

Counting Sheep: Waking up to New Estimates of Livestock Numbers in England c 1800*

By MICHAEL TURNER

Abstract

Before the appearance of official basic agricultural statistics in the 1860s agricultural historians have had relatively few estimates of the extent of farm crops and the number of farm animals on which to rely. This article is concerned with farm animals. It is based on a series of government inquiries which were conducted from 1796–1803, which together covered about 25 per cent of the land area of England. Estimates of the size of the national herds of cattle, pigs, horses, and sheep have been constructed on the basis of these inquiries. From this base, the article proceeds to concentrate on the sheep estimate, which turns out to be much smaller than the one which historians have used in the past. A case is made for suggesting that the recycling of old estimates, on the basis of guesswork rather than scientific methods, has perpetuated a myth about the size of the sheep population in c 1800.

A MEASUREMENT or estimate of the composition of the cultivated area of England is a prerequisite for subsequent calculations of the arable output of the country, but it is not the only prerequisite for an estimate of agricultural output as a whole; equivalent data on the number and types of animals are also required. These prerequisites are made the more difficult for periods when no censuses are available. In 1801, however, an arable census of sorts was conducted, popularly known as the 1801 crop return.¹ But there has been no attempt to venture new estimates of the size of the livestock sector. Volume VI of the *Agrarian History of England and Wales* covering the period 1750–1850 merely reiterated the dated, casual, well-known references which are

paraded on such occasions.² This is not surprising, however, since there is not a comparable 1801 national survey for the livestock sector, nor anything remotely similar for that date or for a further fifty-three years when tolerably good estimates can be derived from the sample counties employed in the 1854 experiment at collecting national agricultural statistics.³ However, there may yet be sufficient fragmentary observations and related data available to make at least an initial estimate of the size of the national herd for the early nineteenth century, which is a prerequisite to making a sensible estimate of agricultural output.

In parts I and II the data are described and a method of estimating the national herd of cattle, sheep, pigs and horses is suggested. This employs a sample of data which cover about 25 per cent of the land area of England. In part III these new estimates for horses, cattle and pigs are placed alongside those which are currently

* My thanks to Bethanie Afton, John Beckett, David Richardson and Donald Woodward for sharing with me some of their thoughts about reconstructing the national livestock herd. My thanks also to the multitude of archivists who answered my inquiries and furnished me with documents. Finally my thanks to the useful comments of referees who must bear collective responsibility for the flights of fancy conjectured in the concluding paragraphs.

¹ M Turner, 'Arable in England and Wales: estimates from the 1801 crop return', *Jnl Hist Geog*, 7, 1981, pp 291–302; M Turner, ed, *Home Office Acreage Returns (HO 67)*, List and Index Society, vols 189, 190, 195, 196, 1982–3.

² G E Mingay, ed, *The Agrarian History of England and Wales*, VI, 1989, in particular the chapters by H C Prince and B A Holderness, though see *passim* under the named animals and their numbers.

³ Mingay, *Agrarian History*, pp 1042–44. See also Phillip Dodd, 'The agricultural statistics for 1854: an assessment of their value', *AHR*, 35, 1987, pp 159–70.

in use, and their plausibility is examined. In part IV the focus of attention is very much on the new sheep estimates in which it is suggested that for too long historians have relied upon a source which seems grossly to exaggerate the size of the national sheep herd. If this allegation is true then it should have serious implications for any estimates of the contribution of sheep to agricultural output, and also implications for our understanding of the growth of the domestic woollen industry over the course of the eighteenth and nineteenth centuries.

I

During the French Wars of the 1790s, and again when the Peace of Amiens broke down after 1802 there was a real fear in Britain that a French invasion was not only possible, but imminent. These fears were founded on facts, with French landings between 1796–8 in Bantry and Killala Bays in Ireland, a landing in west Wales, the observable build up of an invasion flotilla in the French Channel ports, as well a general spirit of republicanism and revolution which spilled over from both France and Ireland into Britain in the 1790s.⁴ In the event there was no invasion, but while the threat remained the British state undertook some precautionary measures. These included the mobilization of the local militia under the Posse Comitatus, the supplementation of that militia, and also the call to arms and service of volunteers. These measures were usually conducted at the local county level under the direction of the lords lieutenant and their deputies,

and usually what information survives about the local preparations for invasion are found in the county lieutenancy and militia records. Occasionally they are found in the private papers of the descendants of a particular lord lieutenant (the case with Cornwall, and also with the equivalent officer, the governor, for county Down in Northern Ireland, for example), and also in quarter sessions records (Hampshire for example). A number of these records have been researched and local county studies have been written up.⁵

Under the authority of the 1798 Defence of the Realm Act (38 Geo III, c 27, 5 April 1798) and repeated in the reconstituted 1803 Defence of the Realm Act (43 Geo III, c 55, 11 June 1803), the lieutenancy were given specific instructions for preparing for the invasion. This included a live and dead stock census.⁶ The idea was to construct an inventory of the amount of moveable live-stock (cattle, sheep, etc), and deadstock (grain and other stored crops), and also of the number of vehicles such as barges, carts, carriages and wagons which were available and could be requisitioned, along with the number of people who could act as pioneers and wagon drivers if the emergency ever came about. These people would be mobilized to transport the farm animals and deadstock to positions of relative safety inland, from which the defending armies and civilian population could be provisioned while at the same time denying the invader a ready means of supply. In the last resort there were details about the implementation of a scorched earth

⁴ See in general, R Glover, *Britain at Bay: Defence against Bonaparte, 1804–14*, 1973. In detail see PRO(Kew), HO/42/39 ff 231–3, letter 31 December 1796, from George Dunbar, major of Liverpool informing the Secretary of State for Home Affairs, the duke of Portland, of the French fleet which had entered Bantry Bay, county Cork; see also the series of articles published in the 1970s by P M Kerrigan, 'The defence of Ireland 1793–1815', *An Cosantoir*, various; PRO(Kew), HO/42/40 ff 88–91, correspondence of February 1797 about the French landing in Cardigan Bay. And on the revolutionary spirit see R Wells, *Insurrection: the British Experience 1795–1803*, Gloucester, 1983.

⁵ For example G H Kenyon, 'The civil defence and livestock returns for Sussex in 1801', *Sussex Arch Coll*, 89, 1950, pp 57–84; J Cranmer-Byng, 'Essex prepares for invasion 1796–1805', *Essex Review*, 60, 1951, pp 127–34, 185–93, and 61, 1952, pp 43–7, 57–74; W E Minchinton, 'Agriculture in Dorset during the Napoleonic Wars', *Proc Dorset Nat Hist and Arch Soc*, 77, 1955 pp 162–73; M Y Ashcroft, *To Escape the Monster's Clutches*, North Yorkshire County Record Office Publications 15, Northallerton, 1977; M Turner, 'Livestock in the agrarian economy of counties Down and Antrim from 1803 to the Famine', *Irish Econ and Soc Hist*, 11, 1984 pp 19–43.

⁶ The Defence Acts were of course public documents, but thereafter the secrecy with which the invasion preparations were subsequently carried out is open to considerable doubt in view of the public notices printed in local newspapers, such as *The Stamford Mercury*, 2 March 1804. My thanks to Shirley Brook for this reference.

policy. Thus when the earl of Carlisle, the lord lieutenant of the East Riding of Yorkshire, was instructed by the Home Office on 31 October 1803 on the removal of live and dead stock to places of safety inland, he was told that those horses and draft cattle which were not required by the army or for transport services, and which otherwise would be in danger of falling into enemy hands, were to be 'shot or hamstrung and the Axle trees or Wheels of all Carriages in the same Predicament should be broken to pieces, or damaged as much as possible'.⁷ Not all of this kind of correspondence or the ensuing detail has survived, and even where it has it is often only a fragment of what was originally said or collected. This article, however, is concerned with the details of the livestock only.

The blueprint for the scheme which was actually implemented was the initiative of the lord lieutenant of Dorset who responded to instructions and requests from the Secretary of State for Home Affairs in 1796 in a more thoughtful and detailed way than his counterparts elsewhere. In August of that year the Home Office prepared some 'General Sketch(es)' for driving the country. They were essentially descriptions of the transportation arrangements which might be implemented in the event of invasion, and the identification of places of refuge, collection, and distribution of produce, and also of places for depasturing animals. These sketches were prepared for the coastal counties of southern England from Somerset round to Norfolk. In consequence the lord lieutenant of Dorset conducted a survey of the moveable live and dead stock available within about 6–8 miles of the coastline of his county.⁸ In general

this scheme became known as 'Driving the Country'. The Dorset plan was widely publicized and thereby set in train what should have been a nationwide survey.⁹ The Defence Act of 1798 was therefore founded 'upon the proceedings taken under the Common Law in the County of Dorset'.¹⁰ Probably in reality, and certainly if the survival rate of the returns is anything to go by, the nationwide survey was either never undertaken in 1798 (nor in 1801 or 1803 when similar surveys were requested), or not undertaken seriously. The coastal counties were in the front line and the inquiry therefore only needed to be partial; and even where details survive they are sometimes only fragments. This arises because the lords lieutenant devolved the responsibility for collecting the data from the county down to the individual militia divisions within the county, and thence down to the parish or other local community division for final collection at the individual farm level. Therefore fragments relating to farms, parishes or other local communities, divisions or groups of divisions, or whole county summaries may survive. Yet when they do survive in the manner which was originally intended they constitute, amongst other things, a live-stock census, containing details of cattle (which can include a breakdown of the information in terms of young and mature beasts, cows and oxen), horses (both draft and riding), sheep (and sometimes goats separately) and pigs. Table 1 summarizes the survival rate of this census, as far as it has been ascertained for England and Wales.

⁷ Humberside Record Office [HRO] LT/4/1, letter of 31 October 1803 from Mr Secretary Yorke to the earl of Carlisle.

⁸ PRO (Kew), HO/42/39, August 1796, and Dorset document in October 1796. In general HO/42/39–43, 46, contains a wealth of information about the invasion plans of the period 1796–98 including a letter of 26 April 1797 (HO/42/40/f 22) from the duke of Northumberland as lord lieutenant of Northumberland in which he refers to the request of the previous November for an

account of live and dead stock within 10–12 miles of the sea and in which he states that he appends the completed returns. However, the return is not with the letter.

⁹ For example, those parts of the Dorset plan which embodied a 'State of the Civil Power of the County of Dorset' can be found in the surviving lieutenantancy papers in East Yorkshire, HRO, LT 9/52, for which see M Turner, 'Dorset prepares for invasion', *Somerset and Dorset Notes and Queries*, 31, no 319, 1984, pp 347–50.

¹⁰ Toulmin Smith, *National Defence in Practice with the Opinions of William Pitt, Charles James Fox, etc, etc, on the Arming of the People*, 1859, p 9.

TABLE I
The livestock inquiries of 1796-1804

County	Date	Coverage (percentage)*		Nature of survival
Berkshire	1798(?)	100	CRO	
Cambridge	1803/4	0	CRO	^a
Cheshire		0		
Cornwall	1803	88	CRO	^b
Cumberland		0	CRO	
Devon		0		
Dorset	1796	36	PRO	parishes within 6-8 miles of the sea
Dorset	1803/4	100	CRO	
Durham	1796	6	CRO	^c
Essex	1798	100	CRO	and in Cranmer Byng
Gloucester	1803/4	0	CRO	^d
Hampshire	1798	18	CRO	
Kent		0		
Lancashire	1803	?		^e
Lincolnshire	1798	100	CRO	
Norfolk	1803	100		In R F Mason
Northumb	1803	100		In S MacDonald
Nottingham	1798	neg	CRO	^f
Somerset	1803/4	4	CRO	^g
Suffolk	1798(?)	neg	CRO	^h
Sussex	1801	100		In G H Kenyon
Westmorland		0		
Yorkshire E		0		
Yorkshire N	1801	8	CRO	ⁱ
Wales		0		^j
Antrim	1803	25		In W S Mason ^k
Down	1803	89	PRONI	and in Turner ^l

* Coverage is the percentage of the land area in the county covered by the surviving parish or 'district' returns.

^a There are surviving returns of horses, conveyances (waggons) and drivers for the Isle of Ely. The surviving 'Minutes of subdivision meetings of Deputy Lieutenants', 1803-4 indicate that parish returns were submitted but their final resting place is unknown.

^b Covering the whole of Cornwall except the hundred of Penwith which is the most westerly hundred in the county including Camborne, Redruth, St Ives, and Penzance.

^c For a closely grouped set of parishes in the east division of Chester Ward.

^d Returns of horses and waggons only for parishes in Whitestone hundred.

^e There is a reference to the 1803 inquiry for Lancashire including a quotation for sheep numbers in J Luccock, *An Essay on Wool*, 1809, p 317. It is far from certain that this quotation is for the whole county.

^f One parish only (ex information Professor J V Beckett).

^g For a closely grouped set of parishes in and around Bath.

^h Livestock returns for three parishes only, but there are also 47 parish returns for the hundred of Blything which give horse numbers alone, and related information with regard to waggons and carts.

ⁱ For a closely grouped set of parishes in Langbaurgh East wapentake.

^j There are no surviving returns for Wales, nor indeed any ever compiled according to Thomas.

^k For the parishes in the three north Antrim baronies of Cary, Upper and Lower Dunluce.

^l Covering all of the parishes in the baronies of Dufferin, Newry Lordship, and Mourne, 99 per cent by area of Upper Iveagh, 93 per cent of Lower Iveagh, 90 per cent of Ards, 84 per cent of Kinelarty, 76 per cent of Castlereagh Lower and Upper, and 68 per cent of Lecale barony.

Sources: Berkshire CRO, D/ERA 07; Cambridgeshire CRO, 283/0116, 0120, 0122; Cornwall CRO, Enys Papers, EN1820/1 and 2, Abstract of Returns; PRO(Kew), HO/42/39, October 1796 (see also W E Minchinton, 'Agriculture in Dorset during the Napoleonic Wars', *Proc Dorset Nat Hist and Arch Soc*, 77, 1955, pp 166-72); Dorset CRO, M6, Plan of the County of Dorset; Durham CRO, Q/D/LM/27-51; J Cranmer-Byng, 'Essex prepares for invasion 1796-1805', *Essex Review*, 61, 1952, p 63; Gloucester CRO, D149 X29; Hampshire CRO, Quarter Sessions Records, Q22/1/2/5/1-83; Lincolnshire CRO, LAO K/QS/Militia-Military, Lincolnshire 1798; J Luccock, *An Essay on Wool*, 1809, p 317; R H Mason, *The History of Norfolk*, 1884, p 463 (my thanks to the late B A Holderness for this reference); S Macdonald, 'Agricultural response to the changing market during the Napoleonic Wars', *Econ Hist Rev*, sec ser, 32, 1980, pp 70-1; Nottingham CRO (ex-information Professor J V Beckett); Somerset CRO, DD/RG/69-72; E Suffolk CRO, FB 220/A7/3; W Suffolk CRO, Ref. 613/19/1; Acc no 786; G H Kenyon, 'The civil defence and livestock returns for Sussex in 1801', *Sussex Arch Coll*, 89, 1950, p 62; M Y Ashcroft, *To Escape the Monster's Clutches*, North Yorkshire County Record Office Publications, 15, Northallerton, 1977, pp 112-51; D Thomas, *Agriculture in Wales during the Napoleonic Wars*, Cardiff, 1963, p 18; W S Mason, *A Statistical Account, or Parochial Survey of Ireland*, 1, Dublin, 1814, pp 172-3; also John Dubourdieu, *Statistical Survey of the County of Antrim*, Dublin, 1812, pp 446-7; PRO(Northern Ireland), D/654/A2; M Turner, 'Livestock in the agrarian economy of counties Down and Antrim from 1803 to the Famine', *Irish Econ and Soc Hist*, 11, 1984, pp 37-41.

In addition, as indicated, individual parish returns are available for 89 per cent of the land area of county Down in Northern Ireland and for about 25 per cent of county Antrim.¹¹ The coastal counties dominate, as expected, but where only part-county details survive they are not necessarily for coastal parishes or places. For example, most of the surviving Hampshire returns cover the old county hundred divisions centred on Basingstoke and Odiham in the north, and the surviving returns for Berkshire, a land locked county, have nothing directly to do with the coast.

We cannot be certain that the information arising from the invasion inquiries was collected meticulously or with great accuracy. There may have been local concerns regarding taxation assessments, a not unfamiliar problem encountered by the assessors of the 1801 crop returns, and this concern may have been reflected in underenumeration.¹² However, there is reason to have more confidence in the accuracy of the livestock enquiries, especially the later ones, because the government of the day included instructions to the lords lieutenant to advise farmers and others that there would be indemnification should their livestock be requisitioned for military purposes or if the livestock and other possessions became victims of any scorched earth policy which had to be implemented.¹³ Therefore it was in the best interests of farmers and other owners of live and dead stock to agree to the inventory and to list their possessions fully.

The survival of returns covers four separate attempts at acquiring the information, the 'dummy' run of 1796, and the inquiries of 1798, 1801, and 1803, and even though

the various instructions which were issued through the office of the Secretary of State for Home Affairs were sent out on specific dates, we know that the resulting information often dribbled in over a considerable time within each inquiry. Unlike the harvest inquiries of the 1790s which were specifically about the state of completed harvests, the invasion scare inquiries were an exercise in taking an inventory at the point and moment of assessment, the timing of which could be important according to the state of the annual cycle of birth, slaughter, and other disposal of the animals. For example, it is important for the historian whether the stock taking was before or after the lambing season. On this point we cannot always be sure. As one observer in county Down commented in November 1803, 'It is obvious, that just now, an almost total change will take place, as to cattle and of course, to dead and livestock, in the slaughtering season'.¹⁴ The Down returns were ordered in September/October 1803, but their subsequent transmission and collation date from these months until at least January 1804 with the possibility that some of the undated ones are even later, and the Antrim returns are said to date from January 1804. The 1804 Dorset inquiry is dated 24 May 1804, but this is almost certainly the collation rather than collection date. G H Kenyon, in collating the three separate censuses which were made for Sussex in 1798, 1801 and 1803, says they were made in the summers of those years 'at much the same season as the 4th June returns...today'. This may be the case for Sussex but not for all other counties. For example the individual Hampshire parish and tything returns all date from the third week in April 1798 and in this particular county this calls into question whether the annual lambing cycle

¹¹ Turner, 'Livestock in Down and Antrim'.

¹² For example, see PRO(Kew), HO/42/40 ff 209-10, letter of 19 February 1797 from the duke of Richmond, the lord lieutenant of Sussex, in which he questions the reliability and fullness of the returns arising from the original inquiry of 1796 because of suspicions that the returns might be used for taxation purposes.

¹³ HRO, LT/4/1.

¹⁴ Public Record Office of Northern Ireland, D654/A2/2, general correspondence, 4 November 1803.

was complete and therefore accounted for.¹⁵

II

Can these livestock figures reasonably be used to impute the size of the national herd? For seven counties – Berkshire, Dorset, Essex, Lincoln, Norfolk, Northumberland and Sussex – the animal census is available on a 100 per cent county basis; for an eighth county, Cornwall, there is a survival rate which covers 88 per cent of the county by area. For a ninth, Hampshire, there is coverage of 18 per cent of the county which is the largest surviving fragment of all the other English counties. For Northumberland the number of horses has not been reported.¹⁶ If for livestock purposes the aggregate of these counties (less Hampshire) was a representative sample of England we could indeed make an estimate of English livestock numbers. However, the sample is mostly located in the coastal counties, and, apart from a large proportion of Northumberland and much of Cornwall, it is confined to lowland counties. Yet while this is only the whole or major parts of eight counties from a total of forty, nevertheless together they comprised a land area of either 6.606 or 7.898 million acres (the smaller coverage excluding Northumberland for horses only), which is 25.1 per cent of the land area of England (or 21.2 per cent when

Northumberland is excluded for the horse sample only). This is not a trivial sample. All but two of the counties, Berkshire and Dorset, are larger than the English average, and at over 1 million acres each, Lincolnshire, Norfolk, and Northumberland are three of the five largest English counties.

The representativeness of these counties for estimating English livestock production for c 1800 cannot be guaranteed, not in geographical or agricultural history terms, nor in terms of consistency of year of collection, or of time of year of collection. Nevertheless they do constitute a large, if self-selected sample, and open up the possibility of proceeding for the first time ever to a tentative national estimate of the livestock herd. A number of weighting factors can be suggested for scaling up from the sample to the national estimate. Table 2 presents the raw data for all the counties mentioned so far except Hampshire, and Table 3 presents the estimates which arise from three different methods of weighting and scaling up.¹⁷ The first weighting factor is simply to take the total land area of the whole of seven and the substantial part of the eighth county (Cornwall) as a proportion of the land area of England, and to apply that proportion to the aggregate of animals for the same counties. This results in the first English estimates in Table 3. Yet is the total area of land the correct method of weighting? Perhaps a more appropriate areal measure would be one which was based on the availability of the main feedstuff required by the animals, which in the case of the cattle and sheep was the available pasture land, though heavily supplemented in a number of counties mainly with root crops. In the case of horses the feedstuff would have been pasture and hay, supplemented with oats. B J Capper writing in 1801 produced

¹⁵ Dorset CRO, M6, plan of the county of Dorset, 1804; Turner, 'Livestock in Down and Antrim', pp 23–4, 41; Kenyon, 'Civil defence', p 65; Hampshire CRO, quarter sessions records, Q22/1/2/51–83. Seasonality was a very important factor in many aspects of economic life in seventeenth and eighteenth-century England, as shown in the pattern of weddings by A Kussmaul, 'The pattern of work as the eighteenth century began', in R Floud and D McCloskey, eds, *The Economic History of Britain since 1700*, 1, 1700–1860, 1994, p 5.

¹⁶ S Macdonald, 'Agricultural response to the changing market during the Napoleonic wars', *Econ Hist Rev*, sec ser, 32, 1980, pp 70–1. In addition, there were eleven parish returns unaccounted for in Sussex. When Kenyon wrote up this episode in Sussex history he substituted eight parish returns from the 1803 survey, and for the remaining three parishes which were missing from both the 1801 and 1803 returns he estimated the animal numbers on the basis of the stocking rates per acre of the adjoining and similar parishes: Kenyon, 'Civil defence', pp 62–3.

¹⁷ We cannot sub-divide the animals for all of the counties into different age or sex groups.

TABLE 2
Record of the livestock numbers in c 1800

County	Percentage cover	Date	Cattle	Sheep	Pigs	Horses
Berkshire	100	1798	16974	81369	20502	11876
Cornwall	88	1803	83049	265928	48002	18373
Dorset	100	1804	72795	393670	35562	15491
Essex	100	1798	53009	306797	89594	37013
Lincolnshire	100	1798	124036	784435	39836	32812
Norfolk	100	1803	132538	433915	126218	44608
Northumb	100	1803	75840	451547	27987	
Sussex	100	1801	62047	346589	63094	22620
Sub-totals of England	25.1		620288	3064250	450795	182793

TABLE 3
Estimates of English livestock numbers c 1800

	Cattle	Sheep	Pigs	Horses
	<i>First estimate</i>			
Weights	25.1	25.1	25.1	21.2
Estimate (millions)	2.471	12.208	1.796	0.862
	<i>Second estimate</i>			
Weights	27.9	27.9	—	23.3
Estimate (millions)	2.223	10.983	—	0.785
	<i>Third estimate</i>			
Weights	20.7	28.8	24.4	23.7
Estimate (millions)	2.997	10.640	1.848	0.771

estimates of the county-by-county distribution of pasture. These suggest that the extent of pasture in England (excluding Monmouthshire) was 14.072 million acres. The extent of pasture in the seven full counties where the invasion returns have survived and proportionately in 88 per cent of Cornwall was, according to Capper, 3.928 million acres (or 3.278 million acres excluding Northumberland as far as the horses are concerned).¹⁸ This provides a new areal weighting of 27.9 per cent of the extent of English pasture (or 23.3 per cent excluding Northumberland for horses), and the resulting second set of

estimates reported in Table 3. Another contemporary commentator, W T Comber, published an alternative estimate of land use in 1808 which suggested that the area of England and Wales over which the cattle were depastured was 17.479 million acres.¹⁹ The equivalent area in Capper (that is, now including Wales) was 16.796 million acres. Comber did not produce a county-by-county estimate. Both Capper and Comber have been regarded as the best of the contemporary observers, though their estimates of land use in general have not always passed without criticism.²⁰

¹⁸ B J Capper, *A Statistical Account of the Population and Cultivation, Produce and Consumption of England and Wales, 1801*, pp 66–73. Though the development of rather more complicated animal feeding regimes had already been developed by this period, especially for sheep. See for example the sections on individual animals in R J Moore-Colyer, 'Livestock', in Mingay, *Agrarian History*, pp 326–34.

¹⁹ W T Comber, *An Inquiry into the State of National Subsistence: Appendixes, 1808*, p 52, appendix 25.

²⁰ H C Prince, 'The changing rural landscape', in Mingay, *Agrarian History*, p 31; H C Prince, 'England circa 1800', in H C Darby, ed, *A New Historical Geography of England*, 1973, p 403; R J P Kain, *An Atlas and Index of the Tithe Files of Mid-Nineteenth-Century England and Wales*, 1986, p 459; Turner, 'Arable in England and Wales', pp 299–301.

TABLE 4
Proportion of the national herd found in the
sample counties, 1871-91*

Year	Cattle	Sheep (in percentages of national total)	Pigs	Horses
1871	20.5	28.8	24.3	24.4
1876	20.6	28.5	24.5	23.8
1881	21.1	30.7	24.8	23.8
1886	20.5	28.3	24.5	23.4
1891	20.7	27.5	23.8	23.2
Mean	20.7	28.8	24.4	23.7

* Based on the total numbers of cattle, sheep, pigs and horses for Berkshire, Dorset, Essex, Lincolnshire, Norfolk, and Sussex, the total numbers of cattle, sheep and pigs for Northumberland, and the total numbers of cattle, sheep, pigs, and horses for Cornwall, but this last county weighted by 0.88 to reflect the equivalent survival of the invasion returns.

Sources: Derived from, *Agricultural Returns of Great Britain*, BPP, 1871, LXIX, pp 60-5; 1876, LXXVIII, pp 32-41; 1881, XCIII, pp 20-33; 1886, LXX, pp 38-51; 1890-91, XCI, pp 2-15.

Although there were both major and minor adjustments within local agricultural regimes over the eighteenth and nineteenth centuries, nevertheless if the broad pattern of the arable counties, the mixed husbandry counties, and the pasture counties was reasonably well set by about 1800 and did not change substantially as between counties subsequently, a third method of weights might be employed which is based on the relative distributions of livestock from another, better documented period. For example, Table 4 takes the same sample counties and reports the proportion of the national herd resident in those counties in the late nineteenth century as recorded in the annual agricultural returns. The late nineteenth century was a volatile period, picking up the tail end of High Farming, the impact of railway developments on regional specialization, and the full brunt of the late nineteenth-century agricultural depression. Yet in spite of these great moments in British agricultural history, the proportion of the national herd which was resident in those counties was remarkably stable. This is demonstrated collectively for the counties as a group, as in Table 4, but it also applied in large measure to the

individual counties. In turn this approach produces a third set of weights which are variable between animals. These weights are applied in the third method of weighting and produce the imputed national herd totals shown in the third estimates in Table 3. One major problem with this procedure is that the intervening period from 1800 to the late nineteenth century saw important changes in regional specialization, especially with the coming of the railways. For example, with sheep there was a tendency towards greater sheep raising eastwards into otherwise traditional arable counties. The sample of counties includes Norfolk, Essex and Lincolnshire, and therefore, perhaps, to employ the late-nineteenth-century distribution of sheep for these counties exaggerates their importance when applied to the early nineteenth century. If this was the case to any significant extent the application of late nineteenth-century weights would have the effect of underestimating the sheep population in c 1800.

Therefore, there are problems associated with these methods of weighting. The principal one with the use of pasture as a weighting device is that it supposes the quality of the pasture was uniform across the country and that the animal stocking rates were also uniform. It also cannot take into account differences in animal breeds and the effect such differences might have had on stocking rates. This last set of issues seems to be intractable, though we can demonstrate the problem with stocking rates. In the annual June returns from 1866 onwards there are data on the numbers of animals and the types of land use. If we take the data for sheep - chosen for reasons which will become obvious below - we note that the rate of stocking in England for every acre of permanent pasture for 1871, 1876, 1881, 1886 and 1891 was 1.8 falling to 1.4. The equivalent measure for sheep for the sample counties was 2.7 falling to 2.0. The sample counties could

bear greater sheep densities per unit of what we take to be the major feedstuff for the animals. The trend also picks up the onset of the Great Depression with a modest decline in sheep numbers (the numerator) and a greater than proportionate rise in the extent of permanent pasture (the denominator) as the agricultural economy retreated from grain production. Nevertheless, the stocking rates on the sample counties were always much higher than for the country as a whole. If this was also the case in the early nineteenth century when a sheep stocking rate for the sample counties was 0.77 sheep per acre of permanent pasture (summation of the invasion returns for the sample counties divided by Capper's estimate of the extent of the pasture for the same sample counties), it suggests that even the low estimate of the sheep population which is computed by the second method of weighting, is itself too high. In the light of the later discussion on sheep numbers this seems an unlikely conclusion. Another problem with using the extent of pasture and other land uses as a measure of the feedstuff available for animals is that it neglects the input of imported feedstuffs. This may have been small for cattle in the early nineteenth century and always small for sheep, but as the nineteenth century proceeded the use of imported feedstuffs for raising cattle increased and if there was not a comparable increase in the national cattle herd then it would have had the effect of withdrawing pressure on pasture resources, relieving pressure on stocking rates and allowing sheep stocking rates to rise.

III

The estimates presented in Table 3 are stark: they are derived from an imperfect database and imperfect methods of deduction and estimation, but do they stand up to closer scrutiny? Contemporary witnesses of the size of the national livestock herd

are few and far between. F M L Thompson so doubted the ease of estimation of horse numbers for later in the nineteenth century when sources are more abundant, that for earlier in the century he suggested that estimates are bound to be little more than guesses.²¹ Nevertheless, he made a 'conservative' estimate of the horse population in 1811 of 1.287 million animals.²² This is a good deal larger than the three estimates listed in Table 3. The horse tax of 1812 suggested that the number of farm horses alone amounted to 800,000. The invasion inquiries allow slightly more detail in that they distinguished between riding and draft horses. For the counties in the sample (less Northumberland) the ratio of the former to the latter was 1:5.4. This varies from high or higher ratios in counties where we assume that a relative dominance of arable production required more draft animals, such as in Essex, Norfolk and Lincolnshire (with ratios of 6.5, 6.1 and 5.2) to low or lower ratios in what we take to be counties with less emphasis on the arable such as Berkshire, Dorset and Sussex (3.8, 4.2 and 4.7),²³ but with a high ratio of 5.8 for Cornwall for what we might normally expect to be a more pastoral county. The horses in the sample can be sub-divided into 28,666 riding horses and 154,127 draft horses.²⁴ The re-estimated national horse population then amounts to 0.135 million riding horses and 0.727 million draft horses on the basis of the land area weighting, 0.123 million riding and 0.661 million draft horses on the basis of the pasture-related weighting, and 0.121 million riding and 0.65 million draft horses on the basis of the late-nineteenth-century historic weighting. The second figure by all three

²¹ F M L Thompson, 'Nineteenth-century horse sense', *Econ Hist Rev*, sec ser, 29, 1976, pp 60-81.

²² *Ibid.*, p 80.

²³ A point also observed by Kenyon with respect to the Sussex and Essex returns in G H Kenyon, 'Livestock in Icklesham, 1798 and comparative livestock figures for Sussex and Essex, 1798 and 1801', *Sussex Notes and Queries*, 14, 1954, p 50.

²⁴ This involves a little creative accounting to include 369 horses which were recorded simply as horses.

me
hor
mil
leas
if it
tho
and
sug
for
ani
cor
fro
A
hor
177
but
rev
in
re-
[sic
hor
this
assu
visi
to
the
lion
tre
the
to
the
tow
atte
po
cor
the
du
ha
tur

²⁵ E

²⁶ In

17

4.

SC

²⁷ W

o

²⁸ J

p

²⁹ p

methods of weighting approximates to the horse farm population. Therefore the 0.8 million farm horses in the 1812 tax is at least of a similar order of magnitude even if it is still a significantly different number, though in point of fact it relates to England and Wales. In addition, E A Wrigley has suggested reducing Thompson's estimate for farm horses from 0.8 to 0.7 million animals, with the consequence of a rapid convergence on the new estimates derived from the invasion inquiry.²⁵

Arthur Young made an estimate of the horse population of England and Wales in 1770 in his *Northern Tour* of 1.171 million, but then in his *Eastern Tour* of 1771 he revised his estimate to 684,491.²⁶ Finally, in 1779 in his *Political Arithmetic* he re-estimated that the number of 'draught [sic] cattle' in husbandry, that is oxen and horses, at 927,610. J R McCulloch reported this estimate in the 1830s and made an assumption, though on the basis of no visible evidence, that the oxen amounted to 150,000.²⁷ This therefore assumed that the horse population was about 0.778 million.²⁸ We have no way of knowing the trend in horse numbers from the 1770s to the end of the eighteenth century except to say that in some parts of the country there was a move away from tillage and towards pasture, with presumably an attendant decrease in demand for horse power, but that in other parts of the country quite the opposite occurred with the extension of tillage which took place during the French Wars. Even if England had become greener²⁹ it surely had not tumbled to grass in any dramatic fashion

in the last quarter of the eighteenth century. Therefore, perhaps with respect to the horse population, Young's England and Wales estimate in c 1770 was not so very different thirty years later. This encourages the hope and expectation that the equivalent estimate of horse numbers from the invasion returns might at least be along the right lines, though that expectation is tempered somewhat by J R McCulloch's view that Young's cattle estimates 'can be regarded only as a very rude approximation', an opinion which we might venture below also applies to his other animal estimates.³⁰

John Middleton, the author of the two editions of the *General View of the Agriculture of Middlesex*, was never shy to advance estimates on matters which were way beyond his brief. In 1798 he estimated the national horse herd in what he called South Britain. This was evidently England and Wales. The calculation was determined on the basis of one horse to every 15 acres of arable, where the arable included clover, rye grass, one year's ley and fallow, plus one horse for every 100 acres of grass. His arable amounted to 14 million acres (revised in the second edition of 1807 to 15 million acres) giving an arable-derived horse population of 933,333 (revised to 1 million), which added to his estimate of 213,000 grass-derived horses (revised to 200,000) gave a total agricultural horse population of 1.146 million horses (revised to 1.2 million). He indicated that to this sub-total should be added a further 600,000 'other' horses of non-agricultural origin (unchanged in the second edition) to arrive at the total horse population.³¹ While we might admire Middleton's apparent precision and methodology, that admiration is almost certainly misplaced since Middleton was not the greatest of contemporary estimators. In both editions of his work he

²⁵ E A Wrigley, *Continuity, Chance and Change: the Character of the Industrial Revolution in England*, 1988, pp 41-2.

²⁶ A Young, *A Six Months Tour Through the North of England*, 4, 1770, p 497; A Young, *A Farmer's Tour Through the East of England*, 4, 1771, p 456, though Young always calls them 'draught cattle', so they may include oxen.

²⁷ We cannot test for this from the surviving returns because too few of them distinguish the draft oxen from the fat cattle.

²⁸ J R McCulloch, *A Statistical Account of the British Empire*, 1, 1837, p 495.

²⁹ Prince, 'England circa 1800', pp 417-8.

³⁰ McCulloch, *A Statistical Account*, p 495.

³¹ John Middleton, *General View of the Agriculture of the County of Middlesex*, 1st ed, 1798, pp 483-4, and 2nd ed, 1807, p 639.

calculated the total acreage of England and Wales at nearly 47 million acres whereas the actual size was nearer to 36 million acres. We may venture that he also exaggerated the extent of the arable and the pasture, and thereby his calculation of the horse population.

At least horses attracted a tax from which a contemporary base of their likely total number can be constructed. For other animals there are no such bases, but there are some contemporary estimates. These come in the main from the same small group of observers, Young and Middleton principally. In each of his *Northern* and *Eastern Tours* Young estimated the English cattle stock. In the former they amounted to 4.571 million and in the latter to 2.168 million.³² In 1779 in his *Political Arithmetic* he settled on a third estimate, but this was only the simple average of the two earlier ones. Thus according to Young the number of cattle in England was 3.369 million, including cows, fattening beasts, and young cattle. This is of a similar order of magnitude to the estimate of cattle which is derived from the historic weightings, but the 150,000 oxen which McCulloch says Young included with the horses should be added to the cattle. Even so, the resulting Young estimate of 3.5 million cattle may seem to bear close comparison with the new highest estimate of 2.997 million beasts based on the invasion returns.

There are very few contemporary estimates which can be employed for a plausible comparison with the new pig estimates of between 1.787 and 1.859 million animals. The best known are Young's estimates of 3.345 million and 1.711 million pigs which accompanied the reports of his two tours.³³ The problem with pigs is the way in which their numbers could fluctuate from year to year. They can be slaughtered

in greater than usual numbers to meet a crisis of overall food supply, as occurred during the Irish Famine of the 1840s, in the knowledge and observable practice that with large and frequent litters their numbers can be relatively easily replenished.³⁴ The invasion inquiry of 1798 came two years after the corn crisis of 1795-6, and the inquiry of 1803 followed more comfortably after the crisis of 1799-1800.³⁵ If there had been a disproportionate slaughter of pigs during these corn crises then, plausibly, by both 1798 and 1803 the pig population would have recovered. In conclusion, a pig population for England of something a little under 2 million animals may not be far from the mark.

IV

When it comes to estimating the sheep population the evidence is just as conjectural as it is for other animals, but if conjecture can be qualified by degrees, it is even *more* conjectural. The dominant position held by the woollen industry in eighteenth-century trade and industry meant that there were any number of contemporaries willing to estimate its size, and therefore often by association, the size of the sheep herd and the wool clip.³⁶ The most often cited of these estimates and the most detailed were produced by a Leeds woolstapler, John Luccock, in 1805 and revised in 1809.³⁷ He not only derived a national total but he also produced sheep totals for each of the English counties distinguishing between the distribution of short and long wool sheep.

In other sources it is most often the sheep population to which contemporaries

³² Young, *Northern Tour*, p. 497; Young, *Eastern Tour*, pp. 456 and 459, in each case the summation of his estimates of cows, fattening beasts and young cattle.

³³ Young, *Northern Tour*, p. 498; Young, *Eastern Tour*, p. 456.

³⁴ On the Irish example see M. Turner, *After the Famine: Irish Agriculture 1850-1914*, 1996, pp. 48-9, 123.

³⁵ For which see M. Turner, 'Corn crises in Britain in the age of Malthus', in M. Turner, ed., *Malthus and his Time*, 1986, pp. 112-28.

³⁶ Estimates of the wool clip tabulated in G. E. Fussell and C. Goodman, 'Eighteenth-century estimates of British sheep and wool production', *Ag. Hist.*, 4, 1930, pp. 132-3.

³⁷ J. Luccock, *The Nature and Properties of Wool*, Leeds, 1805, p. 338; J. Luccock, *An Essay on Wool*, 1809, pp. 338 and 339.

refer-
cuss-
sion
View
Rev
pop
cuss
sing
taki
the
cent
to t
few
Har
near
shee
qua
179
whi
inva
cou
shee
mat
amo
this
pari
whi
I
Vie
lati
as la
is r
hist
inv
seer
the
sub
ate
and
sm
sub
fin

³⁸ Re
of
int
the
the
³⁹ J C
17

referred in any detail whenever they discussed animal numbers. In the quarto version of the Board of Agriculture *General View* of the county of Sussex in 1793 the Revd Arthur Young estimated the sheep population at 340,000 animals, and his discussion of sheep easily formed the largest single section in his county review. Even taking into account that he underestimated the extent of the county by about 6 per cent his sheep estimate is remarkably close to the estimate from the invasion returns a few years later. For twenty-six of the Hampshire parish invasion returns there is near contemporary enumeration of their sheep numbers by A and W Driver in their quarto view of Hampshire agriculture in 1794. These parishes covered 61,000 acres which was 36 per cent of the surviving invasion returns or nearly 7 per cent of the county. The invasion returns record 21,752 sheep for those parishes, whereas the estimates by the Drivers for the same parishes amounted to 23,850 sheep. At 9 per cent, this difference is almost negligible in comparison with the other county differences which are listed in Table 5 below.³⁸

In contrast, John Claridge in his *General View* of Dorset estimated a sheep population of 800,000 which was about twice as large as the invasion return.³⁹ Yet Dorset is reckoned as the model county in the history of the invasion inquiries. The invasion estimates for Berkshire generally seem on the low side. They derive from the individual totals for the seven militia sub-divisions of the county plus the separate returns for the boroughs of Abingdon and Reading. These two boroughs were small, and if we combine them with the sub-divisions which bear their names we find that the average number of animals in

the enlarged seven sub-divisions of the county were 2425 cattle, 11,624 sheep, 2929 pigs and 1697 horses, whereof the contribution made by Reading (borough and sub-division combined) was 902, 3515, 967 and 1490 respectively. Some of these numbers are suspiciously on the low side yet there is every indication from a 'Rough Map of Berkshire' which accompanies the invasion returns that the Reading sub-division was one of the largest, if not the largest in the county. Furthermore, the author of the quarto *General View* of the county in 1794 remarked that the county 'has, and ever must have, from the nature of the soil, a great quantity of sheep upon it', and he made much of the importance of the town of Ilstey as a sheep market, which had 'of late, become a sheep market, of the first importance, not only to Berkshire, but its neighbouring counties. Not less than 20,000 sheep have sometimes been sold in one market day; and it is computed that the annual average is not under 250,000'.⁴⁰ It acted as a regional market for sheep from nearby Oxfordshire and Wiltshire as well as counties further afield. The invasion return for Berkshire, for sheep at least, seems on the low side.⁴¹

The authority which is always paraded on the occasions when a sheep estimate is required is John Luccock. In 1805 he estimated a sheep population of England and Wales of 26.1 million for c 1800, later revised to 24.4 million, in both of which estimates Wales accounted for 1.25 million sheep.⁴² Therefore at first sight the new sheep estimates derived from the invasion returns look to be way off beam. The

³⁸ Revd Arthur Young, *General View of the Agriculture of the County of Sussex*, 1793, pp 71 and 74, in which Sussex is divided broadly into two regions, the Downs on which 270,000 sheep resided and the Weald where 70,000 resided; A and W Driver *General View of the Agriculture of the County of Hampshire*, 1794, pp 23-25.

³⁹ J Claridge, *General View of the Agriculture in the County of Dorset*, 1793, p 7.

⁴⁰ W Pearce, *General View of the Agriculture in Berkshire*, 1794, pp 44, 38.

⁴¹ The effect of discarding the Berkshire returns from the analytical results presented in Table 3 is to adjust the numbers but not dramatically, because Berkshire is a relatively small county in the surviving sample of counties. Doing so increases the national cattle estimate to between 2.3 and 3.0 million, the sheep to 11.0 and 12.6 million, the pigs to 1.8 and 1.9 million and horses to between 0.8 and 0.9 million.

⁴² Luccock, *The Nature*, p 338; Luccock, *An Essay*, pp 338 and 339. It looks as though the second time round Luccock failed to include the slaughter of lambs.

estimate of 12.208 million sheep based on the first areal weight is the more plausible method of estimation given the nature of sheep production – that is, the extensive use of land on regulated and unregulated pastures, supplemented by folding on root crops. The other two estimates of a little under 11 million sheep based on pasture weights and a little over 10.5 million based on historic weights, however, look implausibly low. Luccock's method was to estimate a sheep population for each county on the basis of the sheep stocking rates applied to 'the number of acres, which are supposed to contribute toward the production of wool'.⁴³ It is a little uncertain whether Luccock fully appreciated the land area of England. He certainly understood that a certain amount of land would necessarily have to be deducted from each county because he spoke about excluding hedgerows, coppices, buildings, water, public roads and what he termed but did not define as 'absolute wastes'. For these he deducted one-eighth of the land area of each county. But any other reasonable interpretation of what would remain as part of the contribution towards the production of wool would include the available pasture (including some land otherwise categorized as waste), and an allowance for a proportion of the root crops which were used for feeding sheep. The sum total of this land, according to Luccock and excluding Wales, amounted to just over 24 million acres.⁴⁴ Considering that England is 32 million acres in extent the residual 8 million hardly seems enough to cater for grains and roots (which together amounted to about 8 million acres by the agreement of most estimates) or other lands which otherwise might be used for non-agricultural purposes, or for feeding other animals, such as the 3.5 million acres which Wrigley has estimated was needed specifi-

cally as horse fodder for feeding the farm horse population of England and Wales.⁴⁵ In addition, there was a considerable amount of other non-cultivated land which Comber estimated at nearly 11 million acres. A proportion of that would have been available to sheep in the form of the open moors and mountains, but not nearly at the same stocking rates which applied elsewhere. Surely Luccock has grossly miscalculated the land available to sheep production; and to that land which he has included he has surely applied a stocking rate which is not sensitive enough to land quality.

Luccock's estimate compares badly with the new estimates, though it does compare very well with Young's estimate of 29 million (*Northern Tour*) and 22.2 million (*Eastern Tour*), later averaged in 1779 to 25.6 million sheep.⁴⁶ Middleton's estimate of 38.4 million completes the set (revised in the second edition of his work to 35 million), a figure which further discredits almost any calculation that Middleton ever made, but it leaves us unsatisfactorily and unhelpfully with an enormous range of estimates. It suggests we will never have much confidence in establishing the true sheep population, but at least the invasion returns offer a dramatically different estimate from the one which has been trotted out, though usually with no great confidence, for nearly 200 years whenever a reference to early nineteenth-century sheep was required. Luccock's authority was assured in 1828 in a Select Committee on the British wool trade. One witness, Mr James Hubbard, a woolstapler from Leeds, simply took Luccock's earlier estimates and merely adjusted the ratio of long to short wool sheep. He expressed no great confidence one way or the other in Luccock's numbers, but simply 'assumed those to be

⁴³ Luccock, *An Essay*, p 338.

⁴⁴ *Ibid.*, pp 338–9.

⁴⁵ E A Wrigley, 'Energy availability and agricultural productivity', in B M S Campbell and M Overton, eds, *Land, Labour and Livestock: Historical Studies in European Agricultural Productivity*, Manchester, 1991, p 332.

⁴⁶ Young, *Northern Tour* p 497; Young, *Eastern Tour* p 456; compromise estimate quoted by Prince, 'England circa 1800', p 421.

correct', but he certainly began the trend of picking Luccock from the shelf. A second witness, Mr J L Calcraft, a Lincolnshire farmer, estimated the number of sheep in the county precisely to the last animal to 1,834,782 animals, though further inquiry reveals that this was an uncritical and unattributed steal from Luccock's estimate of long wool sheep.⁴⁷ The importance of offering an alternative estimate of the sheep population let alone a perfectly acceptable one lies in two directions: it concentrates the mind on a particularly difficult and important element in any attempts to measure agricultural output; and equally, it may one day feed into any revised estimates of the size and development of the domestic woollen industry.⁴⁸

In summarizing the evidence from Luccock, Deane and Cole concluded that even he was 'consciously conservative' yet 'may still have been coloured by the climate of exaggeration which had prevailed throughout the eighteenth century in writings on the woollen industry'. More generally Richard Wilson refers to the special place of wool 'in the political and economic writings of the period'...[which meant that]... 'Every pamphleteer who made mention of the wealth of Britain felt obliged to estimate the wool clip'...[and]... 'the results were often fantastic and contradictory'... 'But it was the industry's importance which led to these wild compilations'. In other words there were even larger estimates doing the rounds at the time, with an all-time high of 54 million sheep in 1782. Yet there were also some

low estimates – which incidentally are rarely if ever paraded by historians – as low as 10–12 million sheep in one survey published in 1774, and 12 million in separate estimates which appeared in 1712, 1731, 1736 and 1769.⁴⁹ These low estimates have generally been forgotten in the musings of subsequent historians, but they stand up rather well against the new estimates in this paper. However, if Luccock was remotely correct then the combined English and Welsh sheep stock declined from 26 million at the beginning of the nineteenth century to a little over 18 million in mid-century⁵⁰, at which rough order of magnitude it remained over the period 1866–1914.⁵¹

An important point to make is that the June returns of the late nineteenth century captured a more stable proportion of the annual stock than the invasion returns might have done since the latter were conducted at various times of the year, in some cases perhaps before the lambing of the new season but perhaps after the main impact of the annual slaughter cycle of the immediately preceding season. Luccock's estimate was an annual stock, and not a point specific inventory flow. In truth his estimate for England alone was a net stock of 17.8 million surviving sheep, a figure which excluded estimates of the annual slaughter, wastage, and carrion, which he estimated at over 7 million animals for England and Wales, or 27 per cent of the

⁴⁷ BPP, 1828, VIII, *Report from the Select Committee of the House of Lords appointed to take into consideration the state of the British wool trade*. In chronological order this genuflection includes: McCulloch, *A Statistical Account*, p 501; Fussell and Goodman, 'Eighteenth-century estimates'; P Deane and W A Cole, *British Economic Growth 1688–1959*, 2nd ed, 1962, p 195; Prince 'England circa 1800', p 421; Prince, 'Changing rural landscape', p 43; B A Holderness, 'Prices, productivity, and output', in Mingay *Agrarian History*, though Holderness is far more critical than any of the others.

⁴⁸ See Holderness, 'Prices', pp 171–4 in which he finds that Luccock's estimates for domestic wool production sit uneasily alongside the accepted trend of wool production for the century after 1741.

⁴⁹ Deane and Cole, *British Economic Growth*, p 195; R Wilson, *Gentleman and Merchants: The Merchant Community in Leeds 1700–1830*, p 6. See also, P Deane, 'The output of the British woollen industry in the eighteenth century', *J Econ Hist*, 17, 1957, pp 207–8 for further statements that question the reliability of contemporary estimates (that is, she points to the likely exaggeration in those estimates). The estimation of 54 million sheep, and others quoted in this paragraph, is one of almost thirty contemporary estimates of sheep population listed in Fussell and Goodman, 'Eighteenth-century estimates', pp 132–33, though many of these are clearly not independent estimates but merely repetitions of previous authorities.

⁵⁰ Based on the agricultural statistics of 1854 quoted in Mingay, *Agrarian History*, p 1044.

⁵¹ Though fluctuating between 17.9 and 21.6 million animals, estimates based on five year averages in MAFF, *A Century of Agricultural Statistics: Great Britain 1866–1966*, HMSO, 1968, table 66.

gross stock. Thus by twists and turns we have reduced the Luccock estimate from the usually quoted and, as far as the present exercise is concerned, inaccessible figure of 24.3 million animals for England alone, to a little under 18 million. While this is still considerably more than the top estimate we have derived of a little over 12 million animals, at least the new estimate no longer looks quite so outrageous (and Luccock's figure similarly is no longer quite so formidable), though this assessment makes the unwritten assumption that the greatest impact of the annual slaughter and wastage of sheep was pretty well complete by the time the invasion enquiries reported. This may be far wide of the mark given the disparate dates of the returns from late autumn, into winter, and on into the spring, and in time for the March to April market which was an important time of year for disposal.⁵²

The main problem with the new estimates is that they imply that sheep numbers had remained little changed from the base estimate at the beginning of the eighteenth century. Gregory King proposed a sheep population of 11 million in the 1690s. Yet, what if King was wrong and the sheep population was less than 11 million, and less than it by some margin? After all, estimates of the early modern sheep population are no more secure than those in the eighteenth century.⁵³ Or what if we built into the new invasion estimate Luccock's allowance for the annual wastage and slaughter? In either circumstance this might allow for sufficient growth of domestic woollen output to have occurred in the eighteenth century to satisfy the historians of the woollen industry. By so building in Luccock's full allowance for slaughter and carrion of 27 per cent of total stock into the new sheep estimate, the resulting new gross sheep stock population

comes to between 14.6 and 16.7 million animals. These may seem relatively small numbers against the background of other contemporary estimates, but they are large enough to point to a substantial growth of domestic wool production in the eighteenth century. They suggest that if Gregory King's estimate is at all close to reality the gross sheep population was between 33 and 52 per cent larger, one hundred years later (that is after building in carrion and waste). Luccock's figures of course imply a much larger growth. In addition, a lower estimate c 1800 implies an expansion of the sheep population which is more in line with the growth rate of domestic wool production in the nineteenth century which Deane and Cole preferred to use, and which they based on Board of Trade estimates.⁵⁴ The most often quoted estimates of the contemporary domestic wool clip c 1800 was somewhere between 90 and 100 million lbs. This was for the UK which we understand included Ireland.⁵⁵ There are no end of estimates of average fleece weights from the *General Views* of the agriculture of the counties, the *Annals of Agriculture*, and from Luccock. They varied enormously with the multitude of different breeds which were available, from 7–8 lbs for long wool fleeces to 3–4 lbs for short wool fleeces. The weighted average suggests an average fleece size of 4–4.5 lbs per sheep, which in turn suggests a sheep population of 22–25 million sheep, not a long way from Luccock's estimate but now including the whole of the UK.⁵⁶

In other words, there is sufficient or even considerable doubt over Luccock's

⁵⁴ For a gloss on productivity and yields see Holderness, 'Prices', pp 121–4; Deane and Cole, *British Economic Growth*, p 196.

⁵⁵ B R Mitchell, *Abstract of British Historical Statistics*, 1962, p. 190; Committee on Industry and Trade: *Survey of Textiles Industries*, HMSO, 1928, p. 275.

⁵⁶ Contemporary average fleece weights are listed in Fussell and Goodman, 'Eighteenth-century estimates', pp 138–42, including all three sources listed here. The weighting procedure I have adopted is based on Luccock's county distribution, a case of hunting with the hare and the hounds because in doing so I seem to be accepting the inter-county distribution while at the same time objecting to his aggregate of the counties.

⁵² For which see Moore-Colyer, 'Livestock', p 332.

⁵³ G D Ramsay, *The English Woollen Industry, 1500–1750*, 1982, pp 75–6.

much used estimates to encourage just these kinds of speculations about the size of the national herd and its trend over time. As Holderness put it, 'John Luccock's very detailed calculation of both sheep numbers and wool production in 1805 is speciously precise and *seems* accurate'.⁵⁷ This accuracy can be examined, or even tested, for those counties for which an independent estimate of the sheep population is known. This includes the eight counties from the invasion returns along with several other contemporary county estimates which can be collated from the contemporary *General Views*. These comparisons are made in Table 5.

The invasion returns represent the whole extent of seven of the counties, as well as 88 per cent of Cornwall. The differences between the invasion returns and Luccock's estimates are so dramatic that such differences cannot be accounted for simply by the difference between a measure of the annual stock and a point specific inventory flow. At best the Northumberland returns represent just over 80 per cent of Luccock's estimate for this county, and at worst the Sussex return represents less than two-fifths of Luccock's estimates, and Berkshire is just over 25 per cent, though we have sounded a warning already over the adjudged completeness of the Berkshire returns. Apart from what we have already reported from the author of the quarto *General View* of that county about the prominence of sheep marketing in Berkshire, the author of the later octavo *General View*, William Mavor, was content to repeat Luccock's figures without any criticism or other comment at all. Furthermore, in observing that Luccock slightly underestimated the extent of the county Mavor implied that even the Luccock estimate was too low for Berkshire.⁵⁸ It is also no solution to take

the sample counties in Luccock as a proportion of Luccock's total and apply that proportion to the invasion returns and scale up for England as a whole, because as Table 5 shows this would only be a sensible option if Luccock and the invasion returns differed in a reasonably consistent fashion across counties.

The second half of Table 5 reviews other contemporary opinion of county sheep totals in the light of Luccock's estimate. Vancouver's estimate for Cambridgeshire is based on an average of 1062 sheep per parish for 62 parishes where their numbers are recorded, but in the knowledge that there were 144 parishes where sheep were kept.⁵⁹ Vancouver himself made the estimate recorded in Table 5. An alternative way to calculate the Cambridgeshire total is to say that the 68,988 sheep which were actually recorded were found in parishes extending over 227,375 acres, which amounted to 42.4 per cent of the county. This suggests a county sheep total of 162,708. Whichever way the Cambridgeshire county sheep flock is derived produces a relatively rare example of an estimate which exceeds Luccock's total. The same is true for Pitt's estimate for Northamptonshire, and as we have already noted, Claridge's Dorset estimate of 800,000 sheep also greatly exceeds Luccock's total, but in doing so he makes the invasion estimate for the pioneer county in the invasion inquiry seem quite puny.⁶⁰ Young's estimate for Suffolk in relation to Luccock for the same county is of the same order of difference as a number of the invasion returns. The interesting thing is that Luccock himself thought that

⁵⁹ C Vancouver, *General View of the Agriculture of the County of Cambridge*, 1794, p 205.

⁶⁰ W Pitt, *General View of the Agriculture of the County of Northampton*, 1809, p 214; Claridge, *General View...Dorset*, p 7. In his commentary on Pitt's report on Northamptonshire William Marshall, ever the critical reviewer, commented that 'It were unkind not to indulge the Reporter, sometimes by attending to his estimates, and calculations, even tho we may consider them as little more than day dreams': W Marshall, *The Review and Abstract of the County Reports to the Board of Agriculture*, IV, York, 1818, p 395.

⁵⁷ Holderness, 'Prices', p 171, his emphasis.

⁵⁸ William Mavor, *General View of the Agriculture of the County of Berkshire*, 1809, p 381n.

TABLE 5
John Luccock's sheep estimates compared

(A) Compared with the Invasion Returns

County	'Invasion' estimate	Luccock's short-wool	Luccock's long-wool	Luccock's total	Invasion estimates as a percentage of Luccock's estimates
Berkshire	81369	306600	—	306600	26.5
Cornwall	302191*	203000	—	203000	148.9
Dorset	393670	632240	—	632240	62.3
Essex	306797	519000	—	519000	59.1
Lincolnshire	784435	123648	1834782	1958430	40.1
Norfolk	433915	683704	38500	722204	60.1
Northumb	451547	538162	—	538162	83.9
Sussex	346589	863800	—	863800	39.6
Total	3100513	3870154	1873282	5743436	54.0

(B) Compared with General View estimates

County	General View estimate	Luccock's short-wool	Luccock's long-wool	Luccock's total	General View estimates as a percentage of Luccock's estimates
Cambridge	152928	67744	41688	109432	139.7
Hampshire	350000	516600	—	516600	67.8
Huntingdon	141558	108000	87500	195500	72.4
Northants	710000	—	640000	640000	110.9
Rutland	81146	—	114000	114000	71.2
Suffolk	240000	497000	—	497000	48.3
South Wilts	500000	583500	—	583500	85.7
Total	2175632	1772844	883188	2656032	81.9
Combined total	5276145	5642998	2756470	8399468	62.8

* Based on 88 per cent of the county, scaled up.

Sources: This paper; J Luccock, *An Essay on Wool*, 1809, p 338; C Vancouver, *General View of the Agriculture of the County of Cambridge*, 1794, p 205; A and W Driver *General View ... of the County of Hampshire*, 1794, p 25; R Parkinson, *General View of the ... County of Huntingdon*, 1813, pp 238-43; W Pitt, *General View of the ... County of Northampton*, 1809, p 214; R Parkinson, *General View of the ... County of Rutland*, 1808, pp 715-16; A Young, *General View of the ... County of Suffolk*, 1794, p 75; T Davis, *General View of the ... County of Wiltshire*, 1794, p 19.

on this occasion his own estimate was probably too high, though he says so in the same breath as he takes Young to task for confining himself 'too much to round numbers' and estimating 'the quantity of land in a loose and hasty way'.⁶¹ Luccock's

attempts to engage Young in a correspondence over their differences was frustrated when Young failed to answer Luccock's inquiries, leaving Luccock quite uncertain over the true total for that county. Richard Parkinson's estimates for Huntingdonshire and Rutland have a certain consistency about them relative to the Luccock estimates for those counties, and the difference between Luccock and the Drivers' estimate

⁶¹ A Young, *General View of the Agriculture of the County of Suffolk*, 1794, p 75, and repeated by Young in the various octavo editions of 1797-1813, for example 1813, p 216; Luccock, *An Essay on Wool*, p 246.

for Hampshire is of the same order of magnitude.⁶²

There is one further estimate which can be added to the growing sample. When Thomas Davis, the steward on the Longleat House estate, reported on the agriculture of Wiltshire he reckoned on 500,000 sheep in south Wiltshire, the area of which part of the whole county was 500,000 acres. Luccock's estimate for the same half of the county (clearly distinguished by both Davis and Luccock in their references to the Downs), is, on this occasion, only modestly higher. Davis, incidentally, also commented that the sheep stock 'has been, for many years, gradually decreasing, and that it is now lower, by many thousands than it was fifty years ago', a rare reference to sheep numbers which went counter to the assumed eighteenth century trend.⁶³

What we may finally do is to combine all of the non-Luccock estimates and rework the national sheep herd accordingly. The resulting expanded sample amounts to the whole or substantial parts of fifteen counties, embracing about 36 per cent of the total land area of England, 40 per cent of Capper's English pasturage, and they accounted for 44 per cent of the sheep population of late nineteenth-century England. With these weights they suggest an early nineteenth-century sheep herd of between 14.4 and 11.8 million animals, in which, methodologically, the 14.4 millions equates with the first estimate in Table 3.⁶⁴ The estimate is creeping up, indicating a downward bias in the invasion returns on their own, but even so, this final estimate is still far short of the estimate which has been in popular use for nearly 200 years.

⁶² R. Parkinson, *General View of the Agriculture of the County of Huntingdon*, 1813, pp 238-43; R. Parkinson, *General View of the Agriculture of the County of Rutland*, 1808, pp 715-16; Driver and Driver, *General View...Hampshire*, 1794, p 25.

⁶³ T. Davis, *General View of the Agriculture of the County of Wiltshire*, 1794, p 19.

⁶⁴ This is not to deny some sensitivity in these calculation involving individual counties. For example, substituting the Clandge total for Dorset will increase the scaled-up national estimate but it will still be a long way short of Luccock's estimate.

TABLE 6
English nineteenth-century livestock
numbers (millions)

Period	Cattle	Sheep	Pigs
c 1800 (based on 8 counties)	2.471	12.208	1.796
c 1800 (based on 15 counties)	—	14.445	—
c 1854	2.921	16.223	2.147
1866-70	3.604	18.923	2.008
1881-85	4.325	15.833	2.066
1896-1900	4.701	15.949	2.158

Sources: This paper; adapted from, G E Mingay, ed, *The Agrarian History of England and Wales*, VI, 1989, p 1044; B Afton and M Turner, 'The statistical base of agricultural performance in England and Wales, 1850-1914', in E J T Collins, ed, *The Agrarian History of England and Wales*, VII, forthcoming, section 1, table 4.

V

Shadow boxing of this nature in search of the all-important but illusive facts – both the new startlingly low estimates and the apparently well-established but almost certainly exaggerated higher ones – further exposes the quicksand which faces historians of agricultural output and productivity. Discussions about agricultural revolution are never very far from the thoughts and minds of agricultural historians. The traditional view stressed the processes of change while in more recent times the emphasis on quantification has led to stimulating but still inconclusive views on both the magnitude of overall change and also on the chronological turning points.⁶⁵ How do these new estimates measure up to our current understanding of agricultural history?

Table 6 shows the new estimates in the context of the equivalent numbers we can derive from the agricultural census of nine English counties which was conducted in 1854, grossed up in the same way as the 1800 estimates. In addition we include the annual average animal numbers as reported

⁶⁵ The latest of which is M Overton, 'Re-establishing the English Agricultural Revolution', *AHR*, 44, 1996, pp 1-21; M Overton, *Agricultural Revolution in England: The Transformation of the Agrarian Economy 1500-1850*, 1996, especially chapter 3. See also R C Allen, 'Agriculture during the industrial revolution', in Floud and McCloskey, *Economic History*, pp 96-122.

in the first three decades of the annual returns. The percentage increase in the three animals in the first half of the nineteenth century was 18, 33 and 20 per cent respectively, and 23, 26 and -6 per cent in the third quarter of the century. This long-run trend is entirely plausible, in a way which interposing the Luccock sheep numbers would not be. Indeed, employing Luccock instead would surely make the casual reader draw breath with astonishment at the decline in the sheep population. The Luccock figures make no real sense in terms of the domestic woollen industry. Even though raw wool imports increased dramatically over this period, as a proportion of the domestic industry they still suggest a growth in indigenous wool supplies. In the first decade of the nineteenth century raw wool imports (into GB) fluctuated between 2.4 and 11.8 million lbs, which was less than 10 per cent of the wool consumed, and by the 1850s this had risen to between 74 and 133 million lbs (this time into the UK), which was between 30 and 50 per cent of the wool consumed.⁶⁶ Though on a declining scale, the domestic supply was still paramount, and unless we can suggest a massive increase in the average wool clip, the rise in sheep numbers which the new estimates imply for the period is a more reasonable description of reality than the massive decline in numbers which Luccock's base implies. The modest increase in the sheep numbers in the third quarter of the nineteenth century is wholly consonant with the view that at the time a half of the value of the wool consumed in the industry was imported.⁶⁷

Table 6 can also be used to compare with current views on agricultural growth in the nineteenth century, though we venture along this path with some trepidation. Unfortunately we cannot break down the

animals in 1800 into ages and roles (milk cows, stores, fat stock, etc), though we could for 1854. However, we can value those animals as if mature beasts and as if of unchanging carcass weight upon slaughter, and apply a constant price to the estimates for c 1800 and c 1850. The carcass weights can be taken from Holderness in volume VI of *The Agrarian History* where there is also encouragement to suppose relatively fixed carcass sizes over the first half of the nineteenth century, and the prices can be taken from quotations at the Metropolitan cattle market for inferior and prime live meat.⁶⁸ The resulting values, which at fixed prices amount to a measure of the real volume of animal output, indicate that the animal stock increased by about 24 per cent over the first half of the nineteenth century. Thus far the current view, from R C Allen for example, is that the real volume of animal production (which is not really the same thing as we have measured here) increased by 55 per cent, which is supported by M Overton's separate estimate of the growth of real meat output of the order of 52 per cent.⁶⁹ At least we cannot be accused of exaggeration. Moreover, substituting Luccock's sheep numbers would see animal production make the unlikely move into free fall.

This paper does not pretend to clarify to any great extent these issues, but in these closing remarks it does suggest that a major, and seemingly insurmountable problem has been the lack of any secure base points from which both to quantify change and describe its main components. For the period before the advent of the annual agricultural returns from the mid-1860s there have been several attempts at constructing some of the necessary quan-

⁶⁶ Mitchell, *Abstract*, pp 191-3; Deane and Cole, *British Economic Growth*, p 196.

⁶⁷ Deane and Cole, *British Economic Growth*, p 197.

⁶⁸ Holderness, 'Prices', pp 152-3, using fixed weights of 730 lbs for cattle, 86 lbs for sheep, and 129 lbs for pigs; B Afton and M Turner, 'The statistical base of agricultural performance in England and Wales, 1850-1914', in E J T Collins, ed, *The Agrarian History of England and Wales*, VII, forthcoming, section 9, tables 9, 17, and 20, using the five year average prices centred on 1854.

⁶⁹ Allen, 'Agriculture', p 102; Overton, *Agricultural Revolution*, p 75.

titative and qualitative elements involved in questions of agricultural change or revolution, and briefly these have been reported in the previous paragraph. In all cases there have been reasonable attempts at establishing the arable base – from the inferred evidence of crop yields in probate inventories, to the comparable evidence on crop yields and the extent and distribution of arable land uses in England and Wales during the French Wars, and to the evidence arising from tithe redemption and commutation in the 1830s and 1840s.⁷⁰ All

of these cross-sectional measurements have attracted criticisms, but at least they have offered a series of bases for analysis where none previously existed. There are no comparable bases for a study of the live-stock economy. The estimates constructed in the present paper are offered as an untried starting point in that process.

⁷⁰ For which see editors' introduction and chapters by P Glennie and M Overton in Campbell and Overton, *Land, Labour and Livestock*; M E Turner, 'Agricultural productivity in England in the eighteenth century: evidence from crop yields', *Econ Hist Rev*, sec ser, 35, 1982, pp 489–510; Turner, 'Arable in England and Wales'; Kain, *Atlas and Index*, especially pp 457–67.