agricultural utility of lithic-mulch gardens', pp 425–37; T D Maxwell and K F Anschuetz, 'The southwestern ethnographic record and prehistoric agricultural diversity', in T W Killion, ed, *Gardens of Prehistory: The Archaeology of Settlement Agriculture in Greater Mesoamerica*, University of Alabama Press, 1992, pp 35–68; L S Cordell, *Prehistory of the Southwest*, 1984; F C Hibben, *Excavation of the Riana Ruin and Chama Valley Survey*, University of New Mexico Anthropological Series Bulletin No 300, University of New Mexico Press, 1937; K F Anschuetz, T D Maxwell, and J A Ware, *Testing Report and Research Design for the Mendenales North Project, Rio Arriba County, New Mexico*, Laboratory of Anthropology Note No 347, Museum of New Mexico, 1985.
[83] Lightfoot, 'The cultural ecology of Puebloan pebble mulch', pp 130–31; R L Tjaden, 'Bordered garden plots and field houses near Sapawe, north central New Mexico: a dry farming strategy', unpublished M A Thesis, Arizona State University, Tempe, 1979, p 16; R W Lang, *A Prehistoric Pueblo Garden Plot on the Rio Ojo Caliente, Rio Arriba County, New Mexico: Ojo Caliente Site 7, Features 1–2*, Contract Archaeology Division Report No 065, School of American Research, 1981, p 40; Maxwell and Anschuetz, 'Southwestern ethnographic record', p 57.
[84] Maxwell and Anschuetz, 'Southwestern ethnographic record'; Cordell, *Prehistory of the Southwest*, pp 205–6; Anschuetz *et al*, *Testing Report and Research Design*; J A Ware and M Mensel, *The Ojo Caliente Project: Archaeological Test Excavations and a Data Recovery Plan for Cultural Resources Along U.S. 285, Rio Arriba County, New Mexico*, Archaeology Notes No 99, Museum of New Mexico, 1992.
[85] Lightfoot, 'The cultural ecology of Puebloan pebble mulch', pp 122–24, and, 'The landscape context of Anasazi pebble-mulched Fields', pp 351–53.

Ojo Caliente valleys has not yet been assessed.

Many of the mulched gardens are bordered and/or internally partitioned with fist-sized and larger stones. Some of these, found in the vicinity of non-mulched gardens, may have been incrementally constructed by adding a pebble mulch to more traditional bordered gardens. Others have no stone borders, or only incomplete borders, and are found far from bordered gardens.[86] Many of these gardens are surrounded by borrow pits, or shallow depressions dug into the surface of gravelly ridges and terraces (1–4 m in diameter and 0.2–1.7 m in depth).[87] Some researchers argue that these hollows served as growing pits.[88] Others have demonstrated that much of the gravel used as a mulch on the gardens was 'mined' from these borrow pits, suggesting that their use as growing pits was incidental, if valid at all.[89]

Pebble mulch gardens appear to have been intentionally sited only in areas with a surface/near-surface deposit of gravel.[90] Pebbles were acquired from borrow pits and/or by scraping adjacent areas and raking pebbles into layers over a garden surface.[91] The gardens are generally rectilinear in shape and vary from a small size of 2–3 m to large fields several tens to hundreds of metres on a side; most average 10 or 20 m in length and width.[92] The mulch appears as a layer of pea- to plum-sized pebbles, 3–7 cm high (15 cm in extreme cases), mixed with aeolian sediments incorporated into the mulch layer through centuries of disuse.[93]

Scholars once believed that these pebbled forms were the stone foundations of Pueblo communities.[94] The agricultural nature of these features has now been confirmed with the repeated recovery of maize pollen in soil samples taken from pebble mulch gardens.[95] Furthermore, only one incidence of maize pollen has been recovered from samples taken just off of the gardens, suggesting that maize was indeed grown on the gardens and not on the gravelly soil between gardens.[96] Two lithic hoes have also been recovered from pebble mulch gardens in the Galisteo Basin.[97] The limited natural rainfall of the area, and the great number of pot sherds scattered around many of the pebbled gardens, suggest that the maize was routinely

[86] Lightfoot and Eddy 'The agricultural utility of lithic-mulch gardens', p 426; Maxwell and Anschuetz, 'Southwestern ethnographic record'; D E Buge, 'Prehistoric subsistence strategies in the Ojo Caliente valley, New Mexico', in Fish and Fish, *Prehistoric Agricultural Strategies*, pp 27–34.

[87] Lightfoot, 'The cultural ecology of Puebloan pebble mulch', p 122; Maxwell and Anschuetz, 'Southwestern ethnographic record', p 60; R W Lang, *An Archaeological Survey Near the Confluence of the Chama and Ojo Caliente Rivers, Rio Arriba County, New Mexico*, Contract Archaeology Division Report No 065, School of American Research, 1979, p 19.

[88] Lang, *An Archaeological Survey Near the Confluence of the Chama and Ojo Caliente Rivers*, p 19; Buge, 'Prehistoric subsistence strategies', p 32.

[89] Lightfoot, 'The cultural ecology of Puebloan pebble mulch', p 122; Maxwell and Anschuetz, 'Southwestern ethnographic record', p 60; R A Luebben, 'Leaf Water site', in F Wendorf, ed, *Salvage Archaeology in the Chama Valley, New Mexico*, Monographs of the School of American Research No 17, School of American Research, 1953, p 16.

[90] Lightfoot, 'The landscape context of Anasazi pebble-mulched fields', pp 360–66.

[91] Lightfoot, 'The cultural ecology of Puebloan pebble mulch', pp 120–21; Maxwell and Anschuetz, 'Southwestern ethnographic record'.

[92] D R Lightfoot, 'The prehistoric pebble-mulched fields of the Galisteo Anasazi: agricultural innovation and adaptation to environment', unpublished PhD thesis, University of Colorado, Boulder, 1990, pp 150–52; Tjaden, 'Bordered garden plots and field houses', p 5; Buge, 'Prehistoric subsistence strategies', p 31.

[93] Lightfoot, 'The prehistoric pebble-mulched fields', pp 173–74; Cordell, *Prehistory of the Southwest*, p 205; R W Lang, *Archaeological Investigations at a Pueblo Agricultural Site, and Archaic and Puebloan Encampments on the Rio Ojo Caliente, Rio Arriba County, New Mexico*, Contract Archaeology Division Report No 007, School of American Research, 1980, pp 5, 17.

[94] E L Hewett, *Antiquities of the Jemez Plateau, New Mexico*, Bureau of American Ethnology Bulletin No 32, Smithsonian Institution, 1906, pp 32, 36; R Greenlee, *Archaeological Sites in the Chama Valley, and Report on Excavations at Tsama, 1929–1933*, Santa Fe Laboratory of Anthropology, nd, pp 10, 24; A B Reagan, 'The story of Jemez and Sia', *El Palacio*, 4, 1917, p 30.

[95] K Fiero, *Prehistoric Garden Plots along the Lower Rio Chama Valley: Archaeological Investigations at Sites LA 11830, LA 11831, and LA 11832, Rio Arriba County, New Mexico*, Laboratory of Anthropology Note IIIe, Museum of New Mexico, 1978; K H Clary, *Pollen Evidence for the Agricultural Utilization of Late Classic Period (AD 1350–1500) Puebloan Gravel Mulch Terrace Gardens, the Rio Chama, in the Vicinity of Medanales, New Mexico*, Castetter Laboratory for Ethnobotanical Studies Technical Series Report No 198, University of New Mexico Press, 1987.

[96] Clary, *Pollen Evidence*, p 19.

[97] Lightfoot, 'The cultural ecology of Puebloan pebble mulch', p 127.

pot-irrigated, at least during the hottest and driest part of the growing season.[98]

8. (Maori) New Zealand

More than 400 ha of gravel-mulched fields, and many hundreds of stone piles, are found at scattered locations on both the North and South Islands of New Zealand.[99] These forms of LMA were used by the indigenous Maori sometime during the period AD 1200–1800, and perhaps a little earlier or later.[100]

Most of these gravel fields and stone mounds were used to grow the 'kumara', or sweet potato.[101] One ancient taro garden, uncovered in the Pelorus district, South Island, had its surface covered with small gravels carried from a nearby beach.[102] One scholar has also suggested that maize might have been grown on some of the gravel-mulched fields.[103] The Maori were apparently able to fertilize the soil by burning tea trees (rich in phosphates, potash, and lime) and other wood, scrub, and vegetable matter on the surface of the gravel layer before working the ashes into the underlying soil.[104]

Uniformly-spread gravel mulch was used on large fields, all on the South Island around the Waimea West-Nelson district,[105] Pelorus district,[106] and Kaiapoi area,[107] by applying a 2–6 cm layer of homogeneous-sized gravel across the top of sandy loam soil.[108] Most of the gravel for these fields was obtained from borrow pits, which are scattered in hundreds all around these fields. A few pits are extremely large (2–3 m deep and covering 1–3 ha), but the more numerous pits are much smaller.[109] Once excavated, these pits (known locally as 'Maori holes' and 'kumara pits') may have been used as storage pits for the sweet potatoes grown on surrounding gravel fields, or perhaps they are just being confused with true kumara pits found elsewhere in New Zealand.[110] One early researcher believed that the pits were Maori vapor baths, dwelling places, or defensive works.[111]

A few gravel mounds were built on the South Island in the Kaiapoi area,[112] but the greatest number of gravel and stone heaps were piled around six different sites on the North Island.[113] Remains are especially numerous around the Taranaki coast, Bay of Plenty, and the Auckland Isthmus.[114] Stones were taken from the rocky soil in these areas and piled in large heaps, some up to 8 m in diameter and 1.8 m in height; some mounds have only 2–3 m separation, though most are several metres apart, and many were arranged in rows.[115] All researchers agree that the gravel fields were used to grow crops, but the purpose of the stone mounds has been a subject of debate. At least one scholar has suggested that they are heaps of stone left over from clearing the ground for cultivation, with crops planted between the mounds.[116] However, this still would not preclude their use as

[98] *Ibid*, p 139; Lang, *Archaeological Investigations at a Pueblo Agricultural Site*, p 12.

[99] E Best, *Maori Agriculture*, A R Shearer, 1976; T Rigg and J A Bruce, 'The Maori gravel soil of Waimea West, Nelson, New Zealand', *J Polynesian Society*, 32, 1923, pp 85–93; H Conway, 'Maori horticulture', in W A Pullar, ed, *Soils and Agriculture of the Gisborne Plains*, New Zealand Soil Bureau Bulletin No 20, R E Owen, 1962, pp 62–65.

[100] Best, *Maori Agriculture*, pp 24–25, 240–41; Rigg and Bruce, 'Maori gravel soil', pp 85–93; J Rutland, 'Traces of ancient human occupation in the Pelorus district, Middle Island, New Zealand', *J Polynesian Society*, 3, 1894, pp 220–32.

[101] Best, *Maori Agriculture*, pp 23–28, 121–25, 240–41; Rigg and Bruce, 'Maori gravel soil', pp 85, 87, 90–92; Rutland, 'Traces of ancient human occupation', p 221.

[102] Rutland, 'Traces of ancient human occupation', p 231.

[103] Best, *Maori Agriculture*, pp 24–25.

[104] Rigg and Bruce, 'Maori gravel soil', p 92.

[105] Best, *Maori Agriculture*, pp 121–24; Rigg and Bruce, 'Maori gravel soil', pp 85–93; Rutland, 'Traces of ancient human occupation', pp 220–32.

[106] Rutland, 'Traces of ancient human occupation', pp 22c–32.

[107] Best, *Maori Agriculture*, p 23.

[108] Rutland, 'Traces of ancient human occupation', pp 221, 232.

[109] Best, *Maori Agriculture*, pp 122–23.

[110] Rigg and Bruce, 'Maori gravel soil', pp 85–93.

[111] Rutland, 'Traces of ancient human occupation', pp 222, 232.

[112] Best, *Maori Agriculture*, p 23.

[113] *Ibid*, pp 26, 124–25, 223; Conway, *Soils and Agriculture of the Gisborne Plains*, pp 62–65.

[114] Best, *Maori Agriculture*, p 26.

[115] *Ibid*, pp 122–25.

[116] *Ibid*, pp 26, 124–25, 223.

mulched kumara beds, excepting the largest mounds, where the gravel or stone layer is probably too deep.

9. Lanzarote, Canary Islands

Most of the 400 km² of cultivated fields on the arid island of Lanzarote, in the Canary Islands, are covered with an ash and lapilli (gravel-sized cinder) mulch.[117] Crops have been planted in the moist soil underneath the mulch since 1740, when a volcanic eruption blanketed parts of the island with cinder and ash.[118] These mulched fields are still used to grow onions and carrots,[119] watermelons,[120] lentils, chick peas, beans, maize, grapes and figs.[121]

In some places the crops are grown using *in-situ* ash that has not been modified in depth or areal extent. Across most of the island, however, ash and lapilli deposits have been thinned out, raked and piled deeper, or otherwise altered in order to create a mulch layer suited to the needs of various crops. Most of the fields are farmed with a mulch 10–15 cm thick.[122] Lithic-mulched forms on the island include mostly ash ('picon') fields and lapilli ('arena negra') fields.[123] Lapilli-covered terraces have also been built on some of the mountain slopes.[124] After several generations, some of the farmers who had neither ash nor lapilli on their fields began to transport this material from nearby volcanoes and spread it as a mulch over their land, so that 'one hardly ever sees a Lanzarote field with soil showing'.[125]

In places, where the lapilli cover is especially deep (1 m or greater), pits have been excavated into the cinders, and grapes or figs are planted in the underlying soil.[126] Grape vines planted in cinder pits are especially common around La Geria and near the El Penon mountain.[127] A semi-circular wall of lava rocks is commonly built around the rim of these pits – especially on the northeast rim – which reduces whirlwinds in the pits; grape and fig yields in pits with stone rims average 10 per cent higher than in pits without rims.[128]

10. Lanzhou, China

Pebble-mulched fields have been used to grow cantaloupes, watermelons, vegetables, and cotton near river channels in the Lanzhou area of central China.[129] Rainfall is at a minimum for crop production in this region, and pebbles in old river beds are easily obtainable. Farmers carried the pebbles, mixed with sand, from nearby streambeds and spread them on level to gently sloping fields in a layer 10–15 cm in depth.[130] Old fields were re-mulched every 20–50 years, or new fields incrementally built, as gardens began to lose their fertility. Local farmers understood both the short-term benefits and long-term problems with pebble mulching, explaining that 'the grandfather works hard [to apply the mulch], the son becomes rich [from the increased yield these fields bring], and the grandson becomes poor [as the fields become old]'.[131]

[117] Aschmann, 'Historical development of agriculture', p 98; S Dinkins, 'Lanzarote: the strangest Canary', *National Geographic*, 135, 1969, pp 117–39.
[118] Aschmann, 'Historical development of agriculture', p 98; Dinkins, 'Lanzarote', pp 117, 122.
[119] J J Parsons, 'The Canary Islands search for stability', *Focus*, 35, 1985, p 26.
[120] Dinkins, 'Lanzarote', p 127.
[121] Aschmann, 'Historical development of agriculture', p 98.
[122] *Ibid*, p 98; Dinkins, 'Lanzarote', pp 126–28.
[123] Dinkins, 'Lanzarote', pp 120–28; Parsons, 'The Canary Islands', pp 26, 28; W H Isom and G F Worker, 'Crop management in semi-arid environments', in A E Hall, G H Cannell, and H W Lawton, eds, *Agriculture in Semi-Arid Environments*, Springer-Verlag, 1979, p 205.
[124] Aschmann, 'Historical development of agriculture', p 98.
[125] Dinkins, 'Lanzarote', p 127.
[126] Aschmann, 'Historical development of agriculture', p 98.
[127] Dinkins, 'Lanzarote', p 127.
[128] *Ibid*, pp 127–28.
[129] T C Tsiang, 'China', in *Soil Conservation: An International Study*, FAO Agricultural Studies No 4, UNFAO, 1948, pp 81–85; W C Lowdermilk, 'China fights erosion with U.S. aid', *National Geographic*, 87, 1945, pp 641–80; J L Buck, *Land Utilization in China*, University of Chicago Press, 1937, pp 7, 52, 115.
[130] Tsiang, 'China', p 84; Lowdermilk, 'China fights erosion', p 662; Buck, *Land Utilization in China*, p 52.
[131] Tsiang, 'China', p 84.

Pebble mulch was used in China at least during the years 1800–1950, and possibly much earlier. One writer vaguely describes such finds as 'old'.[132] Another implies that they have been used at least since 1800–1850, but could be older still.[133] Chinese pebble mulch gardens were reportedly in use as recently as 1948,[134] when they were still being repaired and maintained.

III

In addition to the prehistoric/recent historic cases of lithic mulch agriculture outlined above, there are many more places where, even in the latter part of this century, stone and gravel mulch has been applied on a limited horticultural basis (that is not for large-scale, commercial agriculture), or studied for its suitability to contemporary agriculture (Fig 4).

Rock mulch was used on farms in Monroe, New York and Pluckemin, New Jersey in the 1930s and 1940s.[135] It was used on farms in northern Ohio and in gardens in New York City in the 1960s and 1970s.[136] Rock mulching has been known for years to apple growers in the Pennsylvania Poconos, although they may never have called it 'rock mulching'.[137] Rocks piled around tree trunks have been used to improve the growth of pecan trees in Texas, and fruit trees in Ohio, Kansas, Michigan, Florida, Oregon, and California.[138] Rock and gravel mulch has also been used to grow berries in California and Washington.[139]

Agriculturally useless land was brought into production using stone-mulch strips in a 5 ha market garden outside Johannesburg, South Africa; this field was used in the 1950s to grow a variety of vegetables.[140] Vegetables have been grown in between rows of stone strips in Bavaria.[141] Stone mulch has been used to grow potatoes and other vegetables in Sweden,[142] and has been applied to vineyards in France and Mexico.[143] Olive trees south of Aleppo, Syria, are today planted with a large pile of coarsely-crushed limestone around their trunks. This is done both to reduce soil acidity and to increase soil moisture under the mounds. In other parts of the Near East, stone and pebble mounds are still used around fruit trees and grape vines.[144] The integrity of this list is limited by relatively sparse reporting on the use of lithic mulches. Other contemporary cases surely exist, where LMA has been applied but has not been formally researched, and is therefore not yet part of the academic literature.

Although lithic mulch agriculture has been used only on a limited basis in both historic and recent times, controlled agronomic/horticultural experiments with various forms and depths of lithic mulch have demonstrated the potential for expanding this method today. Gravel mulch has been shown to improve the yield of corn, sorghum, tomatoes, and soybeans in studies

[132] Lowdermilk, 'China fights erosion', p 662.

[133] Tsiang, 'China', p 84. The extensive volume on Chinese agriculture assembled by F Bray (vol 6 of J Needham, ed, *Science and Civilisation in China*, 1984,) discusses contemporary agriculture and summarizes many private and state commissioned monographs and treatises on Chinese agriculture *c* AD 535, 1273, 1313, 1600, and 1742, yet never mentions the practice of pebble mulching and so fails to shed light on its origins.

[134] *Ibid*, p 84.

[135] Rodale, *Stone Mulching in the Garden*, pp 54, 62.

[136] E H Faulkner, 'Miscellaneous mulches: gravel', in *Handbook on Mulches*, special printing of *Plants and Gardens*, 13, 1970, p 48; A Sutcliffe, 'The Brooklyn Botanic Garden', also in *Handbook on Mulches*, pp 34–35.

[137] Rodale, *Stone Mulching in the Garden*, p 97.

[138] *Ibid*, pp 39–55, 106–37; J I Rodale, 'Rock mulches', *Organic Gardening*, 7, 1945, pp 4–7; *idem*, 'Decorative rock mulches', *Organic Gardening*, 7, 1945, pp 7–10.

[139] Rodale, *Stone Mulching in the Garden*, pp 54–55, 124–26.

[140] Chilwell, 'Stone mulches increase productivity of soil'; Jacks *et al*, *Mulching*.

[141] Joseph A. Cocannouer, *Trampling Out the Vintage*, University of Oklahoma Press, 1945, p 118; Rodale, *Stone Mulching in the Garden*, p 64; Rodale, 'Rock Mulches', pp 4–5.

[142] Rodale, *Stone Mulching in the Garden*, p 53.

[143] Jacks *et al*, *Mulching*, p 12.

[144] Spencer and Hale, 'The origin, nature, and distribution of agricultural terracing', pp 21–22.

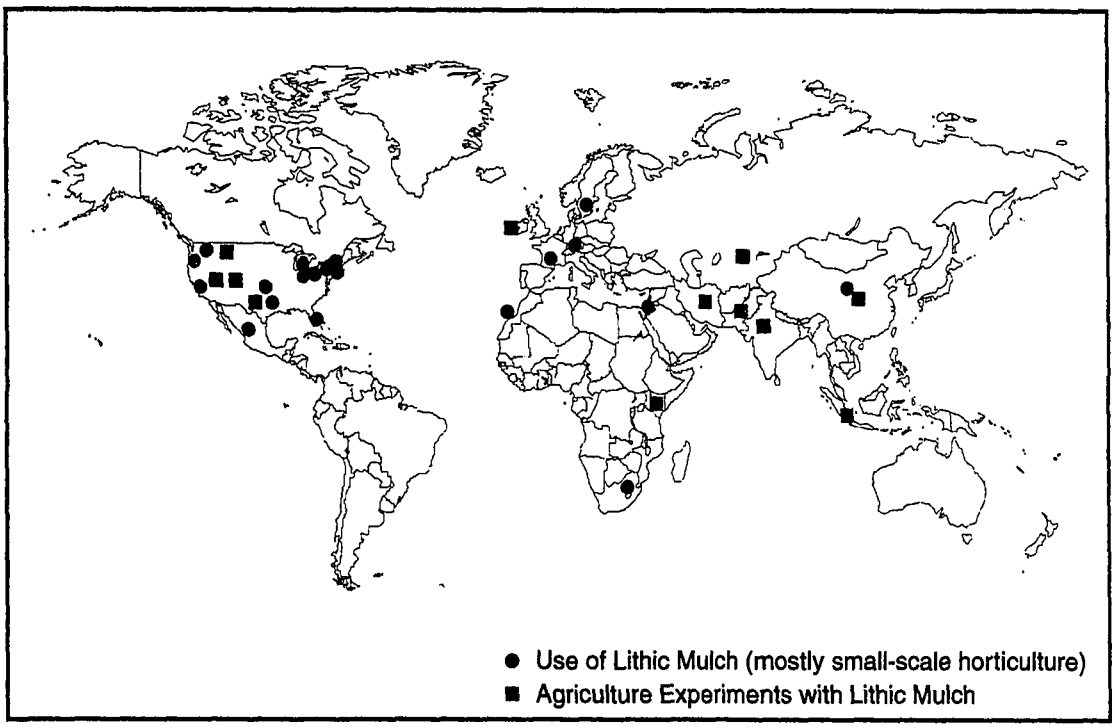


FIGURE 4
Contemporary use of lithic mulch (post-1900) and agricultural experiments with lithic mulch.

conducted in Colorado.[145] A gravel mulch improved the yield of grain sorghum in a three-year study in Texas.[146] Rock and gravel mulches can increase the total production of dryland wheat, according to field trials in Utah,[147] and a four-year study in Montana.[148] Young shade trees responded well to a ground cover of gravel mulch in another study in Tennessee.[149]

Experiments conducted around the world have produced similar results. Stone mulching improved the growth of apple trees in a drought-prone area of Russia.[150] Sand and gravel mulches have been shown to improve the growth of lumber, ornamental, and fruit trees in experiments conducted in Pakistan, India, and Indonesia.[151] Gravel mulch has significantly increased corn yield under arid and semi-arid conditions in Iran.[152] The stem diameter, yield, and total biomass of tea plants significantly increased with the use of a stone mulch in Kenya.[153] Gooseberries and strawberries have been experimentally grown using a gravel mulch in Ireland.[154] In one Israeli

[145] Fairbourn, 'Effect of gravel mulch on crop yields'.
[146] Adams, 'Effect of mulches', and 'Influence of mulches'.
[147] A T Bleak and W Keller, 'Crested wheatgrass yields as influenced by water conservation practices', *Agronomy J*, 66, 1974, pp 326–28.
[148] Choriki *et al*, 'Rock and gravel mulch'.
[149] H van de Werken, 'Fertilization and other factors enhancing the growth of young shade trees', *J Arboriculture*, 7, 1981, pp 33–37.
[150] V Botaniki, 'The effect of a stone mulch on the water regime of apple trees growing on gravelly soil', *Referativnyi Zhurnal*, 1974, pp 330–36.
[151] M I Sheikh, 'Eucalyptus Camaldulensis grows much better than Ceratonia Siliqua and Zizyphus Mauritiana', *Pakistan J Forestry*, 32, 1982, pp 70–71; D W Seckler and K G Tejwani, 'Effect of sand and gravel mulching on moisture conservation for tree saplings', *J Tree Sciences*, 2, 1983, pp 20–23; B Singh, G N Gupta, and K G Prasad, 'Use of mulches in establishment and growth of tree species on dry lands', *Indian Forester*, 114, 1988, pp 307–16; A P Tampubolon and Z Hamzah, 'Effect of water conservation measures on the growth of teak (Tectona Grandis) seedlings in a low-rainfall zone', *Buletin Penelitian Hutan*, 496, 1988, pp 1–15.
[152] Hakimi and Kachru, 'Silage corn responses to different mulch tillage treatments'.
[153] C O Othieno, 'Soil temperature and the growth of the tea plant', *Tea in East Africa*, 16, 1976, pp 1–2; Othieno and Ahn, 'Effects of mulches on soil temperature and growth of tea plants'.
[154] An Foras Taluntais, 'Small fruits', in *Horticulture Research Report 1977*, An Foras Taluntais, 1977.

experiment, the soil surface of test plots was treated mechanically and chemically to create a surface layer of water-resistant dirt clods, which emulated a lithic mulch by increasing infiltration and reducing evaporation of soil moisture.[155]

IV

Many scholars are quick to assert that the diffusion of ideas and technology best explains similarities in agricultural forms and adaptive strategies across wide regions of the earth. With few exceptions, however, cultural diffusion does not adequately account for the historic use of lithic mulch agriculture.

It is possible that Roman colonizers found the Nabatean stone mounds and adapted this technology to their own vineyards and orchards on the Italian Peninsula. It is also possible that Sinagua farmers knew of the Hohokam agave mounds or that rumors of the success of Sinagua ash fields led Anasazi gardeners to experiment with pebble mulching. However, the discontinuity and apparant randomness of LMA across most of the world make it far more likely that LMA was independently invented. Each of these peoples, given similar environments, would surely have noticed the natural effects of stony-ashy surfaces on plant growth and could then improve upon nature by crafting similar forms to enhance their crops.

It is possible that LMA did diffuse more widely, and that these data are incomplete. Perhaps there are other cases of LMA that have yet to be recovered; many other stone piles or gravel surfaces around the world hitherto attributed to something other than agriculture, or assumed to be wholly natural, may have been ignored. It is the intention of this paper to alert scholars to the possibility that LMA may be found at other sites, if we are aware of the historic-environmental context of lithic mulch agriculture, and the likelihood of its use in rocky drylands. Ground-level fieldwork, with an eye to LMA forms, may yet turn up more cases of historic LMA. Large-scale aerial photography (especially colour infrared) of stony and gravelly surfaces around settlements would be particularly helpful to identify geometric patterns which are not easily discernable from the ground.

Lithic mulch agriculture may be little-known, and thus rarely mentioned in the literature, for various reasons: remains may have been obliterated by later construction; lithic-mulched plots may have mixed with aeolian sediments and blended into the surrounding landscape; while archaeologically-viable plots remain at many more sites, LMA may have been overlooked by fieldworkers unaware of this form of agriculture; and finally LMA was rarely used, and always remained a variant strategy peripheral to any cultural core. In every historic case, LMA was adopted to mitigate subsistence risk in dry environments.[156] While it could be used to such ends in arid and semi-arid lands today, its impact on food production would remain, as in the past, minimal compared to irrigated agriculture.

This technique will reduce soil erosion by shielding the soil from raindrop splash, reduce runoff from fields, and slow the velocity of potentially erosive wind across the mulched surface. The storage of soil moisture will increase because the mulch aids infiltration by reducing soil-crust formation and reduces evaporation. A lithic mulch will improve germination and extend the growing season by moderating diurnal extremes in soil temperature and slightly raising the average temperature. The cumulative effect of these benefits will be an increase in the production of plant

[155] D Hillel, 'A new method of water conservation in arid zone soils', in Y Mundlak and S F Singer, eds, *Arid Zone Development: Potentialities and Problems*, Ballinger Publishing Company, 1977, pp 99–108.

[156] D R Lightfoot, 'Morphology and ecology of lithic mulch agriculture', *Geog Rev*, 84, 1994, pp 172–85.

biomass, an improvement in the development of plant roots, and an increase in crop yield.

A solid layer of lithic mulch may limit the recycling of essential nutrients or inhibit the application of fertilizer. It would be possible to remove the mulch each year and till the crop compost/fertilizer into the soil before re-applying the mulch. However, because of the amount of labour involved, this is not likely to be done. This is why Chinese pebble-mulch gardeners did not re-mulch until their gardens began to get 'old' and less productive than non-mulched soil.[157] One alternative would be to leave stone-free strips between mulched rows to receive crop waste or fertilizer. Lithic-mulched strips or mounds are still effective at soil and water conservation but avoid the barriers to sustainable crop production inherent in a solidly-mulched field. Lithic mulch has been applied as strips or mounds in the Negev desert of Israel, northwest Argentina, the Hohokam and Sinagua regions of Arizona, South Africa, Bavaria, and eastern North America.[158]

This study underscores the importance of historic-comparative agricultural research and the need to modify our paradigms as we learn more about the diversity of past agricultural activities. Scholars should be prepared to view lithic mulch agriculture as a taxonomically discrete agricultural form and to consider the possibility of its existence at other historic sites.

[157] Tsiang, 'China', p 84.

[158] Evenari *et al*, *The Negev*; Field, 'A reconnaissance of southern Andean agricultural terracing'; Fish *et al*, 'Prehistoric agave cultivation'; Berlin *et al*, 'A prehistoric Sinagua agricultural site'; Chilwell, 'Stone mulches increase productivity of soil'; Cocannouer, *Trampling Out the Vintage*, p 118; Rodale, *Stone Mulching in the Garden*, pp 39–107.

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Compiled by V J MORRIS
Brynmor Jones Library, University of Hull

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Conference Report: Spring Conference 1996

By JOHN CHAPMAN

SOUTH-WEST London maintained the recent tradition of the conference by providing pleasant spring weather for some fifty members who convened at the Whitelands College site of the Roehampton Institute from 1–3 April.

The conference opened with a highly topical paper by Dr Peter Atkins on the threat to human health from bovine tuberculosis from 1850 to 1950, and the measures taken to combat the disease. Obvious parallels with the current BSE scare emerged, notably the failure of the central government to react swiftly when the problem could have been dealt with relatively cheaply. Dr Atkins drew attention to the contrast with local authorities, such as Glasgow and Manchester, who instituted testing programmes and took powers to control infected animals in the closing years of the nineteenth century and the early years of the twentieth. While this helped to eliminate the TB-infested cows kept in cramped urban conditions, it created problems with inspection as more milk was drawn from distant sources in other local authority areas. The fact that it took until 1937 to institute a national slaughter policy and until the 1960s before the whole country was effectively free of the disease served as a depressing reminder of the time which it can take for effective action against such diseases.

Dorian Gerhold provided an interesting background to the development of the Roehampton area, tracing its evolution from a rural village into a site for large houses and villas for a London-orientated population in the seventeenth and eighteenth centuries, the village being progressively displaced to a new site to the south. Subsequent redevelopment in the twentieth century resulted in the demolition of most of these houses, though Roehampton Institute itself retains remnants.

Malcolm Thick examined Neates' House Gardens as an example of market gardening on London's fringes. He demonstrated the great increase in the area involved over the seventeenth century, and stressed the significance of the Thames-side location for both water supply and transport. This latter involved not merely the transport of produce to the city, but also the reverse flow of dung as fertilizer for the gardens. He noted the mixture of locals and incomers involved in the enterprise, and speculated on the extent to which the high degree of skill acquired in gardening helped to stimulate developments in the conventional farming sector.

Dr Richard Hoyle presented the results of his investigations into Earls Colne, Essex. Starting with a reworking of Macfarlane's data, he offered a significantly different picture of the evolution of the parish to that of Macfarlane. Pointing to the fact that only 40 per cent of the parish was copyhold land, he traced the descent of all the copyholds from the mid-sixteenth century to 1750. Though a substantial proportion of copyhold land changed hands each decade, he found that some 30 per cent remained in the same family from 1650 to 1750, and he found no evidence of larger copyholders buying out smaller. Sales often took place on inheritance, with the heir frequently an absentee who presumably saw little value in retaining land which he did not wish to farm. The lords of the manor appear to have played little active part, neither investing in the estate nor buying land.

The symposium on 'Women in Agriculture' brought together three papers illustrating women as landholders, women as agricultural workers, and women as marketers of produce. Sylvia Seeliger demonstrated that, in spite of the constraints imposed by common law, women in fact formed a significant element amongst the landholders of Hampshire in the eighteenth and nineteenth centuries. Manorial courts were perfectly willing to accept women as customary tenants and the ecclesiastical courts protected widows' rights. Demographic constraints ensured a background level of female ownership, since descent via the female line was often inevitable if land was not to pass totally outside the family. Dr Judy Gielguid examined the operations of the bondage system in Northumberland, whereby male farm labourers were expected to recruit and pay a female labourer as part of their agreement with the farmer. The system can be traced for almost 300 years, to the middle years of the present century, though by about 1875 the bondagers were usually family members. Earlier, Dr Gielguid argued, they had been women with an unusual degree of independence, striking their own bargains

about terms and operating free of the family constraints normal at that time.

Dr Wendy Thwaites presented a picture of the role of women in agricultural marketing, with special reference to Oxfordshire. She drew attention to the traditional distinction between the male-dominated stock and corn selling and women's heavy involvement in the sales of such items as butter, cheese and eggs, pointing out that cottagers and gentlewomen were involved in the latter, as well as farmers' wives. Women's involvement greatly diminished after about 1750 as the items which they had traditionally sold direct in the markets gradually came to be handled by (overwhelmingly male) middlemen.

Dr Peter Edwards gallantly stepped in to replace a speaker struck down by illness, and presented a paper on the evolution of landholding in Rushock. In contrast to the situation in Earls Colne, the lord, in the form of the lessee of the manor, took active steps to remove copyholders from the late sixteenth century onwards, and financial difficulties forced sales by freeholders in the mid-seventeenth. By the end of the century engrossing of holdings was well under way, and copyholds were effectively ended by 1776.

The formal proceedings ended with a visit to Young's brewery. The thanks of all concerned are due to Dr Peter Edwards and his colleagues from Roehampton Institute for their efforts in organizing a most enjoyable conference.

Book Reviews

JACK R HARLAN, *The Living Fields. Our Agricultural Heritage*, CUP, 1995. 271pp. Illus. £32.50.

All civilizations, ancient and modern, are founded on agriculture. The author reviews the evidence for the origins and evolution of farming in various parts of the world, consciously seeking to present a balanced view based on the archaeology, botany, genetics, ecology and anthropology of domesticates and their wild relatives. The author expresses appreciation for the ways doors have been so generously opened to him everywhere in the eighty countries he has visited. There is abundant evidence of the firsthand insights he has gained. The book has all the hallmarks of the authority of scholarship – conciseness, lucidity, and the humility that arises from an acute awareness of how little is known about the past.

The author's approach is exemplified by his treatment of hunter-gatherer societies. He begins by emphasizing the enormous diversity encountered among their many tribes, and the methods used in exploiting the environment. The challenge of conveying some sense of that variety to the reader is met by selecting a few examples for illustration. Harlan takes obvious pleasure in demolishing earlier interpretations of the origins of agriculture – and no shortage of opportunity. Every model examined seems to generate evidence against itself, not least because it has been conceived, in Harlan's words, by 'middle class, university-educated, Industrial Age pragmatists, all looking for some golden bottom line that will explain it all'. Input-output studies, optimum foraging strategies, and all the other armchair-theories are products of the modern mindset. As the author asserts, it is unnecessary to discover mechanisms by which the planting of seeds had to be taught, discovered or diffused. Hunter-gatherers had, and continue to have, the preparatory knowledge required to take up farming, as and when they chose, within ecologically suitable limits. Agriculture emerged not from a single cause and location, but from many.

In exploring how far the processes of domestication might be attributed to evolution, as opposed to revolution, Harlan further warns of the complex nature of the evidence. The Aboriginal stamp on the landscape was by no means unique. Africans, the American Indians, and peoples across Eurasia must also have put their imprint on the fauna and flora, but the changes in those parts have subsequently been so radical as to leave little evidence. As the Aboriginal experience indicates, such changes made in the flora and fauna to benefit the hunter-gatherer did not necessarily lead to outright domestication. After some 35,000 years, no true domesticates have emerged in Australia. The domestication of races of individual species is of a different order. A chapter on 'stones and bones' raises questions as the nature of archaeology and the dating of historical information. It sets the scene for chapters that look in turn at the archaeological record for plant and animal domestication in the Near East, Africa, the Far East, and the Americas. The penultimate chapter focuses on the techniques of bush fallow, and more generally on the various approaches of resource husbandry that have been adopted in respect of soil preparation, water management, sowing and reaping, the preservation of perishables, and food processing.

What emerges from the evidence so ably introduced and summarized in this volume is a synchrony around the world. People everywhere were moving in the direction of food production from the start of the Holocene. Perhaps as a response to the extinction of large parts of the Pleistocene fauna, humans all over the world had to turn to smaller game, more refined and more efficient stone tools, and a greater emphasis on plant foods. Although not necessarily threatened with a shortage of food, a crisis of sorts developed, pushing humans towards the cultivation of plants and domestication of animals.

For the author and reader two impressions emerge. A time and place for the emergence of agriculture cannot be identified for the overriding reason that farming did not come about that way. It emerged from long periods of intimate co-evolution between plants and man. There were many independent attempts made in many locations that fused, over millennia, to produce more effective food-production systems. The second observation is that the human species has become so completely dependent for survival on a few plant species that one could well ask which are the domesticated. Domesticated cereals could not survive without us, and we cannot survive without them. The symbiosis is complete. That is where human life now stands, but the ground is not very firm. The survival of five billion humans depends on a relatively small number of species.

JOHN SHEAIL

BRUCE D SMITH, *The Emergence of Agriculture*, New York: Scientific American Library, 1994. 230 pp. £19.95.

With the aid of hindsight, it has always been tempting to see the origins of agriculture as sympto-

matic of a radical change in much more than subsistence. The contrast between gatherer-hunters and farmers has been politically-charged, used to highlight contemporary differences between the 'primitive' and the 'civilized'. The concentration of archaeological work in south-west Asia (the source of many European domesticated crops and animals) and Meso-America (with the maize-beans-squash triad as the basis for the Aztec and Maya cultures) has promoted this vision of the 'agricultural revolution' as the historical basis of current global domination. Yet there are now at least seven areas of the world which can be argued to have witnessed a similar emergence of modern morphologically-domesticated plants and animals – south-west Asia, north and south China, sub-Saharan Africa, Meso-America, Andean South America and the eastern United States.

The Emergence of Agriculture is a timely review of the evidence for the earliest domesticates from these seven areas. This geographical coverage, a welcome change to many Eurocentric or Americocentric treatments, is matched by the incorporation of much of the latest work in comparative historical plant genetics and the direct AMS (Accelerator Mass Spectrometer) dating of relevant seeds and bones. Generally this book is a good introductory synthesis of the data and some of the traditional issues on a world-wide scale. The production is first-rate with excellent illustrations, very few typographical errors and represents extremely good value.

In covering such a wide area and offering an introductory chapter and a concluding one on explanations within little over 200 pages, Bruce Smith has set himself a challenging task. Anyone approaching this topic has a difficult line to steer between presenting the real but contentious states of the academic debates (for example, the implications of the AMS redating of mesoamerican plant samples) which are confusing for the general reader without background, and offering generalizations or simplifications which will annoy the specialist. Smith's largely successful strategy is to be generally cautious about interpretation in an empirically-based text, while presenting a strong narrative line. One gets a genuine sense of the excitement of research in this field and the fluidity of possible questions and potential answers: it is a book which should stimulate many readers into finding out more.

The problems with the book derive from conceptual issues, rather than the presentation of the data. Smith's own work in the eastern United States has been with floral rather than faunal evidence, and so far the nature of mutation and selection has meant that genetic studies have been more successful in identifying geographically-delimited domesticated plant ancestors rather than their animal counterparts. One effect of this bias is that Smith tends to show more certainty about the identification of domestication in animals than many specialists would claim, as well as perhaps leading to his inaccurate characterization of the relations between genotypic, phenotypic and morphological variation. Inevitably in a book of this size and range there is some glossing over debates about the state of the data. Thus at the Grotta dell'Uzzo in Sicily, as in much of the rest of Europe (cf Rowley-Conwy[1]), the domestic status of the cattle and pigs is highly dubious. But it is exactly these uncertainties which have wider implications than Smith is willing to admit. The difficulty is that despite giving useful examples of hunter-gatherer manipulation of the environment, including the intentional cultivation of wild plants, Smith is still working very much within the old paradigm of origins and revolutions, which relies on equating domestication with agriculture. This in itself begs several questions. Firstly, although Smith recognizes that domestication can be considered as both a status and a process, he suggests a definition which is, quite simply, wrong as far as most animals are concerned: ... we have to expand our earlier definition of domesticates as human-modified plants and animals to include this essential attribute: they have been changed so much that they have lost the ability to survive in the wild' (p 19).

By concentrating on defining seven 'primary centers', ie those where past domestication currently may be identified, Smith still adheres to a traditional 'revolutionary' view of the origins of farming, despite the fact that much of evidence quoted in the book suggests the opposite. He is aware of Hillman and Davies' work[2] on the processes of wheat and barley domestication in the Near East, yet fails to draw on the radical implications: that what they term non-domestication cultivation could well have taken place for 2000 years or more, while morphological domestication may have occurred extremely rapidly (within a few hundred years at most) as a result of a contingent change in the timing and technology of harvesting. In other words, one clearly could have, in theory and practice, agriculture without domestication, as with many root crops used today. To then claim seven centres as 'primary', but in effect based on the

[1] P Rowley-Conwy, 'Wild or domestic? On the evidence for the earliest domestic cattle and pig in South Scandinavia and Iberia', *International Journal of Osteoarchaeology*, 5, 1995, pp 115–26.

[2] G Hillman and S Davies, 'Domestication rate in wild wheats and barley under primitive cultivation: preliminary results and archaeological implications of field measurements of selection coefficient', in P Anderson, ed, *Préhistoire de l'agriculture: nouvelles approches expérimentales et ethnographiques*, Paris: CNRS, 1992, pp 113–58.

contingency of genetic domesticability, seems less than useful in understanding the historical and social processes involved. Similarly, domestication has not been found a helpful concept for exploring subsistence changes and practices including intensive cultivation in much of the Pacific. Even if one does adhere to domestication (more broadly defined in terms of manipulative relationships) as a criterion of the emergence of agriculture, then many other areas could be seen as participating independently in the sorts of processes concerned – for example, Europe for dog, pigs and cattle; central and northern Asia for horse and reindeer respectively; and south-east Asia, Australia and other parts of Africa for root crops. All this calls into question Smith's traditional adherence to identifying core areas for the origins of agriculture (as currently defined) as a way of explaining its emergence. It also raises question marks about his generalized explanation that the intentional avoidance of risk or uncertainty in subsistence may be considered as the basis for agricultural 'emergence': the long delays in the adoption of certain domesticated crops as a subsistence mainstay in much of Eurasia and in eastern North America, among other places, suggests that this explanation is insufficient, at least.

A minor criticism is his use of uncalibrated radiocarbon age ranges when no actual radiocarbon determinations are given. This will not satisfy teachers who have to calibrate dates (the book will make a useful first year undergraduate text), and is potentially confusing for the general readership at whom this book is clearly aimed. Nonetheless, as a broad introduction to the origins of agriculture this book is recommended, even if one suspects that the geographical scope which is one of its major virtues contains the seeds of its own demise, by encouraging the reader to question the nature of the differences between centres and non-centres of agricultural emergence.

MARK PLUCIENNIK

H H LAMB, *Climate, History and the Modern World*, 2nd ed, Routledge, 1995. 437 pp. 120 figs; 11 tables. £60 hbk; £15.99 pbk.

The first edition of Lamb's book was published in 1982 and has proved a popular survey of the interactions between climate and history over the ages. It provides a brief introduction of how the earth's climate works, why it fluctuates and how we can reconstruct former climate from meteorological observations and a variety of proxy records from diaries and grain price records to tree rings and beetle remains. The main theme of the book is on climate and history. The subject is approached chronologically taking the dawn of history as the period when the last glacial phase terminated about 15,000 BC. Early civilizations, such as those of China, the Indus Valley and Egypt, are examined before moving into the Roman period, Viking times and into the Middle Ages. As more information becomes available, so the time period for each chapter decreases and the final two chapters of this section cover 1500 to 1950. Agriculture inevitably forms an important part of much of this section as food production was the key to survival. Although there is an emphasis on Europe, other parts of the world are covered wherever evidence has survived.

The third section of the book is entitled 'Climate in the modern world and questions over the future'. Its first two chapters bring the previous section to the present day with the remainder considering possible causes of climate fluctuations, how we can forecast what might happen in the future and what can be done about it? All the chapter titles and section headings to this point are identical to those of the first edition. A new chapter has been added on the subject of recent developments and the outlook. It refers to the mid-twentieth century cooling, the current warming, the ozone hole, pollution and storminess. Admittedly some of the earlier chapters have been changed slightly through updating and additions but the book is essentially similar to the first edition. All the diagrams and tables have been retained, even when important information should have been included. For example, the table listing the mildest winters in central England since 1659 (defined as having a mean temperature over December to February above 6°C) includes only 1935 and 1975 from this century. The recent spell of mild winters has been excluded as they occurred after the publication of the first edition. Similarly, the figure chosen to demonstrate changes of world temperature is still one published in 1963 and updated by Lamb to 1978; the dramatic increase of world temperature recorded since the 1980s has been omitted. Even though it is clear that Lamb is unsympathetic to the views of the climate modellers and their predictions about future climate based on the human-induced increase in carbon dioxide and other gases in the atmosphere, it is something that should have been given more consideration. There are other examples of where updating should have been more thorough. In the chapter on 'What can we do about it?', there is reference to a recent (1979!) lecture by the chairman of Esso arguing that the world's known oil reserves were sufficient for less than thirty years consumption at the present rate. Half way through this period, the threat seems to have receded and supply is greater than demand.

Whilst still containing a lot of useful and interesting information about climate and its relationships

with history, it is disappointing that the second edition has not been a fuller revision. It could have incorporated some of the more recent advances in Alpine and Icelandic climate history for example, but the main problem is the dated nature of some of the diagrams and tables; misleading conclusions could be drawn from them.

P A SMITHSON

NICHOLAS JOHNSON and PETER ROSE, with further contributions edited by DESMOND BONNEY, *Bodmin Moor: An Archaeological Survey. Volume 1: The Human Landscape to c1800*, Cornwall Archaeology Unit; HBMCE; RCHME, 1994. 131 pp. 76 maps and illus. Pbk £45.

This volume presents the results of an ambitious collaborative project between local and national organizations, with the Cornwall Archaeology Unit and the RCHME undertaking the work, and funding coming from the RCHME and English Heritage. 193 km² of moorland was surveyed at 1:2500, combining aerial photographs, photogrammetry and field survey, with several core areas, covering a total of 15 km², surveyed at 1:1000. Fieldwork started in 1979 and continued into the mid-1980s. The results of the survey were aimed ultimately towards landscape management and archaeological conservation.

The survey aims and methodology are explicitly stated. All too often surveys are published where their purpose, level of accuracy and method of working are left unsaid, therefore it is hard, if not impossible, to assess their strengths and limitations. In the case of the Bodmin Moor survey a sound and thorough approach was adopted. The extensive use of aerial photographs worked well here because the landscape is predominantly grassland. Unfortunately aerial photographs, while still invaluable, are not as useful in some of Britain's more northerly moorlands which are often dominated by heather. Experience in the Peak District for example suggests that less than 50 per cent of the archaeology is visible from the air.

The survey covers all field earthworks and structures from the Neolithic to AD 1800 with the exception of industrial sites, which it is planned will be presented in a separate volume. The findings are divided into two halves. The first, the prehistoric landscape (with Romano-British data), includes ceremonial monuments, defended sites and many settlements and field systems. The historic landscape section again covers extensive settlements and field systems. There are profuse maps, plans and photographs throughout, including several large format loose-leaf illustrations. Only one glaring mistake was noticed, the reversal of the photograph in Fig 43 compared with the plan on the opposite page.

The published report, of necessity with such a large project, gives only a detailed overview of the findings. Examples of detailed survey plans that are included give a glimpse of the wealth of material in archive. While unavoidable, this is still frustrating for the specialist, as it is these surveys that allow critical re-assessment of their interpretation. The present trend in archaeological publishing towards summary publication, while necessary due to the sheer amount of work undertaken and high publication costs, means that we increasingly have to take results on trust.

Turning to a more detailed review of the prehistoric landscape chapter first, the descriptive sections are organized by site type, but these are far more than catalogues. Most sections give a critical review of morphology, dating, and the place in the landscape. One minor criticism is that the final discussion section, mostly concerned with the chronological development of field systems, is not adequately illustrated. Phasing plans, showing areas of differential destruction for any given phase, would have been helpful.

The data include much that is new. In the context of Bodmin Moor, settlements, field systems, long cairns and stone rows are adequately recorded for the first time. Monument types not yet identified elsewhere in Britain include the embanked ceremonial avenue on Craddock Moor and several tor-cairns. The record of the complex range of variation in larger cairns (stone barrows) is particularly useful. This variation includes mound form, kerb type and central foci, including cists, standing stones, natural boulders and tors. The range is very different from such regions as Wessex, Wales and the Peak District. The complex, some would say over-complex, typologies devised by Lynch for upland monuments in Wales cannot be applied successfully in the South-West.

It is interesting that identifiable building platforms without stone footings are not common, those found were mostly associated with probable Neolithic enclosures. Away from South-West Britain, in areas like the Peak District and the Cheviots, the situation is reversed. Simple platforms are common, perhaps reflecting lower rainfall and thus less problems with waterlogging compared with the South-West.

Most important of all, the volume illustrates the sheer numbers of prehistoric sites on Bodmin Moor, many recorded for the first time. Systematic field survey, be it from the air or on the ground, clearly leads to significant increase in known sites wherever it is undertaken in uplands of suitable altitude, just above later ecological thresholds for viable culti-

vation. More importantly it allows the question of how people have organised themselves in the landscape at different times to be more successfully addressed. On Bodmin Moor sacred areas alongside farmed areas can be identified, as can the spaces between, where no features occur. With over 200 prehistoric settlements on Bodmin Moor now identified, together with over 500 km of ancient boundaries, this presents an ideal opportunity for research into such issues.

My only major complaint with the Bodmin Moor volume is that this opportunity was not fully grasped. Although there are many passing comments made, these are never successfully drawn together. This lack of vision and exploratory interpretation is a criticism that can be made of a number of volumes in which the RCHME have had a hand. They often play safe, not venturing into the underlying reasons for why things are as they are. Admittedly, one disadvantage of in-depth interpretation is that as our paradigms change this may in some respects date the volume. However, what is the point of collecting data if someone else is left to work out what it means? Who better to offer interpretation than the data collectors themselves? Even allowing for obvious uncertainties resulting from a lack of chronological definition on Bodmin Moor, I find it hard to believe that this should prevent model building. A presentation of multiple alternatives would have been desirable as the starting point for their testing by excavation and environmental work.

Amongst the issues that could have been more fully discussed are: What is the distribution of settlement in relation to topography and the fertility of soils? Does this change through time? Is the frequent reuse of sites in the medieval period evidence for continuity, or just the reuse of the best land? Do levels of settlement fluctuate through time and, if so, why? What can be deduced about the social structure of prehistoric groups on Bodmin Moor, given the apparent nucleation into large settlements not common outside South-West Britain except in hillforts? Or, is this an illusion, buildings being intermittently rebuilt, there never being more than a handful of dwellings occupied at any one time? To what extent was the landscape perceived in prehistory as containing secular and sacred space, with areas that contain only monuments and others with settlements, fields and monuments? Are there monuments of different form and function depending on which zone they occur within? What are the implications for the nature of society? Are there zones of mixed farming, archaeologically visible as field systems, and other zones used for only pasture? Do each have their own settlements and monuments? Are there monuments that operate on an organisational level beyond that of the local farming families? What are the implications for discussions on status and hierarchical societies? Does change through time from the Neolithic onwards reflect transformations in perception of the land, from semi-nomadic tenure, exploiting the moor as part of a seasonal round, changing later to the owning of the land as part of a sedentary exploitation of the moor?

Unlike the Prehistoric landscape chapter, one gets the impression there was a feeling of being on safer ground with the medieval data. A succinct but clear summary is given of the settlement archaeology in relation to historical and place name sources. These are used to set the scene for placing the archaeological remains in a broader context. The archaeological remains mainly comprise 37 settlements together with extensive fields. Other features include transhumance huts and crosses, although the latter are only mentioned in passing, the emphasis on the medieval text being firmly on the secular. The thorough documentation of the now abandoned settlements and field systems illustrates their character in a clearer way than if they had suffered the ravages of modern farming within the current in-bye land, as have many of today's farms and fields that have medieval origins. The chapter presents a very useful picture of medieval upland land-use that is relevant for studies elsewhere, including evidence for transhumance and permanent settlement in farms and hamlets. The complex evolution of field systems in an upland environment, often using strip-like partition, and the division of the landscape into what can be called private and communal space, are particularly illuminating.

To conclude, perhaps the most fundamental point to be made is that archaeological surveys are often not published, as this is not seen as being as essential as the dissemination of excavation results. This publication illustrates the dangers of such thinking. Survey often provides an overview, allowing vital landscape issues to be addressed. Excavation often only starts to come into perspective when placed in a landscape context. Thus the Bodmin Moor volume is very welcome, particularly as archaeologically this is a rich area, demonstrating the exciting potential of many of our uplands.

JOHN BARNATT

WERNER RÖSENER, *The Peasantry of Europe*, Blackwell, 1994. xiv + 235 pp. 11 illus. 6 maps. £19.99.

This study sets out to summarize the distinctive character of the European peasantry, and trace its history up to the present day. It is one volume in a planned series, edited by Jacques Le Goff, which will tackle major themes in European history, and

will be published simultaneously in five European countries in their own languages. Two hundred pages is a sparing allotment of space for such a subject, and the text cannot linger on any aspect in detail. Yet it is markedly successful in giving a broad conspectus, pausing regularly to compare and contrast four regions of the continent which the author differentiates as west and central Europe, Scandinavia, eastern Europe, and the Mediterranean. He has no space to compare European peasantries with those of other continents, but he has an interesting passage about settlers in America who quickly shed their cultural baggage, and became profit-oriented individuals, associating with neighbours, but without needing the community of the village as they had known it in the Old World.

Despite the variety of countries and peoples with which the book is concerned, many features of the story reveal similar experiences, in the development of common-field farming, continuing colonization, the hardening of feudal demands by landowners, and peasant revolts from the Urals to the Atlantic. A divergent movement between east and west Europe sets in from the sixteenth century onwards, giving increasing freedom to the peasantry of the west, but deepening serfdom in the east.

Up to this point social structure and social relations seem to dominate the text, but the practices of agriculture are then discussed, paying attention to the produce, the influence of prices on peasants' choices, standards of living, and the form of peasant dwellings. The account of the so-called emancipation of the peasantry during the late eighteenth and nineteenth centuries reminds the English reader forcibly of the differences between Continental and English experience, and is a salutary prelude to the final discussion on the role of peasants in Europe now and in the future. They are a deeply-rooted class of cultivators with a long history of flexibly managing through bad and good times, and of handling the land with a sense of responsibility to their heirs. The book is timely reading, for it sets the historical record of family farmers against a very broad European background, and at a moment when some of their virtues are better recognised than for many years past.

This reader found the chapter on the village community and the role of village meetings drawing on fresh evidence, without giving adequate guidance to the sources; meagre footnotes leave readers to guess them from the bibliography. Criticism must also be made of the translation which resorts to clumsy or incorrect terms because the translator is plainly unfamiliar with the conventional vocabulary of agrarian historians. Thus 'glebe' is unsettling when used as a synonym for 'land', and 'servile labour farm' is better rendered as a 'demesne farm', 'the partition of common lands' as 'enclosure' and 'separation' as 'the consolidation of strips'. But in general the text is clear, it is certainly succinct, and it offers some colourful quotations from the German sources which the author handles with most assurance.

JOAN THIRSK

R H BRITNELL and B M S CAMPBELL, eds, *A Commercialising Economy: England 1086–c1300*, Manchester UP, 1995. xi+228 pp. £35.00.

Once every three years an Anglo-American Seminar on the Medieval Economy and Society is convened by Bruce Campbell under the auspices of the Historical Geography Research Group of the Institute of British Geographers. It takes over a provincial hotel, and there over a long weekend, in surroundings designed for certainty, you will find behind every pilaster a medieval historian haunted by doubt. In 1992 it was the Grand Hotel Leicester, and the doubt was over the dynamic of the English economy in the twelfth and thirteenth centuries. The doubts were sown by M M Postan. 'In the period 1000–1300', as Britnell summarizes Postan's views, 'rising population outstripped the growth of resources necessary for producing food, fuel and clothing, and this had adverse affects upon living standards. Within this paradigm, commercialisation, specialisation and technical change were peripheral topics for the history of the Middle Ages.' This view, 'the stagnationist paradigm' as it is termed here, is no longer sustained.

Commercialization has very properly been brought to centre stage. Essential reading are the most recent monographs of the two editors, Richard Britnell's, *The Commercialisation of English Society 1000–1500* (CUP, 1993; reviewed ante 41, 1993, p 188), and Bruce Campbell and others, *A Medieval Capital and its Grain Supply* (Historical Geography Research Group, 1993; reviewed ante 43, 1995, pp 67–72).

This volume cannot be termed 'essential reading', but it does serve a useful purpose in indicating what the specialists were talking about in 1992. Two main areas of concern can be identified, focusing on each of the terminal dates for the volume. Building on the statistics for Domesday Book, two contributors offer models to indicate the level and growth of GDP in 1086 and in 1300. G D Snooks offers one model, based on a view of the Anglo-Norman economy which sees a clear division between a 'demesne' or a 'market' sector and a 'subsistence' sector. 'In 1086', we are told, 'the unfree peasantry was effectively excluded from the market sector by an oppressive feudal military elite.' Only with 'the decline of feudalism' could they be

liberated to take a part in the market, and their doing so 'was little short of a revolution'. This kind of thing would get short-shrift in any second-year essay. Under a more austere title, 'modelling medieval monetisation', Nicholas Mayhew presents an alternative model, which medieval economic historians will find rather more compatible with the world which they think that they understand. It is a challenging one, with GDP increasing from £0.3m in 1086 to a little under £5.0m in 1300, but, after making allowances for inflation, GDP per household increasing from only £0.75 to £1.00 over the same period. In an appendix Snooks and Mayhew, with Christopher Dyer as a neutral referee, comment on these calculations of GDP.

The articulation of this debate will be the most useful contribution of this volume, though it is another question whether a serial publication such as *Economic History Review* or *Past and Present* might not have provided more flexibility for its development. Any journal would certainly have been graced by Robert Stacey's chapter on 'Jewish lending and the medieval English economy'. This is a first-rate study, which covers the full chronological range of the volume. It argues that, 'by 1180, the balance of Jewish economic activity in England had already shifted decisively away from the combination of moneychanging, moneylending and bullion dealing on which the Jews of Norman England had depended, toward a much more exclusive reliance upon moneylending'; and it explains how this happened. Note must be taken finally of an important chapter by Bruce Campbell on 'measuring the commercialisation of seigneurial agriculture', which draws on the research project whose main findings are published in his 1993 monograph. The sample is ten counties, which produces 202 manors, whose accounts in the period 1288 × 1315 are brought in review. The sample seems odd only in including Northamptonshire: we have the manors of the Soke of Peterborough, but not those of Huntingdonshire directly to the south, or those of Ely in Cambridgeshire. This is not a sample which permits generalizations about the fenland. Within the main region, the material is very thoroughly described, and is very interesting. Practically anything could be marketed: 'Pig's innards, rotten pelts, old onions, chaff, nettles, and thorns all appear among the items sold, as do salmon, conger eels, and peacock's feathers.' It is shown that wool sales, 'did not dominate manorial revenues or even pastoral revenues to the degree that has sometimes been suggested'.

The seminar, on the basis of this volume, is seen as being lively but perhaps not quite ambitious enough. The careful reader will observe, though s/he will have to look elsewhere for the argument, that the figures for population, on which our tutorials as well as our calculations of GDP are based, are again under review. Those for 1086 are being inflated, those for 1300 deflated: how, it is asked, could a figure of more than 5.00m in 1300 have been sustained? An answer might be found, for it may be that it is not just the economic modellers who are drawing too tight a distinction between the 'demesne' and the 'subsistence' sectors of the economy. If these arguments are to be taken further, we must turn from the account rolls to the surveys. The material has been collected by H E Hallam, in vol II of *The Agrarian History of England and Wales*: a co-operative project might allow us at least to fix the goal-posts.

EDMUND KING

JOHN GOODACRE, *The Transformation of a Peasant Economy. Townspeople and Villagers in the Lutterworth Area, 1500–1700*, Aldershot, Scolar Press, 1994. xix + 322 pp. £49.50.

This is a very special book, long in the making, but likely to stand for many years as a highly original undertaking, a model of its kind. Starting as a PhD thesis in 1977, it has benefited from the author's further long, deep thought over nearly twenty years, his insights into landowning and land management, and, doubtless, his reflections upon not dissimilar changes going on in and around Lutterworth at present. The resulting book is a powerful and thought-provoking study, carefully differentiating the fortunes, and various mixes of activity of different classes and individuals in the town of Lutterworth and the farming parishes around in the two centuries between 1500 and 1700. Many strands of development are skilfully woven into one tapestry of agrarian and general economic change, while credible people stand throughout at the centre of the scene. The book is based on a thorough study of the documentary information in inventories, parish registers, surveys, lawsuits, and the like, and is then illuminated from an unusual source, namely, the famous pamphlets of John Moore, rector of Lutterworth, and Joseph Lee, parson at Cotesbach, waging verbal war with each other over the merits and defects of common field farming and enclosure in their neighbourhood. Dr Goodacre weighs their every word, and picks up many significant clues from odd phrases here and there which shed a flood of light upon the meaning of other information.

It is impossible in a short review to do justice to the subtlety of the final portrait of a local economy, undergoing change on many different fronts at once. It brings to life in a remarkably vivid way the challenges to individuals and classes, showing both the luckless people who did no more than

survive, and others who seized their chance and manipulated the world to their advantage. Out of this company of credible people come generalities, summing up the whole.

Basically, Dr Goodacre divides the enclosure movement between 1500 and 1700 into three phases, and then gauges the total impact in this region on farming and the town's trade. Before 1500 when enclosure affected about 17 per cent of the area studied, he sees it as a move into pasture farming at a very low level of efficiency and performance; landowners and farmers were making the best of a bad economic situation after the Black Death, though they produced some fine wool that went to Coventry, Gloucestershire and London to make high quality cloth. Lords, incidentally, also kept rabbits, and fed carp in their ponds, characteristic alternative activities chosen by their class at this time. The beneficiaries among lesser villagers were those who kept the manorial estate running for the lord, shepherds and park-keepers, for example, who turned their perks to good account, by keeping their own small dairy herd, or fattening a few beef cattle or wether sheep. Then in the course of the sixteenth century, as livestock fattening became a more obviously profitable enterprise, shrewd men used their common field holdings in conjunction with agistment rights and leases of enclosed pastures to produce mutton and a now coarse, rather than fine, wool, while maintaining the flexibility inherent in having arable crops in the common fields. They could sell grain at the market, and use their fodder crops, especially peas, to feed animals in early spring or winter when enclosed pastures had nothing to offer. They throve upon the circumstances, in contrast with the owners of enclosed estates who clung to the old style of pasture farming, producing small sheep and fine wool, but a wool that did not have the robust future of long wool for combing and hosiery; it was the latter which would make Leicestershire famous in the future. The pamphleteer summed up a whole world of contemptuous observation when he referred to 'graceless graziers with innumerable tods of wool and droves of fatlings'. They were the thrusting, acquisitive, brash newcomers, in a different class from the men who had enclosed pastures in the fifteenth century. Between about 1580 and 1620 the graceless graziers took possession of more of the common grazing rights unused by poor men. Common parish herds and flocks dwindled, the families of the old-style pasture farmers died out, and old enclosures could now be divided into smaller units. Their stored fertility was exploited by the system of ley farming, offering special advantages in those frequent but short episodes of grain shortage in the first half of the seventeenth century. The 1650s were a watershed when at least five parishes in the area were finally enclosed, between 1655 and 1665. Nevertheless, sixteen parishes remained open, and Dr Goodacre see this phase not as the triumph of enclosure over common fields, but as the triumph of common field farmers in exploiting the advantages of both systems at once. His agricultural revolution in the seventeenth century, in short, consisted in the exploitation of this duality, though it benefited only the large farmers, growing grain and marketing it on a substantial scale alongside their livestock enterprises. It did not pay the small farmer who found he could buy cereals at the market cheaper than he could grow them.

Evidence for the advance of large-scale grain farming is seen in the appearance of wagons on farms, carrying heavier loads to more distant places. Meanwhile, the average common field farmer did a bit of everything, growing cereals, keeping a few cows, and breeding a few sheep for others to fatten; the fattening of bought-in sheep became one of the large farmers' sidelines on enclosed summer pasture.

The economy of Lutterworth town is fitted into this pattern of change in a careful analysis of the occupations of dynasties and individuals who prospered. Farming families built cottages on freehold land, added brewing and baking to their other activities, and turned farmhouses into alehouses and inns. When specialists gradually took over from them, the inns of the town became the usual, well-furnished centres for travellers and merchants. Lutterworth developed no particular industrial speciality, as did Hinckley with hosiery, but it steadily built on its good trading situation close to a Midlands crossroads.

This local study is a fine example of the way detailed research finally brings us face to face with an explanation of changes in the local economy which has the ring of truth, but which departs significantly from the conventional generalities. Its argument will be hotly debated by those who prefer one story to explain everything. But it is, in fact, more lifelike to see a variety of manoeuvres in play at different periods and in different parts of the country, even though common field farmers and enclosers everywhere were engaged in the same struggle for dominance. Dr Goodacre takes a long step forward in identifying the strategies in play in good grazing country in south Leicestershire. He opens up the yet more ambitious prospect, to which Professor Charles Phythian-Adams refers in his weighty Foreword, of arriving one day at a taxonomy of farming communities, all undergoing the same revolution, but experiencing, and using it, perhaps, in different ways.

Gratitude for this sophisticated and imaginative work does not silence all criticism. The index is a thoroughly poor guide to the contents of this memorable book. It totally fails, for example, to signal illuminating comments on bread baking, on fish (carp), pigs, poultry keeping, and woad. Yet six clean pages stand at the end; readers will have to supplement the index with their own.

JOAN THIRSK

THORKILD KJAERGAARD, *The Danish Revolution, 1500–1800: An Ecohistorical Interpretation*, CUP, 1994. xii + 314 pp. 20 illus. £35.

This is a stimulating and thought-provoking book, with implications far beyond the narrow limits implied by its title. It seeks to demonstrate that Denmark's agricultural system had reached a point of non-sustainability by the beginning of the eighteenth century and was only able to avoid a repetition of the problems of the later Middle Ages by wholesale reorganization, with repercussions not only on agriculture but throughout the whole of Danish social and political life. Over-exploitation of the forest, massive drifting of sand over agricultural land in Jutland, and problems of water control together led to, and were symptoms of, a major ecological crisis. The first of these drove the population to burn turf, straw and cow-pats as an alternative to wood, with a consequent reduction in land fertility which tipped an already-precariously-balanced agricultural system into a downward spiral. It argues that action was thus inevitable, and took the form of a major revolution in agricultural methods, especially the widespread use of clover and other nitrogen-fixing plants, and of marl. Coupled with this, a decline in the use of wood for fuel and its replacement by other materials for both houses and field boundaries allowed woodland recovery, and resulted in the emergence of a new sustainable rural economy by the end of the eighteenth century. This was, however, achieved at some cost in the form of cold houses, higher disease levels amongst the population, and a fall in general living standards which, it is argued, reached an all-time low about 1800. It was only when coal began to be imported in quantity and imported ready-manufactured goods replaced the Danish-made alternatives that the fuel crisis was finally solved.

It is part of the author's contention that enclosure and the creation of freeholds played little part in stimulating the improvement of the agricultural system. Indeed, he claims that enclosure and the movement to freeholding often led to stagnation and chaos, and that there is a negative correlation between areas in which social reform was or had been carried out and areas of economic growth. He sees agrarian reforms arising primarily from the power struggle between central royal authority and the old aristocracy rather than from any specific agricultural imperative. The crown needed the farmers as allies, and both giving them the freeholds to their land and allowing them to enclose bought their support and weakened the grip of the landed aristocrats. Those who remained tenant farmers were still in a relatively good position, since they were protected by the long-standing prohibition on closing down farms or allowing them to be subdivided. The losers were the cottagers, servants and farm labourers who were deprived of access to common rights but usually received no compensation, since there was no compulsion on the farmers to offer any land or other alternative. Upward mobility in the rural community became increasingly difficult, while downward mobility affected the younger sons of many farmers.

Kjaergaard argues that the effects of the revolution on the landscape and environment were largely positive. The new landscapes which emerged were more colourful and attractive, with a more varied cropping pattern replacing the old cereal monoculture and the new hedgerows breaking the monotony of the old open fields. The changes also led to a greater diversity of wildlife, with increased numbers and a wider range of plants, birds and butterflies spreading through the Danish countryside. Ultimately all these developments owed their existence to the new 'scientific farming', with technological development 'a decisive prerequisite for the major changes'.

Thorkild Kjaergaard has written a challenging book, many of whose implications stretch far beyond Denmark and the eighteenth and nineteenth centuries. Indeed, he briefly expands his arguments to other European countries during the same period, and alludes to possible parallels with parts of present day Latin America, Africa and India. His views are undoubtedly controversial at times, and may not find favour with all scholars of agricultural history, but they will certainly need to be addressed. David Hohnen has performed a valuable service by making this book available in a clear and readable English translation.

JOHN CHAPMAN

LAURENCE WIEDMER, *Pain quotidien et Pain de Disette. Meuniers, Boulangers, et Etat Nourricier à Genève (XVIIe–XVIIIe Siècles)*, Passé Present SA, Geneva, 1993. 511 pp. np.

This is a doctoral thesis on the daily bread supply and the millers and bakers of Geneva in the seventeenth and eighteenth centuries. It faithfully examines the administrative documents of the town, so that the formal structures of control over bakers

and millers, and the official marketing regulations are fully described. Familiar strategies, such as the building up of grain reserves in good times, are enumerated, and the level of stocks, price fixing, and costs of storage are analysed. At the more personal level, millers' routines are uncovered in chapters on their mills (whether owned or leased), the art of milling, types of flour produced, and millers' incomes and lifestyle, as shown in their inventories. Geneva was a wheat-eating citizenry, accepting maslin, barley or oats in years of shortage, but it ate pure rye bread only as a very last resort. A similar profile is given of the bakers, their working day (baking sessions took seven hours, and they usually baked twice a day), their family dynasties, marriages, and incomes. The years of grain shortage are also enumerated, though crises became less frequent and died away in the eighteenth century.

This is a careful study of the formal documentation, but it does not move adventurously outside this safe palisade to pick up clues in casual, literary, or building, sources which might tell us which classes of households baked at home, and which did not, and how they rated the quality of shop and home-made bread. At the beginning of the eighteenth century, fourteen bakers sold ready-made bread, while seventeen public ovens were available to which women brought bread kneaded at home. The number of public ovens barely increased as population rose, yet the author asserts that the majority of households throughout the eighteenth century continued to make their own bread. The reader is left with lingering doubts about changing routines in the period studied. Nor is any reference made to the baking of pies by bakers; did they, or did they not, engage in this too, to use the heat of their cooling ovens, and satisfy the demand for instant food from roving sojourners in the city? For comparative purposes, this is a useful study of town bread supplies, but its exclusively administrative viewpoint will disappoint the women who handle bread in the kitchen.

JOAN THIRSK

PIERRE DE SAINT JACOB, *Les Paysans de la Bourgogne du Nord au dernier Siècle de l'Ancien Régime*, Association d'Histoire des Sociétés Rurales et Editions Universitaires de Dijon, Rennes, 1995. xxxvi + 644 pp. 270 fr.

By a quirk of fate, some gems of academic writing fail to receive the attention they merit. Arguably *Les Paysans* has been one such book but its re-publication as part of a promising new venture offers the chance of it reaching a much wider audience.

In May 1993 a new historical association was founded in France to promote research and teaching in the broad domain of rural history. The *Association d'Histoire des Sociétés Rurales* seeks to meet this objective by organizing regular conferences, producing a journal (entitled *Histoire et Sociétés Rurales*), and publishing a collection of books which will comprise both new works and reprints of classic studies long out of print. The first conference was held at the *Université de Rennes II* in October 1994 and was devoted to a critical review of the current state of rural historical studies in France. The proceedings appear in *Histoire et Sociétés Rurales*, 3, 1995, and consist of three dozen papers grouped around seven themes which review French rural research in the past and at the present, and then explore the relationship between rural history and other branches of French history and with cognate disciplines (agronomic science, archaeology, geography). Each section ends with a substantial bibliography. French scholars are concerned about the apparent decline in the vitality and visibility of their subject, both among researchers and undergraduates. Their vision of the alleged well being of rural studies in other parts of Europe and its relative invisibility in France does not accord with my perception, but this may be a case of the grass always being greener elsewhere. For anyone with a research interest in the rural history of France this volume must be essential reading.

The first volume of the *Bibliothèque d'Histoire Rurale* (edited by Ghislain Brunel of the *Archives Nationales* and by Jean-Marie Moriceau of the *Centre de Recherche d'Histoire Quantitative de l'Université de Caen*) is a handsome reprint of the *doctorat d'état* by Pierre de Saint Jacob, which was published in 1960 but passed with precious little notice in review sections of learned journals. In an extremely informative preface Dr Moriceau hints why this may have been so. After having corrected the proofs, Saint Jacob died at the age of 53 before his treatise appeared and before he was able to occupy the chair of modern history that had been created specially for him at the *Université de Dijon*. His earlier career evokes that of many French historians of earlier generations, with some years as a teacher in village schools and the rest of his life being spent as a history teacher in a *lycée*. That post at the *Lycée Carnot*, of course, enabled him to work in the *archives départementales de la Côte-d'Or* that formed his main source, and gave him access to the *Annales de Bourgogne* and several local history journals which formed the main outlets for his numerous articles devoted to the agricultural history of Burgundy.

Les Paysans is an austere and sober text, the culmination of almost three decades of research. It explores the evolution of rural life in a varied stretch of territory including the woods and pastures

of the Morvan, the famed vineyards around Dijon, and the ploughlands and meadows of several fertile valleys during the 'long eighteenth century' from the 1680s to 1789. The thesis is structured into three main parts, which present the *pays c* 1685, trace social and economic changes during the last century of the *ancien régime*, and then review the economic crisis in northern Burgundy in the 1780s and its relation to the Revolution. In the late seventeenth century the province was an essentially rural region composed of communities which had suffered the ravages of war, disease and disruption and bore the burden of complex, heavy taxation and labour dues imposed by its *seigneurs*, but still had communal systems of cultivation and many communal land resources (woods, rough pastures) in place. During the eighteenth century extensive sections of land were purchased by bourgeois, noble and ecclesiastical investors, and the spread of physiocratic notions (although limited) favoured agrarian individualism and the decline of traditional communal systems. Fiscal impositions were not lightened. Widespread desperation during the 1780s resulted in hostility between the several social classes in the province, with the well being of ordinary farmers and the rural poor not being relieved by the Revolutionary encouragement of individualism, partible inheritance, the sale of communal lands and the subsequent loss of collective resources.

Pierre de Saint Jacob adopted a sober, measured style in his prose which was unbroken by statistical tables, maps or diagrams. His pioneering graphs of changing grain prices and taxation levels were banished to an appendix; his approach was emphatically literary rather than quantitative. He employed *ancien régime* expressions of weight and measure, but offered no conversion to metric equivalents to assist the reader. The bulk of his text is not an easy read, but without doubt his conclusion is brilliantly incisive. Overall, this is a masterly exposition of the demise of traditional communal systems in the face of capitalist innovations, of the exploitation of the poor and weak by the rich and powerful, and of the erosion of collective forms of welfare leaving the needy to their own devices and to an uncertain future. The moral of the book is eternal. *Les Paysans de la Bourgogne du Nord* is unquestionably a classic whose reappearance in a very attractive binding and at a very reasonable price will be welcomed and, I hope, will receive the critical claim that it deserves.

HUGH CLOUT

PENELOPE J CORFIELD, *Power and the Professions in Britain, 1700–1850*, Routledge, London and New York, 1995. x+259 pp. 24 illus. £45.

One of the more intriguing questions for historians of the eighteenth and nineteenth centuries revolves around the issue of power and, in particular, its transferrence from the landed aristocracy to the middle classes. Clearly at the heart of this transfer were the professions, groups who wielded power through their specialist knowledge and set up informal mechanisms of control and self-regulation. Penelope Corfield's book is not simply a discussion of individual professions, although she is happy to estimate numbers and to look in some detail at particular groups, it is also a sustained essay in the growth of professional power set loosely within the context of some of Michel Foucault's ideas.

Corfield argues that in the course of the eighteenth and nineteenth centuries the existing social heirarchy was challenged by a group of power-brokers whose stature depended on control of key areas of specialist information: these were the professions, and their guns were primed with knowledge. The emergence of the group was a reflection of the growing tertiary or service sector within the United Kingdom economy. A profession was already an indication of social status in the early eighteenth century but the position grew stronger as regulation and the imposition of standards helped to raise consumer confidence. By 1851 England, Scotland and Ireland all had a skilled service sector, and much of the book is concerned with demonstrating how the importance of these sectors was much greater than the mere number of professionals would have suggested.

None of this is perhaps entirely surprising, but readers of this journal may have more difficulty accepting Corfield's definition of professionalization as inextricably linked to urbanization (p 23). No one is likely to question her assertion that most towns developed a basic core of professionals, but this is not quite the same as seeing professional people as a rising social group associated almost exclusively with urban growth. Since every parish, whether rural or urban, had a church, it also had (whether resident or absentee) a clergyman, and some (we learn) even doubled as land agents (p 129). Of land agents themselves we hear next to nothing (except for a brief comment on Ireland pp 30–1) although there were not far short of 20,000 of them by 1851 while nearly 6000 veterinary surgeons and farriers must have spent much of their time in rural communities (p 32). Some professionals of course went on tour, notably clerics visiting their poorer benefices, but also barristers, actors, dentists, architects, engineers and others. Rank-and-file attorneys 'lived outside the towns', and some medics were neither more nor less than 'unglamorous village sawbones' (p 215).

Corfield is interested in power, but just how much did these people really wield? The influential

clergyman more often than not required the landowner to sit regularly in the family pew; the land agent was hardly independent; and the local attorney lived a mundane and humdrum life in which the idea of his acting as a local power-broker is unlikely to have figured highly. Perhaps some of the satire and caricature which goes into making up a fascinating chapter in this book was not actually so wide of the mark as we might assume. Yet it would be wrong to suggest that the book is anything other than a scholarly assessment of a significant and growing social group which exercised rather more power than might have been anticipated purely on the basis of numbers. Corfield traces the growth of the professions with some care, but what makes the book interesting is the provocative interplay of evidence about growth and 'regulation' with suggestive comments on the exercise of power not primarily through politics – although as early as 1733 nearly 11 per cent of MPs were practising lawyers – but through notions of power exercised in the respect afforded to them, and bolstered by qualifications, professional associations and institutions, and regulation of numbers. The book makes a significant contribution to our understanding of the nature of social power exercised by those with an intangible expertise.

J V BECKETT

ANGUS J L WINCHESTER, ed, *The Diary of Isaac Fletcher of Underwood, Cumberland, 1756–1781*, Cumberland and Westmorland Antiquarian and Archaeological Society, Extra Series, XXVII, 1994. xlii + 518 pp. £36.

At first glance Isaac Fletcher's *Diary* seems a pedestrian record. It was written in pocket-books which allowed him only four or five lines to each entry, and he relates only the most obvious events in his daily life as a Cumberland Quaker, yeoman farmer, local lawyer, and man of affairs, with business interests in Cockermouth and Whitehaven. Yet we owe Dr Winchester a deep debt for recognizing its importance and the skill and imagination he has brought to the task of editing it. Fletcher was neither imaginative nor observant outside the range of his own concerns; here is no Dorothy Wordsworth or Francis Kilvert. But he was methodical and precise in what he recorded and his diary extends over a whole generation. Dr Winchester has thus been able to use it to recreate a wonderfully vivid, human portrait of Cumbrian society, at the farming and business level, in the eighteenth century.

He has done so by following up Fletcher's multifarious interests in impressive detail, and by truly massive research into his Quaker background and the close-knit family-world that moulded so much of his life. The task has taken seven years to complete, but they have been years well spent. We are given not only a perceptive introduction, but seventeen pages of notes to the text, seven appendices, a useful glossary, and thirty-five pages of biographical notes.

It is impossible to do justice to this wealth of information in the space of a review. But in addition to the introduction, the topographical notes in Appendix III, the letters of Isaac Fletcher and his delightful wife Susanna in Appendix IV, and above all the biographical notes, must be singled out for praise. It is worth reading the latter through from beginning to end for the fascinating picture they give of some 168 people who figure with special prominence in the diary. They bear ample witness to the riches of the biographical approach to the study of provincial society. Ninety-two of those mentioned were fellow-Quakers of Fletcher, a clear indication of the degree to which he, like most Friends, then thought and operated through the denominational connexion. The great majority came of families with deep and enduring roots in the area; the web of local intermarriage Dr Winchester has brought to light is indeed striking. But I also counted at least thirty places outside Cumberland with which Fletcher had more or less intimate dealings, either on business or denominational matters, and often on both. London, Bristol, Birmingham, Coalbrookdale, Galloway, Philadelphia, Virginia, and Maryland all figure among them. For the Quakers of west Cumberland, at least, horizons were clearly far from limited. They were further broadened in that no fewer than ninety-six travelling ministers visited the Quaker meeting at Pardshaw during the period covered by the diary, many of them from other northern counties, but at least seven from America.

Fletcher's prim little Georgian farmhouse at Underwood in Mosser, like the Pardshaw Meeting House itself, still happily survives. Mosser lies on the north-western edge of the Loweswater fells and is one of the eight out-townships of Brigham parish. It was originally St Bees property, and developed from a humble 'shieling on the moss' (*mos* + *erg*), first recorded in 1203. Though it covered only 1018 acres, 14 or 15 holdings had apparently been carved out of it by Fletcher's time, all of them isolated steadings or grouped in the two tiny hamlets of Upper and Lower Mosser. Two of these are recorded in *The Place-Names of Cumberland*; but several more can be traced back to the sixteenth or seventeenth century, and a few (to judge from their name-forms) must be of medieval origin.

Underwood itself comprised two holdings in the seventeenth century; but both of these came into Isaac Fletcher's hands, one through his father's marriage to Margaret Allason in 1693, the other through his own marriage to Susanna Harris in 1743. He extended his farm a little by enclosing his share of the waste and the last remnant of the moss. As it was recorded in 1840, Underwood thus came to comprise 107 acres. In short, it was a typical Cumbrian yeoman's holding, larger than most in Mosser, and quite sufficient to afford a livelihood from his mixed-farming activities.

But like many men in the area, particularly Quakers, Fletcher was a restless, energetic individual, intelligent too, and socially as well as economically ambitious. The busy market town of Cockermouth, scarcely four miles to the north, afforded one opening, while the Lowthers' new port of Whitehaven, only ten miles away, attracted many in the neighbourhood to venture into overseas trade. The picture we are given is thus a very different one from that depicted a generation or so later by Dorothy Wordsworth in the heart of the Lake District. Though farming may have remained Fletcher's chief concern, and there is much of interest about it here, the diary is also dominated by references to his legal work in the Cockermouth area, by divers ventures into local industry and leadmining, and by commerce with Ireland and America, as well as his involvement in Quaker affairs.

Neither for him, however, nor for others equally anxious to prosper by diversifying their activities, is this a typical story of Quaker success. Time and again, the complex business partnerships entered into to raise capital or the like ended in personal quarrels, family disaster, and sometimes bankruptcy. Such tragedies were a matter of much concern to Friends generally at this time, as they were to other Dissenting groups, and unhappily they sometimes became entangled with the doctrinal feuds that were likewise rending the connexion. Perhaps Isaac Fletcher's most useful and profitable activity, in the end, was his clearly able work as an unofficial lawyer, working in with attorneys in Cockermouth, and with the Lowthers' land agent, John Wordsworth, the father of William and Dorothy.

Yet there was a great deal more to Isaac Fletcher's life than that. There is much of homely affection and simple human kindness in these pages too. Illness, mortgages, and other misfortunes could not prevent him from writing a perfectly splendid letter to his nephew in Philadelphia in 1770, trusting that he would soon 'arrive safely again in Old England, the Paradise of the world, the land of wealth & plenty!'

ALAN EVERITT

ARTHUR L STINCHCOMBE, *Sugar Island Slavery in the Age of Enlightenment: The Political Economy of the Caribbean World*, Princeton, New Jersey: Princeton UP, 1995. xviii+361 pp. 5 maps; 7 tables. £29.50.

If you are interested in farming, this book is probably not for you! Few readers of this journal will feel compelled to plough through these nearly 400 close-packed pages. On the other hand, if you are interested in political sociology with a Marxist slant this may be your cup of tea. Essentially, what Arthur Stinchcombe is trying to do here is to give an overall explanation of the relative degrees of slavery experienced in the Caribbean islands in the eighteenth and nineteenth centuries. The crucial element appears to have been the presence of sugar plantations. The islands with plenty of fertile low-lying land, with easy access to the sea and shipping, became the great sugar producers, and sugar was a slave crop. So the more sugar plantations, the more slavery. Thus a scale of slave exploitation can be established, with the great British sugar islands at the top having the most coercive slave regimes, followed by the French, then the Dutch and Danish, and the comparatively benevolent Spanish at the bottom. The Spanish were really only interested in finding gold and silver, not in cultivating sugar, so had fewer slaves. Locked on to this scale of slave coercion is a class analysis in which the British planters ruled their islands for their own commercial gain, colour being a crucial determination of class. The islands of other countries, which used less slaves, had more genial social systems, in which shades of colour were comparatively insignificant. The Spanish again were more relaxed in these matters. Indeed, having placed all the various islands into his ranked categories, the Spanish islands emerge really as being unlike the others. They were more like South American countries in their political sociology, being run by charismatic dictators in fancy uniforms. As for the British islands, whose planters the author seems to go out of his way to vilify, he argues that the extensive freedom from control that they were allowed to enjoy from London enabled them to operate the most repressive systems of black slave exploitation. Even after the African slave trade was ended and slavery itself abolished, the British colonies were able to set up a system of quasi-slavery for indentured Indian labourers. In the colonies of other countries, where control from the metropolis was greater, freedom of the local authorities to exploit black slaves was more constrained and the slaves themselves enjoyed greater freedoms. Of the various islands Haiti enjoys a detailed examination, because of the black slave revolution there which so frightened the Southern States of America in the period before the Civil

War. He chooses not to comment on how effectively the self-liberated slaves there used the total freedom they took for themselves! So this is a substantial study but not one which can be read through lightly. It is not based on original research, but aims to use secondary sources to create an overarching analytical structure by which the degrees of slavery in the region can be assessed. There are some awkward uses of English, such as his continued use of the first person, and his somewhat risible use of popular language: 'But except for the poor sods who died in such battles, such stubbornness was not ordinarily relevant to the military problem' (p 40). But perhaps the most serious problem with the book is the absence of any reference to the terrors of the slave-based social system operated by Africans in Africa from whom the slaves had originally been bought. Even if the English or British (the author is a little confused about these terms) operated the most severe system of slavery in the Caribbean they did not use their slaves for human sacrifice as was common in Africa. It was better by far to be a slave on a British sugar plantation than decapitated or buried alive in the funeral rites for a dead chief!

A J H LATHAM

ROGER J P KAIN and RICHARD R OLIVER, *The Tithe Maps of England and Wales: A Cartographic Analysis and County-by-County Catalogue*, CUP, 1995. 873 pp. £135.00.

This large volume represents a much-needed index and description of the tithe maps of England and Wales, and results from a Leverhulme-funded investigation lasting five years, which was also sponsored by the Public Record Office (to whose staff the volume is dedicated). This will become the standard work of reference to the tithe maps, but it also contains analysis, contextual material and a great deal of insight into cartographic representations of mid-Victorian rural England and Wales. As such it now takes its place beside the earlier Kain and Prince *The Tithe Surveys of England and Wales* (1985) and the Kain *et al*, *An Index and Atlas of the Tithe Files* (1986). Presumably the tithe schedules, which accompany the maps, will not merit such exhaustive treatment, although they too are central to any understanding of the process of tithe apportionment! They do, of course, receive some treatment from the authors in this volume.

The tithe maps resulted from the great government-sponsored cadastral survey of the early Victorian period which has yielded something in the order of 11,800 large-scale detailed maps. The introduction to the volume explains the background to the survey – the commutation, the definition of the tithe districts, the corn rents, the commissioners and valuers. There is a short section explaining the use of the data base and then there follows the main part of the volume: a county-by-county catalogue. Each county has a chapter introduced by a brief analysis of the available maps, with their distribution by tithe district shown by a map which also indicates the tithe-free areas of the county. Within each county there is an entry for each tithe district (most usually a parish but possibly a hamlet or other part of a large parish) which lists dates of apportionment, dates of the map, acreage, scale of map, class (1st or 2nd), name of cartographer, topographical features shown such as 'Giant's grave' (Wye, Kent), 'Castle ruins' (Thanington, Kent), cartouche details. A detailed and extremely useful final chapter summarizes much of what went before, and appendices list assistant tithe commissioners and local tithe agents, and tithe map-makers.

The existence of this volume will undoubtedly save researchers a great deal of time spent previously in tracking down tithe maps to find small amounts of information, and the PRO reference numbers also supplied will also aid PRO searchers. It should be noted, of course, that such references are those relating to material held in the PRO, and that maps held in local archive offices will have locally-relevant references. The book does not inform us as to whether a map also exists for a tithe district in a local record office but to do so would have entailed a truly Herculean task. As it is, the authors and their collaborators and publishers are to be congratulated on the fine production of this most useful work of reference.

BRIAN SHORT

GÖRAN HOPPE and JOHN LANGTON, *Peasantry to Capitalism: Western Östergötland in the Nineteenth Century*, Cambridge Studies in Historical Geography No 22, CUP, 1994. xxi + 457 pp. £40.

This is an extremely detailed and well researched piece of scholarship. It tells that important story of the transition from peasant agricultural production, largely for the purposes of self-sufficiency or very local exchange, to capitalist agricultural production largely for sale. In order to explore this central adjustment the authors have carefully blended a series of theories about the transition with the real-life experiences of communities in one region of Sweden in the nineteenth century. Along the way they pose and attempt to answer some very diverse questions about the structure of peasant society, and the ways that structure had to adapt, or readily adapted to, changed circumstances. These questions involve issues such as farm sizes, agricultural employment, non-farm but parallel rural activities, and the relationships which developed intra-

community, and externally with urban development.

The story is about the parishes and communities of the hundreds of Aska and Dahl in southern Sweden. They are declared as a region embracing a 'new regional geography'. What is new is that this study breaks free from conventional regional studies which are either not regions, but more like 'lumps' of territory gouged out of one or other compass point, or are regions because of their uniformity. Instead the chosen region has a sharply defined geography of contiguous places – like all good regions – but it is one which has been chosen precisely because of its varied rather than uniform physical characteristics. In this way the authors are better placed to test and illustrate the importance of theories of capitalist development, theories which can genuinely have wide applicability through the contrasting habits and attitudes even of near neighbours in space, but who are distant from one another in terms of economic and social development. The incoherence of the region therefore, as a laboratory for testing theories and ideas, becomes a distinct virtue. Another virtue is the eschewing of the systematic approach to the study of human and historical geography (compartmentalized in the habit of chapter headings, such as social, economic, demographic). Instead the authors adopt a more holistic, ecological approach, and explore the concepts and methods of 'time-geography', recognizing that human socio-economic processes may be set in space but they also move through time in a way that the systematic approach to human geography or the time-based cross-sectional approach to historical geography may be unable fully to conceptualize and capture. Human interactions are complex in time-geography terms. At one level, in modern parlance, there was a lot of networking taking place in nineteenth-century Sweden. So it is the study of process as much as of necessary outcome which is important in this work.

The empirics throw up results which are no less interesting for the fact that they might be highly predictable. The relative uniformity of peasant life in 1810 – the beginning of the study – was not as uniform on closer inspection, and similarly the developments by 1860 – the end point of the study – resulted in a series of societies rather than a single society. The processes of change had taken place at a variable pace in different places but also across different kinship groups. It was the direction of change towards the market which was the unalterable fact, and even though by 1860 peasant farming had not yet ceased to be a way of life for everyone, it was surely on the horizon. It is not necessary, therefore, to complete the story to the point where everyone is on a so-called capitalist footing, or indeed has deserted agriculture for urban and industrially-based modes of production. The outcome or end result is not of the fundamental importance, but the process whereby the outcome is achieved is.

More precisely the study region is located a little over 100 miles west south-west of Stockholm. These two contiguous hundreds measure about 22 miles from north to south as the crow flies and perhaps 6–10 miles at their broadest point. I only quote these dimensions to emphasize the very small size and local nature of the study. This is nothing new to historians of Britain who have been fed with a constant flow of equally local and intimate histories – contrasting communities here, parish studies there, the odd special reference to the county of this and that, and the regional study of north, south, east and west. Such studies have become meat and drink both to the generalized histories and to particular studies, either in contrast to or in support of theories and empirics on agricultural, economic, and social change. Long may it be so, and in turn this study of Western Östergötland also makes generous reference to local Swedish studies, and also to those which are more familiar to historians of Britain. In the fullness of time the results derived from this book will be widely quoted in other studies of European peasant agricultural development. My fear, however, is with the general insularity of the British, an insularity born of the fact that the parallel developments in Britain took place at a different time, at a different pace, and very often in a markedly different way. The detailed research in this book, even though in a widely circulated CUP series, may be relegated to the barest footnotes in the future historiography of British agricultural history. That may happen unless more historians than is currently the case take up and run with the theories of the development of the peasant economy and society, and in particular break free from the major constraint of chronology. This is a study of nineteenth-century Swedish development, which, apart from some well-known remnants of peasant survival into nineteenth-century Britain will find few chronological parallels this side of the North Sea. It is for historians of the eighteenth-century, or more likely of early-modern Britain, to plunder this book for its exposition of theory through the laboratory of its empirics. I hope that they do so.

MICHAEL TURNER

DAVID FITZPATRICK, *Oceans of Consolation. Personal Accounts of Irish Migration to Australia*, Cork, Cork UP, 1994. 663 pp. Illus. £37.50 hbk; £19.50 pbk.

This book contains many surprises. On the surface, David Fitzpatrick's project is that of an obsessive

editor. He has reproduced fourteen series of letters (one-third by women) written between 1843 and 1906. They are the correspondence of emigrants, or their families, living in Ireland and Australia. Although a total of 111 letters are reproduced, they are worth reading in full.

The first thing that strikes any reader is the eloquence of these correspondents, most of whom are semi-literate. It was the emigrant, Michael Normile, who gave this book its title when he confessed to his father that letters from Ireland gave him 'an ocean of consolation'. Another emigrant, William Fife, recalled bidding farewell to his children in unforgettable words. He wrote:

> Although I parted with you in Body my heart and the affections of a Father went with yous... I hurried Down close to the side of the water thinking I might have got one sight of Fathys Black Bonnet or your Jacket as I would have Known either. I would have waved my hat and you your hand For the last time. But I could see neither thoug I looked with more Desire than the Watchman Doth for the Morning... The cry of my heart at that moment was Farwell Farewell Farewell My Children though not one tear could I Drop.

The editorial policy of retaining the original spelling, punctuation, and syntax evokes not only the language, but also regional accents. Biddy Burke, writing to her family in Galway, said that Australia was 'agrean' (agreeing) with her 'will' (well). She continued in this reassuring tone: 'I go to Mass every Sunday a nine clock and to vespers at night & so does Patt so ye neadend [needn't] be uneasy atall about us. This is the finest Country in the wourld for young people that takes care of themselves'.

The central focus of the book is on the meaning of 'home' within a culture which is highly migratory. This theme is not a new one for rural historians, particularly not those writing about Ireland. Over the past decade, the interest shown to migration by Fitzpatrick (himself an emigrant from Australia to Ireland) has been extremely fruitful. In this book, however, he has travelled a long way from his earlier 'push-pull' models, multiple regressions and significations, and statistical tables, (although the reader will find some of these in the book). Rather, he is concerned with personal representations of migration. As he points out, statistical inferences are hazardous and 'incomprehensive to the actual immigrant – either content or unhappy according to disposition and experience'. It is way Fitzpatrick has dealt with the experience and representation of migration that makes this book novel.

For academics, the book contains a sophisticated and subtle critique of the conventional historians' craft. With delicacy and in self-deprecating tones, Fitzpatrick discusses the innumerable ways historians 'cheat' by careful selection of evidence, unprovable claims of representativeness, and the careful juxtaposition of quotations. For historians who find his meticulous attention to every syllable intimidating, the critique is devastating. Fitzpatrick reproduces every letter in its entirety and subjects every word to penetrating analysis. He follows this with a detailed reconstruction of the circumstances of writing. Family historians have here a model in reassembling local and family records. Finally, there are a series of thematic chapters which look at broader questions, including the 'ceremonies' of communication, the politics of reciprocity, processes of interfamilial negotiation, and images of Ireland and Australia. The book concludes with a series of 'reflections' on culture, identity, and home.

The book is a treasure-trove for the agricultural historian. The letters are a glorious source in their own right. The writers detail their impressions of land policies, investment in technology and seed, seasonal fluctuations in agricultural prices, local amenities, and relationships of power within the village. We learn a great deal about cows, horses, and pigs from their correspondence. The radical transformation that Ireland underwent in the half century after the famine is seen here from a different angle. Precisely because of the contextual framework that Fitzpatrick provides, the book enables us to question, if not overturn, some of the prevailing myths in Irish historiography, such as the idea that those who failed to emigrate were 'captives' in a dull, restrictive country. Indeed, Fitzpatrick convincingly shows that the evidence of these correspondents suggests that those who remained often viewed their position with satisfaction and, even, an exalted sense of well-being. In Fitzpatrick's words: 'The choice facing the emigrant was not between a ruined world and a place of hope, but between two environments offering disparate prescriptions for human happiness' (p 560).

Despite the intellectual strengths of this book, it would be unfair not to draw attention to the way the book has been produced: wide margins positively incite annotation; there are 66 beautifully reproduced photographs, sketches, and maps; and although the volume is a 'door stopper', once started, it cannot be put down. And that is my only warning.

JOANNA BOURKE

GILBERT SCHRANK, *An Orkney Estate: Improvements at Graemeshall 1827–1888*, Tuckwell Press, 1996. xii + 131 pp. £8.99.

There exists a long tradition of studies of estate management in eighteenth- and nineteenth-century Scotland. Several volumes published by the *Scottish History Society* contain discussion and selected docu-

ments relating to improvements on the Grant of Monymusk, Argyll and Sutherland estates while that by I H Adams concentrates on the role played by Peter May one of Scotland's most influential land surveyors in agrarian change in the North East. In addition, journals such as *Scottish Studies* and the *Scottish Geographical Magazine* contain a number of papers on aspects of the improving movement. Unfortunately however, few monographs based on detailed study of local and regional archives have been published. The pioneering work of P Gaskell on Morvern and M Storrie on Islay and Ardnamurchan has been followed by only a small number of significant local studies, notably I Mowat's book on Easter Ross and S Knox's study of Shetland. The publication of Gilbert Schrank's research on the Graemeshall estate on the Orkney Mainland is therefore especially welcome.

In the introduction, the author emphasizes that the study will focus on the agents of change and the methods of implementation. He goes on to argue that the personalities and characters of the improvers are a key element in understanding landscape change and patterns of landed investment. His assertion that the relationship between lairds and their factors has been seldom studied is more questionable. Overall the introduction is very brief and takes into account only a fraction of the issues and research on the Highlands and Islands.

The main body of the book is divided into five chapters. Chapter one shows how the Orkneys experienced change during the middle decade of the nineteenth century, much later than on the Scottish mainland. In the early nineteenth century, most cultivated land was still in runrig and commonties accounted for 45 per cent of the land area. Overland transportation was poorly developed and cultivation was carried out on lands close to the sea. The rural economy was also dependent on a number of proto-industrial activities; spinning of linen yarn, straw plaited hats and kelp, a raw material for the soap and glass industries of Scotland and England.

The author suggests that economic change in Orkney was a two-fold process. Initially, there occurred a narrowing of the economy as rural industries collapsed and this phase was followed by intensive agricultural modernization. The former subsistence economy based on grain production gave way to beef cattle fed on sown grasses and root crops. Live cattle exports to ports such as Aberdeen and Leith was the key to the profitability of the new order and with the introduction of regular steamship services in 1836, this became feasible.

Chapter two is titled 'The Graemeshall Estate', and begins with biographical details of the estate owners, the Sutherland family, and their factors David Petrie and his son David junior, who managed the estate for almost 80 years. The author explains at length how successive lairds exercised influence over their estates from a distance pursuing careers elsewhere. This state of affairs generated much correspondence between laird and factor and led to the preparation of detailed reports, surveys and rentals. Many of these were carefully preserved by the factors and are now deposited in the Orkney County Archives. The latter part of chapter two focuses on what could be regarded as the final decades of the 'old order', characterized by minimal change in agriculture and a local economy that supplemented its meagre earnings from the land with kelp gathering. The personalities involved in estate management also changed: the old laird died in 1818 and was succeeded by a minor, Alexander Sutherland Graeme, bringing the appointment of a trustee, John Irving, while the retirement of David Petrie in 1827 brought the appointment of his son as factor. Sutherland Graeme's twenty-first birthday also occurred in 1827 and paved the way for sustained improvements at Graemeshall.

Chapter three provides a fascinating account of the lifestyle of the three men who were to re-shape the estate's landscape and economy. Petrie the local man, Irving in his youth a companion of Sir Walter Scott and typical example of the Edinburgh Enlightenment, and Sutherland Graeme, a Scot who was able to take advantage of his professional education to seek career and social opportunities beyond Scotland choosing to live near Hastings.

Chapter four begins by describing the elements of the 'new style' farming: enclosure, drainage projects, roads and bridges and long-term leases. Graemeshall was the first Orkney estate to attempt comprehensive improvement and although eventually successful, many factors slowed progress. Much of the chapter examines seven issues which Schrank identifies as particularly problematic. These include the decline of the kelp industry, low prices for agricultural products in the 1830s and related arrears of rent, the laird's conspicuous consumption, delay in dividing communities, tenant resistance to change, and perhaps not surprising, given the distance involved, conflict between Petrie and Irving.

Chapter five analyses the estate rentals before, during and after the main phase of improvement. What these confirm is a picture of attempted improvement that coincided with a period when the Orkney economy was in recession. Rentals stagnated and arrears of rents increased, yet expenditure was at its greatest. Moreover, drainage and road building was undertaken before government grants were available and it was only through land sales that the fiscal condition of the estate was

safeguarded. In contrast, other landowners delayed improving their lands until rising cattle prices triggered an economic boom in Orkney in the 1850s and 1860s. Graemeshall, with some of the best cattle land in Orkney, also profited from the economic upsurge and this is reflected in a marked upturn in rentals and the disappearance of arrears of rents. The latter part of the chapter reviews the evidence and statements given to the Crofter's Commission which visited Orkney in 1888, providing a valuable picture of the thinking and experiences of the smaller tenants on the estate. The commission's decisions led to reductions in rent and served as a reminder that landlord domination on this and other estates was beginning to be eroded. Ironically, this was at a time when the old laird's son had returned to live in Orkney, had rebuilt Graemeshall house and was taking an active part in estate management and the social activities of the parish.

Overall, this book is a very useful study of local agricultural change. Although the author appears to have made thorough use of the estate management papers the reader may find that there are some themes which are largely overlooked. Fishing and the development of the planned village of St Mary's are only fleetingly mentioned and we are not told much about the new farm buildings or field patterns that followed improvement. The book is illustrated by a number of interesting photographs; however, a more detailed map of the estate and some cartographic treatment of the rental statistics would have been helpful. Nevertheless, this publication is most welcome and it is hoped that it might encourage further local and regional research on agrarian change in eighteenth- and nineteenth-century Scotland.

D G LOCKHART

RICHARD PERREN, *Agriculture in Depression, 1870–1940*, CUP, 1995. vi+81 pp. £6.25.

For nearly thirty years now the Economic History Society has been commissioning its series of pamphlets in economic and social history. This one by Richard Perren is the first to appear with its new publisher, the Cambridge University Press. These studies are 'intended for students and their teachers', and 'designed to introduce them to fresh topics and to enable them to keep abreast of recent writing and debates'. Perren's contribution on *Agriculture in Depression* will not disappoint. Although it is hardly a fresh topic, nevertheless a great deal of good research has been completed in recent decades. This research may have come in the wake of T W Fletcher's invitation of the early 1960s to view the classic depression of the period 1870–1914 (or more narrowly 1879–96) with different eyes, but it has taken Fletcher's story into new realms of detail and analysis. Perren has synthesized this research both in the script and in a usefully annotated bibliography, which is equally usefully categorized under subject headings. This was the period when British agriculture had to come of age in an expanding world of competition. It lost its cloak of unnatural protection when the corn laws were repealed in the mid-nineteenth century. By the end of the century it also lost its natural protection of accessibility. Capital investment, prairie methods, bulk transportation, and general technological change allowed north American grain producers, for example, to overcome production disadvantages and the costs of distance to compete successfully in the British market. The problem of perishability was also overcome through those technical changes which allowed frozen or tinned products also to compete with fresh products relatively successfully. Adapt or perish, specialize and survive became important radical ideas for an otherwise conservative agricultural sector.

Historians all too easily use great moments in history to divide their chronological interests. The Great War has become the great divide between the nineteenth century and modern times. The freshness of Perren's script is to remind us that the fluctuations in prices, incomes and general prosperity of late nineteenth-century British agriculture did not end with the advent of the war. After a brief period of expanded hope for the industry in 1916–21 with a return to protection through price support (at least from 1918 when the Corn Production Act of 1917 began to have some effect), it actually slid into a deeper depression in the 1920s, continuing into the 1930s, when that price support was suddenly removed in 1921. The role of the state, at times neglectful, is particularly well handled and revealed by Perren.

Much more detail has now been added to the story of crisis and survival in British agriculture, and Perren performs an important task by making this story available in an uncluttered way. In short this is a very readable summary of the headlong and near fatal decline of British agriculture in the seventy years after 1870.

MICHAEL TURNER

M A HAVINDEN and E J T COLLINS, eds, *Agriculture in the Industrial State*, Rural History Centre, University of Reading, 1995. iv+232 pp. £9.75.

This volume contains twelve chapters and is divided into three parts. The first part, 'Agricultural production and trade' has six chapters, the second, 'Some results for rural areas', contains three chapters and the final part, 'Effects on governmental policy', contains another three. In addition, there is an introduction by Michael Havinden, who is also the

author of the final chapter in part three and which is really a conclusion drawing together some of the important sub-themes of the whole volume. In their introduction the editors admit they are covering a huge topic and as comprehensive treatment is impossible the contributors have tried to draw attention to key issues. Readers will find that both the positive and negative effects of industrialization on the agricultural sector are covered. The nature of demand for agricultural products by the industrialized countries, and the problems this has created for primary producers in these countries (and in the underdeveloped world) are well known, but they are subjects that still merit further investigation, as this book shows.

In the first chapter Ted Collins charts the changing pattern of declining income elasticity of demand for food in Europe, followed by Louis Ferleger who deals with comparative advantage and crop specialization in the nineteenth century. The chapter on European agricultural productivity and industrialization since 1890 by Patrick O'Brien and Leandro Prados de la Escosura is the only one to have been published before. Their scope and treatment of the subject constitutes a major piece of work, and in some ways provides a core for the whole book. Although the main focus of most articles is Europe, with some reference to the experience of the United States, David Grigg's chapter advances the general perspective taken by O'Brien and Prados de la Escosura by providing a world classification of agricultural systems and their characteristics. Peter Wickens' study of external demand for wool upon Australian and South African sheep farming underlines the contrast between two very different social and production systems. Leos Jelecek deals with some of central Europe by covering the changes in production and techniques in Bohemian agriculture from 1870 to 1945, drawing largely on Czech sources. In part two Michael Thompson informs us about the agricultural substructure which he defines as the inputs of services and products. Peter Dewey analyses the decline of the agricultural labour force and Michael Havinden the effects of de-industrialization on rural areas. In the first of the two main chapters in part three John Bowers criticizes European agricultural policy from 1945 to 1986, and Keith Howe brings this story up to date by reviewing recent changes in European agricultural policy.

Most of this book was given as papers at the International Economic History Conference held in Berne in 1986, but the ten year publication delay since then has given the editors the opportunity to include the chapters by Patrick O'Brien and Leandro Prados de la Escosura and by Keith Howe. In all cases authors are returning to subjects where they have already published so this volume adds to an established body of research. Some of them have taken advantage of the long publication delay to revise their chapters and incorporate some results of the most recent research. Ted Collins has even gone beyond that, to include a projection of income elasticity of demand for food in Europe by the year 2000 of zero, which means by then aggregate demand for food will grow no faster than total population. Seen against this John Bowers' and Keith Howe's studies of the unintended, but generally undesirable, effects of EEC agricultural policy have particular force. This book should make a useful addition to agricultural history libraries and course reading lists and, bearing in mind its low price, one that can be made at a reasonable cost.

RICHARD PERREN

KENNETH BLAXTER and NOEL ROBERTSON, *From Dearth to Plenty: The Modern Revolution in Food Production*, CUP, 1995. xvii + 296 pp. £40.

The late Sir Kenneth Blaxter was one of the more distinguished agricultural scientists of recent years, known especially for his work on the now widely used Metabolisable Energy system for determining the energy requirements of ruminants. At the time of his death he was writing this book. It has been completed by his colleague Noel Robertson. In his preface Blaxter tells us that he was moved to write by a combination of pride in the achievements of the farmers and scientists who have transformed agriculture over the past half century, and anger at the insufficient recognition given to them.

The main part of the book, the preface tells us, 'deals with the discoveries that were made and the people who made them'. It is laid out like an agricultural textbook, with chapters on measurement (mostly concerned with the development of statistical analysis); mechanization; soils, fertilisers and water relationships; weeds, pests and diseases; and plant breeding. Then follows a chapter on changes in crop husbandry systems, covering the development of silage, the introduction of forage maize and oilseed rape – identified here as a new crop, although seventeenth-century farmers might not agree – and the numerous innovations in cereal husbandry. The chapters on animal husbandry follow, as in the conventional textbooks, dealing with the discovery and solution of mineral deficiency problems, animal breeding, animal health, and animal husbandry systems. This is the heroic view of agricultural science, in which the secrets of nature are teased out by the 'selfless work and the inspiration of a relatively few scientists' (p 85). It is written in the style of a textbook which has been careful to note the authors of the seminal papers. Unfortunately the referencing does not

always help to identify these works: we are told (p 71) that 'Many individuals have contributed to our understanding of this phenomenon [cation exchange] but among British workers, Schofield, Beckett and Tinker should be mentioned.' This sentence illustrates two of the problems of this part of the book: the story is told largely, although not exclusively, from a British viewpoint, and only Tinker's work appears among the selected references at the end of the chapter. Neither is the index of much help, being entirely free of personal names.

The impact of agricultural science is discussed at the beginning and end of the book. The first two chapters are concerned with agricultural revolutions past (chapter 1, in which the period 1700–1860 is identified as revolutionary) and present, and especially the years 1936–86. The modern revolution is characterized as one in which land and labour productivity increased markedly. No mention is made of capital productivity, which, considering that it did not increase much, and may have fallen, is perhaps just as well. The authors also analyse gross output, input and incomes at constant prices, and conclude that since net farm income was less in real terms in 1985–7 than in 1935–7, farming had returned to the status quo. This conclusion is hardly justified, given the decrease in the real price of agricultural products. Perhaps it might have been more useful to ask what farm output and income would have been in the absence of technical change and government support.

The final part of the book claims to explain how the science-based revolution happened (mostly by a concise history of UK government funding for agricultural science over the last fifty years), and what should be done as government support for science is withdrawn. In other words, it argues that the agricultural output expansion of the period 1936–86 occurred because agricultural science successfully developed new methods. Its contribution to productivity could 'be judged from the small sample of improved production reported here' (pp 266–7). Thus it is assumed 'that the technological advances reported in part 2 justify the support [to science] already given' (p 252). Farm income support was apparently no more than 'a useful adjunct to science-based enterprise development' (p 266).

It is not easy to determine the readership at which the central core of the book is aimed. Its language is too technical for the general reader, although it would be a useful text on the development of agricultural science for agricultural students. Perhaps its purpose is made clear in the final chapter: it is a plea for continued funding for agricultural research, addressed to the senior civil servants and politicians who decide such matters. Here Blaxter's pride and anger appear most clearly.

PAUL BRASSLEY

RICARDO ROBLEDO, *Economistas y reformadores españoles: la cuestión agraria, 1760–1935*, Ministerio de Agricultura, Pesca y Alimentación, Madrid, no date 146 pp. np.

ALBERTE MARTÍNEZ LÖPEZ, *Cooperativismo y transformaciones agrarias en Galicia, 1886–1943*, Ministerio de Agricdultura, Pesca y Alimentación, Madrid, 1995. 286 pp. np.

Before Spain embarked on the belated process of full-blooded industrialization in the early 1960s, a prosperous agriculture was usually seen as both a necessary condition for more rapid economic expansion and also a guarantee of social stability in a nation prone to rural revolt. Ricardo Robledo's fine study of the long-term contribution of Spanish economists to tackling the perennial 'agrarian question' concentrates on three main phases: the limitations of Enlightened reform during the final years of the *ancien régime*, the creation of a free market in landed property in the nineteenth century together with the rise of agricultural exports, not least wheat, wine and olives, and finally the mounting tensions and ill-fated attempts at agrarian reform during the Second Republic which prefaced the outbreak of civil war in the 1930s. Recent research by agricultural historians south of the Pyrenees places much greater emphasis on the not inconsiderable strides made by Spanish farmers in the first three decades of the present century. Alberte Martín López's detailed study of agricultural change in Galicia at this time, focuses on the Catholic-dominated cooperative movement in north-west Spain and its role in such advances as the redemption of Galicia's notorious leases (*foros*), increased mechanization, and the slow shift from subsistence agriculture to livestock farming.

JOSEPH HARRISON

PETER MICHELSEN, *Vand til Tørstig Jord*, Christian Ejler's Forlag, Køobenhavn, 1995. 160 pp. 240 DKR.

Peter Michelsen, for many years curator of the Open Air Museum at Sorgenfri near Copenhagen, has had a life-long interest in the use of water for irrigation. It began in his home country where irrigation has been used in a number of ways, especially in Jutland. Since his retirement, Michelsen has gathered together his observations from around the world in *Water for a Thirsty Earth.*

The book falls into three parts. The first concentrates on Europe. Perhaps surprisingly for most readers, it looks in detail at irrigation in the Nordic countries. The second part deals with familiar practices in the Mediterranean area. Finally, there is a review of sample areas from the rest of the world in the treatment of which attention is also paid to the side-effects of large-scale schemes. There are 96 illustrations and an English summary.

W R MEAD

BRITISH AGRICULTURAL HISTORY SOCIETY

Conferences and meetings 1996–7

Saturday 7 December 1996
at the Institute of Historical Research, London WC1

Farming in Adversity: Patterns of Response

Dr Phillip Schofield (Oxford) • Dr Elizabeth Griffiths (Kent) • Professor Hugh Clout (UCL)
Dr Alun Howkins (University of Sussex) and Dr Linda Merricks (University of Surrey)
Details from Dr John Broad, History Dept., University of North London, 166–220 Holloway Road, London N7 8DB (E.mail J.Broad@unl.ac.uk)

Saturday 8 February 1997 at the University of Lancaster
in conjucnction with the Centre for North-West Regional Studies, University of Lancaster

Pastoral Farming in the Northern Uplands

Mary Atkin (Kendal) • Dr Richard Hoyle (University of Central Lancashire) •
Dr Angus WInchester (University of Lancaster) • Dr Mary Higham (Clitheroe) •
Dr Charles Searle (WEA Cumbria)

Details from the CNWRS, Fylde College, University of Lancaster, Bailrigg, Lancaster, LA1 4YN (E.mail Christine.Wilkinson@Lancaster.ac.uk)

7–9 April 1997
The society's *Annual Conference* will be held at the University of Portsmouth

Details will be available in January 1997 from Dr John Chapman, Dept. of Geography, University of Portsmouth, Lion Terrace, Portsmouth, PO1 3HE
(E.mail chapmanj@geog.port.ac.uk)

Notes and Comments

CHANGE IN SECRETARY

After many years of stalwart service, Dr Richard Perren bowed out as Secretary to the British Agricultural History Society in April 1996. The new Secretary is Dr. Richard Hoyle of the Department of Historical and Critical Studies, University of Central Lancashire, Preston, PR1 2HE. All correspondence about conferences and meetings of the Society and about more general matters should now be addressed to him, together with any material to be included in Notes and Comments.

INTERNATIONAL CONFERENCE ON LAND MANAGEMENT

An international conference on land management is to be held at the Royal Institution of Chartered Surveyors, Parliament Square, London, 6–8 January 1997. The theme of the conference is Land Management with four sub-themes: Approaches to Land Management; Land Reform; Environmental Issues; Geographic and Land Information Systems. Further details from the conference organizer, Dr Richard K Bullard, School of Surveying, University of East London, Longbridge Road, Dagenham, Essex, RM8 2AS, UK. Tel: +44(0181) 590 7722 Fax: +44(0181) 849 3618 E-mail: Bullard@UEL.AC.UK

SEEKING A MISSING SCOTTISH FARMER

Dr Joan Clarke is seeking help to identify an elusive book. She writes that she has encountered a reference to a work by one Andrew Blackie entiled *A Scottish Farmer's Ride through England a Hundred Years Ago* which may have been published *c* 1802. Dr Clarke has seen it quoted in an article in the *Lancaster Guardian* in 1911 by a well known local historian. A search of both the British Library and the National Library of Scotland has failed to discover the book. Or, she asks, is it perhaps a manuscript? Any suggestions identifying the book should be sent to Dr Clarke at 55 Silverdale Road, Yealand Redmayne, Carnforth, Lancashire, LA5 9TB.

Notes on Contributors

BETHANIE AFTON is a Research Fellow at the University of Hull, currently working on an investigation of farm production in England, 1700–1914, funded by the Leverhulme Trust. Previous research posts have resulted in co-authorship of the forthcoming *Agricultural Rents in England 1700–1914* with Professors M E Turner and J V Beckett and to a contribution to the forthcoming volume VII of *The Agrarian History of England and Wales*. The present article is largely the result of her PhD research into the agriculture of the Hampshire Downs, 1837–1914.

KEN BARTLEY is a Research Fellow in the Department of Economic and Social History at The Queen's University of Belfast. Having trained as a physicist (he holds an MSc in opto-electronics), he made the transition to the social sciences when he was employed as a research assistant in the production of the small-area statistics for the 1981 Census of Population for Northern Ireland. This gave him the opportunity to obtain the expertise in Geographical Information Systems which he is now putting to good use, analysing and mapping data from *inquisitiones post mortem* and the lay subsidies to create an atlas of land and wealth in pre-Black Death England. Future research plans include the development of temporal-spatial models to generate aggregate trends from incomplete and discontinuous historical data.

BRUCE CAMPBELL is Professor of Medieval Economic History at The Queen's University of Belfast. He has long had an abiding research interest in the agrarian history of medieval England and has published many essays and articles on the subject. From early work on Norfolk he has moved on to regional and national studies of land use and farming systems. He has worked collaboratively with Mark Overton on Norfolk agriculture and agricultural productivity, with Dr Derek Keene on the provisioning of London in the fourteenth-century, and with John Power on the derivation of farming classifications from historical data. He is a founder member of the Belgian-based CORN Group, dedicated to researching the rural history of the North Sea area, and is currently writing a book on seigneurial agriculture in England 1250–1450. Since 1991 he has directed the Pre-Black Death England database project at Queen's.

NICHOLAS GODDARD is Principal Lecturer in Geography at Anglia Polytechnic University, Cambridge. His publications include a history of the Royal Agricultural Society of England, *Harvests of Change*, 1989, and contributions to *The Agrarian History of England and Wales: IV, 1750–1850*, 1989, and *VII:1850–1914*, forthcoming. He is currently working on nineteenth-century agriculturists for inclusion in the *New Dictionary of National Biography* and on aspects of sewage disposal and environmental quality in Victorian towns.

DALE LIGHTFOOT is Associate Professor of Geography at Oklahoma State University. His research interests include traditional agriculture and water technology and themes which emphasize relationships between human and physical environments. He has conducted research on lithic mulch agriculture and traditional irrigation systems in the United States, Morocco, Jordan, and Syria.

JOHN POWER is a Senior Research Officer in the Fair Employment Commission, Northern Ireland. He was previously employed as Lecturer in Geographical Information Systems at The Queen's University of Belfast. His research interests include the population geography of Northern Ireland and labour markets and their catchment areas.

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EDITORS: A D M PHILLIPS AND D G HEY

DEPARTMENT OF GEOGRAPHY, UNIVERSITY OF KEELE,

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