

Coprolite Mining in Cambridgeshire

By RICHARD GROVE

IN the second half of the nineteenth century the coprolite-extraction industry in Cambridgeshire and the Isle of Ely was the only real alternative employment to agriculture. From the surviving documents it is possible to discover a good deal about the social and economic involvement of the county, as well as obtaining an impression of the industry itself.

Coprolite is the term used for a particular phosphate, largely comprised of marine animal remains, found in a geological stratum called the Cambridge Greensand which lies at the base of the chalk and above the Gault Clay (fig. 1). The proportion of phosphate to other minerals was much higher than in other phosphate sources previously known, such as guano. Its most important use was as a fertilizer, but during the First World War pits were reopened to provide coprolite as a raw material for munitions.¹ The initiation of the industry depended on interrelated factors, the most important of which was the establishment of an outcrop between Barton in Bedfordshire and Soham in Cambridgeshire. Although its contents were first analysed by Professor J. S. Henslow of Cambridge University, it was first used, almost accidentally, by a miller of Burwell, John Ball, in 1851.²

Before describing the spread of the industry and its effects, the method of extraction must be mentioned. Generally speaking the workable layers of coprolite did not exceed three feet in thickness, and men rarely worked at more than 20 feet below ground; and with certain exceptions land worked for coprolite was reclaimed as extraction proceeded. Ac-

ording to Jukes-Brown (1875),³ and evidence produced at the inquest into the death of a miner in a working at Bottisham Lode in 1876, fields were worked by a system of double trenching.⁴ Topsoil was moved to the side of the field and longitudinal trenches dug.⁵ As the coprolites were extracted from each trench, subsoil and topsoil were replaced. Metal shoes, known as "creepers," prevented slipping in the wet clay. The coprolite was then washed by horses. Transport to the processing factory followed, where the blue-grey nodules were ground and mixed with sulphuric acid to produce a soluble superphosphate. Incidentally, fenland "dug over" in this way was much better farming land afterwards. The light surface layers and peat were marled, and prevented from blowing away. The practice of marling was later killed by high labour costs.⁶ The occurrence of the strata was known by 1849 but mining did not start until John Ball (according to Lucas) discovered how well his turnips were growing in his windmill.⁷ Even the phosphatic subsoil in his windmill was not under-taken until 1858, when the Cambridge Corporation saw the opportunity for fruitful exploitation of Coldham's Common. Enormous quantities of water were needed to wash coprolite, and without the presence of artesian water in the Lower Greensand, down to which wells were bored, the industry could not have existed. Additional factors held development back. Farmers were at first reluctant to have their high-quality fen soils excavated: a traditional market was lacking; the railway network until 1851 was limited; and

¹ H. H. Rogers, Ministry of Agriculture, Trumpington, personal communication.
² A. J. Jukes-Browne and W. H. Penning, *Memoirs of the Geological Survey of Great Britain*, I, 1881.
³ A. J. Jukes-Browne, 'On the relations of the Cambridge Gault and Greensand', *Quar. Journ. Geol. Soc.*
⁴ *The Cambridge Chronicle*, Nov. 1876.
⁵ Mr Reginald Stanbridge, Cambridge University Farm, verbal communication.
⁶ E. A. R. Emmion, *Cambridgeshire*, 1951, p. 221.
⁷ C. Lucas, *The Fenman's World*, 1931, pp. 30-1.

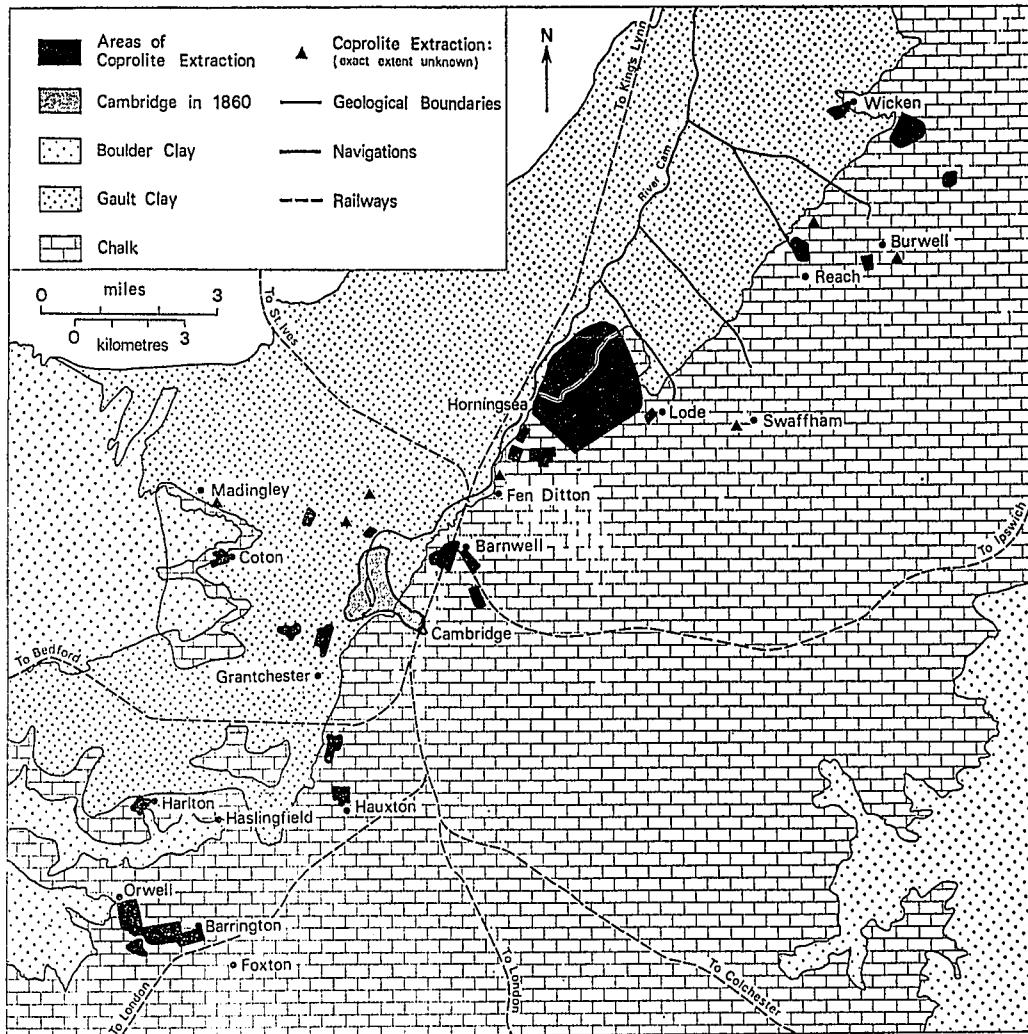


FIG. I
Coprolite mining in Cambridgeshire.

river tolls in Cambridgeshire were high.¹ Inaccurate geological knowledge hampered operations. Although the coprolite was first discovered in north Cambridgeshire, exploitation spread at first in the south, and only later in the valuable agricultural land in the fens. This was in spite of the better quality of seams to the north. But no bridge existed across the Cam to reach the railway from the eastern fen until 1872, and the old fenland lodes were at first in too bad a state to take large industrial lighters. This lack of facilities, and the realiza-

tion of the profits that farmers were making in the south, prompted the rebuilding of old equipment in the north; for instance, in 1871 Swaffham and Bottisham Lode Commissioners books the following entry is included: Ordered that the Clerk apply to the South Level Board for permission to scour out the Bottisham Lode fit for navigation and that the navigation is so bad up the Lode . . . that parties in charge of Barges throw off the lock doors to enable them to get up the Lode.²

¹ Cambs. C.R.O., Cam Conservancy accounts and toll records, 1851-64.

² *Ibid.*, *Swaffham and Bottisham Lode Commissioners books*, 1871.

A letter from the South Level Board reads:

I hear upon good authority that the Coprolite raisers who now use the Bottisham Lode for the conveyance of coprolites, experiencing so much difficulty through the bad state of the Lode, have resolved to take the coprolites to Fulbourn Station with the aid of a traction engine . . . if the coprolites are lost those tolls [8d./ton] will not be worth half of what they are at present.

Subsequent correspondence dealt with the installation of a staunch lock in the following year at a cost of £750, "identical to those on the Brandon river."

As early as 1863 the effect of expansion was being felt on transport; mostly transport of coprolite to the factory. This was noted in the minutes of the Kneesworth and Caxton Turnpike Committee at their annual general meeting on 1 January:

Ordered that the surveyor do obtain 13 tons of Granite for the better repairs of the Road near the Old North Road Railway Station and 30 yards of Gravel for the South end of the Road; ordered that the Clerk write to the Secretary of the Bedford and Cambridge Railway Company to complain of the unsatisfactory state of the Railway bridge [It had been built only three years before] at the Old North Road Station and the approaches thereto

Ordered that in consequence of the increases in traffic occasioned by the opening of the Bedford and Cambridge Railway and the Coprolite works notice to be given in due course the holder of the tolls of our intention to defer to the existing lease at the end of the present term. The surveyor was ordered to employ a fit person to be stationed at or near the Old North Road Station for the purpose of ascertaining the amount of traffic as a guide for the erection hereafter of a new toll gate near that station.¹

This early conflict between rail and road interests shows that the turnpike was not get-

ting its share of the profits from the already large amount of coprolite traffic originating from workings and factories in the Abington Pigotts and Clopton area.² The railways, by 1878, had taken over the bulk of transport, the Great Eastern Railway Company charging only ½d. per ton per mile for coprolite fertilizers.³ However, Colchester and Ball of Burwell still ran their own fleet of steam-tugs and lighters from their factory on the lode to adjacent railheads.

Estate maps of 1870-4 for Eye Hall Farm at Clayhithe show that other farmers resorted to building their own tram-roads to quays on the river. Thirty thousand tons were shipped from this one farm in 1873.⁴ Even then only sites adjacent to navigations could be exploited. The balance between profits from normal agriculture and the costs of transporting the bulky coprolite must surely have been an important production factor. From 1861 to 1875 an increase in the amount of coprolite raised occurred, building up to boom proportions. This is gathered from price fluctuations, parliamentary production accounts, and land-sale documents.⁵

Contributory factors to the boom were the demands from abroad (for instance from Queensland where there was a phosphate deficiency), the formation of a domestic market for coprolite through growing awareness by the farmers of its possibilities (today 75 per cent of phosphate in British soils is artificial), and the activity of companies occupied in working the mineral and speculating in coprolite land. The success of the latter, and its future importance to the county, are exemplified by the brothers Samuel and Joseph Fison. Samuel leased and worked mines at Stow-cum-Quy, Horningsea, and Haslingfield. Joseph dealt in processed artificial manures at Shelford. A rapid series of takeovers and mergers took place starting in the late 'seventies. Prentices, a Suffolk firm, took over the Cambridge Artificial Manure Company in 1878, and were in turn bought up by Fisons, who already had control of the Bedford firm of Packards.⁶

¹ Cambs. C.R.O., L9.5. ² *Ibid.*, Surveyors notebooks, R57/24/27/1.

³ D. I. Gordon, *Regional History of the Railways of Great Britain*, IV, 1968.

⁴ Cambs. C.R.O., R124/P59-61. ⁵ *Ibid.*, C76/99; R54/25/81; 296/SP51.

⁶ P. Williams, Fisons Agrochemicals Ltd, personal communication.

Carter Jonas, now leading estate agents specializing in large sales of agricultural land, were founded in 1871 with capital gained in buying land before the boom and selling it to merchants at highly inflated prices for mining purposes.¹ Characteristics of the boom include the deepening of pits to over 30 feet, as at Orwell and Coldham's Common, changes in the way land was "activated,"² the use of heavy machinery for processing, and the sale of land solely for coprolite working (indicating the importance of confidence in its value) as in this example:

Land for sale in Barrington and Orwell parishes . . . facilities available for mining extensive veins of coprolite . . . most eligibly situate in the County of Cambridgeshire within one mile of Shepreth and 2 miles of Foxton Station on the Cambridge Branch of the Great Eastern Railway.³

Instead of a land agent or coprolite merchant approaching a farmer to work his property, land was simply rented out or sold to coprolite merchants. Rents seem to have been regular throughout the period despite the variation in price of the processed product. The processor effectively controlled land and markets, and to some extent firms such as Fisons must have hoodwinked farmers into underestimating possible profits.⁴

An important indicator of production is the rise or fall of prices for processed coprolite. In the coprolite industry these are particularly difficult to find, and when the information is there difficulties arise in finding exactly comparable products stocked by the various retailers. The following price table is compiled from several sources, but most of the quotations are taken from advertisements in *The Cambridge Chronicle* between 1867 and 1881.

PRICES OF FERTILIZERS DERIVED FROM COPROLITES

Date	Manufacturer	Price per ton (at works)
1867	Cambridge Manure Co., Duxford	£ s. 5 10
1871-March	Cambridge Manure Co., Duxford	5 10 } 2½% per cash
1871-April	Cambridge Manure Co., Duxford	4 10
1875	Cambridge Manure Co., Duxford	4 10
1875	Joseph Fison of Shelford	6 10
1875	Reynolds of Coton	6 0
1875	Cambridge Manure Co.	4 10
1879	Prentices of Duxford	3 10
1881	Prentices of Duxford	2 10

It should be noted that both Fisons and Reynolds delivered free any quantity within a 50-mile radius of Cambridge.

The Duxford company quoted the price of guano, the only possible competitor to superphosphate, at £15 10s. per ton. Additives to the superphosphate, such as corn and root manure, were also sold at a slightly competitive price. The number of people advertising in 1875 is particularly characteristic of the boom period. In other years there was never more than one manufacturer advertising.

There are two possible reasons for the slow decrease in the prices quoted above. The first is that it was a natural response to a very large increase in the supply of fertilizer due to the extensive mining. In the last few years when prices decreased more rapidly this was the result of another factor, imports; this must be considered separately.

In its geological introduction to the county,

¹ Carter Jonas Ltd, personal communication.

² E. Porter, 'The Coprolite Diggers', *Cambs. Hunts. and Peterboro' Life*, May 1971.

³ *Cambs. C.R.O.*, 2ab/SP843. ⁴ *Ibid.*, L70/58: Letters.

the *Post Office Directory* for 1879 says of coprolite production: "In 1877 there were raised from this seam in Cambs. and Beds. [at Potton] 55,000 tons of phosphatic nodules, valued at £150,000."¹ This is confirmed by parliamentary accounts published in the year 1891 which give information on the total mineral production of the United Kingdom and quote a value for phosphate of lime, unprocessed, of 54,000 tons, valued at £150,000.² The slight discrepancy in tonnage is very acceptable for Victorian accounting, and a definite conclusion can be drawn, which is that Cambridgeshire was producing practically all the raw-material phosphate for fertilizer in Britain. The following values from the parliamentary accounts are of considerable interest in following the progress of the boom:

PRODUCTION OF PHOSPHATE
PARLIAMENTARY ACCOUNTS OF 1891

Date	Tons ('000s)	Value in £'000s
1860	30	60
1861	37	75
1862	—	—
1867	37	70
1868	37	71
1869	—	—
1870	35	50
1871	36	51
1872	35	50
1873	150	388
1874	256	628
1875	258	625
1876	69	200
1877	54	150
1878	34	74
1879	30	71
1880	31	87
1881	50	98
1882	50	102
1883	52	104
1884	—	—
1885	30	50
1886	20	32

Date	Tons ('000s)	Value in £'000s
1887	—	—
1888	10	16
1889	22	43
1890	20	38

The value of the mineral compared with other U.K. production shows that in the boom period it had a great deal of economic importance, mostly through exports. In 1874 exports of coprolite were worth £628,000, i.e. more than tin (£605,000), of which Britain was a major producer. The main ports of export appear to have been Ipswich, King's Lynn, and London, where coprolite was quoted on commodity markets from 1873. The significance of the trade to Ipswich is clear from the name "Coprolite Street," given to a street leading down to the waterside.

The fall in production of coprolite was by no means as sudden as the rush had been in the 'seventies. There was a primary lull in 1878. An increase then followed until 1885, probably associated with the agricultural depression when farmers were driven to mining by falling food prices. There were various reasons for the decline after 1885. First of all the most easily accessible seams had been worked out, and the best lay under Cambridge itself.³ Large, easily worked measures of phosphate had been discovered in the U.S.A., in New Jersey. Exploration stimulated by the Cambridge discovery uncovered deposits of phosphate and nitrate in Chile, the Gilbert and Ellice Islands, Spain, Argentina, and South Africa.

The first warning of disaster came in 1884 with falls in rentals of coprolite land, as at Barrington, where rents fell by £10 per acre a year. Carter Jonas, who had made his fortune in prospecting, started to sell land at Clayhithe in 1885 with much coprolite still unworked. The factory equipment at Bassingbourn was sold in 1895, and the last pits near Cambridge closed at Barnwell in 1898, when they were losing 6d. for every ton processed.⁴

¹ Kelly's *Post Office Directory*, Cambridge, 1879.

² Cambridge University Library, Parliamentary accounts: minerals, 1860-90.

³ B. C. Worssam and J. H. Taylor, *Geology of the Country around Cambridge*, 1968, p. 33.

⁴ Cambs. C.R.O., 296/SP241.

However, the industry had made a tremendous impact on Cambridgeshire, in terms of population distribution, employment, and future industrial activity. The mining of coprolite was probably almost entirely manual, and very little mechanization was introduced into the actual extraction process. Thus a large amount of labour was needed. The work, as has been seen, was dangerous, but employers could afford to compensate for this with high wages, especially when the returns on digging were so often great. Dr Charles Lucas thought that the weekly wage varied between £2 and £3, without the seasonal variation of the much lower agricultural wages. Furthermore, Cambridgeshire had no real competing industry other than agriculture. The inevitable result of these united factors was a large influx of labour to the coprolite workings. Druce, quoted by Darby, considered that the county, which through the nature of its agriculture should have suffered most from the agricultural depression of the 'seventies and 'eighties, but in fact suffered less than any other in East Anglia, was saved by its large alternative source of employment in coprolite mining.¹ Later on, heavy unemployment again arose as a result of foreign imports, a situation that might have been prevented had there been protective duties. In a way one could maintain that the county was the victim of Victorian "*laissez-faire*".

It is difficult to pinpoint the precise constitution of the new labour force. The bulk of it may have been farm workers seeking employment during "dead" seasons, going back to the farm when a particular working was exhausted. There are two other sources of labour to be considered: firstly, there is the considerable body of vagrants and beneficiaries of the poor-rate. That this source was significant is borne out by a note in the charity accounts for the parish of Haslingfield.² According to the secretary of the Charity Committee, workings were opened in 1867, partly because they would alleviate the employment situation, and, incidentally, lower the monetary contribution of the farmers and parish gentry to the poor-rates. Another important source was the immigrant Irish navvies, who were now in a

surplus situation because of the decrease in railway-building activity. To a large extent these accounted for the increase in population of rural areas described below. The labour was certainly not all of a temporary nature. One worker is quoted in *The Cambridge Chronicle* of November 1876 as saying: "I have been working in the diggings these last seventeen years." Some men merely moved around from site to site with a particular contractor.

The effect on population was the most obvious sign of a thriving and large-scale industry. Families moving in from outside the county caused a temporary rise in population in the 1870's. The cause of this temporary rise in population of villages in Cambridgeshire has often been queried, and the coprolite mining is the only possible reason for it. The rise interrupts a more general pattern of static or decreasing village population, through drift to the towns and the agricultural depression, complicated by a slower increase in population of villages nearer to Cambridge, a result of the town's rapid expansion in the period 1860-1912. These latter included Chesterton, Histon, and Cherry Hinton, all affected by the mining as well. The national census returns only have been used to illustrate the rise of population in the villages, but these show the rise quite sufficiently. Fig. 11 shows some typical instances, but one especially, Orwell, is most striking. At the bottom of the 1881 Census return for the village, the enumerator has noted the increases in numbers as a result of "demand for labour in the coprolite diggings." Out of the 145 villages in Cambridgeshire, seventy-three show a sudden rise in population in 1871, and then a fall. All of these seventy-three villages are within three or four miles of a phosphate outcrop. No village in the "coprolite belt" shows a decrease for the period, while, on the other side, few villages outside the belt show an increase. Socially, too, the labourers provided new problems. Many landowners who had leased their property to coprolite merchants for exploitation were worried about the gangs of workmen in the same way as others had been alarmed by the shanty settlements of navvies building railways and canals earlier on in the century. In several

¹ H. C. Darby, *The Cambridge Region*, 1938, pp. 120, 127.

² Cambs. C.R.O., R.59/27/1/2, 2/5.

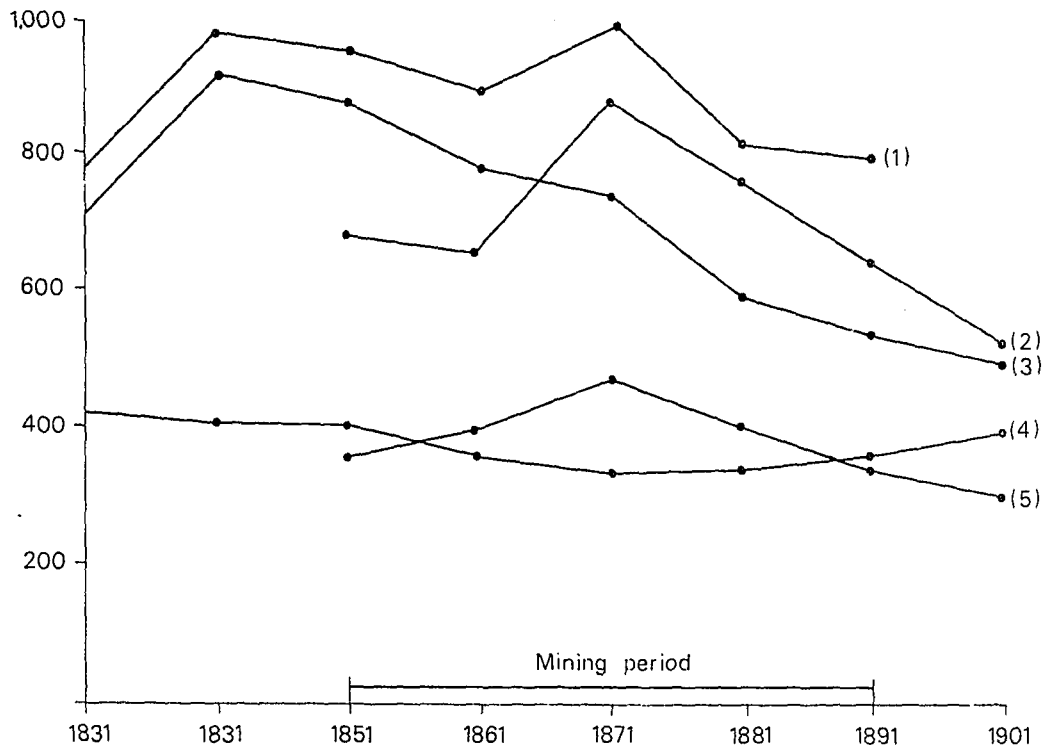


FIG. II

Population of villages during the mining period:
 In the Coprolite belt: 1-Bourn, 2-Orwell, 5-Haslingfield.
 Other parts of County: 4-Shudy Camps, 3-West Wrating.

agreements, for instance that in 1872 between William Woodham and Frank Hills for digging at Shepreth, the landowner reserved the right to eject from his property "any unruly, unreligious, drunken or otherwise persons" to whom he objected. Others, however were more constructive.¹ An agreement dated 30 December 1863 between Sir Charles Beldam and the brothers Fordham stated that Fordhams should relet a small piece of ground (owned by Beldam) on the Bassingbourn Road as "Charles Cooper and other persons employ a large number of men and boys in raising and crushing coprolites in the Parishes of Abingdon Pigotts and Bassingbourn." Charles Cooper wished to erect a small building there at a cost of £65 so that the aforesaid

workers "may have access for the purpose of reading and receiving mental, moral and religious instructions and of being supplied with Tea, Coffee and other unintoxicating refreshments." Beldam also provided that no drunken workers, or those possessing intoxicating liquors on their persons, should be allowed on the premises.² According to Wentworth-Day, the Irish navvies, "who were the cause of many bloody fights in the villages," organized an annual fair at Upware called "the Bustle." Richard Fielder, the self-styled "king of Upware," was in charge of the proceedings. There were dancing-booths, skittle-alleys, and winkle stores. Lucas says that "there were 'bough horses' made of green branches, in which every sort of itinerant pedlar sold beer,

¹ Cambs. C.R.O., R5314/181, 2. ² *Ibid.*, R56/20, 546.

mead—then extensively made at Wicken and other Fen villages—whisky, gin, and rum.”¹

Alternative employment was later provided from two sources within the same spatial context as the fertilizer industry. First the lime and cement-making industries,

started in 1902 simply by digging deeper into the chalk.² Today Barrington has one of the biggest cement-works in the country. Fisons Agrochemicals, too, evolved from the coprolite processing business, and in 1973 employed more than 10,000 people all over the country.

¹ J. Wentworth-Day, *History of the Fens*, reprint 1969, pp. 200-1.

² Fisons Ltd, personal communication.

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