London's intra-urban milk supply, circa 1790–1914

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ABSTRACT. From the early decades of the nineteenth century until the 1870s London's milk supply was produced largely within the city. This was partly due to the envelopment of cowsheds in the expanding built-up area, but new urban locations some distance from the traditional pastures were also sought by cowkeepers wishing to be closer to their market. The development of large-scale production was disrupted in the 1840s by cattle disease, and in the second half of the century the trade was afflicted by several additional adverse factors which undermined its profitability. None of these factors alone, however, can be regarded as a sufficient condition for the decline which ensued. The location of production changed considerably and increasingly came to be concentrated in those areas of London where cost minimization was possible.

THE idea of finding animal husbandry in an English city in the present or the recent past might appear strange in view of the current pressure of urbanization upon agricultural land-use. The built-up area somehow seems an alien environment in which to keep horses, cows, pigs and sheep, but in mid nineteenth-century London the idea of a clear-cut distinction between urban and rural life had yet to develop:

> In the nineteenth century no English city had severed itself from its rural connexion. The largest of them all still conducted extensive back-yard agriculture, not merely half-a-dozen hens in a coop of soap boxes, but cow-stalls, sheep-folds, pig-sties above and below ground, in and out of dwellings, on and off the streets, wherever this rudimentary factory farming could be made to work.[1]

Cowkeeping was especially important. Before the 1860s, when milk was first imported on a large scale by the railways, London's needs were met entirely by urban and suburban producers located within easy reach of the consumer. This was necessary in view of the primitive facilities for the transport of milk by road, which meant that in hot weather it often became sour after a journey of only a few kilometres. The city's virtual self-sufficiency in this important foodstuff well into the mid nineteenth century therefore gives us an opportunity to study an unusual aspect of its commissariat.

The aim of this paper is to outline the structure of London's internal milk supply and the reasons for its decline. No attempt will be made to generalize about *apparently* similar systems in other cities because local circumstances have often been very different.[2]

BEFORE *c.* 1840: THE INTENSIFICATION OF PRODUCTION

Although there had been urban cowkeepers in London from an early date,[3] their output was not significant in the late eighteenth century. Control of the milk supply was exercised rather by those producers who used the rich suburban pastures and meadows for grazing their cattle. The most suitable grasslands lay to the north and north-west of the city, where parishes such as Islington had been renowned for their high quality dairy produce since the sixteenth century.

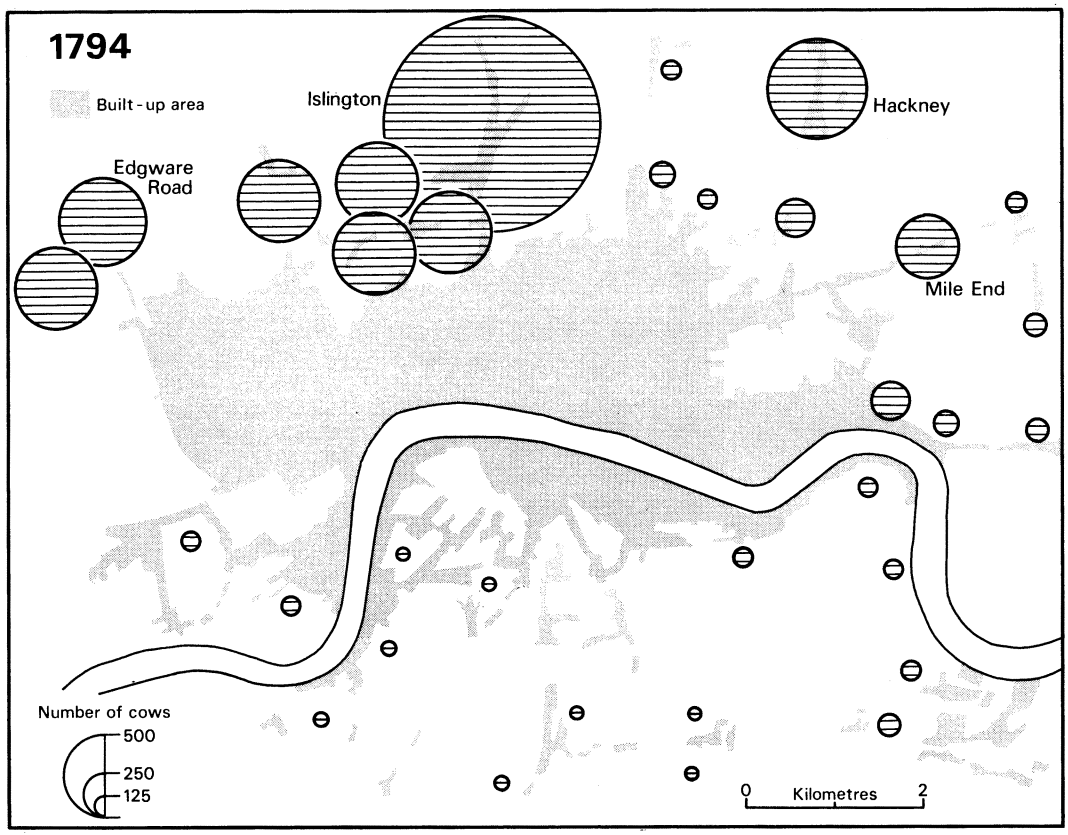

FIGURE 1. The distribution of milch cows in 1794. *Source:* FOOT, P. (1794) *General view . . . Middlesex* (London)

Figure 1 shows for 1794 a distribution of cows in a narrow belt around the urban fringe similar to that later predicted for his 'Isolated State' by J. H. von Thünen.[4]

In the eighteenth century, cow management in this suburban zone seems to have acquired an intensity greater than in any rural dairying area. In 1793 a writer in Arthur Young's *Annals of Agriculture* interviewed five cowkeepers near the city, all of whom kept their animals indoors for 6 or 7 months of the year[5] and fed them on a diet which included brewers' grains.[6] Even when these cows were allowed on to the grassland to graze the aftermath they were given grains as a supplement to stimulate their yield, and the expense of carting the bulky, low-value waste of London's breweries was an important factor in limiting the outward spread of liquid milk production.

In addition to the use of suburban pastures and waste products from urban sources, cowkeepers imported meadow hay, root crops and green fodder from farms within a radius of 30 to 40 km from London. They customarily cut and transported this feed themselves, and the cost advantage therefore lay with the larger-scale producers who saved most by having their own carts to lend mobility, a large staff (including casual labour) for rapid harvesting, and sufficient space for the storage of a year's fodder supply. This relationship between relative cost reduction and size of operation, together with other economies of scale, acted as a catalyst in the emergence of a class of 'capitalist' cowkeepers able to finance milk production on a large scale.[7] Richard Laycock, for instance, in 1810 kept 500–600 cows on 225 ha of pasture in Islington and neighbouring

parishes, and stored for his cattle's consumption 1700–1900 tonnes of grains and 300 tonnes of hay.[8]

The quality of the animals used was high throughout the nineteenth century. Prime shorthorn cows were brought from breeding and dairying districts either newly calved or near parturition for the third or fourth time. The rearing of replacement stock had long since been abandoned, but well into the 1820s and 1830s it was common for a good cow to be kept for several lactations and then sold as a fat beast for more than her original price as a newcomer.[9] The cow's pregnancy was in any case simply a means of renewing her lactation and the quality of the bull used and the calf produced were therefore of little consequence.

The introduction of disease to London's cowsheds in the 1840s meant that a cow's chance of surviving even the first lactation period was slim, and the average length of stay in the cowshed was reduced to a matter of months. A practice of fattening the beast when the yield fell below a daily five to seven quarts (5·7–8·0 l) therefore became standard because she had to be ready for slaughter at the slightest hint of her being diseased, and replacements now had to be bought half-fat. This, coupled with the rapid turnover of cattle, required a heavier investment by every cowkeeper, although the elimination of dry and low-yielding cows did ensure the compensation of a higher average yield. An annual output of 4000 l per stall was not unusual in the second half of the century.[10]

This enforced intensification of output was exacerbated by the competition for land close to London. Cowkeeping, brick-making and market gardening were all potentially profitable occupations, even on land about to be developed for urban use, and there seems to have been comparatively little waste ground in the 'shadow' of early nineteenth-century London. Rents of £10–£15 per ha were being asked for grassland in about 1810,[11] and the ability of the milk producers to pay may be judged from a contemporary description of the urban fringe as a 'green and open tract around London, especially to the north . . ., which is almost solely in the possession of the cowkeepers'.[12]

A curious symbiosis between these semi-rural land-uses seems to have evolved some time in the eighteenth century. Spent brickfields were commonly refilled and grassed over for re-use by cowkeepers,[13] and there was a trade of mutual benefit between milk producers and market gardeners. Substantial portions of the garden grounds of Fulham and St Paul's, Deptford were devoted to the production of fodder for milch cows by the so-called 'farming gardeners', and in return they were able to enhance the fertility of their soil with cow dung.[14]

In fact, as the century progressed, it was competition from urban land-use more than any other which deprived the cowkeepers of their pastures. Owner-occupation was a rarity even amongst the heavily capitalized enterprises and as leases fell in milk production became increasingly vulnerable to speculation in building. John Nicholls, one of Laycock's successors, was thus restricted in the 1840s to 97 ha of grassland in Islington held from eleven different landowners,[15] but even this was gradually eroded. By 1860 little was left apart from his yard and cowsheds, now isolated in the built-up area, and some pastures in distant Hornsey.[16]

This increasing separation of the cowkeeper from his fields prompted one writer to comment in 1825 that 'the situation of the London cow farmers almost excludes the possibility of pasturing their stock'.[17] It seems likely that by then the traditional summer grazing period was restricted in many cases to 6 or 7 weeks, and even then the stock had to be sent 2 or 3 km to find suitable grazing.[18] Several of London's parks were available as rough pasture and in 1837 James Fenimore Cooper observed that 'the Green Park was [still] nothing but a large field cropped down like velvet . . . cows grazed before the eye'.[19] But from the 1820s many cows were entirely restricted to their sheds in what was now the urban area.[20]

Figure 2 shows that in 1829 there were at least 71 cowsheds within the urban area, not only

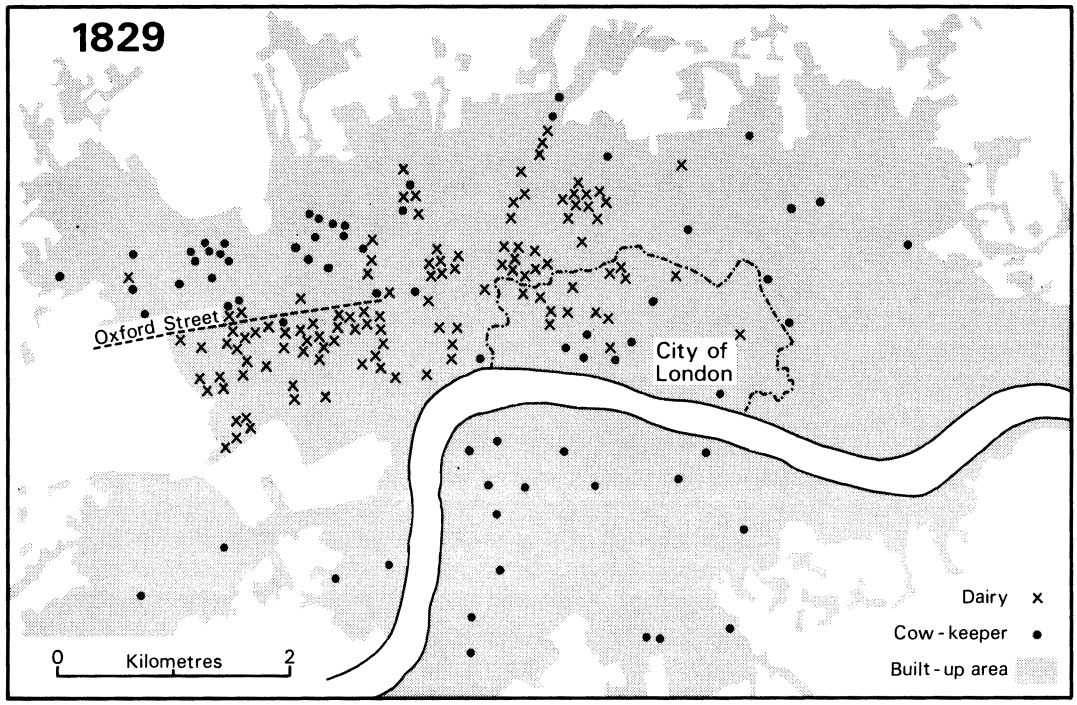

FIGURE 2. The location of cowkeepers and dairymen recorded in *Robson's classification of trades and London street guide* (1829)

in passive response to envelopment by the expanding built-up area, but also as the result of active decisions on the part of milk producers to choose city locations.[21] The latter process was encouraged by a desire to remain in close proximity to the West End market where demand for dairy produce was greatest, and the map shows that a large number of 'cowkeepers' and 'dairymen' were congregated in a belt stretching from Clerkenwell to Hyde Park Corner. Some of the dairymen were probably retail specialists who adopted a fixed-shop type of location, although at this early stage of the century they cannot confidently be distinguished from the milk producers.[22]

THE PERIOD *circa* 1840–1914: CHANGE AND DECLINE

Table I shows various estimates of the changing size of London's milch cow population in the nineteenth century. Problems of interpretation arise where the estimators did not make explicit the area they were dealing with, but it can be fairly confidently asserted that the peak of cow numbers in the administrative areas of the Metropolitan Board of Works (hereafter M.B.W.) and London County Council (hereafter L.C.C.) came in about 1860. This meant that there was a decline in intra-urban milk output several years before the 1865–66 rinderpest epidemic, usually identified as a watershed of prosperity. The table also shows that this so-called cattle plague was not a *coup de grâce* for cowkeeping in London because the number of registered enterprises fell only marginally in the decade 1864–74 and the number of cows kept actually continued to recover into the late 1870s. Cattle disease did, however, play an important part in the changing profitability of the trade, and represented a major new cost in the second half of the nineteenth century.

TABLE I

*London's milch cow population in the nineteenth century**
(county of London only)

Date	*Source*	*Cows*	*Herds*	*Average herd size*
1794	Foot, P.	8 500	?	?
1834	*Fmrs' Mag.* and Robson	9 600	>223	<43·0
1834	Youatt, W.	12 000	?	?
1851	Milburn, M. M.	12 000	?	?
1852	Poole, B.	24 000	?	?
1854	Wynter, A.	20 000	?	?
1856	*Lancet*	17 000	?	?
1858	*Sanit. Rev.*	11 818†	846	14·0
1862	M.O.H. Reports	*c.* 19 231	?	?
1864	M.O.H. and Morton, J. C.	*c.* 18 335	1361	13·5
1867	A.R.‡	9 753	?	?
1870	A.R. and M.O.H.	11 992	1269–1279	9·4–9·5
1874	A.R. and M.O.H.	14 702	1284–1311	11·2–11·5
1878	A.R. and M.O.H.	13 650	1062–1150	11·9–12·9
1882	A.R. and M.B.W.	11 463	939	12·2
1886	A.R. and M.B.W.	10 126	782	12·9
1890	A.R. and L.C.C.	9 104	628	14·5
1895	A.S. and L.C.C.	5 666	413	13·7
1900	A.S. and L.C.C.	5 040	320	15·8
1905	A.S. and L.C.C.	4 262	251	17·0
1910	A.S. and L.C.C.	3 055	199	15·4
1914	A.S. and L.C.C.	2 697	164	16·4

* 'London' in this paper is taken to be the administrative area of the M.B.W. and L.C.C. Foot (1794) is known, however, to have based his estimate upon the smaller area covered by the Bills of Mortality, and one suspects that several later writers (for example Poole) may have included cows pastured outside the M.B.W./L.C.C. area

† This refers to a sample taken by the Metropolitan Association of Medical Officers of Health.

‡ In view of their doubtful accuracy the MS. Agricultural Returns (A.R.) and published *Agricultural Statistics* (A.S.) have where possible been used in conjunction with figures published by local and central government.

Sources: FOOT, P. (1794) *General view . . . Middlesex* (London) p. 84; ANON. (1834) *Fmrs' Mag.* p. 504; ROBSON (1834) *London Directory* (London); YOUATT, W. (1834) *Cattle* (London) p. 261; MILBURN, M. M. (1859) *The cow: dairy husbandry and cattle breeding* (London) p. 70; POOLE, B. (1852) *Statistics of British commerce* (London) p. 227; WYNTER, A. (1854) 'The London Commissariat', *Quarterly Rev.* 190, 292; ANON. (1856) *Lancet*, p. 674; ANON. (1858) *Sanit. Rev.*, p. 91; Medical Officers of Health (hereafter M.O.H.) *Ann. Reports* for London's Vestries and Boards of Works; MORTON, J. C. (1865) 'On London milk', *Jl Soc. Arts* 14, p. 74; The MS. Agricultural Returns (P.R.O.: MAF/68); *Ann. Reports* of the M.B.W. and L.C.C.; *The Agricultural Statistics*

The impact of cattle disease

In 1842, apparently in the interests of free trade, Parliament lifted an embargo on the importation of live foreign cattle which had been steadfastly maintained for 70 years.[23] Henceforth the market was well supplied with low-priced lean milch cows, especially from Holland. Although these newcomers proved inferior fatstock to the customary shorthorn, their propensity to yield large quantities of milk endeared them to producers such as those in London who were concerned more with maximum milk output than with the size of carcass.

The disadvantage of this influx of foreign stock was the introduction of cattle diseases endemic across the Channel, and in the early 1840s both pleuro-pneumonia and foot-and-mouth disease became chronic in London's cowsheds for the first time.[24] Annual losses from accident and disease, which had been estimated at 5 per cent by value in 1825, were probably doubled or trebled by 1850, and in 1862 Gamgee estimated that 'on the 12 000 cows [sic] kept in London and its suburbs there is an annual loss of at least £80 000'.[25] Cowkeepers were therefore keen not to be encumbered with an obviously diseased animal and soon developed the practice of sending any suspect beast to market or to the butcher on the appearance of the slightest symptom of infection. Immediate slaughter was an essential policy if the meat was to be in a fit condition for human consumption,[26] but it was also a policy born out of practical considerations:

> If we cure the beast by treatment we diminish her value by half before she is cured, and it takes some time to get her up to her former value, and therefore it is better to kill her at once.[27]

Perhaps the most significant casualty of this heightened risk was the large-scale producer.[28] The threat of infection became a diseconomy of scale in the 1840s, and between 1834 and 1858 the average herd size in London slumped from 40 to fourteen cows (Table I). But the losses incurred on the sale of diseased carcasses, together with the increased capitalization required by a more rapid turnover of animals, were responsible for a squeeze upon the profit margins of *all* London's urban producers in the 1840s and 1850s, with the result that the supply did not expand at the same rate as latent demand. In consequence, milk at 4*d.* or 5*d.* per quart remained beyond the price range of a large section of society, and the temptation to bridge the gap between supply and demand with a little surreptitious adulteration was too much for many cow-keepers and retailers to resist. The dairy pump or the 'cow with iron tail' was frequently called upon in times of shortage, and it was commonly argued that the liquid sold as milk comprised about one-fourth added water.[29]

Quite apart from the endemic diseases, the rinderpest or 'steppe murrain' had a devastating effect upon London's cowkeeping community in 1865 and 1866, not least because its rapid spread and unknown aetiology caused great confusion as to the best method of containment.[30] Ironically, an early outbreak was recorded in one of the largest and best kept sheds in London, 'Laycock's Dairy' in Islington, then owned by a Mrs Nicholls. This was on 27 June 1865, three days after the first case had been reported in Lambeth,[31] and in the subsequent 18 months at least half of London's urban-based cows were affected in one way or another.[32] As early as November 1865 the East London Cowkeepers' Association estimated that of its members' 4873 cows, 1185 had been destroyed and 2749 sold at a loss.[33] Accurate data were not, however, collected for the whole city,[34] partly because of the harassed condition of the inspectorate, and partly because the cowkeepers were reticent in reporting fresh outbreaks and yet swift to be rid of any cow which displayed recognizable symptoms of disease.

Because insurance was only rarely used by London's cowkeepers[35] their financial loss was considerable when the disease struck, especially in those eastern and northern parts of the city with the greatest incidence of infection. The trade was not crippled, however, and output of milk from London's cows recovered in the following decade to something approaching 85 per cent of its 1864 level. In fact it was not until the late 1870s and 1880s that a steady decline set in.

In nineteenth-century London the rinderpest was limited to this major outbreak in 1865–66 and a minor one in 1877. On the other hand, the insidious effect of the foot-and-mouth disease and pleuro-pneumonia lasted almost continuously for 50 years,[36] and represented perhaps a greater drain upon the resources of the town cowkeepers in the long run (Table II).[37]

TABLE II

Reported cases of cattle disease within the jurisdiction of the M.B.W. and L.C.C.

	Pleuro-pneumonia	*Foot-and-mouth*	*Rinderpest*
1869–73	392	3869	0
1874–78	2780	2287	56
1879–83	1654	5131	0
1884–88	947	287	0
1889–93	142	0	0
1894–98	24	124	0
1899–1903	0	0	0
1903–08	0	0	0
1909–13	0	0	0

Source: M.B.W., *Annual Reports*; L.C.C., *London Statistics*

Sanitation

Although it had always been in the interests of the cowkeeper to protect the health of his cows, he showed little interest in cleanliness for the sake of any neighbouring human population. In fact the conditions of filth found in both urban and suburban cowsheds would have made even King Augeias blush, and if Heracles had been put to the test in early nineteenth-century London he would surely have rated cleaning them out as the most unpleasant of his labours.[38] Yet it was not until the 1840s and 1850s, with the widespread publication of the writings of Edwin Chadwick and John Simon, that the public's sanitary conscience was stirred.[39]

By cleansing the environment, and thereby eliminating the 'epidemic influence' of the atmosphere, the sanitary reformers hoped that they could improve the public health in cities. It was therefore logical that they should have been especially enthusiastic for the exclusion of cattle slaughtering, milk production, and the other so-called 'noxious trades' which created both dirt and smell as a by-product of their operation. John Simon, as Medical Officer of Health in the City of London, was in 1853 the first to introduce bye-laws regulating such aspects of cowshed design as paving, drainage, water supply, ventilation, lighting, removal of dung, and the cow's breathing space, and these were so meticulously enforced that by July 1856 ten cowsheds out of the City's 26 had been given up, presumably in response to the increased cost of cowshed repair and re-design.[40]

The Nuisances Removal Act of 1855 transferred powers from numerous petty bodies in London to the newly constituted sanitary authorities who were empowered to require the prevention of nuisances. But permissive legislation of this kind allowed the local Vestries and Boards of Works the luxury of implementation at their own pace and inevitably led to very uneven results in different parts of London. A set of regulations specific to cowkeeping was proposed by the Metropolitan Association of Medical Officers of Health in 1858, yet it was not until the Metropolitan Self Management Amendment Act of 1862 that a general provision was made for a system of licensing. Sanitary authorities were then able to show cause against the granting of a licence at the local petty sessions.

From 1862 the officers responsible for visiting the producers' premises were a small number of Inspectors of Nuisances and Sanitary Officers,[41] but their job was regarded as a sinecure and they soon acquired a reputation for being ill-trained, lax and corrupt. Much of the impetus for improvement came to depend upon the character of the local Medical Officer of Health, but he in

turn was often hamstrung by the hostility of his employers. In fact the structure of patronage was such that little or nothing was done in some areas:

> Arrayed against reform and amelioration were the powerful forces of vested rights in filth and dirt. And adding to the difficulty was the huge inert mass of ignorance, and poverty, and helplessness of masses of the people.[42]

The growing interest displayed by the wealthy and middle classes in their environment was not shared by people living in the slums, where apathy and degradation were part and parcel of the vicious circle of poverty. In Paddington 'complaints were made of the most pressing nature by householders residing in all those parts of the parish in which cowsheds exist', but in the dockland of Rotherhithe 'not a word of complaint [was] ever uttered against any of them by the inhabitants'.[43] In the 1860s and 1870s conscientious authorities like those of St James's Westminster, St Martin-in-the-Fields and the Strand, either prohibited cowkeeping in their areas by witholding all licences, or very soon made the profession impracticable by their demands for expensive improvements. In other districts little was required besides routine cleansing, no matter how structurally unsuitable the sheds may have been.

Outside West-Central London and the West End, regulation in the early years was little more than an irritant to cowkeepers, and insignificant by comparison with the effect of the rinderpest outbreak in the mid 1860s. The disparity in the enforcement of improvements did foster among sanitarians a desire for standardization, but the cowkeeping problem seems to have had a comparatively low priority. It was not until the mid 1870s, after an upsurge in interest in noxious trades in general,[44] that any centralized supervision was suggested,[45] and not until 1879 that the Dairies, Cowsheds, and Milkshops Orders made it possible.[46]

On 7 October of that year the M.B.W. issued its own regulations with 22 specific requirements for the construction and cleansing of cowsheds and dairies.[47] The standard breathing space, for instance, throughout London was to be 800 cu ft in most sheds, or 600 cu ft where the ventilation was thought to be adequate. This was a compromise between the 500 cu ft recommended by Easton in his editorials for the *Cowkeeper and Dairyman's Journal*, and the 1000 cu ft rigidly enforced by some Medical Officers of Health.[48] It satisfied few and particularly angered the members of the Metropolitan Dairymen's Society who argued that 'to insist on 800 cu ft of space per cow would speedily annihilate the London cowsheds, and spread distress amongst the cowkeepers of the metropolis'.[49]

The breathing space regulation was not a conspicuous success. The authorities often reduced the number of cows a licensee could keep, in order to increase the average space per animal, but they rarely enforced any structural alteration beyond the addition of a ventilator or the removal of a loft. Proposed new cowsheds had to be designed with the space requirements in mind, but in several areas the overcrowding experienced in older sheds was tolerated. In fact the overall average cubic space was still only 625 cu ft in 1894 after 15 years of centralized control.[50]

This description of the emergence of local and centralized supervision highlights the slow-paced and complex evolution and doubtful effectiveness of cowshed regulation in London. From 1838 when Drs Arnott and Kay recommended official action, and from 1846 when Simon called for the exclusion of noxious trades from the whole city, nearly half a century passed before effective control was established throughout the urban area. Even then it was accomplished in a number of indirect ways and rarely involved the actual closure of a cowshed by the termination of its licence (see Table III). In effect the authorities were more successful in their insistence upon improvements which increased the costs of cowkeeping, and therefore contributed to declining profitability in the late century, than they were in their desire to directly inhibit milk production.[51]

TABLE III

Methods of cowshed regulation used by the M.B.W. and L.C.C.

Date	*Licences granted and taken up*	*New licences granted*	*Objections lodged*	*Applications refused*	*Adjournments*	*Inspections*
1881	955	24	?	1	139	9749
1883	890	5	?	12	40	7618
1885	812	5	?	2	26	7427
1887	747	3	?	6	14	7506
1889	673	?	59	32	6	?
1891	604	8	19	46	8	3460
1893	512	2	52	13	14	3962
1895	413	2	68	13	?	3736
1897	375	3	47	5	11	4199
1899	330	0	22	8	12	3590
1901	298	0	20	5	4	?
1903	277	0	18	5	3	1945
1905	251	2	21	4	7	1887
1907	234	0	4	0	?	1809
1909	213	0	6	2	8	1648
1911	187	0	7	7	5	1319
1913	171	0	7	3	5	1186

Note: Licences were granted by the local justices before 1889, and thereafter by the L.C.C.

Sources: M.B.W., *Minutes* and *Ann. Reports*; M.B.W., Registers of Licensed Cowhouses (G.L.R.O.: M.B.W./1807b); M.B.W., Contagious Diseases (Animals) Act 1878, Executive Committee Papers, 1881–89 (G.L.R.O.: M.B.W./824–9); L.C.C., *Ann. Reports* and *London Statistics*; L.C.C., Registers of Licensed Cowhouses (G.L.R.O.: L.C.C. PH/REG/2/17–31); L.C.C., Printed Papers of special meetings of Public Health Committee for licensing slaughterhouses, knackers' yards and cowhouses, 1889–1914 (G.L.R.O.: L.C.C. PH/REG/2/37–38)

Competition from railway milk

It has in the past been thought that the Cattle Plague of 1865–66 was instrumental in encouraging a railway milk trade by reducing the capacity of urban producers to meet demand. David Taylor has recently shown, however, that the importation of country milk had reached a significant scale well before this date.[52]

From 1845 the Brentwood and Romford districts of Essex were regularly supplying hospitals in London and were sending accommodation milk to the capital at times of shortage.[53] Only a few years later Liverpool was reported to be drawing large quantities of milk from 25 to 50 km by rail at a wholesale price which it was thought would undermine the profitability of urban and suburban producers.[54] But no such threat materialized for some time in London because of the technical and logistical difficulties of supply encountered over the much longer distances from the nearest significant dairying area.[55] Even after the devastation of the rinderpest had made long-distance milk traffic imperative, there was some complacency about the traditional supply system:

> It may be anticipated that if we are spared any future infliction of the cattle plague, the number of cows kept within the limits of London will be restored, and probably increased. The carriage by railway from distant dairies will be superseded, and the original condition of the metropolitan milk trade re-established.[56]

In fact the urban herd did recover in the early 1870s, and after a temporary relapse in the late 1860s the railways also became a major supplier. Demand rapidly increased in the 1870s and 1880s and there was undoubtedly room in the market for both urban and rural milk because

the former was regarded as being of a better quality and it therefore commanded a higher wholesale price.[57]

In the last two decades of the nineteenth century complaints about the quality of railway milk were less frequently heard as the use of cooling apparatus and chemical preservatives became more widespread. Direct competition with the urban product continued to be restricted, however, because the majority of imports arrived at termini serving the West End, in areas where cowkeepers had already been greatly reduced in numbers. The railway milk sent to stations in or near the East End, especially Liverpool Street and Stratford Junction, came largely from East Anglia where the costs of production were high, and it therefore represented less of a threat to local production.[58]

CHANGING PROFITABILITY

The data recorded in the Appendix attempt to measure the changing profitability of milk production in London. They express the likely range of costs incurred and revenue received by London's cowkeepers at four cross-sectional dates, and are based upon a large amount of fragmentary evidence.[59] In view of the great range of management strategies adopted, varying from gross profit maximization to cost minimization, it is not possible to be more definite about an average or modal account. An enterprise is hypothesized, however, with a mean cost-revenue combination, and from this a number of interesting points emerge.

It seems that the optimum period for both fully urbanized and suburban pastoral cowkeeping came in the first half of the century. Thereafter, rising costs and static revenue meant that in 1860 and 1890 a net loss would have been sustained if the management system hypothesized in the Appendix had actually been adopted. In reality production continued to be marginally profitable for two reasons.

First, many cowkeepers found that their continued viability depended upon securing the wider margin available to the retailer of milk. This represented a departure from their earlier practice of selling the daily produce of a certain number of cows to a contracting dealer or milkmaid. After the mid century such producer-retailing was only possible in those areas of east London where competition from fixed dairy shops and retail rounds had yet to develop fully.

Secondly, a regime in which costs were cut to a minimum became the rule for the surviving cowkeepers. In preference to the traditional shorthorn, many now bought the smaller Dutch cow and, in response to the falling price of beef, did not attempt to fatten it. Others found that an increase in their own or their family's labour was necessary. Most cowkeepers, however, were not able to bear the personal sacrifice required in terms of hard work and meagre reward, and in the late century production was increasingly concentrated in the hands of rural immigrants,[60] especially from Wales (Table IV), because 'they alone among the inhabitants of the United Kingdom [could] make cowkeeping in London pay'.[61] For them the occupation was ideal because it offered a rare chance to use their rural skills in the city,[62] and it was therefore a convenient stepping-stone to urban life.

Even with these adjustments the prosperity of urban cowkeeping was severely curtailed in the second half of the century. The effects upon costs of disease and enforced structural and sanitary improvements have already been noted, but there were also significant developments in the revenue account. In the 20 years or so before 1900 these included a collapse in the market for urban cow beef,[64] a reduction in the return from the sale of manure to farmers and market gardeners,[65] and a decline in the wholesale price of cowshed milk.[66]

The changing location of production

As a result of this struggle to minimize costs in the face of a stagnant or falling revenue there was

TABLE IV

The proportion of London's cowkeepers who had Welsh surnames

Date	*Cowkeepers*	*Welsh surnames*[63]	*Percentage*
1881	998	240	24
1890	285	116	41
1900	168	82	49
1910	102	47	46

Sources: G.L.R.O.: M.B.W./1807b; *Post Office Directories*, London and Suburban

Note: The numbers of cowkeepers recorded here do not correspond to the number of herds shown in Table I because of the incomplete nature of the Directory material

a modification of the geographical concentration of production within the urban area. The market orientation of the early century, with sheds in or near the West End and City of London, was undermined in the 1850s and 1860s by the action of the Medical Officers of Health in those areas. A need to reduce costs increasingly came to dominate the locational decisions of producers because cowsheds survived most successfully in those areas where it was possible to cut the transportation cost of the fodder input from breweries and hay merchants,[67] where local sanitary controls were least rigorously enforced,[68] where the rents asked for suitable premises were low,[69] and where there was a minimum of competition from railway milk. In the second half of the century these conditions were met most satisfactorily in the East End. In 1881 the M.B.W.'s first register of licensed cowkeepers,[70] for instance, showed a concentration of premises in the part of the urban area to the north of the River Thames and to the east of the City of London (Fig. 3). This was the area which also offered the best opportunity for producer-retailing, and where the large Jewish community ensured a steady demand for locally produced kosher milk.[71]

DISCUSSION: CAUSES AND CONSEQUENCES OF DECLINE

Neither the Cattle Plague of 1865–66, nor the desire of those in authority to close insanitary cowsheds, can be singled out as causes of the decline of milk production in London after *c.* 1860. They were merely contributory factors to a complex process of adverse circumstances which gradually eroded profitability in the second half of the nineteenth century. Unfortunately even the timing and pace of this erosion is uncertain. The declining cow population is an inadequate index because the trade came increasingly to be dominated by rural immigrants who were inured to a low return for their labour.

The fall in the number of urban cowkeepers came about less as a process of failure through bankruptcy or of closure by the authorities, than as a result of producer mobility. Table V shows that the average length of time each property was used as a cowshed was as little as 11 years in both Bethnal Green (in the East End of London) and Plumstead (on the rural-urban fringe in the south-east of the city). This rapid turnover of premises meant that leases were short, or that cowkeepers actively sought to improve their location by frequent changes of address. Licences for sites not previously used for milk production were difficult and costly to secure because both the M.B.W. and the L.C.C. imposed their most stringent structural and sanitary requirements on any proposed new cowshed. Most urban producers could not afford to restart under these circumstances and therefore natural wastage became a principal agency of decline from about 1880. Retirement and death were responsible for a steady thinning of the ranks, but many cowkeepers gave up their licences to become specialist retailers.

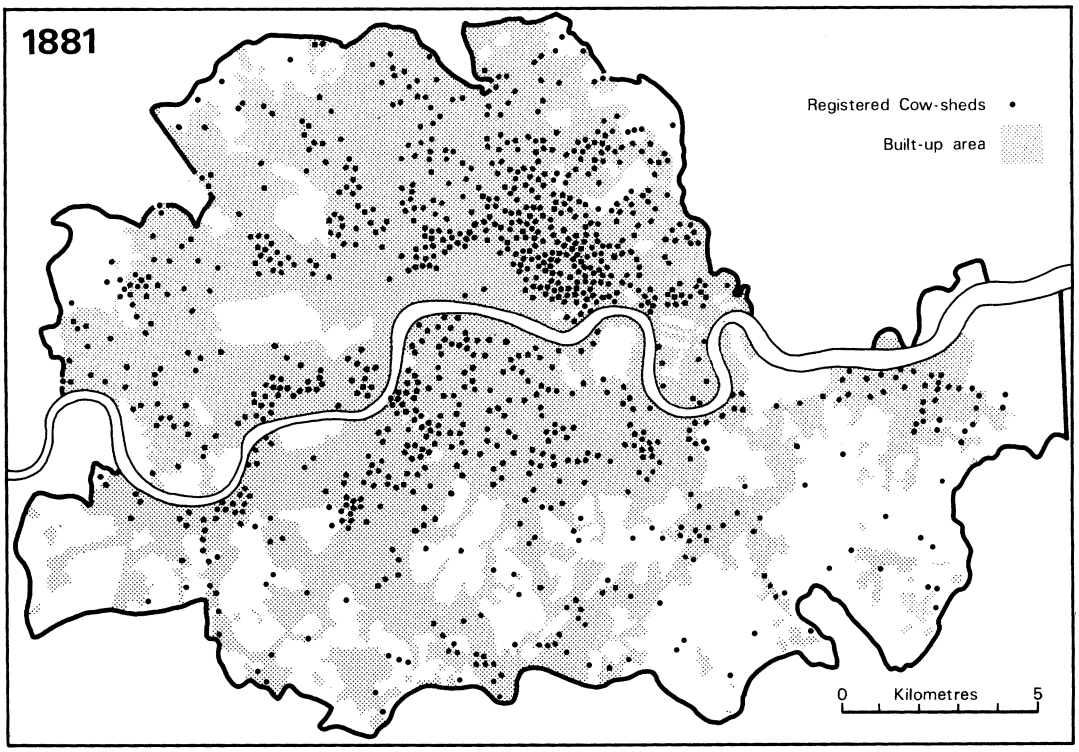

FIGURE 3. The distribution of registered cowsheds in 1881 within the jurisdiction of the Metropolitan Board of Works. *Source:* G.L.R.O.: M.B.W./1807b

TABLE V

Producer mobility

	Bethnal Green (*1867–1914*)	*Plumstead* (*1863–1914*)
Average length of time a cowkeeper stayed in one property (years)	5·08	5·11
Average trading life of each cowkeeper (years)	7·31 (154 cowkeepers)	7·30 (112 cowkeepers)
Average length of time one location was used as a cowshed (years)	11·83 (105 premises)	10·95 (81 premises)

Source: Annual Reports of the respective M.O.H.

At their peak in the 1850s and 1860s the 'noxious' and semi-agricultural trades such as cow-keeping, pig-keeping, cattle slaughtering and animal marketing must have contributed in no small measure to the deteriorating environment of the neighbourhoods in which they were concentrated.[72] These tended to be the poor areas of London which, as far as milk was concerned, also experienced the highest rates of adulteration and the lowest *per capita* consumption. There is no doubt that the people living in the slums suffered most and benefited least from the production of milk in their locality.[73]

Cleaner milk was produced in London as a result of pressure from the sanitary authorities in the last few decades of the century, but by that time the urban supply was diminishing. The

country milk imported as a substitute and supplement was by comparison produced in largely unregulated conditions, and ironically the proportion of sour, dirty and infected milk on the market therefore increased. This was almost certainly partly responsible in the 1890s for London's rising infant mortality rate from so-called summer diarrhoea, at a time when most other common diseases were being brought under control.[74] The decline of urban cowkeeping may therefore be regarded as somewhat of a mixed blessing.

CONCLUSION

This paper has traced the evolution of London's milk supply from suburban-based production at the turn of the eighteenth century, through a phase of largely intra-urban cowkeeping in the mid nineteenth century, to the period after *c.* 1860 when imported country milk increasingly became the mainstay of the trade. An attempt has been made to explain this evolution in terms of a gradually changing level of profitability rather than any supposedly revolutionary effect of a cattle plague.

Given even a slightly different combination of circumstances in the late nineteenth century, it is conceivable that milk production in London might have continued to be viable. In European cities as diverse as Paris and Liverpool town milk was successfully produced well into the twentieth century,[75] as it is to this day in many Third World cities.

Further research is needed into forms of 'agricultural' land-use which are able to survive for long periods in an urban environment.[76] An extension of the examination of processes of change at the rural–urban fringe into the city itself might then serve to discourage the popular impression that 'agricultural uses can practically never compete with urban ones within city areas'.[77]

ACKNOWLEDGEMENTS

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NOTES

1. DYOS, H. J. and WOLFF, M. (1973) 'The way we live now', in idem (eds) *The Victorian city, images and realities* (London) 893–907, see p. 898

2. The extensive literature on cowkeeping in cities other than London shows that locational influences have differed markedly. See for instance MULLALY, J. (1853) *The milk trade in New York and vicinity* (New York); PHLIPPONNEAU, M. (1949) 'Les laitiers — nourrisseurs de la banlieu parisienne', *Bull. Ass. Géogr. fr.* 198, 9–18; BRUNGER, E. (1955) 'Dairying and urban development in New York State, 1850–1900', *Agric. Hist.* 29, 169–74; PHLIPPONNEAU, M. (1956) *La vie rurale de la banlieu parisienne* (Paris); HILL, H. (1956) 'Liverpool—last stronghold of town cowkeepers', *Dairy Engng* 73, 107–10; FIELDING, G. J. (1962) 'Dairying in cities designed to keep people out', *Prof. Geogr.* 14, 12–17; GREGOR, H. F. (1963) 'Industrialised drylot dairying: an overview', *Econ. Geogr.* 39, 299–318; WIKKRAMATILEKE, R. and SINGH, K. (1970) 'Tradition and change in an Indian dairying community in Singapore', *Ann. Ass. Am. Geogr.* 60, 717–42

3. Thomas Farmer, who in 1612 had recently moved to Westminster from Islington, was charged with keeping 'eight kyne tyed up in the kitchen which by his own confession he hath lately converted to a cowhouse'. MANCHEE, W. H. (1924) *The Westminster city fathers (the Burgess Court of Westminster), 1585–1901* (London) p. 76

4. He argued that demand for this most perishable of agricultural commodities would ensure that 'the price . . . will rise to the point where the land used to produce it cannot be more profitably devoted to any other product'. HALL, P. G. (ed.) (1966) *Von Thünen's Isolated State* (London) p. 9; for other evidence of the suburban dairying belt see LYSONS, D. (1795–1806) *The environs of London . . . within twelve miles of that capital* (London); HUNTER, H. (1811) *The history of London and its environs* (London); BULL, G. B. G. (1956) 'Thomas Milne's land utilisation map of the London area in 1800', *Geogrl J.* 122, 25–30; idem (1957) 'The changing landscape of rural Middlesex, 1500–1850', unpubl. Ph.D. thesis, Univ. of London; PARTON, A. G. (1973) 'Town and country in Surrey *c.* 1800–1870: a study in historical geography', unpubl. Ph.D. thesis, Univ. of Hull

5. ANON. (1793) 'Cows for the supply of London', *Ann. Agric.* 21, 526–33

6. Brewers' grains are the spent grains or husks or malt left after the 'wort' has been drawn off. This waste was most plentiful in the brewing season of October to May, but could be preserved in pits. CORRAN, H. S. (1975) *A history of brewing* (Newton Abbot) p. 12. An account of the use of brewers' grains in suburban stock fattening is given in MATHIAS, P. (1952) 'Agriculture and the brewing and distilling industries in the eighteenth century', *Econ. Hist. Rev.* 2nd Ser. 5, 249–57

7. As early as 1694 a Mr Harrard of Hoxton was selling the milk of up to 400 cows, although we cannot be sure if they were all under his own management, and in 1714 Messrs Ratcliff, Rufford and Pullen between them kept 359 cows on the grasslands of Islington. BATES, T. (1718) 'A brief account of the contagious disease which raged among the milch cowes near London in the year 1714', *Phil. Trans. R. Soc.* 30, p. 873; HOUGHTON, J. (1782) *A collection for the improvement of husbandry and trade* (London) pp. 297–8

8. NELSON, J. (1811) *The history, topography and antiquities of the parish of St Mary, Islington* (London) pp. 107–9. Besides this large-scale milk producing enterprise the Laycock family were entrepreneurs in other semi-agricultural activities. Charles Laycock had in the late eighteenth century been described as one of the greatest goose-feeders and wholesale poulterers in the kingdom, and his son Richard derived a substantial income from his overnight 'layers' in Islington which in the years 1825–27 accommodated 150 000 cattle and 460 000 sheep destined for Smithfield Market. 'Report from the Select Committee . . . into the state of Smithfield Market', *British Parliamentary Papers* (hereafter *B.P.P.*) 1828 (551) viii. pp. 236–40

9. GAMGEE, J. (1863) *The diseases of animals in relation to public health and prosperity* (Edinburgh) p. 10

10. For a full description of the changing yield of London's cows see the author's thesis (in progress) 'The milk trade of London, *c.* 1790–1914', Univ. of Cambridge

11. The rent asked for Cream Hall, Islington, was £11.05 per ha in 1807, and £14.83 per ha in 1811 for Eton College's Hampstead farm of Chalcot. Greater London Record Office (London) (hereafter G.L.R.O.) P83/MYRI/390; THOMPSON, F. M. L. (1974) *Hampstead, building a borough, 1650–1964* (London) p. 12

12. HUNTER, op. cit. Vol. 2, p. 3 (note 4)

13. BAIRD, T. (1793) 'London brick fields', *Ann. Agric.* 21, p. 150

14. LYSONS, op. cit. Vol. 4, pp. 575–6 (note 4)

15. Public Record Office (hereafter P.R.O.) IR 29/33 (Islington Tithe Apportionment)

16. 'First report of the Commissioners . . . into the origin and nature of the Cattle Plague', *B.P.P.* 1866 (3591) xxii. p. 59, Q.793

17. ANON. (1825) *A treatise on milk* (London) p. 81

18. Some cowkeepers sent their dry cows and herd followers to the Essex marshes for summer grazing. GREENHOW, E. H., 'Report on murrain in horned cattle . . .', *B.P.P.* 1857 (2233II) xx. p. 382; an 1852 survey of the City of London's 26 cowkeepers showed that 73 per cent of their cows were sent out for summer grazing an average distance of 9·5 km. City of London Record Office (hereafter C.L.R.O.) MS. Minutes of the Sewers Commission lxxxviii (1852) p. 96

19. COOPER, J. F. (1837) *Gleanings in Europe: England*, Vol. 1 (London) p. 65

20. ANON. (1831) 'London dairies', *Br. Fmrs' Mag.*, 76–82

21. It is not clear what proportions of these new enterprises were started by cowkeepers transferring from the urban fringe, or by newcomers to the trade

22. The authenticity of the distinction made between 'cowkeepers' and 'dairymen' by Robson in 1829 is difficult to establish, especially in view of the recombination of all these addresses under one heading in the 1832 edition of his *London Directory*. For a discussion of problems encountered with the use of directory material see the author's doctoral thesis

23. 'Customs tariffs of the United Kingdom from 1800 to 1897', *B.P.P.* 1898 (C8706) lxxxv; MINISTRY OF AGRICULTURE, FISHERIES AND FOOD (1965) *Animal health, a centenary* (London) p. 7

24. Foot-and-mouth disease had first been introduced in 1839 and pleuro-pneumonia in 1841. The crowded conditions in London's cowsheds made them the principal source of propagation in a series of epidemics which swept through the country in the next half-century, the most serious of which were the rinderpest 'cattle plagues' of 1865–66 and 1877. WATERS, G. (1849) 'Pleuro-pneumonia among cattle', *Jl R. agric. Soc.* 9, 342–65; FLEMING, G. (1871–81) *Animal plagues: their history, nature and prevention*, Vol. 2 (London); SMITHCORS, J. F. (1957) *Evolution of the veterinary art* (Kansas City) p. 385

25. GAMGEE, J. (1862) 'Cattle diseases in relation to supply of meat and milk', in the 5th Report of the Medical Officer of the Privy Council, *B.P.P.* 1863 (162) xxv. 206–98

26. There was, however, a considerable trade in diseased meat in the poor areas of London until controls became more effective in the 1870s and 1880s. RUGG, H. H. (1850) *Observations on London milk* (London) p. 12; GREENHOW, op. cit. pp. 412–17 (note 18); on 22 April 1863 the General Purposes Committee of the Association of Medical Officers of Health (now the Society of Community Medicine) recorded in their minutes that 'a very serious amount of disease exists among the cows of the London dairies, and . . . animals thus diseased are habitually slaughtered and used as food'

27. 'First report of the commissioners . . . into the origin and nature of the Cattle Plague', *B.P.P.* 1866 (3591) xxii. p. 247, Q.4530

28. Another significant effect had wider implications. It could be argued that the increased turnover of high yielding milch cows made London a drain upon the genetic resources of the country's dairy breeds. This may well have been one factor in a stagnation of the national average yield in the nineteenth century which lasted until the 1870s or 1880s

29. RUGG, op. cit. p. 34 (note 26); HASSALL, A. H. (1855) *Food and its adulteration: comprising the reports of the Analytical Sanitary Commission of 'The Lancet' for the years 1851–54* (London) p. 341; WYNTER, A. (1854) 'The London Commissariat', *Quarterly Rev.* 190, p. 293; WILSON, J. (1854) 'New milk dairies', *Encyclopaedia Britannica*, 8th edn (Edinburgh) p. 622

30. ERICKSON, A. B. (1961) 'The cattle plague in England, 1865–7', *Agric. Hist.* 35, 94–103. Atmospheric influences, spontaneous generation, and infection were all put forward as possible causes. This debate paralleled a similar one about the nature of the disease afflicting human beings

31. *B.P.P.* 1866 (3591) xxii. p. 55, Q.646

32. Morton estimated that only 10 000 out of the usual 24 000 cows remained to supply London and its suburbs in

December 1865, although this did not necessarily imply that 14 000 had been infected. MORTON, J. C. (1865) 'On London milk', *Jl Soc. Arts* 14, p. 74

33. *Annual report of the M.O.H. on the sanitary condition of the City of London* (1864–65)

34. The voluminous records of the Veterinary Department of the Privy Council Office (P.R.O.: PC/8) and the Cattle Diseases and Cattle Plague Committees of the M.B.W. (G.L.R.O.: M.B.W./677 and 811–18) await detailed analysis

35. J. Gamgee reported for Scotland that among the town dairy cows 'mortality is so great that after several years experience, and at high rates of premium, insurance of them had to be given up'. *B.P.P.* 1863 (161) xxv. p. 208

36. This was at least partly due to the conservatism of a cowkeeping community contemptuous of veterinary advice. Professor Brown of the Veterinary Department of the Privy Council Office in 1873 could not remember a single instance of an urban dairyman reporting a diseased cow in the 4 years' operation of the Contagious Diseases (Animals) Act. 'Report from the Select Committee . . . into the operation of the Contagious Diseases (Animals) Act, 1869', *B.P.P.* 1873 (353) xi. 311, Q.2469; results of the inoculation carried out proved favourable, but one inspector commented in 1888 that 'on recently going through the London cowsheds I found that there were few of the dairymen who inoculated the whole of their cattle'. 'Report of the Departmental Committee . . . into pleuro-pneumonia and tuberculosis in the United Kingdom', *B.P.P.* 1888 (C5461) xxxii. p. 469, Q.5724

37. Assessing the financial loss is not straightforward. From accounts of the compulsory slaughter policy published in the M.B.W.'s *Minutes* from 1880 to 1890 it is calculated that although the standard rate of compensation to the cowkeeper was 75 per cent of the cow's value (average full value £19.52), the return to the M.B.W. from the sale of the hide and carcass averaged only £6.06 or 31 per cent of this value. In other words the cows which died of disease in the cowshed would have been worth comparatively little at the knacker's yard, and therefore the incentive was great for the cowkeeper to sell his beasts before a disease was recognized or the infection could take hold.

38. The 24 000 cows in and around London in 1860, for instance, would have produced about 275 000 tonnes of manure annually. *Cowkeep. Dairym. J.* (1879) 1, p. 13; ibid. (1881) 3, p. 36. This was used in large quantities on farms in the immediate neighbourhood of London, but it was also shipped by barge along the Essex and Kent coasts and by rail as far inland as Bedfordshire. BEAVINGTON, F. (1963) 'The change to more extensive methods in market gardening in Bedfordshire', *Trans. Inst. Br. Geogr.* 33, 92–4; idem (1975) 'The development of market gardening in Bedfordshire, 1799–1939', *Agric. Hist. Rev.* 23, p. 31; BAGWELL, P. S. (1974) *The transport revolution from 1770* (London) p. 72

39. See LAMBERT, R. (1963) *Sir John Simon, 1816–1904, and English social administration* (London)

40. C.L.R.O. *MS. Minutes of the Sewers Commission* lxxxvii (1852) 828–33, and lxxxviii (1853) 91–4; C.L.R.O. PD/53/3; SIMON, J. (1852) *Report on cowhouses* (London); HAYWOOD, W. (1853) *Report to the Honourable the Commissioners of Sewers of the City of London of suggestions of rules and regulations for the management of cowhouses* (London); ANON. (1856) 'Cowhouses in the City of London', *Agric. Mag.* 35–6

41. '*A list of the numbers of officers employed by each authority was published in Metropolis Rates . . .*', *B.P.P.* 1867–68 (37) lviii. p. 51

42. JEPHSON, H. (1907) *The sanitary evolution of London* (London) p. 89; WOHL, A. S. (1973) 'Unfit for human habitation', in DYOS and WOLFF, op. cit. p. 607 (note 1)

43. *Annual Report of the M.O.H. of the Vestry of Paddington* (1858–95); *Annual Report of the M.O.H. of the Vestry of St Mary, Rotherhithe* (1862–63)

44. 'Report from the Select Committee . . . into the noxious businesses', *B.P.P.* 1873 (284) x. p. 431; 'Return of all persons licensed as slaughterers of cattle or sheep within the limit of the metropolitan district', *B.P.P.* 1873 (387) lvi. p. 575 and 1874 (128) lvii. p. 925; Slaughterhouses, etc. (Metropolis) Act 1874

45. In December 1875 T. O. Dudfield presented a paper to the Society of Medical Officers of Health entitled 'London cowsheds: the desirability of bringing them under the operation of a uniform code of bye-laws', and this was followed in February of the following year by the Society's 'proposed bye-laws for regulating metropolitan and urban cowsheds and dairies'. *Ann. rep. Soc. of Medical Officers of Health* (1875–76) 16–19

46. The authorities entered a relevant section in the Public Health (Metropolis) Bill of 1877, and attempted to have cowkeeping included in restrictive legislation on noxious trades. Neither of these proposals was successful, and it was left to the drafter of the Contagious Diseases (Animals) Act of 1878 to make provision for the framing of Orders concerning the milk trade. The Local Government Board was the body responsible for making these Orders.

47. These were based upon bye-laws proposed in the Minutes of the Council Meetings of the Society of Medical Officers of Health, 1878. I am grateful to Mr N. G. T. Taylor of the Society of Community Medicine for allowing me access to these records.

48. *Trans. Soc. med. Offrs Hlth* (1879–80) p. 91; *Cowkeep. Dairym. J.* (1870) 1, p. 10

49. *Annual report of the Metropolitan Dairyman's Society* (1880) p. 4. I am grateful to Mr L. Bray of the National Dairymen's Association for making a series of these reports available to me.

50. G.L.R.O.: L.C.C. PH/REG/2/23

51. The first and most frequently used method was the visit of the inspector who suggested possible improvements and threatened various forms of action if they were not carried out. Table III shows that visits by M.B.W. and L.C.C. inspectors to each cowshed averaged between five and eleven per annum, but it cannot show the spatial variation of visitation by the inspectors of local sanitary authorities. This was most lax in the poor districts of London where the domestic Rate brought in too little to finance a large sanitary staff. Cowkeepers seem to have made changes in the structure or management of their sheds only when repeatedly reminded, and in slum areas this pressure was minimal. Secondly, a Notice to carry out necessary works could be served upon the cowkeepers which, if ignored, was used at the annual licensing session as grounds for the magistrate to refuse an application. Such refusals seem to have been most common in the early years of the L.C.C.'s

administration (1889 onwards). Short of depriving the cowkeeper of his livelihood it was also possible for the magistrate to grant an adjournment of the hearing on condition that specific alterations were to be made. This method was frequently used during the jurisdiction of the M.B.W. over milk production (1879–89). Finally, prosecution for non-compliance with the regulations was possible, but was rarely used except as a punishment for keeping cows in unregistered premises

52. TAYLOR, D. (1971a) 'The development of English dairy farming *c.* 1860–1930', unpubl. D.Phil. thesis, Univ. of Oxford; idem (1971b) 'London's milk supply, 1850–1900: a re-interpretation', *Agric. Hist.* 45, 33–8; see also WHETHAM, E. H. (1964) 'The London milk trade, 1860–1900', *Econ. Hist. Rev.* 2nd Ser. 17, 369–80; idem (1970) 'The London milk trade, 1900–1930', *Res. Pap.* 3, Inst. Agric. History, Univ. of Reading

53. *Rly Chron.* (30 May 1846) p. 533; PORTER, G. R. (1850) 'On a comparative statement of prices and wages during the years from 1842 to 1849', *Jl R. statist. Soc.* 13, p. 215

54. BEESLEY, G. (1849) *Report on the state of agriculture in Lancashire* (Preston) p. 17

55. Early hindrances to the long distance transportation of milk included the unsuitable design of milk cans and railway wagons, difficulties of preserving milk in hot weather, the inflexibility of railway timetables and freight rate structures, the absence of a wholesale trade capable of the complex organization necessary, and the reticence of the rural producer to enter a trade of unproven potential

56. CLUTTERBUCK, J. C. (1869) 'On the farming of Middlesex', *Jl R. agric. Soc.* 2nd Ser. 5, p. 24

57. 'Dealers in milk will give from 4*d.* to 6*d.* per barn gallon [*c.* 30 per cent] more for town-shed milk than for what is delivered by the railways'. MORTON, op. cit., p. 73 (note 32)

58. In 1913, for instance, the Board of Agriculture's *Return of Market Prices* yields the following average weekday accommodation milk prices (in pence per l) at London's major termini: Waterloo 0·862; Liverpool Street 0·852; Euston, King's Cross and St Pancras 0·850; Paddington 0.815

59. There must, of course, have been some accounts kept, but they have only come to light so far in the wholesale and retail sectors of the trade. Nevertheless, evidence in the nineteenth-century agricultural literature and trade press has enabled the reconstruction of the animal management systems of at least 47 London cowkeeping enterprises in the period 1865–1914, and several more in earlier decades. This evidence gives confidence that the ranges of likelihood recorded in the Appendix are a useful basis for estimating the trend in profitability. For an interesting qualitative account of the management of cows in London see MORTON, J. C. (1868) 'Town milk', *Jl R. agric. Soc.* 2nd Ser. 4, 69–98

60. Rural immigrants are or have been responsible in several of the world's cities for the maintenance of urban milk production. This was true in the late nineteenth century, for instance, of the Auvergnats in Paris, and was also recently the case among the people of Dutch descent in Los Angeles and Hindus in Singapore. *Cowkeep. Dairym. J.* 33 (1910) p. 234; PHLIPPONNEAU (1956) op. cit. p. 89 (note 2); FIELDING, op. cit. 12–17 (note 2); GREGOR, op. cit. pp. 305–6 (note 2); WIKKRAMATILEKE and SINGH, op. cit. (note 2)

61. BAXTER, A. E. (1896) 'Milksellers', in BOOTH, C. (ed.) *Life and labour of the people in London*, Vol. VII (London) 173–87; *Cowkeep. Dairym. J.* (1903) 25, p. 536

62. JONES, G. S. (1971) *Outcast London* (London) pp. 143–4

63. The 'Welshness' of a surname was judged from REANEY, P. H. (1976) *A dictionary of British surnames* (London). This is a crude measure because a Welsh surname would not have guaranteed that its bearer was a recent immigrant

64. The introduction in rapid succession in the 1870s and early 1880s of cheap canned, chilled and then frozen meat, knocked the bottom out of the market for the carcasses of fat cows reared and killed in London. Cowbeef, however, had never been popular in London, because of the suspicion that much of it was diseased

65. Manure had traditionally been paid for and collected by market gardeners or farmers as a return load after they had been to market with their own produce, but in the 1860s and 1870s when the authorities began to insist that the dung should be removed regularly and sometimes daily, it rapidly became a liability. Thus, in 1879, the trade press remarked that 'tons of natural farmyard manure may be had of cowkeepers in the north of London gratuitously'. *Cowkeep. Dairym. J.* (1879) 1, p. 13

66. The wholesale price of town milk fell in parallel with a decline in the contract price of railway milk in the late 1880s and 1890s. Its fortunes were in this sense tied to circumstances in the country milk trade

67. In 1881 the distribution of fodder suppliers, namely breweries, brewers' grain merchants, distilleries of whisky and gin, haymarkets, and hay and straw merchants, was most concentrated in the City of London and east central London. Suppliers of one sort or another were, however, comparatively numerous in most parts of the city except in the suburbs where cowkeepers would anyway have had access to pasture and meadow

68. Here a distinction should be drawn between the inspectors of the central authority (the M.B.W. from 1879 to 1889, and the L.C.C. from 1889 onward) and those of the local sanitary authority. In the latter case they tended to be Inspectors of Nuisances and Sanitary Officers whose duties involved alleviating many hazards to health. There seems to have been a tension between the inspectors of the local and central authorities which manifested itself in contradictory demands upon the cowkeeper. For a full list of the strength of the inspectorate in each local district see BATE, G. P. (1886) *Report on the sanitary condition and vital statistics of the Parish of St Matthew, Bethnal Green, 1885* (London) pp. 8–9, and the L.C.C.'s *London Statistics*

69. Annual rental per stall varied from £1 paid for Coomber dairy farm in Fulham (in 1879) and £1.50 by H. Jones of Shadwell (in 1904), to £4.50 paid for Holland Park Farm, with its proximity to the West End, by E. C. Tisdall (in 1874). G.L.R.O./E/WS/12; G.L.R.O. PH/REG/2/37; SHEPPARD, F. (ed.) (1973) *Survey of London, Northern Kensington*, Vol. 37 (London) 127; *B.P.P.* 1874 (262) vi. p. 398, Q.2648

70. In the Greater London Record Office (London) a number of registers are preserved. The first to be drawn up by the M.B.W. (M.B.W./1807b) is dated 1881 and records the name of the licensee, the address of his cowhouse(s), any subse-

quent changes of these items, and whether the licence was applied for and granted in the years up to 1885. 24 other registers have also survived, making it possible to trace licences through parish lists, lists of registration numbers, surname indices and street indices. At several dates the numbers of cows permitted in each shed was recorded along with other information concerning the cubic volume available for cows' breathing space, the nature of any objection lodged about sanitary defects, the distance of the cowshed from the nearest inhabited property, and the conditions attached to each licence.

71. One writer has argued that this continuing specialized demand was a major factor in the survival of urban cowkeeping in the East End of London into the 1920s. DULDYKE, E. R. (1937) 'The economic geography of the milk supply of London', unpubl. M.A. thesis, Univ. of London

72. DYOS, H. J. (1967) 'The slums of Victorian London', *Vict. Stud.* 11, 5–40, see p. 25

73. It could be argued that London's local and central authorities showed more interest in regulating the activities of stockmen than they did in improving the housing conditions of working-class people. While cowsheds were becoming less cramped in the 1880s, conditions in the houses of the poor were becoming more overcrowded; while cowkeepers had to limewhite their premises at least twice annually, there were many slum properties which were not cleansed for years; and while most cattle diseases were made notifiable by the Animals Order and the Contagious Diseases (Animals) Act of 1869, human disease was not similarly treated in London until the Infectious Diseases Notification Act, 1889. JEPHSON, op. cit. pp. 202, 342–3, 357 (note 42)

74. BEAVER, M. W. (1973) 'Population, infant mortality and milk', *Popul. Stud.* 27, 243–54

75. PHLIPPONNEAU (1956) op. cit. p. 89 (note 2); HILL, op. cit. (note 2)

76. See ATHERALL, P. G. (1976) 'The displacement of market gardening around London by urban growth, from 1745 to 1939', unpubl. M.Litt. thesis, Univ. of Cambridge

77. FOUND, W. C. (1971) *A theoretical approach to rural land-use patterns* (London) p. 75

APPENDIX

The following account has been estimated from fragmentary evidence. It does not relate to the management system of any one specific enterprise, and therefore to accommodate the element of uncertainty in the calculations a range of possible variations in the individual items of cost and revenue has been incorporated. It would not have been possible for a cowkeeper to minimize his costs while maximizing his revenue, but a number of intermediate strategies would have yielded a profit even in 1890. For the full details of evidence and methods of estimation see Atkins (App. 1).[10] All the data are expressed in £ per stall per annum.

	1790	*1825(A)*	*1825(B)*	*1860*	*1890*
Costs					
Replacement of cow	2·88–6·50	5·00–10·00	26·67–40·00	29·76–39·43	20·00–50·00
Loss from disease	0·30–0·50	1·00	1·00	2·98–4·73	0·36–0·89
Feed	14·89	22·26–23·41	24·33–27·45	21·54–30·91	19·82–28·51
Labour	0·50–1·00	1·00–2·00	1·00–2·00	3·00–6·00	3·00–5·00
Cowshed structure	0·50	0·50	0·50	0·50	2·00–5·00
Rent	1·00–3·00	2·00–7·00	1·00	1·00–3·00	1·00–5·00
Miscellaneous	0·20–2·00	0·25–2·00	0·25–2·00	1·00–3·00	2·25–3·25
Total	20·27–28·39	32·01–45·91	54·75–73·95	59·78–87·57	48·43–97·65
Revenue					
Sale of cow	4·32–9·75	5·00–10·00	26·67–40·00	25·49–33·34	22·11–40·50
Sale of calf	0·20–1·00	0·50	0·50	0·00–0·50	0·00–0·50
Saving on diet of dry cows	0·30–1·49	0·45–2·34	0·36–0·82	0·32–1·86	0·30–1·71
Manure	0·50–1·00	0·75–1·50	0·00–1·50	0·00–0·56	0·00–0·56
Sale of milk (wholesale)	12·70–15·63	26·06–32·99	37·29–39·41	36·25–39·52	30·83–32·56
Total	18·02–28·87	32·76–47·33	64·82–82·23	62·06–75·78	53·24–75·83
Hypothetical enterprise					
Costs	28·41	39·47	57·69	65·75	64·72
Revenue	30·06	42·56	66·86	61·11	51·24
Balance	+1·15	+3·09	+9·17	−4·64	−13·48

Note: In 1790 and 1825(A) the account relates to a semi-pastoral economy, and in 1825(B), 1860 and 1890 to a fully urbanized management system. The hypothetical enterprise is a mean cost-revenue combination