

Seeing the Wood for the Trees: the diversity of local fuel sources and the transition to a coal burning economy in England.

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Introduction

A number of economic and environmental historians have, over the years, suggested that England made the transition from an organic to a fossil-fuel economy long before the conventional 'industrial revolution' of the eighteenth and nineteenth centuries. Nef argued in the 1930s that already, by the sixteenth century, coal was becoming the main supplier of thermal energy in the country, as a consequence of a serious shortage of wood, caused by industrial expansion and population growth.¹ Nef's ideas were challenged by Coleman,² and somewhat nuanced by Hatcher,³ but the importance of an 'early' transition to a coal economy – occurring before the end of the seventeenth century, and associated to varying extents with a shortage of alternative fuels - has been restated by a number of economic and environmental historians, including Richard Wilkinson, Tony Wrigley, Brinley Thomas and Paul Warde.⁴ What has characterised most discussions of this subject has, however, been a confusion of 'national' and 'regional' stories. For some purposes it is, indeed, important to know the date of 'national transition', defined as the point at which coal began to provide more than half of England's thermal energy.⁵ But for many enquiries it may be more important to know when the different regions and areas of the country became primarily coal using, which is a rather different thing.

Past research into England's fuel supplies, and in particular into the chronology of coal adoption, has tended to focus almost entirely upon wood produced from managed, coppiced woodland. Allen, for example, based an estimate of wood fuel supply in England largely on the suggestion made by Gregory King in the 1690s that the area of woodland used to supply fuel amounted to 1.5 million acres.⁶ Yet it is clear that a significant proportion of the fuel used in many districts comprised wood cut from hedgerows and pollarded trees, rather than from managed woodland, or materials harvested from commons and other marginal land. William Harrison for

¹ J.U. Nef, *The Rise of the British Coal Industry* (1932), pp. 158-76.

² D.C. Coleman, *The Economy of England 1450-1750* (1977), pp. 84-5.

³ J. Hatcher, *The History of the British Coal Industry. Volume 1. Before 1700: Towards the Age of Coal* (1993), pp.5-7, passim.

⁴ R.G. Wilkinson, 'The English Industrial Revolution', in D. Worcester (ed.) *The Ends of the Earth: Perspectives on Modern Environmental History* (1988), pp.80-99; B. Thomas, 'Was There an Energy Crisis in Great Britain in the Seventeenth Century?', *Explorations in Economic History* 23 (1986), pp. 124-52; E.A. Wrigley, *Continuity, chance and change: the character of the Industrial Revolution in England* (1988); E.A. Wrigley, *Energy and the English Industrial Revolution* (2010); P. Warde, *Energy Consumption in England and Wales 1560-2000* (2006), pp. 32-9; 67.

⁵ The most detailed, but still very preliminary attempt at quantifying national fuel supplies has been done by Warde, who estimated that coal became a more important provider of thermal energy than wood around about, or a little earlier than 1620'. Warde, *Energy Consumption*, p. 67. Hatcher speaks of such a transition definitely happening by around 1700 and perhaps before 1650, Rackham between the mid- and late seventeenth century, and Allen by 1700. Davidson rightly highlights the diversity of local fuel economies while asserting, on the basis of no clear quantitative evidence, that coal only became the main domestic fuel around 1840. Hatcher, *British coal industry*, pp.47, 55; O. Rackham, *Woodlands* (2008), p.131; Allen, *The British Industrial Revolution*, p.96; C. Davidson, *A woman's work is never done. A history of housework in the British Isles, 1650-1950* (1982), pp.74, 77.

⁶ Allen, *The British Industrial Revolution*, p.96.

example, writing at the end of the sixteenth century, argued that a shortage of wood would soon drive the inhabitants of London to burn ‘fenny bote, broom, turf, gall, heath, furze, brakes, whins, ling, dies, hassocks, flags, straw, sedge, reed, rush and also seascale’.⁷

Peat, Gorse and Heather

Harrison’s ‘fenny bote’, or peat, was a fuel of considerable significance, especially in upland districts, where raised bogs supplied ample reserves of *sphagnum* peat.⁸ This was extensively exploited from medieval times. In the South Pennines, for example, it has been suggested that all the peripheral blanket peats have been significantly affected by extraction, while on Dartmoor ‘some areas seem to have had their altitude lowered by cutting’.⁹ Indeed, the paucity of ancient woodland in upland districts has in part been explained by the fact that the availability of peat made the enclosure and protection of coppices unnecessary.¹⁰ In the later eighteenth century peat was still being removed on such a scale from the upland commons in parts of the north west that it was causing serious damage to the grazing. At Bolton in Westmoreland in the early nineteenth century, for example, it was argued that if the common was not enclosed it would soon be completely ruined by peat extraction.¹¹ Peat was widely used as a fuel in the seventeenth century not only in remote rural areas but also in a number of northern towns, including York.¹² It was extracted on a commercial scale in the mosses of south-west Lancashire, supplied to Ormskirk and Liverpool in the seventeenth century in a mixed economy alongside the output of the local coalfields.¹³

In the lowlands, too, peat continued to be a significant fuel source well into the post-medieval period. In 1797 Frederic Eden reported that it was ‘the usual fuel consumed by labourers’ in Lincolnshire, and was more generally used on the Isle of Axholme.¹⁴ Peat was still being dug on an industrial scale in south Cambridgeshire in the late nineteenth century: the last extensive excavations, at Swaffham, were only closed at the start of the Second World War.¹⁵ There were numerous local sources, throughout eastern England especially.¹⁶ Peat was employed industrially, as well as domestically, usually in the form of peat charcoal. It was used to fire lime kilns and, alongside wood charcoal, for smelting tin and other non-ferrous metals, only being finally replaced by coal in the first half of the eighteenth century, following the development of the reverberatory furnace.¹⁷

⁷ G. Edelen (ed.) *The Description of England: the Classic Contemporary Account of Tudor Social Life*, by William Harrison (1994), p.281.

⁸ I. R. Rotherham, *Peat and Peat Cutting* (2011).

⁹ I.G.Simmons, *The Moorlands of England and Wales: an Environmental History 8000 BC – AD 2000* (2003), p. 233; C.P. Rodgers, E.A. Straughton, A.J.L. Winchester, & M. Pieraccini, *Contested common land. Environmental governance past and present* (2011), p.93.

¹⁰ O.Rackham, *Trees and Woodland in the British Landscape* (1976), p. 93.

¹¹ I. Whyte, *Transforming Fell and Valley: Landscape and Parliamentary Enclosure in North West England* (2003), p. 33.

¹² Rotherham, *Peat and Peat Cutting*, p.25.

¹³ J. Langton, *Geographical change and industrial revolution. Coalmining in south west Lancashire 1590-1799* (1979), pp.56-7.

¹⁴ F.M. Eden, *The state of the poor: or, an history of the labouring classes in England from the Conquest to the present period* (1797), p.566.

¹⁵ A.Day, *Fuel from the Fens* (1999), p.vi.

¹⁶ T. Williamson, *The Norfolk Broads: a Landscape History* (1997), pp. 98-103.

¹⁷ M. Palmer and P. Neaverson, *Industry in the Landscape 1700-1900* (1994), pp. 48, 83; Simmons, *Moorlands*, p.128.

Many other combustible materials were regularly cut from marginal land but have received little attention in calculations of aggregate fuel supplies.¹⁸ Both heathlands, and to a lesser extent moors, grew significant quantities of gorse or ‘furze’ (*Ulex* sp.), boom (*Sarmanthus scoparius*), heather (*Calluna vulgaris*, *Erica* sp.) and other vegetation which was burned as a domestic fuel.¹⁹ In the early seventeenth century Thomas Blenerhasset could comment of Horsford Heath near England’s second city that ‘This heathe is to Norwich and the Countrye heare as Newcastle coales are to London’.²⁰ Gorse was sometimes cultivated in special enclosures, protected from grazing. At Sithney in Cornwall, for example, it was reported in 1801 that

Here are, it is almost literally true, no trees; consequently a considerable part of every estate is under furze, which would frequently, with proper cultivation, produce whatever the cultivated lands now produce.²¹

Heather was more widely exploited, cut in the form of turves which were dug to a depth of at least 2.5 cm, which thus included both the vegetation and more importantly a portion of matted root material. In the 1760s, Gilbert White, writing about the almost treeless Forest of Wollmer near the south coast in Hampshire, noted how ‘such forests and wastes... are of considerable service to neighbourhoods that verge on them, by furnishing them with peat and turf for their firing’. Heather, broom and gorse were all used industrially, especially for firing brick kilns. When Blickling Hall in Norfolk was constructed in 1617-21 for example more than a million bricks were fired in kilns entirely fuelled with gorse and broom faggots.²² Well into the nineteenth century most of the kilns on the Bedfordshire brick fields were likewise fired using heathland vegetation.²³

The continuing importance of peat, gorse, heather and the rest as fuel, at least amongst the poorer elements in society, into the early nineteenth century is evident from the terms of numerous nineteenth-century enclosure awards. In recognition of customary uses (and also to reduce claims on poor relief) parliamentary enclosure commissioners often allotted an area for use as a fuel allotment, to be cut by the poor for gorse, turf or peat, although sometimes rented out from the start to provide coals for them.²⁴ In upland areas enclosure commissioners often allocated a ‘moss dale’ for the cutting of peat not to the poor, but to farmers, smallholders and cottagers.²⁵

Farmland Trees and Hedges.

Other significant sources of fuel have also been largely ignored by historians: for it is clear that much of the fuel wood consumed in England did not in fact come from

¹⁸ e.g. Warde, *Energy Consumption*, p.21.

¹⁹ C. J. Humphries and E. Haughnessy, *Gorse* (1987).

²⁰ T. Barrett-Lennard, ‘Two hundred years of estate management at Horsford during the 17th and 18th centuries’, *Norfolk Archaeology* 20 (1921), pp. 57-139; p.20.

²¹ M. Turner, *Home Office Acreage Returns HO67. List and Analysis* (1982), I, pp. 33-4.

²² Norfolk Record Office, MC3/45. Map of 1729, Blickling Hall, no catalogue number.

²³ A. Cox, *RCHME Survey of Bedfordshire. Brickmaking: a History and Gazetteer* (1979), p.27.

²⁴ S. Birtles, ‘“A Green Space Beyond Self Interest”: the Evolution of Common Land in Norfolk c.750-2003’. Unpublished PhD thesis, University of East Anglia, 2003.

²⁵ Whyte, *Transforming Fell and Valley*, p.76

coppiced woodland at all, but from hedges and farmland trees. Hedges, the main form of field boundary in lowland England, needed to be rigorously managed, otherwise they would develop into a line of unconnected shrubs and trees, and this was achieved in two main ways, both of which would of necessity have produced significant quantities of fuel wood. The most familiar is perhaps *laying* or *plashing*, in which the hedge was cut back and the principal stems carefully woven to form, on regrowth, a solid wall of vegetation.²⁶ But in many districts hedges were simply *coppiced*: their constituent shrubs were cut down, at intervals of between ten and twenty years, to within a few centimetres of the ground.²⁷

By the end of the eighteenth century hedges were usually planted solely with hawthorn or blackthorn, or with a combination of these species, and single-species thorn hedges were also recommended by some seventeenth-century agricultural writers.²⁸ But the evidence of numerous other early writers, including Fitzherbert and Norden, as well as the comments of foreign visitors and others, indicate that the planting of mixed hedges was common in the early modern period and continued into the eighteenth century.²⁹ Landowners planted a range of shrubs partly because it was hard to source large quantities of hedging thorn but also because, while the latter made a good stock-proof barrier, it had few other practical uses, made indifferent firewood, and was awkward to handle. Useful species might also be added some time *after* hedges had been planted. Arthur Young thus described in the early nineteenth century how in Hertfordshire the need for firewood had ‘induced the farmers to fill the old hedges everywhere with oak, ash, sallow and with all sorts of plants more generally calculated for fuel than fences’.³⁰ Even in the late eighteenth and early nineteenth centuries, when single-species planting had become the norm, older hedges were still a major source of fuelwood. William Marshall noted in 1787 how, in north-east Norfolk, the ‘old hedges, in general, abound with oak, ash and maple stubs, off which the wood is cut every time the hedge is felled; also with pollards, whose heads are another source of firewood’. The entire supply of wood in the district, he added, ‘may be said, with little latitude, to be from hedge-rows’.³¹

As this quotation indicates, most hedgerows contained pollarded trees – trees managed like aerial coppices. Leases often laid down detailed stipulations regarding the management of both, normally reserving the ‘bolling’ or trunk of the pollards to the landlord, restricting the frequency with which hedges and pollards could be cropped and sometimes insisting that pollards should only be cropped when the hedges in which they stood were plashed or otherwise ‘new made’. A lease drawn up in 1693 concerning a farm in Aldenham in Hertfordshire stipulated that the tenant ‘shall not lopp or cutt or cause to be lopped or cut any of the pollards growing upon the premises but when the hedges shall be new made and ditches scoured where the sayd pollards do grow’.³² Pollards also grew free-standing in pastures and meadows, and the number of farmland trees in old-enclosed districts is often astonishing. A farm

²⁶ R. and N. Muir, *Hedgerows: Their History and Wildlife* (1997), pp.96-104

²⁷ N. Kent, *General View of the Agriculture of Norfolk* (1796), p.182; W. Stevenson, *General View of the Agriculture of Lancashire* (1815), p. 212.

²⁸ J.Worlidge, *Systema Agriculturae; the Mystery of Husbandry Discovered* (1681), p101.

²⁹ W. Johnson ‘Hedges: a Review of Some Early Literature’, *Local Historian* 13, 195 – 204; pp. 197-9; J. Fitzherbert, *The boke of husbandry* (1533), p. 53; Norden, *Surveyor’s Dialogue*, p. 201.

³⁰ A. Young, *General View of the Agriculture of Hertfordshire* (1813), p.49.

³¹ W. Marshall, *The Rural Economy of Norfolk*, two vols. (1787), Vol. 1., p.96.

³² Hertfordshire Archives and Local History, D/EAm/E3.

survey made at Denham in Suffolk in 1651, for example, suggests that there was an average of 38 trees per hectare, while at Thorndon in the same county another, made in 1742, implies no less than 72 per hectare.³³ A set of detailed maps drawn up as late as the mid eighteenth century by Henry Keymer for farms in Norfolk, which record every hedgerow tree on the properties surveyed, suggest an average density of around 37 per hectare.³⁴ As late as 1784 a survey of West End Farm in Wormley in south-east Hertfordshire recorded an incredible 1,496 trees scattered through 28 fields covering a mere 38 hectares.³⁵ Most of these trees – usually between 75% and 85% - were pollarded.

Pollards were also a prominent feature of many commons.³⁶ When in 1695 the commoners went to law in an abortive attempt to prevent their manorial lord, Sir Henry Monson, from felling the hornbeam pollards growing on Cheshunt Common it was said that there were 24,000 on 1,186 acres: that is, a density of around 50 per hectare.³⁷ Estate accounts show that Monson's descendants were still lopping the pollards on nearby Broxbourne Common as late as 1778 on a twelve-year rotation. No less than 3,809, again probably hornbeams, grew on 60 acres, a density of over 155 per hectare.³⁸

The local and regional availability of these various sources of fuel depended on a very wide range of factors – geology, enclosure history, and the extent to which – on common land especially – fuel production was compromised by agricultural use, in the form of livestock grazing. Where this was intense plants like gorse and broom could not grow into the large, woody plants suitable for firewood. John Norden, writing in 1618, described the gorse in the West Country, which grew 'very high, and the stalke great, whereof the people make faggots'. He continued:

And this kind of Furse groweth also upon the Sea coast of *Suffolke*: But that the people make not the use of them, as in *Devonshire* and *Cornwalle*, for they suffer their sheep and cattell to browse and crop them when they be young, and so they grow too scrubbed and lowe tufts, seldome to that perfection that they might be.³⁹

Fuel supply and agriculture

It is not my purpose here to venture an estimate of the quantities of fuel which, in aggregate, these various neglected sources must have produced: but it may have been enough to modify, by several decades, many recent estimates of the date at which coal became the primary supplier of thermal energy in England, which principally compare

³³ J. Theobald, 'Changing Landscapes, Changing Economies: Holdings in Woodland High Suffolk 1600-1840', Unpublished MA dissertation, University of East Anglia 1993; West Suffolk Record Office T1/1/6.

³⁴ Norfolk Record Office, WIS 138, 166X3; NRO PD 703/45-6. See also G. Barnes and T. Williamson, *Ancient Trees in the Landscape: Norfolk's Arboreal Heritage* (2011), pp. 64-82.

³⁵ Together with 569 'spars' or immature specimens: Hertfordshire Archives and Local History D/EBb/E27

³⁶ G. Barnes, P. Dallas, H. Thompson, N. Whyte and T. Williamson, 'Heathland and Wood Pasture in Norfolk: Ecology and Landscape History', *British Wildlife* 18 (2007), pp. 395-403.

³⁷ Hertfordshire Archives and Local History 10996 A/B.

³⁸ Hertfordshire Archives and Local History D/EBb/E26.

³⁹ J. Norden, *The Surveyor's Dialogue* (1618), p. 235.

– as we have noted – coal production with the amount of fuel produced by managed woods. What is clear is that it was only in the course of the eighteenth and early nineteenth centuries that most areas of England came to use coal as a normal domestic fuel – and with major impacts on the agricultural landscape.

As population rose rapidly after 1750 it made more economic sense, in many circumstances, to use land formerly employed to produce fuel to grow food. Rising food prices may thus have served to increase the cost of local fuels, especially wood, relative to that of coal. This is because traditional fuels competed for space with cropped land: the rise in the value of crops would therefore raise the rental value of areas like managed woods, and thus the cost of the fuel cut from them. As Rock Church expressed it in his *Old Thrift Newly Revived* of 1612, the price of coppice wood in any region was determined by 'the value and vent for Wheat is in that place where it groweth'. If the price of grain went up, so must the price of wood, even if demand for wood remained unchanged.⁴⁰ But substitution of local fuels by coal would not have been possible on any scale if the latter had not become more freely available, and the crucial factor here was unquestionably the progressive improvements in transport which occurred in the middle and later decades of the century.

Contemporaries were agreed on the importance of water transport in structuring the use of coal. William Harrison, writing in the 1570s, noted how coal use was just beginning to spread 'from the forge into the kitchen and hall, as may appear already in most cities and towns *that lie about the coast*, where they have little other fuel except it be turf or hassock' [our italics].⁴¹ Pehr Kalm in 1748 similarly observed that while coal could be found in London, and was widely burned in villages within a fourteen mile radius, 'in places to which they had not any flowing water to carry boats loaded with coals' the population continued to burn wood - mainly from 'trees they had cut down in repairing hedges' - or 'fuel of some other kind, as bracken, furze etc'. Of particular importance, therefore, in the spread of coal use was the massive extension of the canal network following the completion of the Bridgewater canal (designed to serve the coal mines at Worsley) in 1761, 'the movement reaching a crescendo in the 'mania' of 1789-93'.⁴² The canal mania was directly paralleled by the improvement in roads through the establishment of turnpike trusts, which was likewise rapid in the later eighteenth century.

The spread of coal use had major implications which have never really been fully explored by economic or environmental historians. In the seventeenth century the English countryside had been a source of fuel as well as food: by the nineteenth century, fuel production had become a minor aspect of land use, outside managed woodland, and this change in the balance of priorities is apparent in many aspects of the rural landscape. The steady decline in pollarding is particularly noteworthy. Opposition to pollarding had existed from the seventeenth century but this was in large measure because the practice was associated with common rights and with damage to timber trees on tenanted land, and as late as the mid-eighteenth century pollarding was being written about in a positive manner by men like William Ellis. In the second half of the century, however, opposition mounted, and in 1796 William Marshall typically declared himself 'an ...enemy to Pollards; they are unsightly; they encumber and

⁴⁰ R. Church, *An Old Thrift Revived* (1612), p.29.

⁴¹ Edelen, *Description of England*, p.281.

⁴² N.Cossons, *The BP Book of Industrial Archaeology* (1987), p.256.

destroy the Hedge they stand in ... and occupy spaces which might, in general, be better filled by timber trees; and, at present, it seems to be the prevailing fashion to clear them away.⁴³ By the middle of the nineteenth century most farmland trees were managed as timber, rather than pollards, a dramatic reversal of the situation a century earlier.

More important, perhaps, is the way in which the middle and later decades of the eighteenth century saw a decisive shift towards the planting of single-species thorn hedges. The practice of multi-species planting seems to have declined to such an extent that the authors of the various *General Views of Agriculture*, produced in the decades around 1800, regularly contrasted 'recent' and 'old' hedges in terms of the types of shrubs they contained. The Rev St. John Priest, for example, in the *General View of the Agriculture of the County of Buckinghamshire* of 1813 noted that the hedges of that county 'are of two sorts, old and new. The old fences consist chiefly of a mixture of ash, willow, and hazel, with some whitethorn ... The new fences consist of whitethorn...'.⁴⁴ John Boys, writing about Kent, noted the difference between 'old hedges, such as Nature has formed', and the newer 'quickset hedges raised from the berries of the white thorn';⁴⁵ while in Cheshire the contrast was between the new enclosures, of 'white, or haw-thorn', and the 'ancient fences', consisting of 'hasle, alder, white or black-thorn, witch-elm, holly, dogwood, birch &c &c'.⁴⁶ At the start of the nineteenth century Arthur Young commented that the new style of hedge, neatly trimmed and composed entirely of hawthorn, was 'a mere luxury and ornament, and has nothing profitable to recommend it'. He added, significantly: 'Hedges thus cease to be the collieries of a country'.⁴⁷

Many agricultural historians continue to place the 'new rotations', featuring clover and turnips or other root crops, at the centre of the eighteenth- and early nineteenth-century 'agricultural revolution'.⁴⁸ The enhanced supplies of Nitrogen and other chemicals necessary for crop growth which resulted from increased stocking levels raised yields, together with the expansion of the cultivated acreage, provided sufficient grain to feed the rapidly expanding (and increasingly urbanised) population in the period after 1750. As all historians are aware, however, other developments were also important in raising productivity, and it is arguable that many of these were directly or indirectly related to the onset of large-scale industrialisation. Increases in soil fertility would have produced weeds as much as crops, and turnips were only beneficial if sufficient labour was available to weed them. Large inputs of labour were also required for the various schemes of reclamation, enclosure, marling and under-drainage crucial to agricultural 'improvement'. It is therefore probably significant that the industrialisation of the north and west of England led to a measure of de-

⁴³ William Marshall, *Planting and Rural Ornament* (1796), pp.100-101.

⁴⁴ Rev. St John Priest, *General View of the Agriculture of the County of Buckinghamshire* (1813), p. 123.

⁴⁵ J. Boys, *General View of the Agriculture of the County of Kent* (1813), p.61

⁴⁶ H. Holland, *General View of the Agriculture of Cheshire* (1813), p. 121.

⁴⁷ Young, *Hertfordshire*, p.52.

⁴⁸ The central importance of the enhancement of soil nitrogen, emphasised in the 1980s by G.P.H. Chorley in 'The Agricultural Revolution in Northern Europe, 1750-1880: Nitrogen, legumes and Crop Production', *Economic History Review* 34 (1981), pp. 71-93; and in the 1990s by J. Sheil, 'Soil Fertility in the Pre-Fertiliser Era', in B. Campbell and M. Overton (eds) *Land, Labour and Livestock* (1991), pp. 51-77; has been restated forcibly by Robert Allen, 'The Nitrogen Hypothesis and the English Agricultural Revolution: a Biological Analysis', *Journal of Economic History* 68 (2008), pp. 182-210.

industrialisation across large parts of the populous south and east, lowering real wages in key areas of arable production.⁴⁹ The progressive improvements in transport outlined above may also have had an impact on levels of overall food production, for they allowed the cultivation of cereals to be concentrated in those areas best suited by climate and soils to arable farming: the period between 1750 and 1850 saw a significant reorganisation of England's agrarian geography, with the emergence of the modern division between a largely pastoral west and a largely arable east.⁵⁰

The substitution of coal for local fuels is arguably another part of this complex jigsaw of interdependence between industrialisation and agrarian change, for many of the 'improvements' considered important by contemporaries were directly associated with the declining value of traditional fuels. The enclosure of commons and the reclamation of marginal land were thus frequently associated with the destruction, on a massive scale, of supplies of gorse, heather and broom on heaths and – through drainage – of peat on the remaining fens and mosses. The enclosure of commons also led, in some districts, to the removal of untold thousands of pollards, as for example when the Midland forests like Rockingham were enclosed and largely turned over to farmland or plantations. The northern section of the 2,000-acre Northaw Common in Hertfordshire still had thousands of pollards growing on it when enclosed by an Act of 1803: the work of division was continuing when the Ordnance Survey draft 2" map was made, the surveyor writing the words 'clearing for enclosure' across its area, indicating clearly enough its expected fate. Of course, historians have often concentrated on the supposed agrarian benefits arising from the enclosure of 'wastes'. But major increases in the arable area, and in yields per acre, also came from changes in the landscape of districts which had long been enclosed, especially in south-east England and East Anglia. These involved the removal of pollards from field boundaries, the widespread replacement of mixed species hedges with ones composed solely with hawthorn, and a significant degree of hedge removal and field amalgamation. Where successive maps of a farm or parish exist in such areas significant amounts of 'rationalisation' are usually apparent: the rector of Rayne in Essex typically observed in his tithe accounts of the 1780s how on one local farm 'the fields were over-run with wood', but 'since Mr Rolfe has purchased them, he has improved them by grubbing up the hedgerows and laying the fields together'.⁵¹ A few landowners, such as George Hall at Weston Colville in Cambridgeshire in 1825, planned (and largely carried out) reorganisations of ancient field patterns which were so extensive that the areas in question today resemble, with their ruler-straight hawthorn hedges, landscapes created by parliamentary enclosure.⁵²

It is noteworthy that the 1791 government enquiry into the state of the nation's timber supplies included the question: 'Whether the Growth of Oak Timber in Hedge Rows is generally encouraged, or whether the grubbing up of Hedge Rows for the enlarging

⁴⁹ T. Williamson, *The Transformation of Rural England: Farming and the landscape 1700-1870* (2003), pp.168-70.

⁵⁰ *Ibid.*, pp.158-63: the change is clear when the maps of early modern farming regions prepared by E. Kerridge, *The Agricultural Revolution* (1967), or Joan Thirsk, *England's Agricultural Regions and Agrarian History 1500-1750* (1987), are compared with those of nineteenth-century farming regions presented by writers like James Caird, *English Agriculture in 1851-2* (1850).

⁵¹ Essex Record Office D/P 126/3/2

⁵² Cambridgeshire Record Office 124/P83a.

of fields, and improving Arable Ground, is become common in those Counties?’⁵³ The answers received suggest that in arable districts hedge removal was ‘frequent’, ‘becoming common’, or the ‘general practice’.⁵⁴ Farming diaries from the period, where these exist, likewise indicate the extent of landscape ‘tidying’ which went on in many old-enclosed districts.⁵⁵ In 1801 one observer of the Essex countryside was able to declare: ‘what immense quantities of timber have fallen before the axe and mattock to make way for corn’. The comment would have been appropriate in many old-enclosed areas of southern and eastern England.

There is an understandable tendency amongst historians to discuss major economic and environmental developments in national rather than in regional or local terms. Whatever the pace of national transition, for many purposes a more critical matter was the regional and local character of the spread of coal use beyond coal fields and major urban centres, so that coal became the main provider of thermal energy in each *district* of England and Wales. This development, in association with other circumstances, allowed quite substantial areas of land to be freed up for food production, and permitted a significant intensification of agriculture on others, producing a number of significant changes in the fabric of the rural landscape. These were in one sense local and regional developments, but they had major national implications, in both environmental and economic terms.

⁵³ S.Lambert (ed.) *House of Commons Sessional Papers of the Eighteenth Century: George III; Reports of the Commissioners of Land Revenue*, 8-11, 1792 (1977), pp.708, 724, 748

⁵⁴ *ibid*, p.776.

⁵⁵ S. Wade Martins and T. Williamson, *The Farming Journal of Randall Burroughes 1794-1799* (1995), p.29.