

Metrological Analysis of Regular Village Plans in Yorkshire¹

By JUNE A. SHEPPARD

IN recent years, considerable light has been thrown on the origins and evolution of Scandinavian row villages of regular plan (*radby*) by the employment of the techniques of metrological analysis.² This involves identifying the dimensions of village tofts and field units shown on seventeenth- and eighteenth-century maps, and the interpretation of these dimensions in terms of multiples of ancient units of measurement. Since Yorkshire resembles Scandinavia in having many villages with regular layouts, about the origins of which little is yet known, it seems worth exploring the value of metrological analysis in an English context.

The basic premiss is that regularity is unlikely to have arisen by chance and that it therefore almost certainly represents an element of deliberate planning in the layout. The aim is to discover the date (or dates) of the planning and the principles on which it was based. The first part of the paper is concerned with the units of measurement used and any light these may throw on the problem; the second part deals with the relationships between dimensions and medieval fiscal assessments.

MEASUREMENTS

Statute land measures were definitely in existence by 1305,³ and it is likely that the process of standardization started in 1197 when standard weights and measures, including iron *ulnae* for measuring cloth, were distributed to royal officials in all boroughs.⁴ It was during this period that the statute foot replaced the traditional foot measures, of which four seem to have been used in England and Wales. The Greek common foot of 12.47 statute inches and the Roman foot of 11.65 statute inches are thought to have been used especially for building measurement, whilst the Pythic or natural foot of 9.9 statute inches and the northern foot of 13.2 statute inches were employed for measuring both buildings and land.⁵ The natural foot is said to have been associated especially with Celtic peoples, and it was certainly used in Wales; the parts of England where it is most likely to have been employed are the

¹ I am indebted to B. K. Roberts for discussions about this work at all stages in its preparation and to Mrs P. Tillett for drawing the figures. I am also grateful to the Department of the Environment for allowing me to examine R.A.F. vertical air photographs of the villages described, and to Queen Mary College (University of London) for a grant towards the cost of illustrations. The article was originally presented as a paper at a Conference in Durham on "The Regulated Village" in September 1972.

² E.g. D. Hannerberg, 'Solskifte and older methods of partitioning arable land in Central Sweden during the Middle Ages', *Annales de l'Est*, memoir no. 21, Nancy, 1959, pp. 245-59; S. Göransson, 'Field and village on the island of Öland', *Geografiska Annaler*, XI, Stockholm, 1958, pp. 101-58; S. Göransson, 'Village planning patterns and territorial organization', *Acta Universitatis Upsaliensis*, Uppsala, 1971; S. Helmfrid, 'Östergötland "Västansång"', *Geografiska Annaler*, XLIV, 1962; F. Hastrup, *Danske Landsbytyper*, Aarhus, 1964.

³ C. M. Watson, *British Weights and Measures*, 1910, pp. 36-9.

⁴ W. H. Prior, *Notes on the Weights and Measures of Medieval England*, Bulletin de Cange, Paris, 1924, pp. 22-3.

⁵ F. G. Skinner, *Weights and Measures*, 1967, p. 93.

north and west. The northern foot was used especially by Germanic peoples, and it is thought to have been the most common unit in southern and eastern England. The convenience of having royal standards to which to refer may have led to a rapid replacement of these traditional units by the statute foot of 12 inches during the thirteenth century.

The other principal medieval land measure was the rod, pole, or perch, which also varied in length, being longer in northern than in southern districts.¹ Although the statute perch of $16\frac{1}{2}$ statute feet (= 15 northern feet) was established by 1305, in the case of this unit the customary lengths of northern England were retained for many centuries, although redefined in units of statute feet.² Hence, whilst the actual length of the foot changed during medieval times, the actual length of local perches did not.

In respect of lengths of perches, Yorkshire falls clearly into the northern region. The lengths mentioned in medieval land records range from $17\frac{1}{2}$ to 24 feet,³ with most references being to perches of 18 feet and 20 feet. Although it was not specified that these were statute feet, it seems reasonable to assume that they were, in view of the consistency between these dimensions and those mentioned in later sources. These perches are likely to have been made up originally of whole unit multiples of either the natural foot or the northern foot, but it is not immediately clear which of these two units prevailed in the county, since one of the common lengths, 20 statute feet, is equivalent to 18 *northern* feet, whilst the other, 18 statute feet, does not have an integer equivalent in northern feet but does comprise exactly 22 *natural* feet. It seems feasible, therefore, that both natural and northern units were used in the county prior to the thirteenth century and that a different length of perch was associated with each.

In this context, a hint of a possible earlier history of measurements is provided by an analysis of the interior dimensions of the twenty-five Yorkshire churches of pre-1100 date listed by H. M. and Joan Taylor.⁴ In twenty out of the twenty-five at least one dimension can be interpreted as representing an integer multiple of natural feet. Of the five exceptions three are in the towns of York and Ripon; four appear to have been measured in common feet, and only in the late-Anglo-Saxon church of St Mary Bishophill Jr in York does the northern foot appear. A tentative interpretation of this pattern of distribution is that the natural foot and its associated perch (18 statute feet) were the indigenous measurement units of the Yorkshire countryside from at least dark-ages times; the common foot was used mainly in the towns, whilst the northern foot may have been a relatively late arrival, introduced first into the city of York. In view of the apparent association of the northern foot with the 20-foot perch, it seems feasible that the latter came into use in Yorkshire later than the 18-foot perch. This possibility, together with its convenient size, makes the perch the most suitable unit for use in metrological analysis.

¹ F. Pollock, 'A brief history of Domesday', *Eng. Hist. Rev.*, xi, 1896, p. 218.

² *Second Report of Commissioners for Weights and Measures*, B.P.P. 1820.

³ Lengths extracted principally from monastic chartularies and Yorkshire Archaeological Society Record Series volumes.

⁴ H. M. and Joan Taylor, *Anglo-Saxon Architecture*, Cambridge, 1965. Recent excavation under York Minster has shown that the interpretation of St Peter's requires revision.

The system of reckoning in medieval Yorkshire was predominantly octonal or duodecimal. Landholdings were measured in oxgangs (bovates) and ploughlands (carucates), with 8 oxgangs making 1 ploughland. The fiscal assessment recorded in Domesday Book used the same units, and J. H. Round was able to demonstrate how townships were frequently grouped to form "hundreds" of 12 carucates.¹ The long hundred of six score was extensively used. Alongside the standard currency units of 12 pence to 1 shilling and 20 shillings to 1 pound, in Yorkshire the mark and its eighth part, the ora, were widely used in accounting.² The several composite manors valued in 1066 at £12, £24, £32, £40, and £56 also suggest reckoning in multiples of £8 and £12.³ The origins of octonal and duodecimal reckoning are not clear; oxgangs and ploughlands, marks and orae were probably introduced by the Scandinavians,⁴ but other European peoples had systems that were at least partially octodal or duodecimal.⁵ It is therefore likely that the Scandinavian influence merely re-enforced an existing tradition of reckoning. In view of the existence of this pattern, however, it seems reasonable to anticipate that other measurements, such as linear ones in perches, with which we are here concerned, will also tend to occur in multiples or factors of 8 or 12.

The maps from which the measurements were taken were the sheets of the Ordnance Survey, 1st edition, 1:2,500, surveyed and published in the 1880's and 1890's. These offered three main advantages over other possible sources such as tithe maps of the 1840's, enclosure maps of the late eighteenth and early nineteenth centuries, and estate maps of the seventeenth and eighteenth centuries: there was a complete cover of the county; the standard of accuracy was high; and the scale was large and consistent. The late date of the maps has certain disadvantages, for internal changes, such as the enclosure of greens, the division of some plots and the amalgamation of others, and the expansion of the built-up area, were not uncommon during the eighteenth and nineteenth centuries. In a few villages where detailed seventeenth- or eighteenth-century maps are available, however, comparisons suggest that the changes were rarely fundamental.⁶ It therefore seems likely that the main elements of pre-enclosure village plans can be identified on these late-nineteenth-century maps.

The regular villages of Yorkshire have the form of rows of tofts and crofts (hereafter together called tofts), facing a fairly straight street or narrow green, or in a few cases a green that is more nearly square. In addition there are some more complex plans comprising rows of tofts lying at angles to one another, and sometimes having more than one green. The church and the manor-house (or its former

¹ J. H. Round, *Feudal England*, 1895, pp. 79-80.

² J. Hunter Blair, *An Introduction to Anglo-Saxon England*, Cambridge, 1962, p. 295; R. Weldon Finn, *An Introduction to Domesday Book*, 1963, p. 226. It is not clear, however, how distinctive Yorkshire was in this respect.

³ F. Brooks, *Domesday Book and the East Riding*, East Yorkshire Local History Series, no. 21, 1966, pp. 38-9.

⁴ H. R. Loyn, *Anglo-Saxon England and the Norman Conquest*, 1962, p. 132; R. Lennard, 'The origin of the fiscal carucate', *Econ. Hist. Rev.*, 1st ser., xiv, 1944, pp. 51-63.

⁵ E.g. the Romans, O. A. W. Dilke, *The Roman Land Surveyors*, Newton Abbot, 1971, p. 52.

⁶ Especially clearly demonstrated by a plan of Kilham village (East Riding), c. 1725, on a scale of 4 chains to an inch, in the East Riding Record Office, DDD V/12/53.

site) are frequently located at the ends of the rows or detached from them. On initial consideration three dimensions seemed to be suitable for measurement: the width of the village street or green; the depth of toft rows; and the length of toft rows. In practice the last of these gave rise to problems, for in a number of cases rows appear to have been subsequently extended, and the decision as to where measurement should begin or end becomes extremely difficult. Only where both ends of a row abut upon a lane, a stream, or some other permanent feature, or where a sudden change of depth occurs, can a reliable measurement of length be taken. In view of this it was decided to omit row lengths from the initial stage of analysis.

Although the measurement of the widths of streets or greens and of the depths of rows gave rise to fewer problems, certain decisions had to be taken that require justification. In the first place, few streets or greens are of exactly the same width throughout, and the same applies to the depth of toft rows, yet for purposes of analysis a single dimension only was required for each. Where the change of dimension was consistently in one direction, as in the case of a wedge-shaped green, or where the same dimension occurred only twice, as in a spindle-shaped green, no figure was recorded for analysis. Where the variation was around some norm, however, and the width or depth fluctuated from just below to just above this figure, with a range of less than 0.25 inch on the 1:2,500 map (about 52 feet), then the norm was taken as the measured dimension. A second decision was that, in those villages where a green had been enclosed to form front gardens, the building frontage lines were taken to represent the former boundaries between green and toft rows.

The measurements of green or street breadths and of toft-row depths were taken from a sample of 100 villages of regular layout. Since any classification of plans by visual inspection is bound to be to some extent subjective, only three broad plan groups were identified in Yorkshire: those where the plan is dominated by regular elements; those where both regular and irregular elements are significant; and those with predominantly irregular elements. The sample formed 48 per cent of the villages classed as regular and 14 per cent of all villages in which regular elements are present. It was not a scientifically selected sample owing to practical problems of access to maps; nevertheless, the large proportion it forms of the total number of regular villages suggests that confidence can be placed in the validity of the results.

For the two selected dimensions, diagrams were constructed to show the frequency with which particular lengths were recorded, to the nearest 0.05 inch (10.4 feet). Peaks of frequencies may be presumed to represent commonly used multiples of the basic unit or units of measurement; since the latter are most likely to have been the 18-foot or 20-foot perches, scales of these are added to the frequency diagrams. Of the seventy recorded breadths of streets and greens, sixty-four are under 160 feet. Fig. 1 shows four peak frequencies, of which the first two could represent two and four multiples respectively of either of the perches, although the 18-foot perch appears to offer the close fit. The third and fourth peaks coincide with six and eight perches of 18 feet, rather than with any likely multiple

of 20 feet. The implication is that the 18-foot perch in multiples of 2, 4, 6, and 8 was the principal unit used in laying out regular streets and greens, although the 20-foot perch may have been used in a minority of cases.

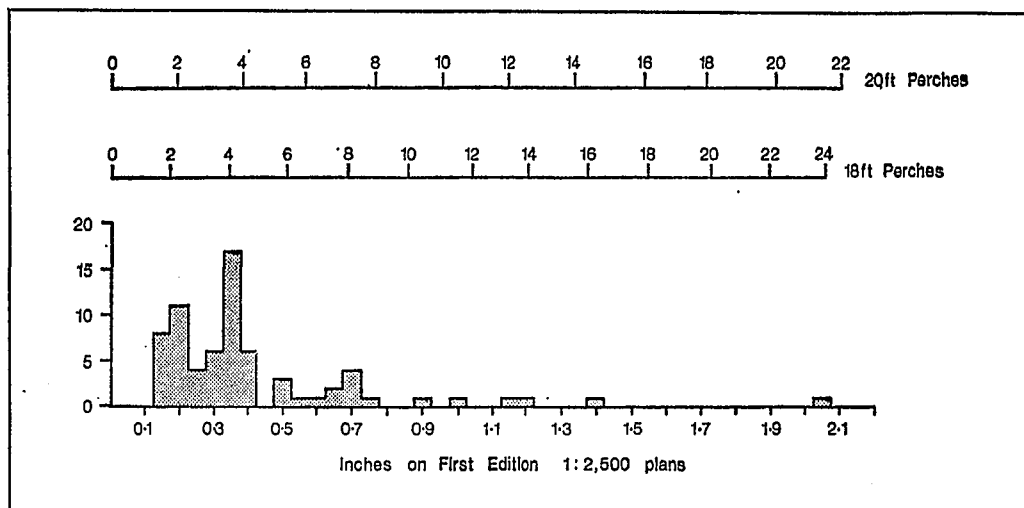


FIG. I

The number of sample streets or greens of different breadths as measured on the Ordnance Survey, 1st edition, 1:2,500 plans, together with scales of 18-foot and 20-foot perches.

The range of row depths is greater, and fig II shows the depths of the eighty-four rows in the sample that are less than 4 inches (about 833 feet) in depth. Fifty-four, or 65 per cent, are between 200 and 400 feet deep. Some frequency peaks coincide closely with significant multiples of 18 feet, i.e. 8, 12, 16, and 20. Other peaks could represent multiples of either perch, e.g. 12 times 20 feet or 14 times 18 feet; 16 times 20 feet or 18 times 18 feet; 32 times 20 feet or 36 times 18 feet; and one minor peak appears to equate with 8 times 20 feet, rather than with any significant multiple of 18 feet. The evidence from row depths thus appears to corroborate that from green breadths and points to the general conclusion that the 18-foot perch was the most widely used when laying out regular plans, although the 20-foot unit was employed in some instances.

When those rows that appeared to have depths most closely approximating to significant multiples of 20 feet were re-examined, they were seen to fall into three groups. First, there were a few where a straight-line measurement taken from the front to the rear of the row may not coincide with the line of the original measurement, so that accordance with the 20-foot unit may be fortuitous. For instance, the straight-line depth in Pickering Eastgate could represent 16 times 20 feet or 18 times 18 feet, of which the former seems the more likely because of its octonal character. If, however, the measurement is taken along the curve of the toft boundaries, it becomes 20 times 18 feet, or 18 times 20 feet, of which the former is the more likely. This, therefore, can no longer be classed as a row providing evidence

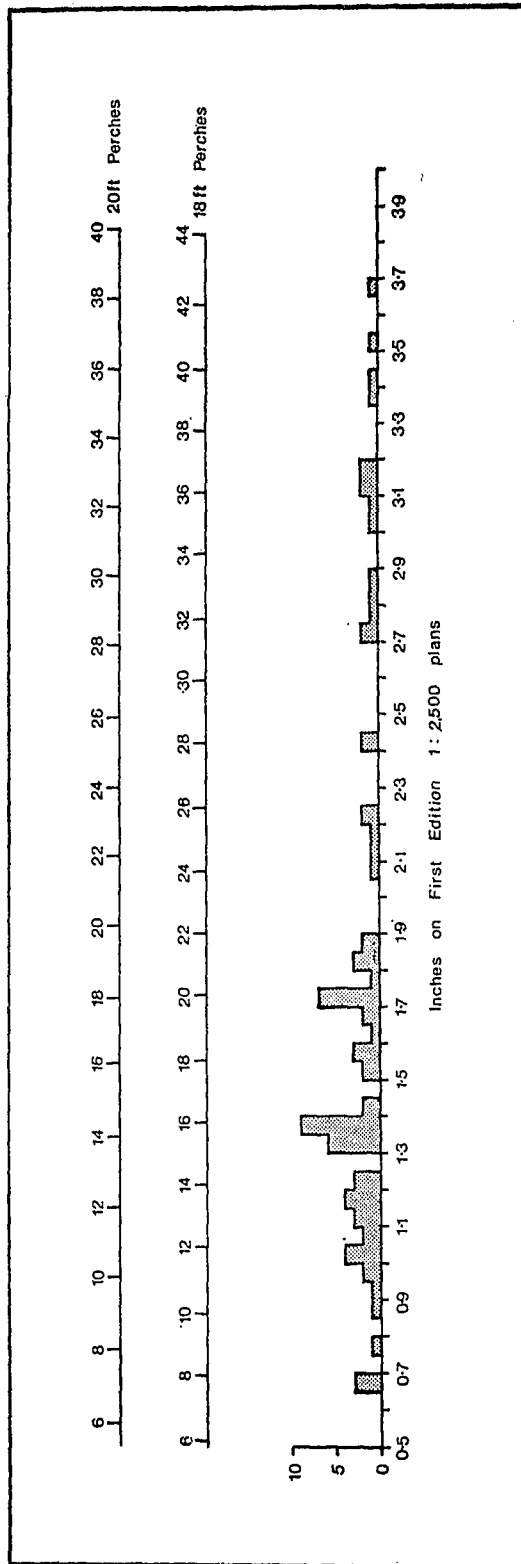


FIG. II

The number of sample toft rows of different depths as measured on the Ordnance Survey, 1st edition, 1:2,500 plans, together with scales of 18-foot and 20-foot perches.

for the 20-foot unit. Secondly, in the two settlements of New Thirsk and Terrington, both baronial market centres,¹ all the measured dimensions conform to significant multiples of the 20-foot unit, and the evidence points to both having been laid out in their entirety using this perch. Thirdly, several villages each have a row that appears to accord with multiples of the 20-foot perch, alongside a green and at least one other row where the measurements point to the use of the 18-foot perch. The row using the 20-foot perch must be interpreted as having some different origin from the rest of the plan, and the most likely explanation is that it was later, and that during the interval between the laying out of the two rows the 18-foot perch was replaced by that of 20 feet. Closer examination of the rows with a possible 20-foot module thus supports the view that the majority of the original regular plans used the 18-foot perch.

This conclusion does not contribute greatly to the dating of the regular plans, in view of both the long period of time during which the 18-foot perch had probably been in use, and our present limited knowledge of the period of introduction and rate of diffusion of the 20-foot perch.² Two rather general conclusions, however, can be hinted at. First, the existence of a few settlements where the 20-foot unit was used throughout, together with others where it seems that rows using the 20-foot perch were added to plans otherwise measured in 18-foot units, indicates that at least some of the regular planning post-dates the introduction of the longer perch. Secondly, where irregular rows and clusters of tofts, or regular rows measured by the 20-foot perch, were apparently added to an existing regular plan measured in 18-foot units, the population presumably grew after the initial layout was established. The great period of population growth was the twelfth and thirteenth centuries, and the implication is therefore that the original plans date from the early thirteenth century *at the latest*, in order to leave time for a need for subsequent additions to develop. The analysis of the measurements themselves can at present take us no nearer than this to the dating of the plans.

ROW LENGTH AND THE FISCAL ASSESSMENT

Although uncertainty about the exact location of the ends of some rows made the length measurement unsuitable for use when establishing the basic measurement units, it is this dimension that is especially relevant in the second stage of analysis. The 18-foot unit can be recognized in many rows in the spacing of the parallel boundaries between tofts, particularly in the Vale of York where many small farms still had their buildings located in the villages in the late nineteenth century, and where the toft layout therefore remained relatively unaltered. In those villages where row ends can be identified because they abut on to a cross lane or there

¹ M. W. Beresford, *New Towns of the Middle Ages*, 1967, pp. 518-19; T. Whellan *et. al.*, *History and Topography of the City of York and North Riding*, Beverley, 1857, pp. 146-58; Mary E. Dymond, *Terrington, a history of the parish*, privately printed, n.d. c. 1968.

² J. Radley found that messuages already in existence in Danish times in Ousegate, York, had frontages approximating to 18 feet, which makes a post-Viking date for the introduction of the 20-foot unit eminently feasible—*Medieval Archaeology*, xv, 1971, pp. 43-5.

is a sudden change of row depth, the total length frequently conforms to an octonary multiple such as 48, 56, 64, 72, 88, and 104 times 18 feet.

Work on the *radby* of south Sweden and Denmark has shown that the length of toft rows was related to the medieval fiscal assessment of the township.¹ Within any one village, each unit of assessment was allocated a standard length of frontage, so that holding A, assessed at twice the figure of holding B, would also have a toft twice as wide as that of holding B. One frontage: assessment ratio might prevail throughout a region, as in Östergötland, with the result that many villages had identical dimensions.² The ratio varied, however, from region to region and from one period of time to another.³ Is it possible to identify such a ratio in the planning of the regular villages of Yorkshire?

The most comprehensive information concerning the medieval geld assessment in Yorkshire is provided by Domesday Book. Assessment figures for individual townships in fiscal carucates and bovates are given both in the main body of the Yorkshire Inquest (the Text), and in the so-called Summary, the latter recently shown to be a copy of a slightly earlier geld list.⁴ The figures for many vills are identical in the two lists, but the Summary often gives separate details for the component parts of estates where the Text provides only a composite total. No earlier geld list is extant, whilst the only reasonably complete coverage for a later period is provided by the 1284-5 survey of knights' fees known as Kirkby's Inquest, supplemented by the few surviving portions of other early fourteenth-century inquisitions into knights' fees.⁵ This later information has several limitations. No survey of fees has survived for certain whole wapentakes, whilst elsewhere there are some composite entries and a number of vills were omitted or listed without assessment figures. The coverage of assessment data is thus much less complete for the period around 1300 than it is for 1066-86.

One hundred and two Yorkshire villages with regular plans have extant assessment figures for both 1066-86 and c. 1300, and a comparison of these two sets of figures provides some insight into the extent to which assessments changed during the interval. In twenty-five instances the figure was unchanged; in another thirty-four the difference amounted to 1 carucate or less, and it is likely that many such small differences can be attributed to clerical or transcription errors. Thirty-two vills showed a decline of more than 1 carucate; again transcription errors may be partly to blame, but another explanation for decline can be found in the different bases of the two sets of figures. Domesday Book figures are believed to represent the full assessment,⁶ whilst the later lists probably exclude land exempted from the payment of geld,⁷ and since considerable areas may have been exempted during the

¹ Göransson, 'Field and village', pp. 101-58; Göransson, 'Morphogenetic aspects of the agrarian landscape of Öland', *Oikos Supplementum*, 12, Copenhagen, 1969, pp. 68-78; Göransson, 'Village planning'; Helmfrid, *loc. cit.*, pp. 139-89; Hastrup, *op. cit.*, English summary, pp. 258-69.

² Helmfrid, *loc. cit.*, pp. 184-6. ³ Göransson, 'Field and village', p. 135; Hastrup, *op. cit.*, p. 260.

⁴ Sally Harvey, 'The Domesday Book and its predecessors', *Eng. Hist. Rev.* LXXXVI, 1971, pp. 761-3.

⁵ All printed in *Surtees Society Publications*, LIX, pt 1, 1866.

⁶ J. H. Round, 'Danegeld and the finance of Domesday', in P. E. Dove (ed), *Domesday Studies*, 1, 1888, pp. 92-116.

⁷ A. L. Poole, *From Domesday Book to Magna Carta*, Oxford, 1951, p. 418.

twelfth century, a smaller figure for *c.* 1300 than for 1086 is no cause for surprise. It thus seems quite probable that in these ninety-one villis so far considered (89 per cent of the total sample), the assessment did not change during the twelfth and thirteenth centuries. Only in the eleven villis where there was an increase of more than 1 carucate is there a serious likelihood of reassessment. Close examination of the circumstances in two villis of this group, West Tanfield and Carthorpe, indicates that in fact the increases were probably the result of local adjustments between neighbours,¹ and this could well be the explanation in the other nine cases, too. The evidence thus points to an absence of major changes in the basic assessment figures during the twelfth and thirteenth centuries, although there was some local readjustment, together with varying degrees of exemption from the associated liabilities.

Relating assessment figures to row lengths gives rise to certain technical problems. First, where 1086 and *c.* 1300 assessment figures differ, which figure is likely to be the significant one? The answer depends partly on whether row lengths were related to the total assessment or to the geldable portion only, and partly on the date when the rows were established; since both are at present unknown it seems wisest to take both eleventh- and thirteenth-century figures into consideration where they differ. A second question is whether the churchyard and Hall Garth should be included when measuring frontages if (as is rarely the case) they appear to form part of a row. Inclusion implies that church and manor contributed to the geld, but unfortunately it is not known if this was the case. Once again, therefore, it seems wisest to take both possibilities into account, and to consider both inclusive and exclusive measurements. As a result, in the case of some villis there is uncertainty about both of the figures between which a relationship is being sought, and the scope for erroneous conclusions is considerable. This must be borne in mind throughout the analysis.

The technique adopted was to measure all rows in multiples of 18 feet, estimating the location of the ends where this was in doubt. Villages were then grouped by their eleventh-century assessment figures, and the approximate measured frontage in 18-foot perches listed for each village. A few villages in each group were found to have roughly the same length of frontage, which approximated to a ratio of 2 perches per bovat of assessment. On the assumption that some of the frontage measured in the original rough calculations may have represented unidentified additions to the original rows, the plans of all the regular villis in the county were then re-examined to test for the possible existence of this ratio. A temptation at this stage was to see rows of the appropriate length wherever there was doubt about the

¹	1086	1284-5		1086	1284-5
	<i>Carucates</i>	<i>Carucates</i>		<i>Carucates</i>	<i>Carucates</i>
West Tanfield	8	11	Carthorpe	4	11
Burton on Yore	4	—	Normanby	6	—
Well and Nosterfield	8	6		—	—
East Tanfield	5	8	Total	10	11
	—	—		—	—
Total	25	25			
	—	—			

position of row ends; it is to be hoped that awareness of this possible source of bias provided adequate protection against it.

The testing of the ratio brought to light a number of villages where the fit was close, and four of these are now described in order to demonstrate both the validity of the approach and the problems involved.

A. *Copt Hewick* (fig III). This village is one of a relatively small group that in the late nineteenth century consisted of a single row of tofts only. It was assessed at 3 carucates in the eleventh century but, as part of the Liberty of Ripon, was not included

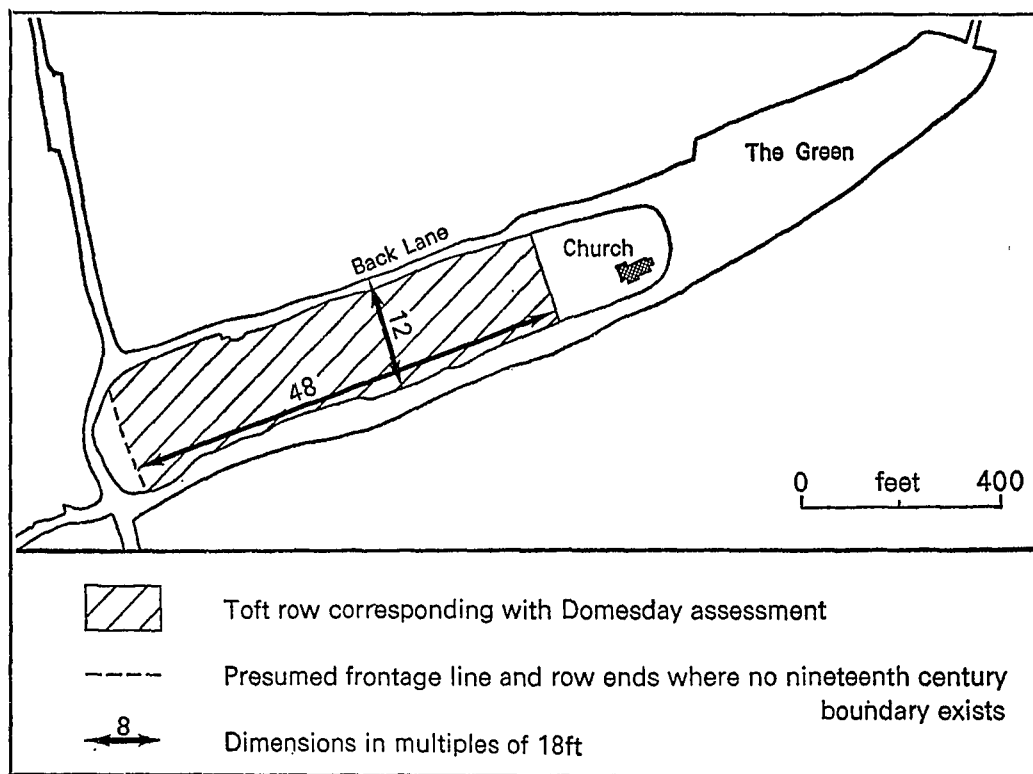


FIG. III

Copt Hewick: suggested original layout.

in any thirteenth- or fourteenth-century list of knights' fees. The toft row fronts on to a road trending approximately east-north-east; whilst the western end and rear of the row are delimited by a lane, the eastern end is occupied by the churchyard beyond which lies the green. Toft row and back lane combined are 12 perches deep, except at the western end where the curvature of the lane results in diminished depth. Total frontage, excluding the churchyard, is 50 perches, but if only that part with the full 12-perch depth is considered the frontage then becomes 48 perches, which by the ratio being tested corresponds to 3 carucates. It is postulated that this section was the original row, with the remaining 2 perches frontage at the western end representing a later addition.

B. *Hemingbrough* (fig IV). A much more common nineteenth-century plan had a row of tofts on each side of a street or narrow green, one side (or part of one side) having a more regular layout than the other. In a number of cases the assess-

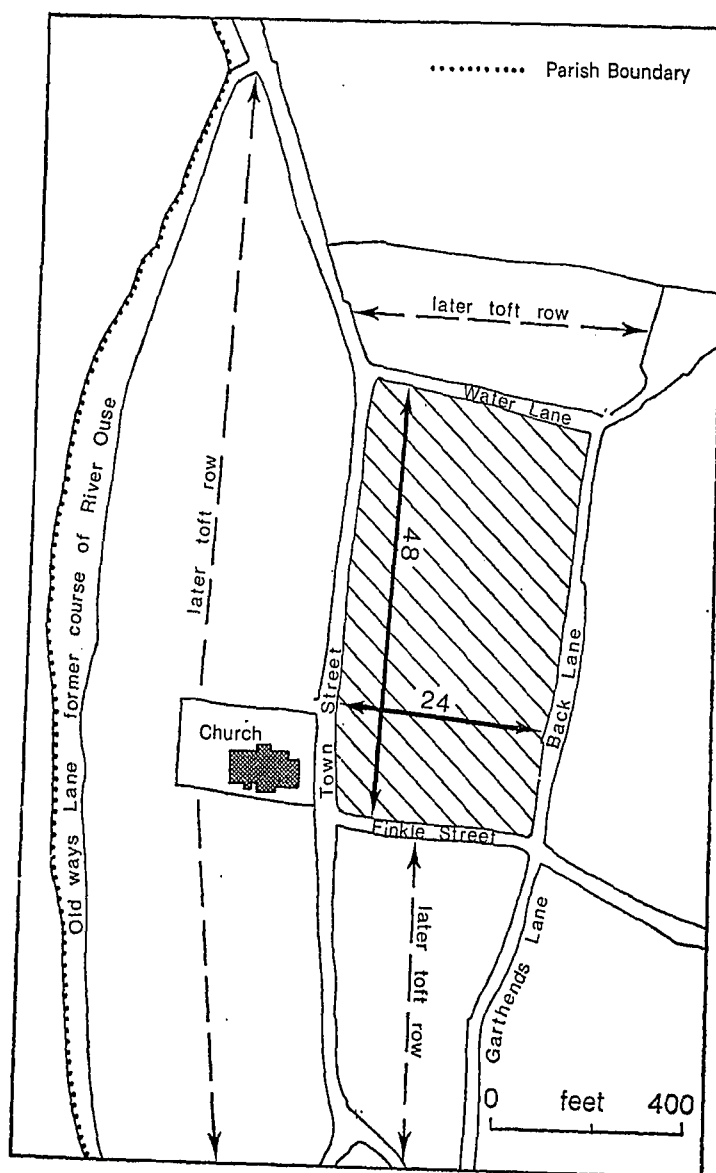


FIG. IV

Hemingbrough: suggested original layout. Key as fig. III.

ment figure fits the length of the more regular row, and the other row or rows are therefore presumed to be later additions. Hemingbrough, assessed at 3 carucates in both 1066 and 1284-5, illustrates this type of plan. Regularity of depth identifies the original row as that lying on the east side of Town Street, between Water Lane on

the north and Finkle Street on the south. This row is 24 perches deep and 48 perches long, the length representing exactly 3 carucates by the ratio. The frontage of the later rows was longer than that of the original row, a frequent feature of this type of plan that makes identification of the original nucleus somewhat more difficult than in one-row villages.

C. *Thornton-le-Beans* (fig. v). The original measured frontage was in some villages divided between two facing rows, either or both of which may have subsequently been extended. This characteristic increases the complexity of the task of identifying the original rows. Thornton-le-Beans, assessed at 6 carucates in both 1066 and

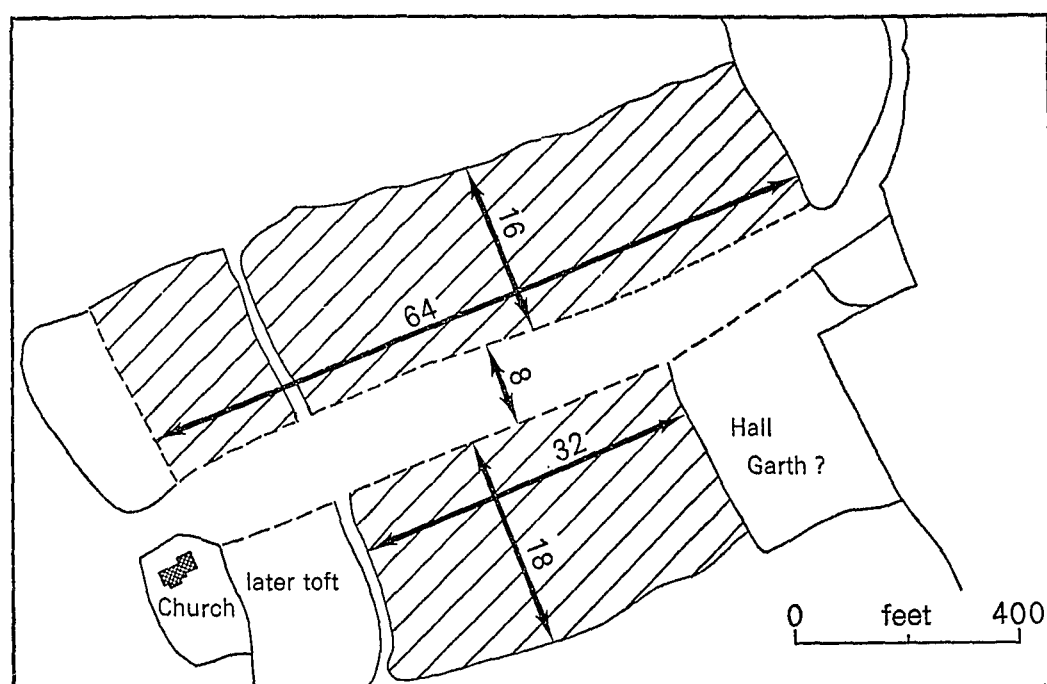


FIG. V

Thornton-le-Beans: suggested original layout. Key as fig. III.

1284-5, provides one of the more easily interpreted examples. Two rows, 16 and 18 perches deep from the building frontages, face a regular 8-perch green, but in the nineteenth century there were no true back lanes, only a broad green track extending behind part of the northern row. The original southern row seems likely to have ended at the cross lane on the west, for the toft to the west of the lane is deeper, whilst two deeper tofts at the eastern end of the row may represent the former Hall Garth. Measured between the cross lane and the presumed Hall Garth boundary, this row is 32 perches long, equivalent to 2 carucates. If the original northern row is taken to extend from a western boundary opposite the eastern limit of the churchyard to an eastern boundary at the point where the orientation of the street changes sharply, it measures 64 perches, representing 4 carucates. On the nineteenth-century

map, no boundary survived at the postulated western end of this row, but air photographs reveal traces of a former trackway at this point, thereby supporting the interpretation. The two rows together correspond to the total assessment figure.

D. *Upper Poppleton* (fig vi). This village may be taken as representative of a relatively small class in which there were three or more original rows arranged around a green or a grid of streets. With each additional row the problems of interpretation increase, but fortunately in the example selected the later additions were small and the approximate original layout can be reconstructed without difficulty.

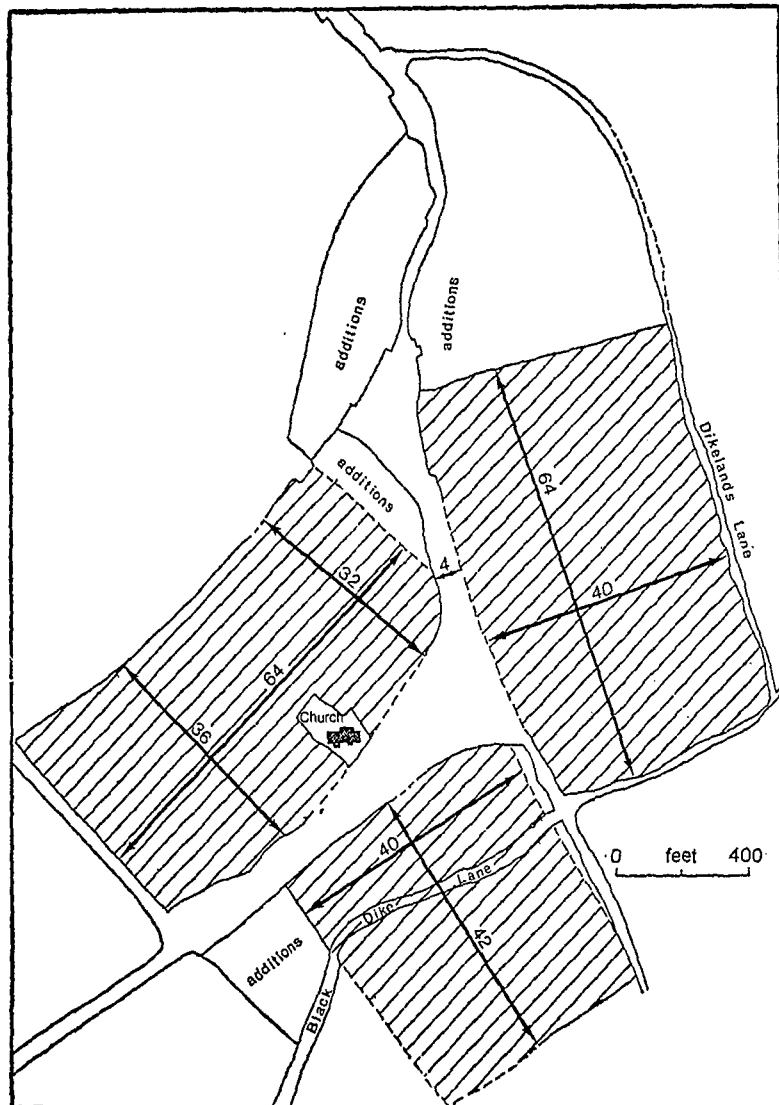


FIG. VI

Upper Poppleton: suggested original layout. Key as fig. III.

Upper Poppleton has a triangular-shaped green with irregular extensions to the north and to the south-west. The vill was assessed at $10\frac{1}{2}$ carucates in 1066, 8 carucates belonging to the Archbishop of York, and $2\frac{1}{2}$ carucates to the estate of Osbern de Arches: by 1284-5, the whole vill was held by the Benedictine abbey of St Mary in York, and no assessment figures are given. There are three toft rows, of which the most regular lies on the east side of the green with a standard depth of 40 perches. The southern end of this row is fixed by a lane, but the northern limit could have been any one of several toft boundaries near the northern extremity of the green. A second row lies between the northern and south-western arms of the green, with a more variable depth around 32 to 36 perches. Again, one end is fixed by a lane, but on the north-east the limit could have been either of two boundaries, beyond which there is an irregular shaped toft that is clearly an addition carved out of the green. This row has the complication of a centrally placed churchyard. The third row, south of the south-western arm of the green, seems likely to have extended across Black Dike Lane, with a total depth around 42 perches. A change in the width and orientation of the lane probably indicates the western end of this row. At the east end, the gentle curve of the frontage is broken by a sharp angle between green and lane, hinting at a small later encroachment; if this is excluded, the row is 40 perches long. Forty perches represents $2\frac{1}{2}$ carucates, which suggests the possibility that this row comprised the tofts belonging to Osbern de Arches's estate. The combined frontages of the two other rows, which perhaps represent the share of the Archbishop, should total 128 perches. This length of frontage, or some close approximation to it, is clearly present, but the precise share of each row is difficult to determine. Fig. VI shows one possible arrangement, with each row 64 perches long; another possible layout would give 68 perches of frontage to the eastern row and 60 to the north-western row, the latter total being attained either by the omission of a toft at the east end of the row shaded on fig. VI, or by the exclusion of the churchyard.

As these examples demonstrate, in no instance is the cartographic evidence completely unequivocal. The case for a standard ratio between frontage and fiscal assessment rests rather on the frequent recurrence in villages of varying size, layout, and location of dimensions that make such a relationship feasible or even probable. The fact that B. K. Roberts, by means of much more detailed study of a few villages, has found evidence for a connection between frontage and assessment in the neighbouring county of Durham increases confidence in the interpretation.¹

Frontage measurements in the 182 regular villages for which an assessment figure is available produced the following results:

good examples of the ratio	27 villages
probable examples of the ratio	41 villages
frontage longer than appropriate	38 villages
frontage shorter than appropriate	76 villages
Total	182 villages

¹ B. K. Roberts, 'Village plans in county Durham: a preliminary statement', *Medieval Archaeology*, xvi, 1972, pp. 33-56.

Where the measured frontage is too long, a possibility is that correct-length rows are embedded in and indistinguishable from later extensions, so that this category, whilst not confirming the ratio, does not disprove it. Some of the seventy-six villages where rows are too short, especially where the deficiency is small, may represent cases where tofts or whole rows have been lost by shrinkage, perhaps in late medieval times. But it seems unlikely that all seventy-six can be explained in this way, and the alternative must be considered of a group of villages in which a different ratio was used, resulting in shorter rows. Since it was noticed when testing the 2-perches-per-bovate ratio that in several cases the measured frontage was exactly half the expected length, the ratio of 1 perch per bovate was selected for testing in the seventy-six villages where the first ratio apparently did not operate. In twenty-one cases, the agreement between the new expected row length and the measured length was close. A good example is provided by Bulmer, assessed at 6 carucates in Domesday Book, and in a 1300 inquest into knights' fees. This village has a row 16 perches deep west of the churchyard and north of the green (fig. vii); in length this measures exactly 48 perches, equivalent to 6 carucates using the shorter ratio. Although there are fewer examples of this ratio than of the more generous 2 perches per bovate ratio, the evidence for its use is just as convincing.

These are the only two ratios of frontage to assessment that can be identified

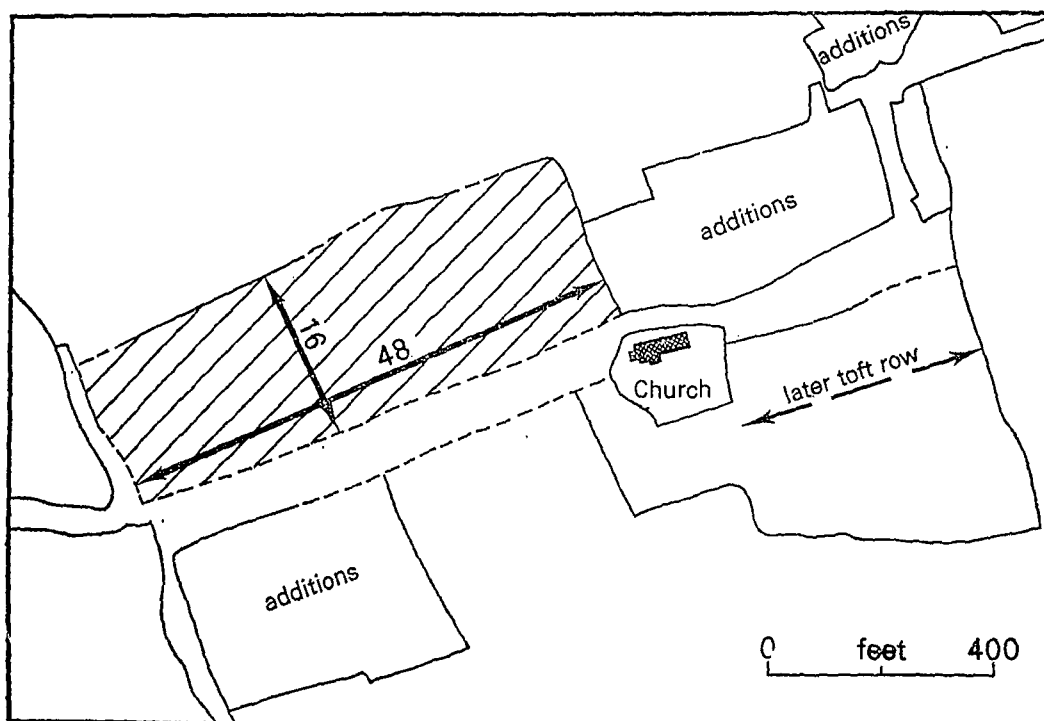


FIG. VII

Bulmer: suggested original layout. Key as fig. iii.

with certainty, but others may have been used in a small number of cases. Stillingfleet, for instance, has a single row that is twice the length expected when using the 2 perches to 1 bovat ratio, and one cannot help wondering whether this row was laid out using the more generous ratio of 4 perches of frontage per bovat. The possible existence of such unidentified ratios in a minority of villages adds to the problems of demonstrating a link between frontage and assessment. In view of the many difficulties, the recognition of a likely relationship between the two measures in eighty-nine out of the 182 regular villages considered (48 per cent) must surely be regarded as fairly conclusive evidence that, in Yorkshire villages of regular plan, the assessment normally determined the length of frontage.

It is now possible to return to the question of the date of origin of the plans. The close association between frontage length and assessment figures suggests that the regular rows were laid out at a time when the geld assessment was a significant factor in rural life. The principle that taxation and other responsibilities such as bridge maintenance were distributed in proportion to landholdings was already of considerable antiquity by the eleventh century, but the particular assessment that is listed in the Yorkshire folios of Domesday Book is likely to have been fairly recently drawn up, perhaps during the early years of the eleventh century.¹ Plans that reflect this assessment are therefore unlikely to have originated prior to the eleventh century. From the Norman conquest until 1162, the main form of direct taxation was based on the assessment, i.e. geld was paid, perhaps annually, at a fixed rate per hide or carucate.² The granting of exemptions, however, steadily reduced the value of this tax, and after 1162 it was no longer used, apart from special "carucages" in 1194 and 1220. The assessment may thus already have been of only antiquarian interest when it was recorded in the late-thirteenth- and early-fourteenth-century lists of knights' fees. It seems reasonable to suggest, therefore, that the assessment figure is more likely to have been taken into account when planning village layouts before c. 1220 than after.

This line of argument thus points to the eleventh and twelfth centuries as the most likely period of origin of the regular plans. A limited prospect of greater precision of dating within this broad period appears to be offered by the eleven regular villages that experienced significant increases of assessment between 1086 and c. 1300 associated with local readjustments.³ In five cases, it is impossible to

¹ F. M. Stenton, *Anglo-Saxon England*, Oxford, 1943, p. 639; F. M. Stenton, *Types of Manorial Structure in the Northern Danelaw*, Oxford, 1910, p. 90; P. Sawyer, *The Age of the Vikings*, 2nd edn, 1971, p. 172.

² Poole, *op. cit.*, p. 418; W. Farrer, 'Introduction to the Yorkshire Domesday', *The Victoria History of the County of York*, II, 1912, pp. 138-41. Farrer points out that Yorkshire carucates paid at a lower rate than carucates in other counties.

	1086	1284-5		1086	1284-5
	Carucates	Carucates		Carucates	Carucates
Burrill and Cowling	7½	10	Spaldington	9½	10½
Carthorpe	4	11	West Tanfield	8	11
Cottam	9	12	Tockwith	5	7
Laxton	1	3	Wheldrake	6½	10
Levisham	2¾	4	Wilton (nr Pickering)	5	10
Old Byland	6	3			

suggest any certain matching of frontages with either assessment figure, and in Wilton and Spaldington a case could be made for a match with both figures. The evidence from Wheldrake, however, points clearly to a relationship with the earlier figure, whilst in Burrill and Cowling, Carthorpe, and West Tanfield (all lying north of Ripon and within a few miles of one another) there is a possible match with the later figure. For instance, the two rows of Carthorpe can be interpreted as having a combined frontage of 176 perches, which represents 11 carucates at the 2 perches per bovat ratio. The limited conclusion that can be drawn from these few cases is that different villages may have been planned at different times during the period under consideration.

CONCLUSION

The aim of this reconnaissance survey has been to demonstrate the validity of a technique not previously used in England except for County Durham,¹ hence each stage of analysis has been considered in rather tedious detail. Once the range of possible variables is known, however, it should be feasible to streamline the procedure, and to use metrological analysis alongside more traditional approaches in unravelling the many unsolved problems associated with medieval and dark-age settlement. At this stage it is acknowledged that the work described raises more questions than it answers.

Although the emphasis is thus on the potential value of the technique, one point has emerged from the analysis that warrants further comment; this is the somewhat earlier period of origin suggested for the planned layouts than is currently fashionable. Pamela Allerson appears to favour a twelfth- or thirteenth-century date for the regular plans of the Pickering district;² M. Beresford hints at a later thirteenth- or early fourteenth-century date for East Witton in Wensleydale;³ and medieval archaeologists have drawn attention to several cases of regular plans replacing or extending earlier less regular layouts during the thirteenth and fourteenth centuries.⁴ Can these differences be reconciled?

The notion of a link between toft frontage and assessment may have been of considerable antiquity, and it would surely have had considerable appeal, both to administrators seeking to pin responsibilities on to landholders, and to peasant farmers anxious to avoid unreasonably heavy exactions. On the other hand, it must have been difficult to put into practice where former privileges and boundary patterns were jealously preserved. J. G. Hurst believes that this was rarely the case in late Saxon and early medieval villages, in which plans were in a continual state of flux,⁵ but I wonder whether this may not be too broad a generalization? Instead, three sets of circumstances can be postulated that would have favoured changes of

¹ B. K. Roberts, 'The regulated village', *Durham County Local History Society Bulletin*, 12, April 1970, pp. 1-4; 'Regulerede landsbyer i grevskabet Durham', *Kulturgeografi*, Aarhus, Denmark, 117, 1972, pp. 170-83.

² Pamela Allerson, 'English village development: findings from the Pickering district of North Yorkshire', *Trans. Inst. Br. Geog.*, 51, Nov. 1970, pp. 95-109.

³ M. W. Beresford and J. K. S. St Joseph, *Medieval England: an aerial survey*, Cambridge, 1958, pp. 103-6.

⁴ M. W. Beresford and J. G. Hurst (eds.), *Deserted Medieval Villages*, 1971, esp. pp. 124-7.

⁵ *Ibid.*, p. 129.

layout, including the opportunity to establish regular rows: where settlements were devastated and recolonized after an interval; where there was a powerful lord whose officials could override the wishes of the peasant community; and where there was an alteration in physical or economic circumstances that made the existing settlement site inconvenient.

In Yorkshire, an opportunity for the replanning of settlements on a grand scale was provided by William I's "harrying of the north" in the winter of 1069-70, when a scorched-earth policy led to a vast area being devastated. Administrators at various levels must have been in their element during the late eleventh and twelfth centuries organizing the recolonization of the area, and this could well have been the occasion for the creation of the nuclei of many of the regular village plans of the county. In villages that escaped the devastation, whether in the more remote parts of Yorkshire or elsewhere, older layouts probably survived, whilst some of the wasted villages were no doubt recolonized without regular planning. Subsequently both planned and unplanned settlements might have been affected by such factors as the amalgamation of neighbouring townships or the asymmetrical expansion of the arable area, which made rebuilding on a new site necessary, thus giving scope for further use of the model layout in rows. Carthorpe and its neighbours may fall into this category, as well as some of Pamela Allerston's examples. A powerful feudal lord might redesign his settlements at any time, but perhaps he would have been most tempted to act in this way during the period of active demesne farming during the thirteenth and early fourteenth centuries.¹ Settlements with powerful lords were also particularly vulnerable to later desertion, so that it may not be entirely fortuitous that those excavating deserted medieval village sites should find evidence for relatively late regular plans. In short, villages formed of regular toft rows may have originated at any date between c. 1070 and c. 1400, and I am inclined to believe that those already in existence by 1200 were in the majority.

Much further work is needed before the hypothesis can be fully substantiated, and in this metrological analysis clearly has a role to play. In England, as in Scandinavia, this technique could provide a significant link between the documentary and the archaeological approaches to the investigation of medieval and earlier settlement patterns and forms.

¹ M. M. Postan (ed.), *Cambridge Economic History of Europe I: The Agrarian Life of the Middle Ages*, Cambridge, 2nd edn, 1966, pp. 585-91.