Chapter 3
The 'Charmed Circle'

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All of the evidence indicates that Georgian and Victorian cities in Britain were filthy and represented one of the all-time peaks of sanitary transgression by any standard that one might wish to apply. Much of the problem lay with the inability or unwillingness of the local state to abate nuisances caused by poor housing conditions and to provide suitable facilities for the removal and disposal of human waste.[1] As we have seen, animals were also prominently involved. It was innate in the rapid population growth and accompanying urbanization of the early nineteenth century that animals were required for transport and for the provision of fresh meat and milk. Their numbers grew, as did the quantity of their faeces and the waste products from slaughtering, and the smells produced by the various manufacturing industries that were based upon processing their flesh, skin and bone.

With regard to their animal wastes, late eighteenth and early nineteenth-century cities were moving towards, but never quite achieved, a closed system in which the vast quantities of dung from the many town horses and cows were utilized in intensive peri-urban horticulture and hay-making. These in turn then provided sustenance for animal and human urban dwellers. In talking about agriculture in the environs of London at the mid-century, Andrew Wynter summed up the constant recycling involved:

> Every clearance of ground is deeply trenched, and its powers restored with a load of manure to every thirty square feet of ground. This is the secret of the splendid return, and it could be effected nowhere but in the neighbourhood of such cities as London, where the produce of the fertilizer is sufficiently great to keep down its price. And here we have a striking example of town and country reciprocation. The same waggon that in the morning brings a load of cabbages, is seen returning a few hours later filled with dung. A balance as far as it goes is thus kept up, and the manure, instead of remaining to fester among human beings, is carted away to make vegetables.[2]

1 Inglis 2007.
2 [Wynter] 1854: 294.

There is abundant evidence that similar systems were in operation in cities across Europe and North America, Paris being one of the best documented.[3] Michel Phlipponneau summed up the situation there well for 1892 when he said that many highly productive market gardens simply would not have existed without the city's horses and the waste they produced.

> L'existence de cultures maraîchères autour des villes de garnison de la région parisienne, Versailles, Saint-Germain, Meaux, Mantes, Rambouillet, n'est pas sans rapport avec la présence d'une nombreuse cavalerie.[4]

Johann Heinrich von Thünen, writing in 1826, understood the general significance of town-sourced manure to nearby farmers. His own estate was in Mecklenberg near the town of Tellow, to the south east of Rostock.[5] His interest was in formulating an abstract model of the rural economy, and one of his conclusions was that land use would vary with distance from urban centres according to a number of factors that included the cost of transport. With regard to peri-urban agriculture, his comment was that 'the distinctive feature of this ring is that it buys most of the manure it uses from the town ... It is this which puts the first ring so far ahead of all the rest'.[6]

For the purposes of this chapter, we will concentrate mainly on London and its hinterland. The broader 'manured region', as we may style it, was initially the radius of convenient cartage, about five to ten miles at the beginning of the century, expanding with better roads to perhaps 15 to 20 miles and, later, with railway carriage, as far as 50 miles. The friction of distance was mediated through the expense of carting a bulky, low-value substance, causing the rapid taper of its profitability. Carey summed up well the peculiar tension between fertility and distance: 'Of all the things required for the purposes of man, the one that least bears transportation, and is, yet, of all the most important, is manure'.[7]

In sequence from London, this seems to have affected, first, the most intensive types of market gardening, growing delicate items such as asparagus; then, further out, vegetables and fruits were grown on farms; and, finally, hay was produced as fodder for the many town horses. The neat geometry of von Thünen's concentric ring model was never in evidence around London because of the distorting effects of the major routeways (including the River Thames and several canals) and of soil characteristics.[8] Figure 3.1 does nevertheless give some impression of the structure of the manured region.

3 Barles 1999, Bouchet 1993, de Silguy 1996, Jugie 1993, Trochet et al. 2003.
4 Phlipponneau 1956: 74.
5 Rostock is on the Baltic coast of Germany.
6 Thünen 1966: 10.
7 Carey 1856, vol. 1: 274.
8 Atkins 1987.

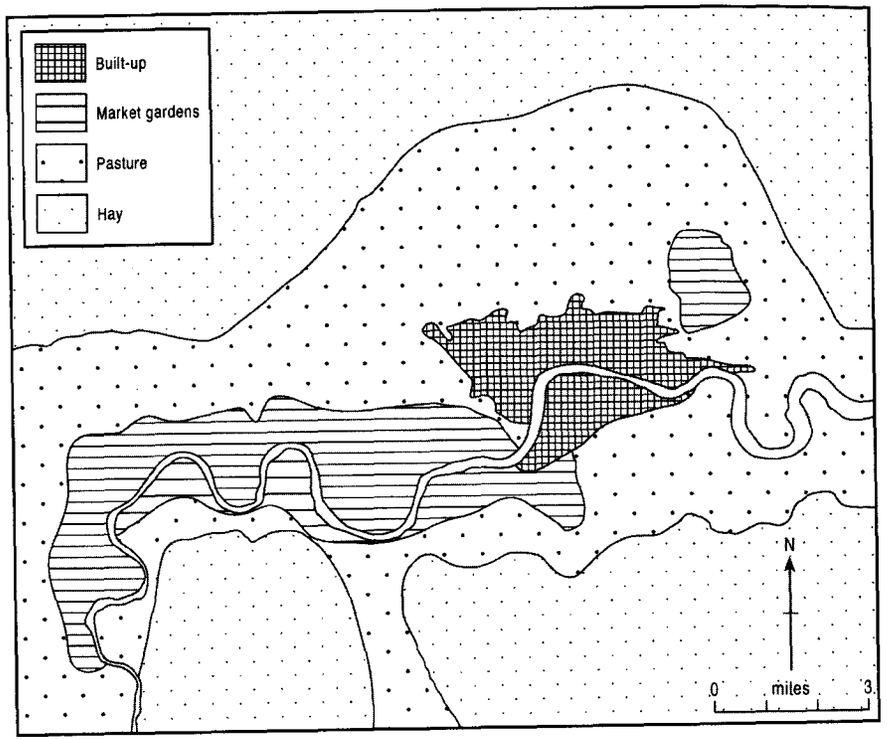

Figure 3.1 The manured region around London in the first decade of the nineteenth century

Source: Redrawn after Bull 1957

Hay-making for London Livestock

Starting at the spatial extremity of the manured region, we have many descriptions of the production of fodder. As early as 1748, Pehr Kalm, a Swedish traveller, published a detailed account of his impressions. Around London he was particularly struck by the luxuriant growth of grass in the meadows and pastures 'on most sides of London, close in to the town'. This was because, he observed:

> the grand opportunity for getting all kinds of choice manure here in London to spread on these meadows is the thing that especially contributes to this fertile growth. Their owners derived a very large profit from this source, for some of these pastures were let to those who kept cows, to supply the town with milk; others were hired out to butchers, to keep there for a time the cattle they had bought for slaughter; some to brewers or others, to turn their horses in. A fixed

> charge was paid per day for every animal that had freedom to go there, which for the whole year mounted up to a considerable sum.[9]

50 years later, John Middleton was a similarly close observer in his *General View of the Agriculture of Middlesex*.[10] He described a mature system of 'upland meadows and pasture', covering much of the county and dedicated to supplying hay to the 30,000 horses and 8,000 cows in London at that time. Middleton was impressed by this meadow, which was 'manured in a greater degree than any other ... in this kingdom' and which yielded up to two tons of hay per acre, 'of the highest quality, for the feed of horses, in the world'.[11] The muck was applied in October when the soil was dry enough to bear the weight of a heavy cart. The clay soils of much of Middlesex meant somewhat restricted agricultural possibilities and the system of hay-making described by Middleton added welcome value. By now the pasturing of Kalm had declined – at least until the last hay was cut and the land was turned over to fattening cattle and sheep destined for the London markets. It had been replaced by a more intensive system of taking the hay to the animals.

There seems to have been some specialization in the production of either horse or cow fodder, with slightly different management systems for each. Land beyond the building frontier in St Marylebone, Islington, St Pancras and Paddington, for instance, was used by cowkeepers. They manured it every other year and mowed the grass two or three times a summer. It was common also, further afield in Middlesex, for farm tenancies to include a clause in which meadowland was to be manured every year or every other year at the rate of one load of manure to every load of hay sold off the farm.[12] In other words, a concept of sustainable fertility had been formalized in order to prevent tenants 'mining' the soil towards the end of their occupancy.

According to Middleton, hay-making in Middlesex had been 'brought to a degree of perfection altogether unequalled by any other part of the kingdom'.[13] He estimated that 120,000 acres of grass in Middlesex, 30,000 in Herts and Essex, and 100,000 in Surrey, Berks and Kent, were dedicated to it, at the equivalent of 6.5 acres per beast.[14] This hay was sent to markets in Whitechapel, Smithfield, St James's and Southwark.[15] Here it was sold in loads of 36 trusses, each weighing 56 lb. (or 60 lb. if it was new hay),[16] making a total of just under a ton per load.[17]

9 Kalm 1892: 28–9.
10 Middleton 1798: 223.
11 Ibid: 225.
12 Rham 1850: 170.
13 Middleton 1798: 237.
14 Ibid: 301.
15 Middleton 1807: 546. The St James's hay market was transferred to the Cumberland market on the Regent's Canal in the 1820s.
16 The size of hay loads increased and the unit cost of transport fell once hay presses came into use in the second half of the nineteenth century. Tarr and McShane 2005.
17 Note that the tons referred to here are imperial tons. For American short tons, multiply by 1.12; for metric tonnes, multiply by 1.02.

According to an anonymous writer, the stimulus offered to the manured region continued well into the mid nineteenth century.

> In the neighbourhood of large cities, and especially in the neighbourhood of London, manure is a mere drug. The supply is so large in proportion to the demand, that it can always be had for an almost nominal price, and often for the mere cost of conveyance.[18]

This continuity was picked up again a decade later by Evershed in his prize essay on Hertfordshire for the Royal Agricultural Society of England.[19] He included a section on the belt of hay farms, mainly in Middlesex but extending north on the London clay as far as its junction with the chalk. Intensive management there seems to have remained unchanged since Middleton's day, with an average of five tons per acre of well-rotted manure being applied each year and yields of one to 1.5 loads of hay per acre, making them amongst the most intensive grasslands in the country.[20] With rents and labour costs higher than elsewhere, but also greater profitability, this system remained attractive to many farmers. Hay and straw was sold locally to agents who then transported it to market. Their return journey, more often than not, was carting a load of manure purchased at 1s. per load and sold in the countryside to farmers for seven times that rate.[21]

At about the time that Evershed was writing, the type of fodder used for horses was changing. The importation of maize created a cheap provender that was considered to be suitable as a substitute for expensive items such as oats and hay.[22] The cost of keep therefore fell between the 1850s and 1870s, facilitating a rise in horse numbers but stabilizing or reducing the call upon Middlesex hay.

Calculating the amount of hay consumed is problematic because requirements varied according to the amount of heavy work performed. Brewers' dray horses in 1798 were fed two trusses of hay a week (16 lb. a day), along with straw, oats and beans.[23] But these were large animals and their intake was certainly above the average diet for a town horse. Bradfield, who was knowledgeable about London omnibus horses, estimated the weekly consumption per stud of 11 horses to be 14 trusses (10 lb. per animal daily), a figure later confirmed (10.6 lb.) by Reynolds.[24] Sidney's ration for draught horses was 15 lb. of clover hay chaff and 22 lb. of oats, beans and maize, and Michael Thompson's calculation of an average for the whole

18 Anon. 1850: 193.
19 Evershed 1864: 282–4.
20 Each load was 18 cwt or 0.9 tons.
21 The United Kingdom's pre-decimal pound sterling was divided into twenty shillings (abbreviated 's.'), each of which had 12 pence ('d.').
22 Gordon 1893: 16, Turvey 2005: 51.
23 Middleton 1798: 564.
24 Bradfield 1855, Reynolds 1882: 53.

country was 14.7 lb. of hay.[25] Turvey's analysis of the business archives of the London General Omnibus Company is more definitive.[26] It shows an average of 10.9 lb. of hay fed per horse in 1857 and 6.75 lb. in 1876.[27]

If we take 10 lb of hay daily as a minimum for the 200,000 or more horses in London at the end of the nineteenth century, then at least 325,000 tons of hay were required. The true figure is probably between 400,000 and 500,000 tons. It is therefore easy to see why meadow was so important to home counties' farming. As previously mentioned, yields were already two tons per acre in 1798, and on the most intensive farms this rose to six tons by the mid nineteenth century.[28] The Agricultural Returns for the 1890s show that meadowland in Middlesex and Surrey combined had fallen to 160,000 acres but this would still have been enough for London's horses and the cattle and sheep that passed through on their way to market.

Horticulture

Closer to the city the manured region was devoted to various forms of horticulture. In nineteenth-century Paris, horse and cow manure supported a system of cultivation that was 'one of the most productive ever documented'.[29] Using one million tons of town dung, it was responsible for 100,000 tons of primeur vegetables delivered to the central markets, a substantial portion of the city's out of season demand. The main crops were asparagus, beans, peas, cauliflowers, melons, cucumbers, lettuce, chicory, and radish. The system's peak of activity and prosperity seems to have been between the 1840s and 1880s, based on about 3,500 acres of market gardens within the 1860 boundaries of Paris and its immediate surroundings. There were 1,800 holdings, about one third in Paris itself, the average size of which was small, at about 1.85 acres, and the cultivation was intensive, employing a workforce of 9,000.[30] Every scrap of valuable soil was put to use, regularly producing four to five crops a year and sometimes as many as seven.[31] In 1900, 60 per cent of the cultivated land in the Departement of the Seine was fertilized by manure and street sludge from Paris.[32]

25 Sidney 1880: 160, Thompson [1983]: 60.
26 Turvey 2005: 51.
27 In Paris the average ration before 1850 was 15.4 lb of hay. See Chapter Six in this book. Later, the Compagnie Générale des Omnibus fed a ration of 16.5 lb. of oats, 10 lb. of hay and 10 lb. of straw, and in 1871–2 the Compagnie Générale des Voitures gave rather less: 14.3 lb. of oats, 5.5 lb. hay and 6.6 lb. of straw. See Bouchet 1993: 207–8.
28 Caird 1852: 465.
29 Stanhill, 1977: 270.
30 Barral 1864.
31 Phlipponneau 1956.
32 Barles 2005a.

In the Paris of the 1860s, contractors, mostly farmers, were invited to bid for the removal of street waste. Much of this was used on the land and in 1900 there were about 500 contracts in operation.[33] In addition, there was a system of turning human waste into agricultural fertilizer, with ten or so drying plants processing it into pelleted form or poudrette, a manure made from night-soil, dried and mixed with charcoal, gypsum, ashes, earth, peat, or sawdust.[34]

Courtois-Gérard and Moreau and Daverne are the main sources for a reconstruction of this astonishing system, and also Ponce, who was himself a maraîcher on 2.5 acres of ground.[35] He grew each year nine tons of carrots; nine tons of onions, radishes and other vegetables; 6,000 heads of cabbage; 3,000 cauliflowers; 5,000 baskets of tomatoes; 5,000 dozen pieces of choice fruit; and 154,000 heads of salad – a total of more than 100 tons.

It took half a century for the anglophone literature to pick up on the maraîchères and publish lengthy accounts of their system. One of the most eloquent and enthusiastic was by Russian emigré prince Peter Kropotkin.[36] For him, the key activity in these market gardens was the use of fresh manure to create hot beds. Set up each November, these were in full production from December to April. The fermentation of the fresh manure used released sufficient energy to raise the temperature in the enclosed spaces of cold frames and cloches and make germination and growth possible well before the main season. Stanhill estimated that 472 tons of manure were applied annually per acre, where half of the holding was under glass for hot beds, but the average (with a quarter under glass) was 280 tons, equivalent to the manure of 45 horses per acre or a one foot depth across the whole plot.[37]

Each holding had a horse that was employed in hauling produce to market and then returning with manure from the stables and cowsheds in the city centre. Weathers, who looked into the costs of the maraîchères, estimated that manure, at 40 per cent of expenditure, was almost as big an input as labour.[38] The capital employed in such market gardens was substantial, with land as close as this to the built up area being very expensive – twice that of the equivalent London holdings – but also because of the elaborate arrangements that were necessary in the creation of the specific microclimatic conditions suitable for each crop. Key technologies used for this included large bell cloches (five to six million in the Paris region) and glass-covered forcing beds (half a million), in addition to frequent irrigation by hand-held watering cans. Straw mats were also called upon

33 Phlipponneau 1956.
34 Barles 2002.
35 Courtois-Gérard (six eds 1843–70), Moreau and Daverne (four eds 1845–70), Ponce 1869.
36 Kropotkin 1899.
37 Stanhill 1977: 273.
38 Weathers 1909: 17.

as protection from frosts, and walls were built at certain angles as wind breaks, sometimes with reflective surfaces to maximize the available light.

Such was the make-over of the land by these maraîchers that their leases allowed them, when they moved, to take their soil with them, down to a specified depth, along with their equipment. This was in recognition that they were responsible for creating the fertility and therefore deserving of recompense.[39]

Although perhaps never quite so intensive as Paris, the evidence suggests a similarly close association between horticulture around London and the use of manure. Malcolm Thick's history of the Neat House Gardens summarizes this convincingly for the seventeenth and eighteenth centuries.[40] He argues that their location near to the Thames, in Pimlico, was important for ready access to manure coming by water, and every gardener with a river frontage had wharfage rights. Manure was, he says, 'the mainstay of the Neat House's productivity' and he cites a Gardeners' Company petition in which it was claimed that they 'cleansed the city of all dung and noisomeness'.[41]

Dung from London enabled the Neat House gardeners to create hot beds on the same principle as in Paris. One has to remember that the climate during the Little Ice Age of the eighteenth century would not always have been favourable to the more delicate crops, but the motivation for the use of hotbeds, and other technologies of micro-climate modification, was probably more to do with the production of early season crops, in order to reap profits when demand could not be met by the farmers of 'main crop' varieties. The hot bed, if correctly laid, enabled the fermentation of fresh manure to raise the temperature of an enclosed space, so facilitating the germination and growth of delicate subjects under frost-free conditions. Also, as in Paris, part of the system was the use of 'lights', glass bell cloches and straw mats as regulators of this temperature rise. The heat created had to be watched at the upper end, so ventilation and shading were important skills.

According the Middleton, the Neat House gardens were the most productive in the London area, yielding £200 per acre.[42] At about 200 acres, their share of total value was about 16 per cent of the area under the spade at the turn of the eighteenth century.[43] But, rather than heavy field vegetables, the Neat House gardeners specialized in asparagus, melons, cucumbers, celery and other crops with premium prices, luxury items for those with deep pockets and a delight for the kind of out of season delicacies that would have come with attached prestige. As such, the Neat House occupied the same sort of niche later exploited by the Parisian maraîchers, not in competition with other market gardeners and farmers who produced roots and cabbages, but rather complementary to them. The Neat

39 Kropotkin 1899.
40 Thick 1998.
41 Ibid: 101.
42 Middleton 1798.
43 But only six per cent if the outer ring of plough cultivation is included.

House history came to an end in 1825 when the last remaining gardens were taken over as development land.

While the Neat House gardens were depicted as a kind of miracle of productivity and a triumph of environmental modification, later representations of London's horticulture tended to stress its survival against the odds. Already, by the time of the following description, it was obvious that competition for land at the urban fringe had become acute during the building booms of previous decades.

> The traveller by railway out of London, where he be journeying east, west, north, or south, or to any of the intermediate points of the compass, will observe, if he be looking out of the window of his carriage, the stubborn resistance of cabbages and onions to the progress of the great brick and mortar invasion. In the battle between the houses and the market gardens, the latter have been compelled to yield bit by bit of their territory; but the enemy finds himself closely pressed on every side. Celery and asparagus have thrown up earthworks to the very walls of his fortifications. Regiments of rhubarb with waving plumes, bristling squares and onions, orderly battalions of cabbages, wild rabbles of radishes and onions surround his outposts, and overflow every occupied spot. They maintain their position, in spite of the insidious attempts of the invader to befoul their water and poison the very air they breathe; but traitorous negotiations are opened between the nurseryman and the builder, and their strongholds must sooner or later be capitulated.[44]

As the re-imagining of the city progressed in the second half of the nineteenth century, it became stranger to think of horticulture close to the heart of a metropolis such as London. An example might be the famous 100 acre Brompton Park Nursery, which was founded in 1681 and in the 1850s provided the building site for the museums of South Kensington.[45] Despite our retrospective incredulity, Peter Atherall found that market gardens and nurseries were able cling on for lengthy periods on sites that were otherwise ripe for development.[46] His main explanation for this was that most were on leased land, where tenants-at-will or those on annual leases gave landlords the flexibility to sell a plot later to speculative developers at the moment when the price was right. During quiet periods in the building cycle, often the most profitable use of land was one form or other of intensive horticulture. One disadvantage of this knife-edge arrangement was that tenants had little incentive to invest in a particular plot if they could not be sure they would be there the following year. But this was less of a problem where a lease contained a 'resumption clause'. This was a legal device, similar to the one used Paris, that guaranteed the grower compensation for any 'improvements', such as the fertility created by intensive manuring. As a result,

44 [Thomas] 1853: 409.
45 Harvey 1973, Sheppard 1975.
46 Atherall 1975.

> intensive nursery, glasshouse and floricultural holdings had the greatest competitive strength among non-urban land uses, and there was often little difference between the sale price of land devoted to these uses and that charged for open building land.[47]

There are other stories to be told about market gardening in the manured region. One we might call 'making the soil' is discussed by Joan Thirsk.

> It no longer appeared essential for horticulture to be confined to a few naturally-suited market-garden soils ... The excellent soils in use around London were recognized as being man-made, and so long as town manure was available to maintain fertility, more such soils could continue to be manufactured.[48]

Both Middleton on Middlesex and Stevenson on Surrey, comment that, already in the early nineteenth century, immense quantities of manure had been used to enrich the soil of the peri-urban area.[49] Close to the River Thames on the south bank, for instance, the sandy loams of a strip from Battersea westwards to Richmond gradually became 'in general a black loam or rich mould'. At that time 18 to 20 miles was the outer limit for carrying manure, which, after all, was only a return load once crops had been delivered to the London markets. Figure 3.1 shows that market gardening near a river or canal was constrained in the first half of the nineteenth century to within a couple of miles of the wharf where it was brought by barge. The 1881 distribution is more scattered due to the possibility of railway transport.

One of the problems with stable dung was that it was mixed with straw and so needed to be stored and rotted until it could be put on the land. Night-soil, on the other hand, was applied immediately and was considered to give a bigger boost to fertility, although there is no evidence to suggest that it was ever used extensively near London.[50]

Tremenheere in his account of Ealing wrote that 'the abundance of manure which is obtained from London makes the farmer, in a great degree, exempt from that necessity which compels a systematic rotation of crops'.[51] This freedom was the result of the application of amounts of manure that varied from ten to 80 tons per acre, depending upon the type of crop. Celery and onions apparently responded best to heightened fertility.[52] Evershed even found one unlikely market garden, 'of

47 Ibid: 69.
48 Thirsk 1997: 171.
49 Middleton 1798, Stevenson 1809: 37.
50 This compares with the situation in America where, according to Tarr (1996: 295), in 1880 about half of cities had systems where farmers would collect human waste for composting or direct application.
51 Tremenheere 1843: 125.
52 Whitehead 1880, 1882. 1904, Dyer and Shrivell 1913.

40 or 50 acres, in the parish of Bermondsey, flourishing in the midst of smoke and vile smells', where 100 tons of manure were used per acre, bringing it up to levels of intensity that were not far below those of Paris.[53] Most of this holding was planted with radishes, cauliflowers, and celery – the same combination year after year, without rotation.

Whitehead was one of the most authoritative authors on what he called 'the charmed circle' of London's manured region.[54] By the time he was writing, the 'old system' was changing but there still remained an 'inner circle' of spade cultivation on smallholdings, where manuring levels remained high and there was the advantage of proximity to both stable manure and large wholesale vegetable markets, along with the availability of cheap labour, either local or migrating gangs who passed through at times when extra hands were required. It was here that the higher value crops were grown, such as asparagus, sea kale, broccoli, cauliflowers, French beans, celery, radishes, lettuces, mustard, and cress. These required skill in terms of their management and greater investment in equipment such as forcing frames.

Beyond this was an 'outer circle' of lesser intensity, where heavier vegetables were grown and those that provided less entrepreneurial opportunity for catching a high price on a day of shortage for that particular item in Covent Garden. Many of these 'farm-gardens', as they were sometimes called, sent their produce to central London and brought manure back on the return. They grew crops such as cabbage, peas, beans, onions, Brussels sprouts, cauliflowers, and purple sprouting broccoli, using the plough rather than the spade.

According to Brayley, there were 2,000 acres of market gardens around London under the spade, mostly in Middlesex, and about 8,000 acres under the plough.[55] Before the railways linked London to growers in Kent or the Vale of Evesham, it was difficult for other parts of the country to compete with the freshness, quality and price of such peri-urban produce and Dodd claimed that three-quarters of the capital's vegetable consumption was supplied from within a 12 mile radius.[56]

However, the distribution of market gardens and nurseries never stood still from year to year. A glance at the distribution around London in circa 1819-23 and 1881 (Table 3.1) demonstrates the degree of change. Almost all of those operating at the first date had disappeared 60 years later under the tide of urbanization and the new ones were less dependent upon manure brought on the river by barge.

Within the inner circle of spade cultivation there was a specialization by crop (Table 3.2) that in some instances was based upon physical characteristics of the soil, such as friability and free drainage. But there is evidence that the skills and risk-taking preferences of individual growers were also important. An example is the cultivation of herbs in Mitcham, which provided raw material on a large scale from the eighteenth to the mid nineteenth centuries for the nascent herbal

53 Evershed 1871: 423.
54 Whitehead 1878: 749-52.
55 Brayley 1810, vol. 1: 21.
56 Dodd 1853: 463.

Table 3.1 Estimates of extent of market gardens around London, 1795–1879

Source	Estimate
Lysons 1792: vol. 4, 575-6	5,000 acres of vegetables and 800 acres of fruit; 1,700 acres of potatoes; 1,200 acres of cow feed; 300 acres of herbs; 3–400 acres of nurseries. Fulham had by far the largest acreage (2,175), followed by West Ham (700), Kensington (590), East Ham (570), St Paul Deptford (500), Isleworth (430), and Barking (400).
Anon, *Gentleman's Magazine* 71, 1801: 273	10,000 acres under vegetables.
Middleton 1798	3,000 acres of fruit in Middlesex, spade vegetables 1,800 acres, 500 acres in Surrey. Plough vegetables up to 10 miles: 1,800 acres in Middlesex, 3,500 acres in Surrey, 1,700 acres in Kent, and 1,000 acres in Essex. 1,500 acres of nurseries.
Cuthill 1851	12,000 acres in vegetables, 5,000 acres in fruit trees. 35,000 horticultural labourers.
Shaw 1879	beginning of decline near London.

medicine industry in London. In 1805 James Moore had a 500 acre farm there on which he used 20 tons per acre of 'the strongest rotten dung' to grow a range of 'physic' plants: peppermint (150 acres), spearmint (four acres), marsh mallows (one acre), angelica (between a half and one acre), camomile (four acres), liquorice (ten acres), hyssop (half an acre), poppy (two acres), lavender (five to six acres), and roses (ten acres), among others.[57]

By the 1870s and 1880s market gardeners were feeling the effect of competition from further afield. There were a number of factors involved.[58] First, the railways were by then able to deliver quantities of the higher value, delicate crops in a timely fashion. By the end of the century, such were the contacts and the organizing capacity of the vegetable wholesalers that they were able to draw in supplies from all over the country. Meanwhile the 'inner circle' was under local challenge from growers who were investing in greenhouses made up of the large, industrially-manufactured panes of glass (10 x 8 inches up to 18 x 24 inches) that were coming on the market from the 1850s onwards.[59] These greenhouses were increasingly concentrated in the Lea Valley in East London. A third factor was the shortage, towards the end of the nineteenth century, of cheap, seasonal migrant labour, and spade cultivation had therefore all but disappeared by 1900.[60] Finally,

57 Malcolm 1805.
58 Whitehead 1882.
59 Thirsk 1997: 182.
60 Bennett 1950.

Table 3.2 Market garden specialisms around London, 1792–1879

Source	Specialism
Lysons 1792	Asparagus (Deptford St. Paul's, Chiswick, Battersea, and Mortlake); pineapples and grapes (Lambeth); onions (Deptford); herbs (Mitcham); potatoes (Barking); herbs (Mitcham)
Loudon 1825	Asparagus (Mortlake and Deptford); cabbage and cauliflower (Battersea); celery (Neat Houses); peas (Charlton and Plumstead)
Cuthill 1851	Herbs (Mitcham); liquorice, strawberries, rhubarb, horse radish, sea kale (Rotherhithe, Bermondsey)
Dodd 1856	Asparagus (Mortlake), cabbage (Battersea), celery (Chelsea), onions (Deptford), peas (Dagenham)
Burbridge 1877	Asparagus (Fulham, Mortlake, Isleworth), celery (Fulham), herbs (Mitcham), mushrooms (Fulham, Chiswick), onions (Fulham, Chiswick, Woolwich, Deptford, Mitcham)
Shaw 1879	Flowers (Barnet, Potters Bar, Finchley, Enfield, Tottenham); forced fruit (Finchley, Potters Bar, Barnet); grapes (Isleworth, Leyton, Finchley, Fulham); peaches (Finchley, Fulham); pineapples (Isleworth); outdoor strawberries (Isleworth, Acton, Deptford, Chiswick, Twickenham); beans (Wandsworth); spring cabbage (Wandsworth, Fulham, Gunnersbury); seakale (Fulham, Chiswick, Barnes, Deptford, Woolwich); forced rhubarb (Hammersmith); onions (Lea Bridge, Fulham, Chiswick, Deptford); celery (Fulham); herbs (Mitcham)

the decline in numbers of town horses after the First World War was decisive because a major element of comparative locational advantage was gone. By the 1930s market gardening had retreated on to the deep loams to the west, where the soil was sufficiently fertile not to require large applications of manure.[61]

Our understanding of the scale of the system in the manured region depends upon some calculations of the quantities involved. Various estimates have been made of the amount of manure produced in cities such as New York. In 1900 there were 130,000 horses creating 400,000 tonnes of manure to dispose of.[62] Clearly there would have been a correlation between horse numbers, the demand from commercial hauliers and public transport, and the prosperity of potential private owners of horses for their carriages; and there would have been some districts of cities where the residents would have been significantly more mobile than others. Both the populations and physical extents of cities were growing during the century and one would therefore expect the total of manure produced to have increased.[63]

61 Willatts 1937.
62 McShane and Tarr 2007: 25–7, Melosi 1981: 20, Lay and Vance 1992: 132.
63 McShane and Tarr 1997.

Table 3.3 Animal manure produced in London, 1800–1893

	Horses ('000)	Horse manure ('000 tons)	Cows ('000)	Cow manure ('000 tons)	Animals driven through streets			Total manure ('000 tons)
					Cattle ('000)	Sheep ('000)	Manure ('000 tons)	
1800	30[1]	320	8[1]	110	125[2]	842[2]	5	435
1825	32[3]	340	9[4]	120	157[2]	1,130[2]	7	467
1855	54[3]	620	17[5]	224	300[6]	1,553[6]	11	855
1893	200[7]	2,135	7[8]	88	232[8]	888[8]	9	2,231

Sources: [1] Middleton 1798: 301; [2] McCulloch 1834: 261; [3] Turvey 2005: 47; [4] Loudon 1826: 1083–4; [5] Anon. 1856: 674; [6] P.P. 1867–68 (153) lv.459; [7] Gordon 1893 estimated 300,000 horses but this was probably too high; [8] Agricultural Returns of Great Britain, 1893, P.P. 1893–4 (C.7256) cl.1

There is an attempt in Table 3.3 to make a calculation for London in the nineteenth century, based upon various assumptions. In the absence of any detailed information, the results should be taken as indicative. They add some modest additional depth to the musings of Michael Thompson and Ralph Turvey but there are limitations as to how far one can go with such calculations.[64]

Table 3.3 uses the horse dung multipliers discussed in Appendix 3A. Also included are the cattle and sheep that were driven through the streets on their way to market.[65] The extraordinary increase in horse numbers in the second half of the century explains the vast quantities of manure that were produced, topping two million tons annually in the 1890s. The demand from those market gardeners and farmers within a realistic carting or barging distance was probably falling at this moment, so it was inevitable that the bottom would drop out of the manure market at the very time that stable and cowshed owners needed it most. As Turvey has noted, manure became a 'bad' after having for so long generated a virtuous circle of fertility and prosperity.[66]

In view of the amount of manure deposited on the streets, it is not surprising that there were many crossing sweepers in London serving those pedestrians who wished to keep their footwear clean.[67] They mostly frequented busy streets where the potential of being rewarded for their trouble was greatest.

64 Thompson 1970, 1976, 1983, Turvey 2000, 2005.

65 It was decided here is that only one day's manure would be included for these animals because after that they would either have left London after being sold or been quickly dispatched in the capital's slaughter-houses.

66 Turvey 2000.

67 A system of street orderlies was started in 1843/4 by the National Philanthropic Association, a vehicle for the philanthropy of Charles Cochrane. Low 1850, Winter 1993.

By the middle of the nineteenth century, local authority scavengers had begun systematic street cleaning and business for the crossings sweepers declined. But a modern system of household refuse collection and disposal by local authorities was delayed until the Public Health Act of 1875.[68] This made provisions for the removal by the Sanitary Authority on appointed days of accumulations of refuse from premises.

The Transport of Manure

Charles Cochrane of the National Philanthropic Association, in a letter to the editor of the *Medical Times*, estimated in 1851 that 2,000 cart loads of manure were at any one time waiting to be removed from the stables and mews of London.[69] This was in July of that year but it seems likely that the true figure was much higher than Cochrane imagined because regular removal was more common in the autumn and winter when the fields were being prepared. Accumulations built up in the city in summer, when arable farmers were too busy with their crops to worry about town manure.

Farmers and market gardeners seem to have made deals with the owners of individual stables but there were also collection points where agents accumulated large heaps of manure that were visible for all to see. At the beginning of the nineteenth century St George's Fields in Southwark had a 'grand depository' for manure and night-soil,[70] and there were other large laystalls in Clerkenwell, Bloomsbury, Hyde Park Gardens, Lincoln's Inn Fields, and Tothill Fields.[71]

The spatial envelope of the manured region depended upon the relative availability and costs of road and water transport. According to Arthur Young, market gardeners in Lewisham and Blackheath did not bring dung back by road from London after delivering their crops.[72] Instead they barged 'large quantities' from Deptford Creek. The main reason for this was the high cost by road, which at 3d. to 5d. a ton mile meant that manure costing 2s. a load in London was 4s,10d. after a journey of ten miles and 9s,2d. after 17 miles, a price that was prohibitive for most growers. John Middleton made a similar calculation in 1798 and found the expense to be even higher at 10s,2d. per ton mile over 13 miles to South Mims for back carriage but 19s,4d. for a one-way load of manure.[73] One factor was the poor state of the roads, which slowed the journey and, as

68 Wilson 1976.

69 *Medical Times* 24, 1851: 106–7.

70 Malcolm 1805: 117, Stevenson 1809: 510, 512, Thornbury 1885, vol. 6: 343.

71 Fussell 1971: 173, Commissioners on Sanatory Condition of Labouring Population of Great Britain Report, P.P. 1842 (006) xxvi, 439.

72 Young 1772: 94.

73 Middleton 1798: 302. The cost was less, at 12s. if this was back carriage after a load of vegetables had been delivered.

late as the 1840s, carts generally delivered manure only up to a range of six to nine miles.[74] One reason for the poor road surfaces, according to the turnpike commissioners was that there were some heavy-duty carts, with loads of six to eight tons, that were carrying hay and straw into London at a half toll and then returning back with toll-free manure.[75] These churned up the road surface.

Barge or lighter transport was much cheaper. The cost at Weybridge and Chertsey, over 20 miles from central London, in 1809 was only 4s. to 5s,6d. per ton, a 50 per cent mark-up as against 400 per cent or more for the cart and horse.[76] It is hardly surprising, therefore, that Figure 3.1 shows a strong guiding of market gardening along the corridor of the Thames, mostly within two or three miles of a wharf.[77] Some individual market gardeners and nurserymen in west Middlesex required large quantities of manure. A Mr Norris of Isleworth, for instance, in the early 1840s was taking 50 barge loads a year, equating to over 1,500 tons.[78] It was much the same picture south of the river in Surrey.

> The culture of both garden and nursery grounds is principally limited to those parishes which lie within a moderate distance of the river Thames, on account of the convenience it affords of water-carriage for the manures from the London stables.[79]

There were economies of scale for barges carrying 30 or 40 tons, loading from gathering points such as Letts' Wharf in Commercial Road, Lambeth, which in the 1870s was handling 30,000 tons of horse manure annually for the City of London, along with 'street slop' and household refuse.[80] Some of the barges were specially designed with flat bottoms and sails to navigate the shallows of the lower reaches of the Thames to ports as far as Rochester, 80 to 90 miles downstream. They were described by Dickens in *The Uncommercial Traveller* as a 'fleet of barges that seem to have plucked their brown and russet sails from the ripe trees in the

74 Royal Commission for Inquiring into State of Large Towns and Populous Districts: First Report, P.P. 1844 (572) xvii.Q.4661

75 Commissioners of Metropolitan Turnpike Roads North of Thames, Fifteenth Report, P.P. 1841-I (327) xii.249, Turvey 1996.

76 Stevenson 1809: 511.

77 Pratt (1906) found west Middlesex still to be one of the key clusters of horticulture in the country, much of it within twenty miles of London, stretching from Chiswick and Kew, through Isleworth and Brentford, to Hounslow, Feltham, Heston, Southall, West Drayton, Yiewsley, Harlington, Hayes and Harmondsworth. The holdings, at 50 to 100 acres, were larger than those of earlier eras close to the urban area, suggesting that by then the farming gardener had replaced the more intensive spade gardener.

78 Royal Commission for Inquiring into State of Large Towns and Populous Districts: First Report, P.P. 1844 (572) xvii.Q.4651.

79 Brayley 1850, vol. 1: 233.

80 Turvey 2000.

landscape'.[81] These so-called 'stackies' made return journeys to central London with hay stacked up to 12 feet high on deck.[82] According to Bagwell and Lyth, their trade peaked just before the First World War, with hundreds of vessels involved.[83]

In east London, the Lea Navigation was in use in the early nineteenth century as far as Enfield for as little as 3s,4d. a ton.[84] In 1862 120,000 tons of manure were carried and this represented just over one third of the total traffic of all goods on that waterway.[85] The Paddington, Regent's and Surrey canals were also heavily used.[86]

The opening of railway lines with facilities for storing and carrying manure did not bring a revolution in the extent of the manured region. The structure of freight rates was such that this type of bulky, low value commodity was expensive to move. Frere summed up the farmer's dilemma when he hypothesized that 'a farmer can buy London manure at his local railway station for 8s,6d. a ton but he is indifferent, whereas his friend who has access to barged manure for 5s. at a local wharf has a good deal'.[87] At this time the usual price paid at stables in London was 2s,2d. per ton. Carting to a railway station within a mile added 60 per cent, and the railway rate was a further 3s. per ton for a 25 mile journey, a total of 6s,6d delivered to the rural station.[88]

Some growers brought only as much manure by cart as they had room for after delivering their produce to market, the rest coming by other means. An example was the garden-farm in Barking, eight miles from London, described by Evershed.[89] The carted manure here, about half of requirements, was bought in London at 3s. or 3s,6d. per ton, and the rest came at 5s. a ton to the railway station or quay. A few years later, Whitehead described a market garden a little further out in Essex, 16 miles from London.[90] This was apparently too far for carting manure, which had to be brought by barge to Rainham and then by traction engine, adding greatly to the cost. This confirms once more that there were limits to the outer radius of manure transport by road.

As manure in London became more of a nuisance than an asset in the last decades before the First World War, its value fell sharply and, paradoxically, it was taken further afield. In the 1890s, for instance, it was available at Swanley

81 Dickens 1868: 303.

82 Benham 1948, 1951, Carr 1951, Davis 1970.

83 Bagwell and Lyth 2006: 31. Dung was used as ballast and regulated by legislation. An Act of 1805 (32 Geo II c.16), for instance, limited the annual total that could be carried to 2,000 tons.

84 Middleton 1807: 376.

85 Royal Commission to inquire into best means of preventing Pollution of Rivers: Third Report, Vol. II, P.P. 1867 (3850-I) xxxiii. Q.4521.

86 Mayhew 1851, vol. 2, 194–6.

87 Frere 1863: 128.

88 Evershed 1864: 285.

89 Evershed 1871: 424.

90 Whitehead 1879: 842.

Junction, 17 miles from London, at the astonishingly low price of 2s,1d. per ton.[91] It is difficult to see how this could have been achieved unless the Borough of origin, Newington, was subsidizing the carriage in order to find an outlet for its unwanted street sweepings.

Rider Haggard's account of rural England, based on his travels in 1901 and 1902, makes many references in the chapter on Hertfordshire and Middlesex to manure brought from London. He quotes one farmer as saying that 'In Hertfordshire prosperity is, in the main, confined to the neighbourhood of the railway line'.[92] Farmers were using 15 tons or more per acre for potatoes and two to three tons for other arable and pasture.

Bedfordshire is an unusual example of how the manured region lived on beyond the immediate environs of London. On the valley gravels and greens and of the Sandy and Biggleswade areas, market gardening expanded when the Great Northern Railway was built in 1851 and enabled the movement of large quantities of stable manure from London.[93] It arrived by the truckload and 'a strong factor in the concentration of market gardening within a belt a mile or so from the railway line was the limit to which large tonnages of manure could be moved by horse and cart'.[94] The area affected was a corridor 15 miles by five that had not been highly valued as arable land because it was 'thin hungry loam underlain by gravel'.[95] But in the hands of a band of small independent growers on plots of ten to 15 acres each, this was an advantage because they were able to exploit a soil that was easy to work and 'warm and early', and now with a fertility and humus content that could be made and remade with imported dung. The problem for them came after the First World War when London manure was scarce and it finally ceased to be available in the late 1930s.[96]

Conclusion

Strategic urban thinkers such as John Martin and Edwin Chadwick had hoped that all urban faeces, both human and animal, would be used productively in agriculture and so achieve the objective of a clean and healthy city funded by a sustainable income stream.[97] One can see the utilitarian influence of Chadwick's mentor, Bentham, here but there is also something peculiarly Victorian about the urge for both 'good and

91 Parsons 1893–4: 99.
92 Haggard 1902, vol. 1: 511.
93 Rigg 1916.
94 Evershed 1871: 432. Coppock 1961 recalls that manure cost 4s.6d. per ton at the railway station but double that five miles away.
95 Hall 1913: 424.
96 Beavington 1963: 93.
97 Martin 1842.

gold'. It was difficult to escape a moral foundation to this cleansing of the Augean Stables.

According to Zola, writing about Paris, the manure there 'symbolizes the world and its life … Paris rotted everything, and returned everything to the soil, which never wearied of repairing the ravages of death'.[98] In other words, this chapter has reflected the view current in the mid nineteenth century that animal 'wastes' carried a creative and regenerative potential; indeed, they were crucial to a cycle of fertility that gave the world an organic wholeness that was an 'improvement' of nature rather than the interruption introduced by modernity.

As we have seen, the manured regions around London, Paris and other large cities supported several highly productive agricultural activities and were responsible, for a period, for supplying the bulk of horticultural commodities and horse fodder to the city. It was the Great Separation that disturbed the 'urban symmetry' of circulating waste and removed the possibility of a manured region.[99] Night-soil was no longer available and manure became expensive to transport over longer distances as the city expanded and market gardening was pushed further out. Eventually even the quantity of manure declined as urban horses were replaced by motor vehicles and other waste-producing animal industries were removed to where they were less likely to cause a nuisance. In the next chapter we will look in greater detail at these 'noxious' industries that made up London's blood and guts economy.

Appendix 3a: The Quantity of Animal Manure Produced in London

The assumptions used in Table 3.3 are worth spelling out. First, many of the nineteenth century commentators relied heavily upon Boussingault's (1843) calculation of a manure output per animal of 34.2 lb.,[100] but in retrospect this seems to be on the low side. Reviewing the modern literature, Lawrence et al. regard 57.3 lb. as a daily average for a 1,100 lb. horse involved in intense exercise, making 9.3 tons per annum per beast.[101] This annual output, which is used in the present calculations, is more than the 7 tons assumed by McShane and Tarr,[102] the 7.3 tons of Mayhew, the 5.9 tons of Stanhill,[103] and the 5.4 tons of Primrose McConnell,[104] and it is considerably more than the three to four tons allowed by Thompson and the five tons of Evershed.[105] Stephens comes in higher at 12 tons but this includes

98 Zola 1873: 243.
99 Gandy 2004.
100 For example, Aikman 1892: 20.
101 Lawrence et al. 2003.
102 McShane and Tarr 2007: 26.
103 Stanhill 1977.
104 McConnell 1897. McConnell estimated an additional 1.8 tons of urine.
105 Thompson 1976: 77, Evershed 1864: 284. The National Philanthropic Association estimated 30 lb. per day on streets per working horse (4.89 tons per annum).

litter.[106] For Paris, Vincey calculated that 8.9 tons of stable manure were produced per horse in that city, and more if a portion of the ever-present street mud, 'gadoue', is included.[107] In Table 3.3 no allowance is made for changes in the average size of town horses through time.

Second, horses used in vehicle traction would have spent no more than a portion of their day on the road. The heavy weights they pulled meant that rest was essential and much of their dung would therefore have been collected in the stable. London omnibus horses spent only four hours a day working,[108] but the delivery horses kept by railway companies and vestries worked about 70 hours a week.[109] It seems reasonable to assume that the average horse spent one third of its time on the road and excreted about half of its manure there. When in the stable, the manure would have been mixed with litter, and Thompson remarks that this meant a tripling of its bulk. Overall, a fair division seems to be 9.3 tons for the street and 12.0 tons for the stable. According to Heiden, a horse worked 260 days, of 12 hours each, in the course of a year, or the equivalent of 130 whole days in the open and 235 days in the stall.[110] Calculating from the above data, he estimated that a well-fed working horse would produce about 50 lb. of manure in a day, or 8.15 tons in a year.

The annual manure output of cattle is assumed to have been 11.4 tons yearly or 13.2 tons including litter; that for sheep 0.6 tons.[111] Overall, Middleton suggested that 500,000 tons of manure were produced in London, more or less in line with Table 3.3.[112] Thompson estimated that English towns together saw three million tons of droppings a year in the 1830s, rising to ten million in 1900.[113] If he is correct, the latter figure is about a quarter of the national output of farmyard manure, which Dyer thought was 40 million tons,[114] and Russell and Richards 37 million.[115] Other estimates were somewhat lower. The General Board of Health reported in 1850 that in the one third of a mile in Regent Street, between the Quadrant and Oxford Street, three loads of manure were collected daily – the equivalent of 1,000 tons a year. Then using an unnamed City of

106 Stephens 1889, Division 3, 98.

107 Vincey 1896 cited by Barles 1999: 244. See also Barles 2001, 2005a, 2005b, Jugie 1993.

108 Gordon 1893: 21. Mayhew observed that horses worked for no more than six hours a day. Mayhew 1851, vol. 2: 194–6.

109 Ibid: 58, 80.

110 Heiden 1866.

111 The cattle estimate is from Morton (1868: 83–4), and that for sheep from Aikman (1892: 21). There were, of course, many other calculations, for instance by Turnor (1911: 76) 8 tons per cow; McConnell (1897) 8.9 tons per cow and 3.6 tons of urine, sheep 0.3 tons, pigs 0.8 tons.

112 Middleton 1807: 374.

113 Thompson 1970: 10.

114 Dyer 1894.

115 Russell and Richards 1916. See Brassley 2000: 537.

London district where 20,000 tons were estimated to be collected annually, a total for the whole of London was calculated at 200,000 tons. This must have been an upper estimate because it was arrived at by multiplying the area of that district by 20, in proportion to its size as five per cent of the total area. But, of course, the traffic would have been less further out from the centre.[116] Henry Mayhew's calculation was even lower.[117] He notes that 141,466 loads were scavenged from the streets of London and lists the contractors in each parish. About 150 carts and 440 men were engaged, along with 550 'orderlies' who swept the streets. Some of the scavenged material was mud or dust ground from the granite sets by the wheels of carriages, but about 80 per cent by weight had started as manure.[118] Mayhew's figure, including the droppings of cattle and sheep driven through the streets to and from markets and slaughter-houses, was 160,000 tons.[119] This seems modest, not least because the authorities in a much smaller city, Manchester, were collecting 40,000 tons from its 24 street sweeping machines and the total carted away from that city to surrounding farms was at least 78,000 tons in 1845.[120]

Appendix 3b: The Value of Manure

Manure was of such value in early nineteenth-century New York that heavy urban horses were able to earn their purchase price back in a relatively short working life of five years.[121] This was never quite the case in Britain. It is true that prices were on a rising trend up to about 1860, with manure from private stables available in central London to be carted away at 1s,3d. a load in 1763, 2s. in the 1790s,[122] 3s. in 1809,[123] and 3s. in 1851.[124] Some local authorities also made money by selling street-scavenged manure (Table A3.1) and in the case of a number of Scottish cities in the 1840s, most notably Edinburgh, these sales paid for their cleansing

116 Report by the General Board of Health on the supply of water to the metropolis, P.P. 1850 (1218) xxii.247–8.

117 Mayhew 1851, vol. 2: 186.

118 But Codrington (1888, 4) pointed out that only 14.2 per cent of London's soft core was street manure.

119 Mayhew 1851, vol. 2: 194–6.

120 Playfair 1845: 348. Adding stable and cowshed manure together, the Manchester total would have been about 100,000 tons a year or about half a ton of animal manure per inhabitant. Royal Commission for Inquiring into State of Large Towns and Populous Districts: First Report, P.P. 1844 (572) xvii.Q.6087.

121 McShane and Tarr 2007: 26.

122 Baird 1793: 19.

123 Stevenson 1809: 512.

124 Mayhew 1851, vol. 2: 201. In deflated 2010 values these are equivalent to £4.67 (1763), £5.60 (1790), £5.09 (1809), and £8.78 (1851).

Table A3.1 The sale of scavenged manure, 1845

Town	Cost of scavenging (£)	Sale of manure (£)	Quantity collected (tons)	Collection points
Aberdeen	1,400	2,000	–	2
Ashton-under-Lyne	170	17	–	1
Chorlton-upon-Medlock	650	–	2,153	1
Edinburgh	12,000	10,000	30,000	2
Glasgow	2,759	1,100	–	6
Haddington	–	130	–	1
Liverpool	4,820	1,150	–	1
Manchester	5,600	800	–	7
Rochdale	207	18.5	–	2
Perth	1,300	1,730	–	1
Preston	531	271	–	1
Salford	–	88	–	1
York	–	8–10,000	–	–

Source: Playfair 1845.

budgets.[125] Later, the Royal Sanitary Commission reported that sales to farmers in the late 1860s were at a considerable loss to a number of urban local authorities: Bury £100 (removal costs £700), Leeds £7,445 (1869), Leicester £136 (1868, but costs £1,900), Northampton £560.

After the mid-1870s the manure market went into decline, with 1s,4d. to 1s,6d. the going rate at the end of the century, and 1s. in 1905.[126] The price rebounded just before the Great War when the introduction of motor vehicles made it a scarce commodity as horses were replaced. In 1910 it was 3s to 3s,6d., and in 1913 4s. to 4s,6d.[127] In other cities where there were fewer takers, prices were significantly lower. In Edinburgh, for instance, one ton of manure fetched only 3d. in 1890.[128] The manure of London omnibus horses, which had been worth 14s. a year in the 1850s, by the 1890s earned only 1s to 2s. per animal,[129] a trend that closely shadowed a similar depreciation in New York.[130]

125 I am grateful to Paul Laxton for this reference. Sales in some cities included night-soil.

126 Haggard 1902, Hall 1913: 428.

127 Dyer and Shrivell 1913: 11–12. The deflated values here are £4.04 (1900), £2.87 (1905), £9.27 (1910), and £9.15 (1913).

128 Wilson 1976: 126.

129 Turvey 2000: 11.

130 McShane and Tarr 2007: 27.

Falling prices were partly due to a broadening of the agricultural fertilizer market in the second half of the nineteenth century. Fresh animal manure was now in competition with guano imported from Peru and manufactured chemical fertilizers, which could be afforded by middling and larger farmers. Nevertheless, advocates of the agricultural uses of manure and night-soil still had a voice. Their enthusiasm was recorded by various observers and travellers, such as Daniel Hall, Rider Haggard and the prize essay writers for the Royal Agricultural Society of England.[131] Having said that, the scale of the London-centred manure economy was impossible to reproduce in other parts of the country and anyway the intensive or 'high farming' of the mid nineteenth century was different because it depended upon expensive concentrates and capital investments such as drainage. Ironically, outside the Home Counties and a few other peri-urban regions, organic manure was at times in short supply and not well used by comparison with its skilful application around London, where there were experienced gardeners directing large labour forces in the finer points of nutrient management.[132]

The second, and clinching, factor in the declining value of London manure is clear to see in Table 3.3. Its availability increased from approximately 435,000 tons in 1800 to 2,231,000 tons in 1893, a five-fold increase, but the area of vegetable cultivation in market gardens in Middlesex and Surrey increased from 10,000 acres in 1800 to about 14,000 acres in 1893, not enough additional absorptive capacity to deal with the surplus locally.[133]

By the late 1880s, manure was becoming difficult to dispose of from the smaller London stables.[134] In Kensington, it was remarked that

> non-removal is sometimes the fault of the coachman, who will not give the refuse away and the farmers being now, as a rule, unwilling to pay for it. At certain seasons – e.g. haymaking and harvest time – there is no doubt a difficulty in getting the receptacles cleared, farmers being too busy to collect the refuse. Formerly, when the parish consisted largely of market gardeners, the cultivators of the soil were glad enough to get the manure by satisfying the demands of the coachman and others. Now that it has to be hauled miles to the suburban farms and gardens, the stable owners, moreover, being at the mercy of the waggoners, the case is far otherwise, and not infrequently payment has to be made to ensure removal, however irregularly.[135]

A third, lesser, reason for the dip in manure prices from the seventies was a change in quality. The London General Omnibus Company's report for the first

131 Haggard 1902, Hall 1913.

132 Brassley 2000.

133 Anon. (1801) *Gentleman's Magazine* 71: 273, Agricultural Returns.

134 Codrington 1888: 4, Turvey 2000.

135 Medical Officer of Health (1890) *Annual Report of the health and sanitary condition of the Parish of St Mary Abbots, Kensington*: 207–8.

half of 1877 stated that until recently straw only had been used for bedding, but cheaper materials were now being introduced, and that these might lower the value of the manure. Six months later, the Directors expressed a hope that manure from their stables in which sawdust was used would become better appreciated by farmers and easier to sell. The other alternative to straw was peat, and this too seems to have lowered the value of the manure, since the Great Western Railway had a Paddington contract in 1883 of 2d. per horse per week for horses littered with straw and 1d for those littered with peat.

London manure was what Thomas Magnell has called a 'collapsing good'.[136] The long-term price trend was such that, by 1893,

> all over London horse owners are growling about this manure question. At one time the manure was worth threepence a horse a week; happy is the man who can nowadays get a farthing a week per horse for it; many give it away, and there are a large number who are obliged to pay for its removal as trade refuse.[137]

From once being a profitable good, horse dung had become a public bad.[138] It created smells and dust and turned major thoroughfares into obstacle courses for those with clean shoes. It attracted flies and was associated in many minds with disease.[139]

136 Magnell 2006: 162–3.
137 Gordon 1893: 46.
138 Turvey 2000.
139 Biehler 2010.