OPEN–FIELD CULTIVATION AND THE DOMESDAY RECORD FOR THE NORTH RIDING OF YORKSHIRE

S R Eyre

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SCHOOL OF GEOGRAPHY • UNIVERSITY OF LEEDS

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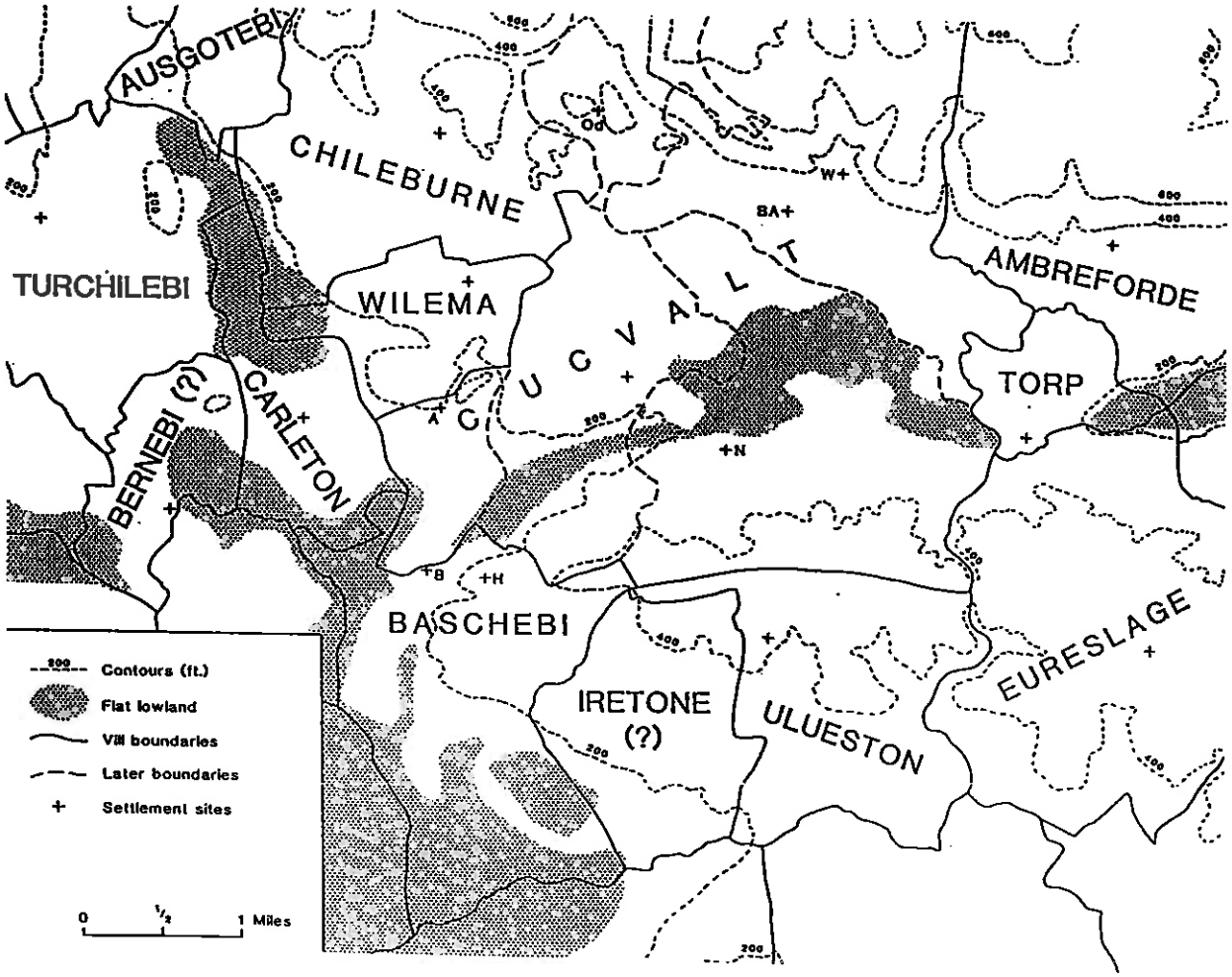
This paper presents a hypothesis which brings together three strands of evidence. Separate, they are of limited significance, but viewed together they seem to suggest that the Domesday record for the North Riding of Yorkshire presents a picture of actualities - something which has long been doubted, if not flatly denied, by historians. The case will be made that, viewed in the light of field archaeology and some aspects of agrarian history, most of the Domesday entries for arable land seem to mean what they say.

THE MAP AND FIELD EVIDENCE FOR OPEN-FIELD CULTIVATION

It is now thirty five years since the AHR published a paper on the reversed-S form of open-field strips, and a lively discussion revolved around the main point it had raised regarding the technical reasons for this conspicuous and widespread phenomenon [1]. Throughout this debate however, the basic underlying point was never questioned: no one cast any doubt on the actual association of the form with open-field ploughing. Indeed a number of authorities like the Orwins and G C Homans had already accepted it [2]. Subsequently nothing seems to have been said which refutes it. Although absence of the form proves nothing (ancient ridge-and-furrow may well have been obliterated and a quite unrelated pattern of enclosures have been established where once there were open fields), nevertheless its presence, in parallel groups, demonstrates beyond reasonable doubt the former existence of open-field strips. It is only recently that some deeper historical implications of its distribution in parts of North Yorkshire have emerged.

Where the Hambletons and Howardians give way westwards to the flats and low swells of the northern Vale of York there is a zone in which, prior to the advent of modern agricultural techniques, the extension of cultivation was strictly circumscribed. Here there were gentle to moderate slopes with a gradient, generally speaking, of between 5 and 15 degrees on which open-field ploughteams could operate with maximum efficiency. But these often terminated abruptly on the margin of flat lands whose agricultural utility was greatly restricted prior to large-scale deep ditching and sub-surface drainage systems: in many springs and autumns ridge-and-furrow could not have disposed of the run-off from the slopes above, nor could it have lowered the ground water to a manageable level. The land in the vicinity of Coxwold, where the geological faults of the Coxwold-Gilling Gap divide the Hambletons from the Howardians, was within this zone. Here the civil parishes of Husthwaite and Carlton Husthwaite (the Baschebi and Carleton of Domesday Book) almost epitomise this

MAP 1



DOMESDAY VILLS AND LOCATIONS OF PRESENT SETTLEMENTS

(B=Baxby; H=Husthwaite; A=Angram;
BA=Byland Abbey; N=Newburgh;
W=Wass; Od=Oldstead)

dichotomy between the manageable and the undrainable. They stand where the well-drained Jurassic strata are overlapped by thick, level layers of late-glacial and alluvial materials (MAP 1).

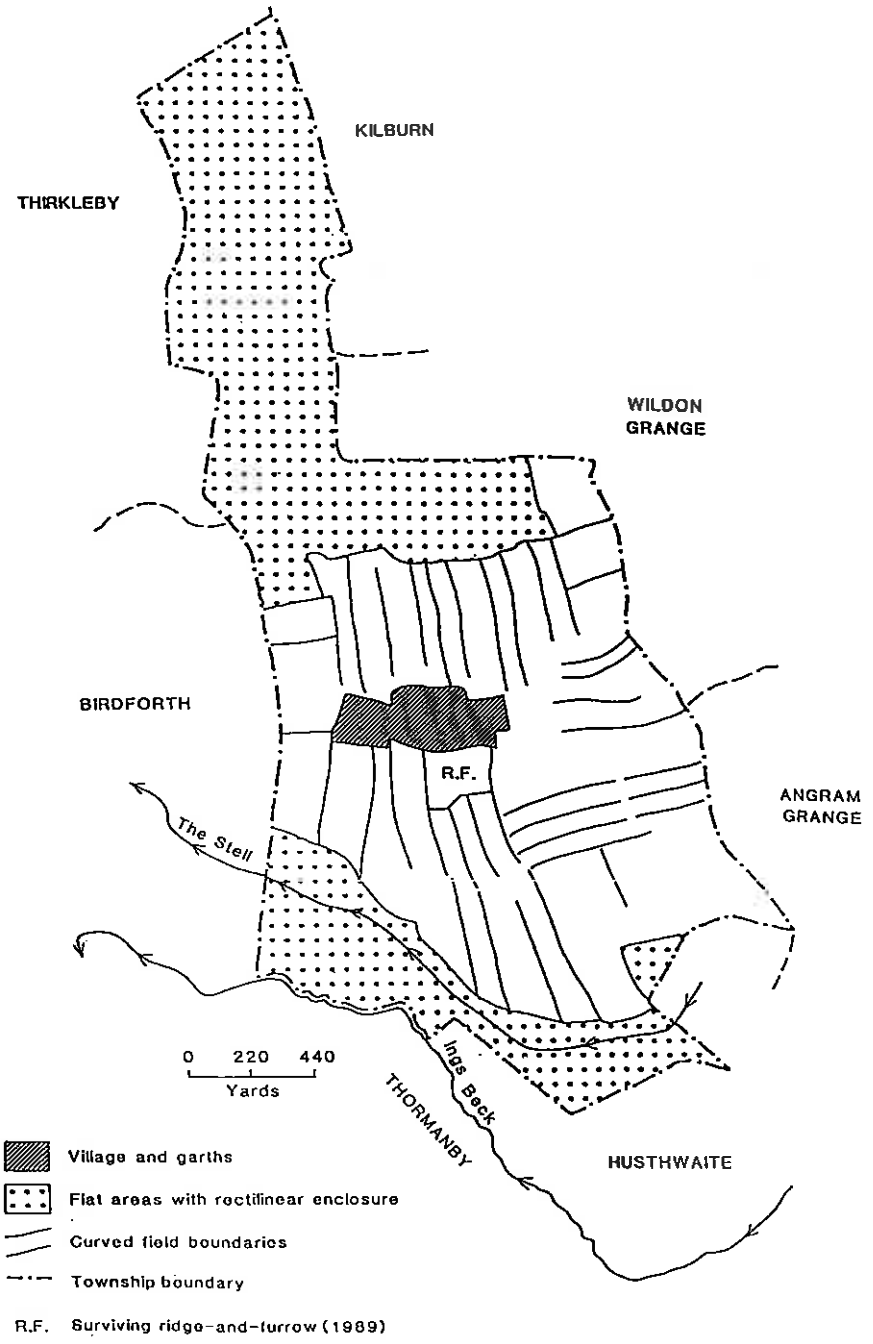
The fields of Carlton Husthwaite

The field patterns of both these townships are shown in precise detail on the First Edition Six-Inch Maps of the OS (Sheets 104 and 121) for which the survey was carried out in 1853. The Tithe Survey Maps of 1841 also show an almost identical pattern. When analysed with strict objectivity the patterns in Carlton Husthwaite fall into two categories, those which are entirely rectilinear, and those whose long boundaries are all curved (though the long, curved strips are often sub-divided by short, straight hedges). The segregation of these two sets within the township is very striking: the former covers the level areas to north and south while the latter is confined to the central, sloping area around the village (MAP 2).

On the basis of all precepts regarding the archaeological evidence for open field, there would seem to be no room for doubt that this central area was the open-field area of Carlton Husthwaite: physiographically it is exactly where one might expect it to be, and it has within it about nine acres of high, curved ridge-and-furrow (RF). It would be unrealistic to pretend that the size and shape of the village island can be diagnosed exactly, to the nearest yard, but the disposition of the surviving ridge-and-furrow, and the curvature at the ends of the strip fields as they approach the boundary as shown on MAP 2, do suggest that this reconstruction is not far removed from realities as they were at the height of open-field development. The outer limits of the postulated open-field area also form two smooth fronts, making it a very compact entity.

The two areas of rectilinear enclosure are clearly former commons. The whole of the northern one is actually called 'Carlton Common', and although there was no enclosure act for it, it is obviously a relatively late, planned enclosure. The roads which cross it are of regular width and are clearly the product of a surveyor's plan, whereas, to east, west and south they become winding and irregular where they plunge in amongst the ancient enclosures. The area at the southern end of the township was even more intractable. It comprises areas known as 'Low Ground' and 'The Ings' which are partly in Carlton Husthwaite and partly in Husthwaite, and it appears to have been a kettle-hole left by the retreating Vale of York ice during the last stages of glaciation. It is separated from a tributary of the Ings Beck (Elphin Beck) by hummocks of morainic material, and it is a measure of the ill-drained nature of 'Low Ground' that, at the point of nearest approach, the bed of this beck is some feet higher than the surface of 'Low Ground'. It was not until the completely

MAP 2



ENCLOSURES ANALYSIS FOR CARLTON HUSTHWAITE
1855

artificial 'Stell' was dug, carrying drainage water to join the Ings Beck a mile or so lower downstream, that this land could be improved. It is not conceivable that open-field agriculture could ever have been carried on here.

It would appear then, that the only way in which the area of open field in Carlton could have been materially different from that shown here, is if the township itself had either lost or gained some territory. As will be seen below, however, there is no reason whatever to suppose that this has occurred: boundaries here seem to have been very stable over the past 900 years, and there is no evidence for any of the contiguous townships having gained or lost any of their land. It would appear certain that any open field ever referred to in Carlton Husthwaite must have been within the area shown on MAP 2. Careful measurement shows this to be 430.4 acres in extent.

It is with heightened interest, therefore, that one turns again to the Domesday record. Carlton Husthwaite (Carleton) was one of the vills which was given by Ulfr to the Archbishop some time between 1066 and 1086 (Folio 303b). The entry reads:

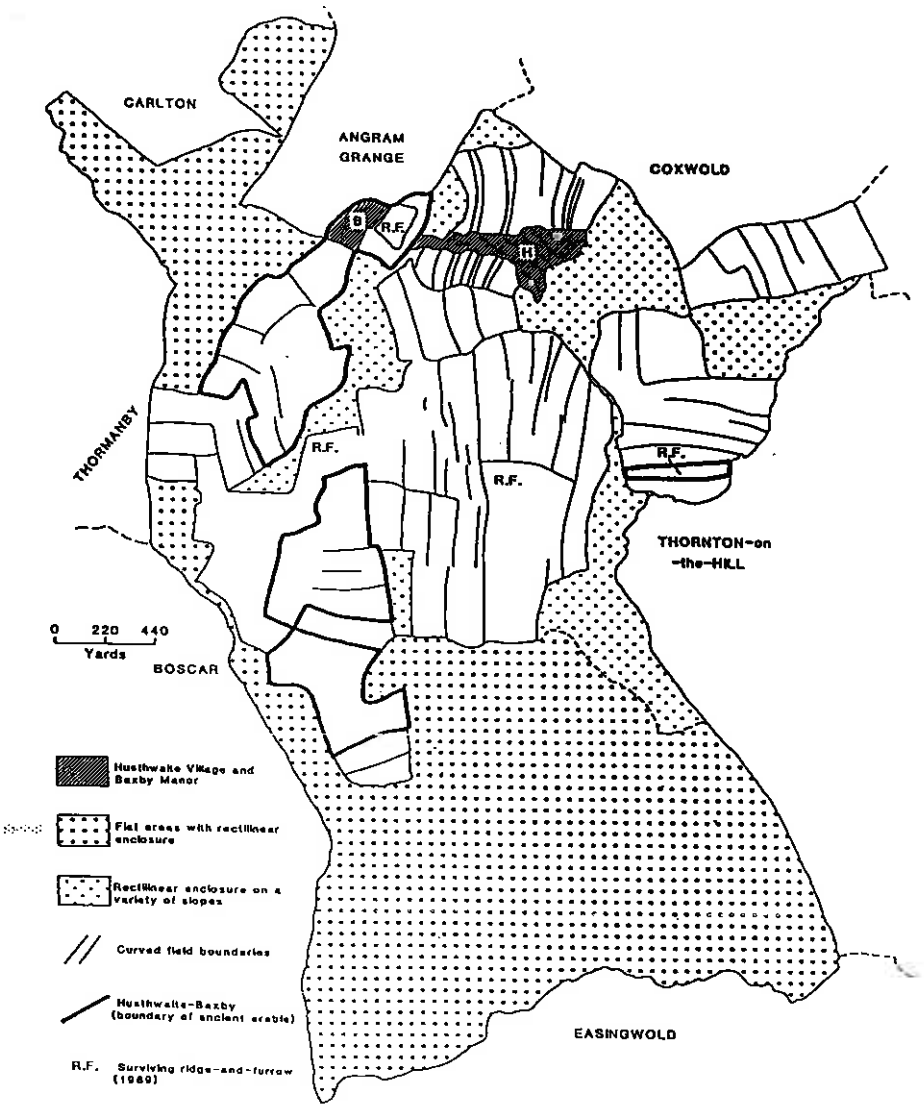
In Maltun,	1 car. to geld,	Ulf had 1 manor.
In Wilbetun,	1 car. " "	" " " "
In Pochelaf,	1 car. " "	" " " "
In Ambreforde,	3 car. " "	" " " "
In Flaxtun,	6 bov. " "	" " " "
In Mortun,	2½ car. " "	" " " "
In Bachesbi,	6 car.1 bov."	" " " "
In Carleton,	4½ car. " "	" " " "

Between them all, 19car. 7bov., 10 ploughs possible. Now St.Peter's has them. Waste, except for 4 villeins who have 2 ploughs....' [3]

Carlton (Carleton) was thus assessed at 4½ carucates in 1066 and, if ploughs are distributed proportionately between carucates (10 between just short of 20), Carlton would have needed 2¼ of the 10.

On the face of it this is a strange statement, but it is no more so than most of those that can be derived from DB. Much of the latter part of this article is devoted to this relationship between carucate assessments and ploughteams; it is merely noted at this point that a ratio of 2:1 is commonplace in the North Riding. One is drawn almost irresistibly to speculate that, if the maximum open-field extent in Carlton had been achieved by 1066, then an assessment of 4½ carucates and a ploughing power of 2¼ ploughteams were deemed appropriate for an arable area of around 430.4 acres. So a carucate here would have been equivalent to (='levied on') 95.6 acres (equivalent to eight bovates of 11.96 acres each), and a ploughteam would have been 'responsible for' 95.6 x 2 = 191.2 acres.

MAP 3



ENCLOSURES ANALYSIS FOR BAXBY AND HUSTHWAITE

1855

The fields of Husthwaite and Baxby (Bachesbi)

The name 'Husthwaite' does not feature in DB but it is significant that, up to the 1880s, what is now the civil parish of that name was in the two townships of Baxby and Husthwaite. Baxby, however, was in the form of seven separate islands all embedded within the lands of Husthwaite, four of which are clearly shown on MAP 3. (The other three were entirely within the stippled areas on the map, being late allocations of common to the land-holders of Baxby). In other words, although administratively separate, their economies were deeply interwoven: not only had their ancient cultivations been carved out of a continuous area of open field at some time in the past but, until enclosure, their grazings also had been inter-commoned.

Nevertheless, in spite of their close relationships, it is clear that these two manors already had separate identities in 1086. Under the lands of the Archbishop, already referred to, there were '....in Bachesbi (Baxby), 6 car. 1 bov. to geld....' where '....Ulf (Ulfr) has had 1 manor.' As well as this, however, there was also a small outlier of Coxwold Manor here, as evidenced by the entry under the lands of Hugh Son of Baldric (F.327b):

> In Cucualt (Coxwold) Kofsi had 10 car. of land to geld. In "Iretone" 3 car.; Eureslage (Yearsley) 3 car; Ampreforde (Ampleforth) 1 car; Ausgotebi (Osgodby) 3 car.; Turchilebi (Thirkleby) 8 car.; and Bachesbi (Baxby) 15 bovates; together 20 car. less 1 bov. of land to geld. There is land for 15 ploughs.' [3]

If we add the 10 carucates for Coxwold itself to the 20 carucates (less 1 bovate) of its outliers, this amounts to an assessment of 30 carucates (less 1 bovate). This is said to be land for 15 ploughs - again a 2:1 ratio.

The important point from the standpoint of Baxby is that here is another 15 bovates ($1\frac{7}{8}$ carucates). If these are added to the $6\frac{1}{8}$ already encountered in the Archbishop's lands, this neatly produces a total assessment of 8 carucates. In the light of this there seems little room for doubt that Baxby (Ulfr) and Baxby (Kofsi), respectively, are the interlocked townships of Husthwaite and Baxby: assessment of their areas (vide infra) carries one almost to the point of certainty.

The extent and distribution of former open field is not quite so clear cut here as in the case of Carlton, nevertheless the areas of uncertainty are small. The large extents of former wet common to both North and South, now completely covered with rectilinear closes, are beyond doubt: the former have already been discussed in the context of Carlton, and the latter are quite well

documented in deeds and correspondence dating from the first three decades of the seventeenth century. It is clear that the basic drainage work and land improvement began at that time. About a quarter of the commons were allocated to Baxby and the remainder to Husthwaite.

The areas denoted by finer stippling (MAP 3) are also enclosed in straight-sided closes and their surviving names certainly have no open-field connotations. The land just to the east of Husthwaite village is generally steeply sloping and thin-soiled, and that to the south of Baxby Manor is a mixture of steep bluff and wettish watercourse along the line of what appears to have been a glacial overflow channel between 'Low Ground' and the even lower lands to the south. The substantial area on the east side of the centre of the township, running along its boundary with Thornton-on-the-Hill, is interesting in that half of it is occupied by four closes called 'The Ruddings'. The name-element 'ridding' or 'rudding' is one which can be demonstrated to have been applied frequently to land just cleared of trees. From their position and from documentary reference, 'riddings' can usually be shown to have been made late in medieval times and, quite often, not to have been incorporated into the open fields [4]. In this instance 'The Ruddings' were made on a terrace, above the level of the Kyle Valley just to the south, but nevertheless very flat and quite difficult to drain. The evidence suggests a post-Domesday assart farmed in severalty from the outset.

The remainder of Husthwaite and Baxby is invested by closes with curved boundaries (MAP 3), and within these there are four substantial areas of broad, curved ridge-and-furrow. Furthermore there is ample documentary evidence for five separate 'bovates', some still in process of consolidation and enclosure in the eighteenth century, one as late as 1772 [5].

The location and extent of the former open fields of Baxby and Husthwaite can thus be determined with some precision. Measured in the same way as those of Carlton they are found to have 194.4 and 607.9 acres respectively - a total of 802.3 acres. This seems to establish them firmly as the Baxby (Kofsi) and Baxby (Ulfr) of DB. They were assessed then at 1 7/8 carucates (15 bovates) and 6 1/8 carucates (49 bovates) respectively, a numerical ratio of 1:3.27. The nineteenth century areas of 194.4 and 607.9 acres have a ratio of 1:3.13. This is a remarkably close correspondence.

Also of the greatest significance, we may note that if, as in the case of Carlton, maximum open-field extent had been achieved by 1066, then a total assessment of eight carucates (1 7/8 + 6 1/8) and a ploughing power of four ploughteams (each vill belonged to a group with a 2:1 carucate:ploughteam (c:p) ratio) was deemed appropriate for

a total of 802.3 acres. So a geld carucate here would have been equivalent to (='levied on') 100.3 acres (equivalent to 8 bovates of 12.54 acres), but a ploughteam would actually have been 'responsible for' 100.3 x 2 = 200.6 acres. The fact that Baxby was in two manors does not materially affect the issue since they would almost certainly have had close co-arational arrangements.

The point which must be stressed here, as with Carlton, is that there are two relevant concepts which must be kept quite distinct. First there is the geld carucage which is deemed here to be equivalent to the total arable area for which the ploughteams were responsible - calculated at 802.3 acres for the Baxbys. This would include the land in fallow as well as that being cultivated in any particular year. Secondly there is the area actually being cropped in one year - only half of the total area in a two-field system, but two thirds of it in a three-field one.

Other townships in Coxwoldshire [6]

The remaining townships of the former Manor of Coxwold, along with some others whose lands were closely interlocked, have also been examined. Some such as Thorton-on-the-Hill (the probable 'Iretone' in DB), Thorpe-le-Willows, Yearsley, Oulston and Birdforth, had suffered so much field re-planning even by the nineteenth century, or originally had their open fields enclosed in such large closes, that very little evidence has survived. In the case of Thirkleby also, although some very fine sets of fossilized open-field strips are still apparent on nineteenth century maps, early emparking of a substantial part of the township has obliterated much of the ancient pattern. In three of the identifiable Domesday vills, however, analysis of the total area seemed possible, and the results are presented in Table 1 along with those for Carlton, Baxby and Husthwaite. An analysis is also presented for Coxwold itself, although it seemed likely from the outset that this would not produce a meaningful result (vide infra).

It will be seen that for Ampleforth (Birdforth), Kilburn and Wildon Grange the amounts of measured open-field area per Domesday carucate are very similar to those for Carlton, Baxby and Husthwaite - a little larger, but only marginally so. In the case of Coxwold it must be remembered that the Domesday vill included the now separate civil parishes of Newburgh, Byland Abbey and Angram Grange (MAP 1) so that the ten carucates assessed must have been dispersed over these as well as over what is still Coxwold. The significant point is that Newburgh was almost completely emparked, and its ancient patterns obliterated, beginning as long ago as the dissolution of the monasteries. Apart from small areas of much degraded ridge-and-furrow little trace of former open field can be

TABLE 1. Carucate and Ploughland Sizes in Coxwoldshire

	Domesday Carucage (Bovates)	Measured Area of Former Open Field (acres)	Mean Carucate (Bovate) Size (acres)	Number of Ploughs (TRE)	Acres per Plough
Carlton	4½ (36)	430.4	95.6 (11.96)	2¼	191.3
Baxby	1⅞ (15)	194.4)			
		)	100.3 (12.54)	4	
Husthwaite	6⅛ (49)	607.9)			200.6
Ampleforth (Birdforth)	1 (8)	111.6	111.6 (13.95)	½	223.2
Kilburn	6 (48)	666.7	111.1 (13.89)	3	222.2
Wildon Grange	3 (24)	316.5	105.5 (13.19)	2	158.2
Coxwold (with Newburgh, Byland Abbey and Angram	10 (80)	712.1	71.2 (8.90)	5	142.2

detected here. And yet Newburgh occupied 2317 acres of the total of 5849 acres of what was formerly Coxwold - almost 40 per cent. It is unthinkable that this area did not contain quite a large proportion of the former open field of Coxwold and that the average carucate (bovate) size must have been much larger than 71.2 (8.9) acres.

The case of Wildon Grange is anomalous for another reason. Although its mean carucate size is very close to the average, the area per ploughteam is very low at 158.2 acres. But this is only to be expected since it is the only vill amongst those cited here where the c:p ratio is not 2:1. The entry in DB is found under the lands of Hugh son of Baldric (F 327b) and it says:

> 'In Chileburne (Kilburn) Arnketill had 6 car. of land to geld. Land for 3 ploughs.....
> In Wilema (Wildon Grange) is soc of this manor, 3 car. of land to geld. Land for 2 ploughs.' [3].

So, unlike Coxwold and its outliers, unlike the nearby lands formerly held by Ulfr, and indeed, unlike Kilburn to which it was in socage, Wildon Grange had a c:p ratio of 3:2. The significance of this will be explored later; it is merely noted here that if the 158.2 acres per plough in Wildon Grange was ploughed in a three-field instead of a two-field system (ie. two thirds of it per annum) this would imply a carucate size of 105.5 acres - very similar to that in the other townships.

PLOUGHING THE OPEN FIELDS

Before confronting the contentious issues surrounding any attempt to extract hard information from DB it is helpful to explore the implications of having one ploughteam for each couple of hundred acres in the open fields. It clearly suggests a two-field system with a hundred acres under crops and a hundred in fallow, fifty acres being ploughed before Christmas and fifty afterwards. With a three-field system the task would be similar: the 100 acres would merely occupy two thirds of the total with the ploughteam managing only 150 acres.

It is not possible to reconstruct, furlong by furlong, the open-field pattern of Carlton using nineteenth century maps and present-day field evidence. There are certainly a number of complete reversed-S forms in the hedgerows even today, and most of them approximate closely to 220 yards in length. Some are a little shorter and some longer. The surviving nine and a half acres of ridge-and-furrow is made up of thirty two ridges averaging about 190 yards in length and with pronounced reversed-S curvature. But large numbers of the curving boundaries on the nineteenth century maps have kinks along their length and are clearly double or even treble units. They seem to have resulted from the

end-to-end joining of furlongs. Whether this conflation occurred before or after total enclosure cannot often be inferred.

It seems, then, that one must be content merely with measurements in statute acres, but this may not be entirely unrealistic. Many of the ridges in the five patches of surviving ridge-and-furrow (MAPS 2 and 3) have a width approximating very closely to the standard rood of sixteen and a half feet or multiples of it, though there are almost an equal number which seem to be based on one of around twenty one feet. When the latter predominate, however, it is noteworthy that the ridge length tends to be shorter, as with those of around 190 yards at Carlton. It may well be quite realistic, therefore, to proceed on the assumption that, although few 'acres' were exactly 220 x 22 yards, probably the great majority did not depart from it by very much. It is not possible to prepare a satisfactory statistical statement, but the average 'acre' of four ridges in Coxwoldshire probably approximated to 5000 rather than 4840 square yards.

The ploughing season

The traditional view of ploughing was that it took place between Michaelmas and Martinmas (September 29th to November 11th) and between Twelfth Night and Lady Day (January 5th to March 25th). Not counting Sundays this gave thirty nine days before Christmas and sixty eight after it. Although this certainly under-states the true length of the ploughing periods, particularly in wet or cold years, nevertheless it does bring home the fact that the spring ploughing was much more problematical. In particular, the plough oxen would be far weaker after a winter in the stall [7].

These problems apart, however, it is the sheer hardihood and persistence needed to carry out these ploughing operations which require an effort of credence in the modern mind. Given even a modicum of dry weather, is it possible that a cumbersome ploughteam could have ploughed around 100 'acres' in time for the next growing season? One thing seems certain: unless a whole acre could be completed on a day when ploughing was physically possible, such a target could not have been achieved. Even beginning well before Michaelmas on last year's fallows, the task would have taken up all the time available.

The speed of the ploughteam

Within the living memory of farming communities, ploughs drawn by a pair of shire horses were expected to turn over an acre in a day. Much greater feats were achieved when need pressed and conditions permitted but one acre was the norm. We know that this was done with a furrow slice which was between ten and twelve inches in width and four or five in depth. There seem to be no reasons to imagine that the dimensions of the medieval plough were significantly different: they seem to have had shares and

mould boards of similar dimensions, though much heavier and less sophisticated [8]. Furthermore, there seem to be no good reasons for supposing that the furrow slice would have been much different from that found to be optimum in recent times: a wider one would have placed greater strain on the mould board, and a narrower one would have entailed more furrows per acre.

There seem to be no substantial reasons for doubt regarding Walter of Henley's instructions as to how land should be ploughed. His general precept was that, where the acre of forty perches was being ploughed as 'straitly' (narrowly) as it should be immediately prior to sowing and harrowing, the plough should go '....thirty six times up and down'. [9]. In other words its length should be traversed seventy two times. He was thus prescribing seventy two furrow slices for a width of twenty two yards (792 inches), and this implies exactly eleven inches per furrow. There seems no reason to doubt, therefore, that an eleven-inch furrow, even in Yorkshire, would have been regarded as anything but commonplace, so given a rood of five and a half yards (198 inches), one can postulate that eighteen traverses, nine in each direction, would have been sufficient. The distance travelled would be 18 x 220 = 3960 yards (2¼ miles).

The speed at which ox teams moved is unrecorded. In any case it would be variable according to many factors, some of which have already been mentioned. From the eighteenth and early nineteenth centuries we have a variety of statements all tending to the conclusion that land could be ploughed much more quickly with shire horses, even though the ox team was composed of a larger number of animals. (This in spite of the fact that Walter of Henley seemed to think that there was little to choose between medieval oxen and horses in this respect). Indeed it was maintained by many 'improving' agriculturalists that it was only tradition, allied to the edibility of the ox at the end of its working life, which had prevented the demise of the plough ox at a much earlier date. As Payne reminds us, however, these improvers were much out of sympathy with traditional methods and cannot be relied on for objective comparison [8]. One can be confident that, if nothing else, the large ox team would give a much steadier pull than that obtained from a pair of faster, livelier shire horses: if one of the eight oxen stumbled or, for any reason, momentarily relinquished its effort, the effect would be minimised by the size of the team. It may well be because of this that, even at the autumn ploughing, reduction in the size of the team would not have been viewed with favour by experienced ploughmen.

However, it is imperative to think in terms of a slow gait and, because of this, there are those who have felt it possible that the 'half-acre' of Piers Ploughman could well have been '...the amount of land which custom expected to

be plowed in the course of...a long morning's work...' [10]. Since the evidence indicates that the normal ploughing day did not extend beyond the middle of the afternoon, one must consider this point because, if half an acre was the normal stint, the hundred acres by Lady Day could not possibly have been achieved. So how slow was 'very slow'?

Observation of modern bovines leads to the view that an unhurried but purposeful walk is somewhere between sixty and forty yards per minute (2 mph or less),and given that the plough ox was drawing a burden, the mean speed was probably nearer the latter. Moving at forty yards per minute (a cricket pitch length in thirty three seconds), the time to travel a furlong of 220 yards would be five and a half minutes. Taking Walter of Henley's eleven-inch furrow and allowing a full minute to turn and catch breath at the end of each furrow, the standard rood of 220 x 5½ yards would be ploughed in 1 hr 56 min. To complete the calculation one may postulate an interval of 3 min to change rood and set up a new rig, and an hour break at midday for human sustenance and for watering the oxen. The whole acre could thus be ploughed in a day, three roods in the morning and the final one in the afternoon, with completion at 2.50 pm (TABLE 2).

This is a purely theoretical scenario, but there seem to be no inherently unlikely elements in it; if anything it may err on the cautious side regarding the ox team's potential. The little direct documentary evidence which we have seems to support the view that ploughing whole acres in one operation did take place. There is the absorbing entry in the court rolls of Newington, Oxfordshire (1298) that '.... they (all the villeins) said that John Grug and Geoffrey his brother took without consent the beasts of good men by night on the eve of Michaelmas and plowed two acres and a half, with three plows .... ' [11]. This seems quite explicit:it could be done, even at night!

The Open Fields and the Domesday Survey

It was not impossible, then, for one plough to turn over a hundred acres before Lady Day, but one can imagine the urgency and the hardship (and even the shortfall) if the weather were persistently bad. It is when one reflects on these realities that the original concept of 'the carucate' is seen with all its ominous implications. No matter how much it may ultimately have become a fiscal abstraction, originally it was a reality which, with its appurtenances, had to support the oxen which ploughed it, the men who owned the oxen, and all the extended families and landless labour appertaining to those men. It is small wonder that agrarian scholars have returned, again and again, to Domesday Book: it alone has seemed to offer a comprehensive over-view, township by township, of the carucates and ploughlands of England. Unfortunately its enigmatic nature

TABLE 2. Ploughing the Statute Acre

	Time taken (min)	time of day
	Begin work	6 am
	99 (in motion) 17 (to turn)	
FIRST ROOD	116	7.56 am
	3 (to set up new rig)	
SECOND ROOD	116	9.55 am
	3 (to set up new rig)	
THIRD ROOD	116	11.54 am
MIDDAY BREAK	(60)	12.54 pm
FOURTH ROOD	116	2.50 pm
	470 7hr 50 min	

- its seeming refusal to call a carucate a carucate -has caused a retreat into disillusionment time and time again.

The present writer tenders no apology for succumbing to the same temptation, but he does apologise to the legion of investigators who have pitted their wits against DB but whose work is not all acknowledged here. To review all the important analyses that have been made over the past century or so, would fill many volumes. He can merely give an assurance that he has done his best to note the precepts and reservations of scholars such as Round, Maitland, Stenton, Joliffe, Galbraith, Harvey and Kapelle. It should also be noted that all which follows is only held to be applicable to Yorkshire - the North Riding in particular. In the future the type of approach adopted here may yield profit elsewhere, but the writer has browsed sufficiently through the DB folios for many other counties to be convinced that, outside Northumbria, not only the nomenclature, but the tenurial and fiscal realities were significantly different.

The maximum Extent of the Open Fields

It is important to sustain the argument that open fields like those of Carlton and Baxby may well have achieved their maximum extent by 1066: this cannot just be assumed. Of first importance is the enormous decrease in population pressure which must have occurred in the winter of 1068-69 during the harrying of the north. How many died in the violence and in the subsequent famine and pestilence cannot be calculated, but assessments of population for 1086 have put that for the Vale of York at around two per square mile as compared to nineteen per square mile in neighbouring Lincolnshire [12]. Some impression of the carnage is to be found in the near-contemporary account of Orderic Vitalis who is just about as even-handed as any post-Conquest historian as between his eulogies for William and genuine sympathies for the natives [13]. Most reliable of all, however, must be the cold record of DB itself. Though compiled seventeen years after the cataclysm, it records vill after vill as 'waste' [14].

Although Coxwold itself had increased its population and ploughs in 1086, possibly because surviving natives and oxen had been herded there as a pool of labour, most of the townships for many miles around were very different. Carlton and Baxby (Ulfr) were part of that group of vills belonging to the Archbishop (vide supra) which was assessed at nineteen carucates and seven bovates TRE but which was now 'waste except for four villeins'. The two bordering townships to the west, Hutton Sessay and Thormanby, which had seven carucates TRE, were also 'waste', and Thirsk with its surrounding vills, a few miles to the north, had only about one third of the ploughs that were possible TRE.

Further north again there was Northallerton, a large manor assessed at thirty five carucates which, with all its soclands, was all 'waste'. To the south was Easingwold and its soclands which had land for twenty seven ploughs but which now had just five and a half ploughs, twelve villeins and four bordars. Further afield to north and south the picture was similar. It is inconceivable that this derelict region could have been reoccupied at the same intensity of cultivation except after some generations of population growth. It must also be remembered that Yorkshire continued to be within range of Scottish incursions and the attendant disincentives to immigration.

Even when the population of the North Riding began to approach its former densities later in the twelfth and thirteenth centuries, it is possible that more intensive rotations would have been capable of absorbing more people without any increase in cultivated area. Direct evidence is not available but circumstantial evidence does suggest a continuous process of conversion from two-field to three-field systems as the centuries went by (vide infra). If this occurred on a manor with 600 acres of open field, a cropped area of 300 acres would become one of 400 acres at a stroke - land for a further plough.

A strong case can be made for there being no necessity to expand the arable area of 1066, and if actual extension of this area was delayed until the fourteenth century it is more likely to have been expansion in severalty than by extension of open field. In his comprehensive work on assarting from the twelfth to the fourteenth century, Bishop [15] shows how difficult it is to interpret documentary and field-name evidence in this connection. Much of the evidence is ambiguous but a little of it does indicate clearly that some 'assarts' which were made were incorporated into open fields. However, as Bishop himself points out, it is hardly ever clear whether the 'assarts' were extensions onto common grazing land and degraded woodland which had not formerly been cultivated, or whether they recolonised former open fields which has tumbled down to pasture and scrub after the Conquest. This would surely be the case in Yorkshire where so much had become 'waste' after the winter of 1068-69. Another point that Bishop makes clear is that many new 'crofts' were made out of former open fields. This certainly seems to have taken place in order to permit the southward extension of Husthwaite village where all the garths behind the individual messuages were long, curving strips which had been laid out initially as open field furlongs (MAP 3).

Huge numbers of such furlongs must have gone out of use after the harrying of the north and it is only reasonable to postulate that, when recolonisation of waste vills began, derelict ridge-and-furrow would be cleared first. The great expenditure of man-hours that would be necessary

before any return on labour would be possible must have been better devoted to land which was already ditched and ridged up, quite apart from the fact that it would probably be the most amenable and fertile land in the township. To return to the main point, it seems inescapable that the re-assumption of established furlongs would, almost rood by rood, reestablish the lines on the landscape which were already there TRE. The limits of open-field cultivation may well have been very little different even two centuries after the Conquest, and these may well be the limits which we are still able to plot in Carlton and Baxby.

THE DOMESDAY CARUCATE IN THE NORTH RIDING

In 1888 Canon Isaac Taylor [16] advanced the view that there must be some significance in the fact that so many Yorkshire Domesday vills were given the same carucate: ploughteam (c:p) ratios. Unfortunately he went on to infer that the 1:1 ratios indicated two-field systems and the 2:1 ratios three-field ones. He implied that the assessors (for Yorkshire) had devised a kind of formula or code whereby '1:1' meant one unit in cultivation and one in fallow, whereas '2:1' meant two units in cultivation and one in fallow. There are two main problems here. First, Domesday does not actually say this, so one has to imagine that the assessors and scribes were using an abstruse, obscure shorthand. Secondly, on any reading of it, Taylor's scheme makes the geld assessment a very in-equitable one. With hindsight it seems as though Taylor failed by a hair's breadth to decipher the Domesday entries, and the point can be made that he was probably unlucky in that much of his work was in the East Riding where he found a large number of 1:1 ratios, and allowed these to dominate his thinking.

Taylor seems to have appreciated clearly that the term 'carucate' had two quite distinct meanings (quite apart from its having been appropriated for geld purposes). On the one hand it had been used to refer to the total amount of land which a full plough team could maintain in rotation over the years (fallow as well as cultivation). In other contexts it had meant the amount of land which, literally, the ploughteam did plough in one year or what, over the centuries, has often been referred to as 'land on the plough'. To take a concrete example, a manor with a two-field system might have 192 acres 'maintained' by one ploughteam, but only one half of it, 96 acres, would be ploughed in one year - 48 acres in autumn and 48 after Christmas. In different contexts and in different places either the 192 or the 96 might be referred to as 'a carucate'. Similarly a manor with a three-field system might have 144 acres 'maintained' by one ploughteam (similar, perhaps, to the case of Wildon Grange in Coxwoldshire), but only two thirds of it would be ploughed in one year, again, 48 acres before and 48 acres after

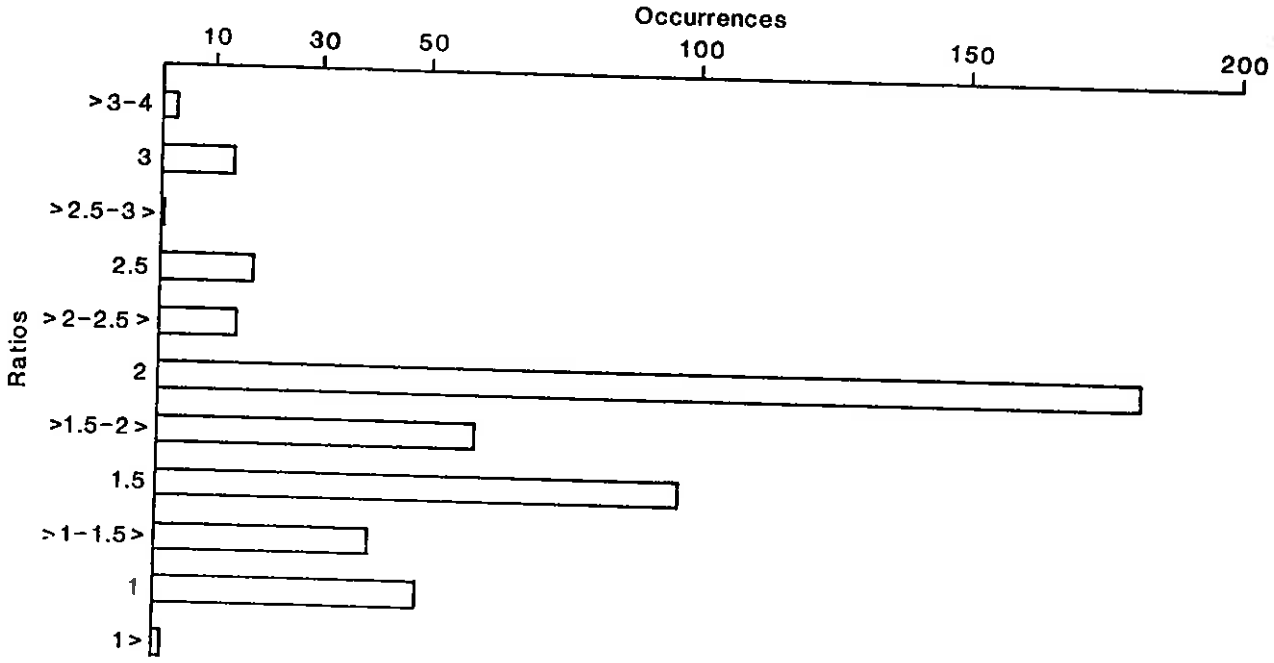
Christmas. Either the 144 or the 96 acres might be referred to as 'a carucate'.

The argument which the writer seeks to sustain in this paper is that the evidence from Carlton, Baxby and the rest of Coxwoldshire indicates that, in the North Riding, the Domesday 'carucate for geld' can be equated with the amount of land actually ploughed for crops in one year. On the other hand the DB references to 'x ploughs possible', 'land for x ploughs', and so on, were a statement of the number of ploughs actually required to maintain the existing rotation of the vill concerned. If this view can be fully supported then DB presents, for Yorkshire, as simple, useful and explicit a statement of arable area and contemporary crop potential as could possibly have been compressed into concise entries. I am not unaware that this is a heretical statement. That the first part of each TRE statement is a geld assessment is obvious, because it says so! Nevertheless it seems equally obvious that, at the outset, geld assessment was based on real carucates, and although this may well have degenerated into a mere legal fiction in some counties, in Yorkshire, for some reason, it had persisted. Indeed, a century ago, Horace Round said that this might well be the case when he commended Isaac Taylor for his efforts and urged that more local studies should take place to put Domesday on the ground [17].
What Round did not realise, and what Taylor overlooked, was that a much neater, more equitable, and more logical hypothesis suggests itself if one focuses on those Domesday entries which have 2:1 and 1½:1 (3:2) ratios of carucate to ploughteam (c:p). For the North Riding there are 481 entries with unambiguous statements for both carucates and ploughteams. Of these 183 (38.0 per cent) have a ratio of 2:1, 97 (20.2 per cent) have 1½:1, and 59 (12.3 per cent) are between the two. So 339 (70.5 per cent) have ratios of 2:1, 1½:1 or somewhere between (FIG 1). The remaining 142 (29.5 per cent) will be discussed later, but a clear view of our hypothesis requires that we focus first on the 339 entries.

The 183 with a ratio of 2:1 vary between the unique entry for Moorsholm (f300a) with its '½ car of land...Land for 2 oxen' (ie. quarter of an ox team for half a carucate), through the many larger vills up to the case of the Burneston group (f313a) which had '40 car taxable. 20 ploughs possible'. On the other hand the 97 cases which have a 1½:1 ratio include no really large manors or groups. A few, like Loft Marishes and Wrelton (f300b), have 1½:1, numerous cases have 3:2, 6:4 and 9:6, but the largest, like Masham (f312a) have only 12:8.

The vills with ratios between 2:1 and 1½:1 are of various sizes. A considerable number have 5:3 but a few are smaller. Cayton has 4:2½ and Brompton 1¾:1 (f300b). Those of larger size range through 9:5, 10:6, 12:7 and

FIGURE 1



CARUCATE:PLOUGHTEAM RATIOS (c/p)

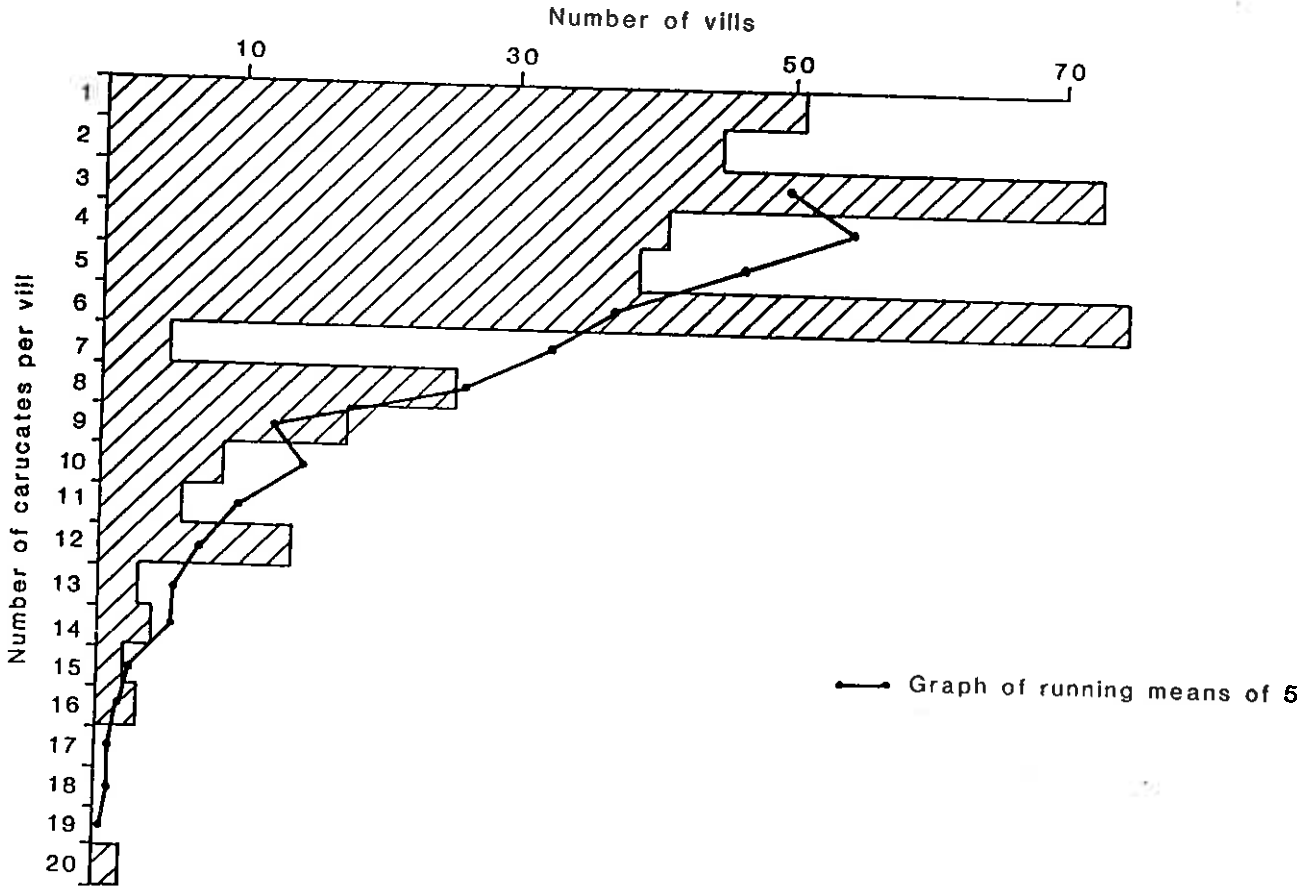
15:8, and the largest is Pickering with 37:20 (f299b). A mere nodding acquaintance with algebra suggests that every one of these can be rationalised into a manor (or group) with a mixture of two-field and three-field rotations. For instance every one of those with a 5:3 ratio could well have had two of its carucates managed by one plough in a two-field system, and the other three carucates by the remaining two teams in a three-field one. This is not the only solution but it is a very tempting one. All the other cases in this category can be viewed similarly: the 10:6 into a 4:2 and a 6:4, the 12:7 into a 6:3 and a 6:4; the 15:8 into a 12:6 and a 3:2; and the 37:20 complex into two-field systems totalling 28 carucates with 14 ploughteams, and three-field ones with 9:6. Perhaps the most riveting case of all is that of Nunnington (f305d) with a ratio of 6:3½ which '....two thanes had as two manors....' How tempting it is to envisage one of these as having 3:1½ in a two-field system, and the other with 3:2 in a three-field one!

Reservations about the Domesday Carucate

These scenarios are very tempting but one must not be carried away by them: there are alternative interpretations. The point is merely being made that 70.5 per cent of the c:p ratios for the North Riding are happily accommodated by the hypothesis. Before proceeding to a scrutiny of the other 29.5 per cent it is imperative to try to respond to some of the reservations which scholars have expressed regarding the Domesday carucate. From Horace Round [18] to Ian Maxwell they have urged caution about referring to it as an actual area. As Maxwell put it: '....the carucate in Yorkshire implied not what was real but what was rateable' [19]. And as recently as 1986 the Editors of the translation of Yorkshire DB have repeated an oft-made assertion that '....the carucage figure was a statement of geld liability rather than an accurate description of the situation on the ground....' linked with the statement that '....the extent or carucage...and the productive capacity, have an air of artificiality about them. Carucages are often expressed on a duodecimal basis...' [20].

The duodecimal flavour of Domesday carucate numbers is a fascinating subject. If we take all the 481 entries for the North Riding and plot number of occurrences against number of carucates per vill, we certainly find distinct maxima emerging at 3, 6, 8-9 and 12, even though the over-all size distribution of vills revealed by a graph of running means reveals an almost smooth curve with a single maximum near the four carucate level (FIG 2). But this peaking at 3, 6, 8-9 and 12 need have nothing whatever to do with any artificial grouping of vills into twelve-carucate units for purposes of geld, or of the allocation of geld in halves, thirds, quarters, and so on, to the constituent vills of a shire or hundred. If the great

FIGURE 2



NUMBER OF CARUCATES PER VILL IN THE NORTH RIDING

majority of vills in an area have two- and three-field systems, although a variety of accidental factors will have resulted in five-carucate, seven-carucate, and eleven-carucate vills, and so on, nevertheless the most convenient arrangements will have been those in which there was a simple rotation through two- and three-carucate groupings, or multiples of these. Since six is the lowest common multiple of two and three, one would surely be surprised if the six-carucate vill were not of common occurrence. Indeed, with a large enough sample, it is only to be expected that aggregation would also produce a maximum at twelve with subordinate ones at nine, fifteen and so on. If this is the main obstacle that can be said to lie between us and an on-ground reality for the Yorkshire 'carucate', there seems to be no reason why we should not, cautiously, lay aside a century-old phobia, even though, just over the frontier in Derbyshire, Notts and Lincolnshire, things are more problematical.

The Problems of the Domesday Assessors

On the basis of the evidence already presented it is clear that the relationship between carucates for geld and ploughteams in the North Riding was not random. It does not seem possible, as some have suggested, that in order to arrive at an assessment of 'x carucates for geld', the assessors took into account not only a fairly complex factor of 'y ploughlands' but also a vague and mostly unspecified 'z other resources'. As a number of scholars have asked: 'Why go to so much trouble to produce an almost inscrutable document?' The fact that 70.5 per cent can be rationalised so neatly into a simple equation involving just two variables, indicates that it was just these two which were at the focus of the exercise. Perhaps all the other detail listed in DB was for future action and reference, and had little to do with geld assessment [21]. After all, it was the corn produced by the arable land which constituted the basis, not only of subsistence, but the economy as a whole. Nevertheless, the remaining 29.5 per cent of the entries demand explanation: it is unthinkable that they can all be ascribed to scribal error or the purposeful mis-statements of interested parties. The checks and balances would be far too assiduous, and such a level of carelessness or deception would not have been tolerated in Winchester.

It is helpful to try to view Domesday entries from the standpoint of those who collected and codified the information. They were dealing with two types of item. First there was the '<u>cultura</u>' or '<u>carucatum arandum</u>', ideally of ninety six 'acre' strips, which could be verified on the ground. Secondly there was the number of ploughteams, ideally of eight oxen each, which were required to maintain the rotation (or rotations) in operation at the time of assessment. In simple cases the task of assessing and describing was relatively

straightforward, but in many cases it must have been problematical. Even where the assessors understood clearly what was intended, the process of producing a concise record forced them to use a form of words which is obscure at the present day. This applies to the very small manors with less than one carucate to geld, which, under any kind of rotation, would have required the full services of a whole ploughteam. Even for the thirty five vills which had '...one carucate to geld. Land for half a plough...' we are presented with shorthand which is capable of at least two interpretations. With the entry for Moorsholm where there was '...half a carucate to geld, land for two oxen...' (f300a) we have a really ambiguous statement. Many of these smaller manors or soclands were almost certainly functioning parts of larger units, and where the record says 'land for half a plough (ie four oxen)' or 'land for two oxen' it is almost certainly indicating that the appropriate number of animals were contributed to make up full ploughteams, and the lands concerned were ploughed in sequence with the bovates of neighbouring manors. It was not impossible to plough with two oxen as clearly indicated by that unique (for Yorkshire) entry for Arthington in the West Riding where, in 1086, it was noted that '...There is there one villain ploughing with two oxen...' (f307c). The very fact that this statement was made so explicitly strongly suggests that it was unusual. But we cannot know how unusual.

There is another group of vills which cannot be rationalised in this way however. They are epitomised by Stainton which had '...seven bovates to geld; one plough possible...' (f305b). Even with a three-field system, strictly proportionally, this manor could not have required more than $4_{2/3}$ oxen to plough 56 strips (ie. two thirds of 84 strips). Such entities as $4_{2/3}$ oxen have no place in the real world, nor are the $3_{1/2}$ that would be implied if Stainton had a two-field system. Furthermore, given a three-field system, one suspects that even if there were co-aration with a neighbouring manor, such complicated arrangements as one villein supplying an ox on a third of the days involved, and another villein from the other manor supplying his ox on the other two thirds, perhaps did not occur. It could well be that ploughing for part of the time with only four or six oxen did occur regularly in some cases like this, and that these constituted the 'one plough possible'. In this case it could possibly have taken just as long to plough the 56 strips as was normally taken to plough 96 with a full team. All this is speculation, but it does illustrate the point that a degree of generalisation must have taken place in the process of codification. There would be many manors of an odd size, and spelling out the details was perhaps not important provided the size of the geldable area was clearly stated. If the 'geld rate' was two shillings per carucate then, on seven bovates, you paid your twenty one pence!

These generalisations, consciously made, are even more relevant when one considers an even greater number of the larger vills. Many of those which had land for more than one plough cannot be expected to fit neatly into any hypothetical scheme. We must remember that in the statements for each vill no fractions of a ploughteam are reported except for 'one half'. The assessors clearly did not feel it necessary to have resort to entities such as 'three quarters' (or 'three parts') of a team. Indeed, when one looks at the record for the North Riding, one suspects that they often generalised to the nearest (or next highest) whole number.

In order to demonstrate this one can look at all those vills which had six carucates to geld. There are 75 of them of which 38 have a 6:3 c:p ratio and 28 a 6:4 one (TABLE 3). So 66 of the 75 (88 per cent), according to our hypothesis, can be rationalised as two-field and three-field vills. Of the remaining nine, seven have 6:6 and one has 6:5; these will be discussed below. The final one is Nunnington, already noted, with its 6:3½ ratio. One significant point about six-carucate vills has already been remarked upon in the context of the duodecimal element in our statistical sample. What may also be noted (except for Nunnington which was two manors anyway) is the absence of any evidence for the mixing of two-field and three-field systems in six-carucate vills. Can it be that two-field systems of six carucates converted so felicitously into three-field ones that intermediate stages were rarely desirable? It is also interesting that the ratio of putative two-field to three-field in manors of this size was 38:28 so that, even with a pattern which facilitated conversion, the two-field ones were still more numerous.

With the six-carucate vills in mind it is very instructive to turn to the five-carucate ones. On the above premise one might expect to find the largest number with 5:2½, and quite a number with 5:3⅓ (the equivalent of 6:3 and 6:4 respectively). From what has already been said, of course, we know we shall find none of the latter, but it comes as rather a surprise to find only one with 5:2½. So what did the assessors find - or what did they say they found? Of the 39 vills with five carucates, 21 are shown as having 5:3 and 11 as 5:2. Five had 5:4 and one had 5:5, and the remaining one had the 5:2½ already referred to. So, dealing with this awkwardly-shaped type of vill, it seems as though, rather than say 'land for 2½ ploughs' the assessors may have generalised to a whole number and, even with a two-field system, often generalised upwards. Nor should this come as a surprise: with a two-field system of five carucates, one can reasonably postulate that, for at least half the ploughing season, three full ploughteams would have to be used. On the other hand, some of the vills shown with a 5:3 ratio may well have had three-field systems, but normally managed to get away with three ploughs. Some of the 5:4 vills, however, may also have had

TABLE 3 C:P Associations by Size of Vill

Carucates (C) in vill	Ploughteams (P) in vill	Occurrences	Size of Sample
1	1/2	36	47
	1	11	
2	1/2	1	44
	1	33	
	1 1/2	0	
	2	10	
3	1	13	65
	1 1/2	8	
	2	37	
	3	7	
4	2	30	38
	2 1/2	1	
	3	5	
	4	2	
5	2	11	39
	2 1/2	1	
	3	21	
	4	5	
	5	1	
6	3	38	75
	3 1/2	1	
	4	28	
	5	1	
	6	7	
8	2	1	26
	4	19	
	5	1	
	6	4	
	8	1	
9	4	1	17
	5	5	
	6	9	
	9	2	
10	5	4	9
	6	1	
	7	1	
	8	1	
	10	2	
12	6	2	13
	7	3	
	8	7	
	10	1	

three-field systems but, because of above-average 'acre' size or a few extra strips somewhere, they actually needed four ploughs on many occasions. Conversely, the 5:2 vills can be explained away as having a smaller-than-average bovate size in a two-field system, so that the number of days in the year on which three ploughs were needed was regarded as relatively unimportant. In any particular case one cannot be really confident about what took place on a five-carucate vill. However one must not forget the point, already made, that a 5:3 ratio may well indicate a hybrid vill incorporating a 2:1 two-field element and a 3:2 three-field one. Would not a five-carucate structure encourage the abandonment of a strictly two-field rotation, but then inhibit the final total conversion to a three-field one?

The four-carucate vills have ratios which, given the above, are almost predictable. Of the 38 vills concerned, 30 have 4:2 and five have 4:3. Only one has 4:2$_{1/2}$ and two have 4:4. The striking point is that so many have the 4:2 indicative of a two-field system, and so few have the 4:3 and 4:2$_{1/2}$ which most clearly approximate to the 4:2$_{2/3}$ arithmetically indicative of a three-field one. This again reinforces the view that two-field systems were still numerous at the time of the Conquest, particularly where the carucate arithmetic did not facilitate conversion to three-field ones.

With the smaller vills one is clearly on less secure ground when speculating about the figures. The three-carucate ones show a clear predominance of 3:2 ratios, with 37 out of a total of 65. This might well be expected since this structure would lend itself to a three-field rotation. It is interesting, however, that there are eight with 3:1$_{1/2}$ which seems to suggest some persistence of a two-field one. With the smallest vills also, the ratios of 2:1 and 1:$_{1/2}$ are clearly predominant, and two-field systems seem to be indicated. On the other hand, there must be doubt about what the assessors might have recorded when they encountered small three-field systems. For the two-carucate vills there are no examples of a 2:1$_{1/2}$ ratio (TABLE 3) and clearly they did not use this connotation even though it would have been the closest approximation to the 1$_{1/3}$ teams which, arithmetically, would have been 'required' for such a vill if it had a three-field system. Is it possible that most of the ten 2:2 ratios recorded indicate three-field systems? This would have been a correct expression of realities on about one third of the ploughing days. On the other hand, may it not be that some of the 2:1 entries indicate three-field systems, this being the closest approximation in whole numbers? With the one-carucate vills, although a 'ploughteam' of some kind would be required, axiomatically, whenever ploughing took place, the assessors seem to have had no inhibitions about recording 'half a plough'. There seem to be no ways of testing any hypothesis about such entries, and one can only record and map them at their face value.

On the other hand, the larger vills do provide some support for the precepts already expressed though, inevitably, the samples are small (TABLE 3). The eight-carucate vills show a marked preponderance of the 8:4 ratio (19 cases out of 26) and, no matter how the generalisation indicating three-field systems might have been couched, it seems clear that there were less of them. But the nine-carucate structure certainly seems to indicate a majority of three-field systems, with nine of the 17 cases having a 9:6 ratio. The ten-carucate vills seem to follow the eight-carucate ones with four out of nine having a 10:5 ratio. The twelve-carucate ones, which presumably would have found either rotation equally convenient, show a clear preference for the three-field one, seven having a 12:8 ratio and only two a 12:6 one. In this respect, unaccountably, they differ from the six-carucate ones which had the balance in the other direction.

If one ignores the one- and two- carucate vills, the evidence in TABLE 3 shows 102 cases with an exact 2:1 ratio, and 81 with 3:2. However, for obvious statistical reasons, this probably underweights the three-field systems.

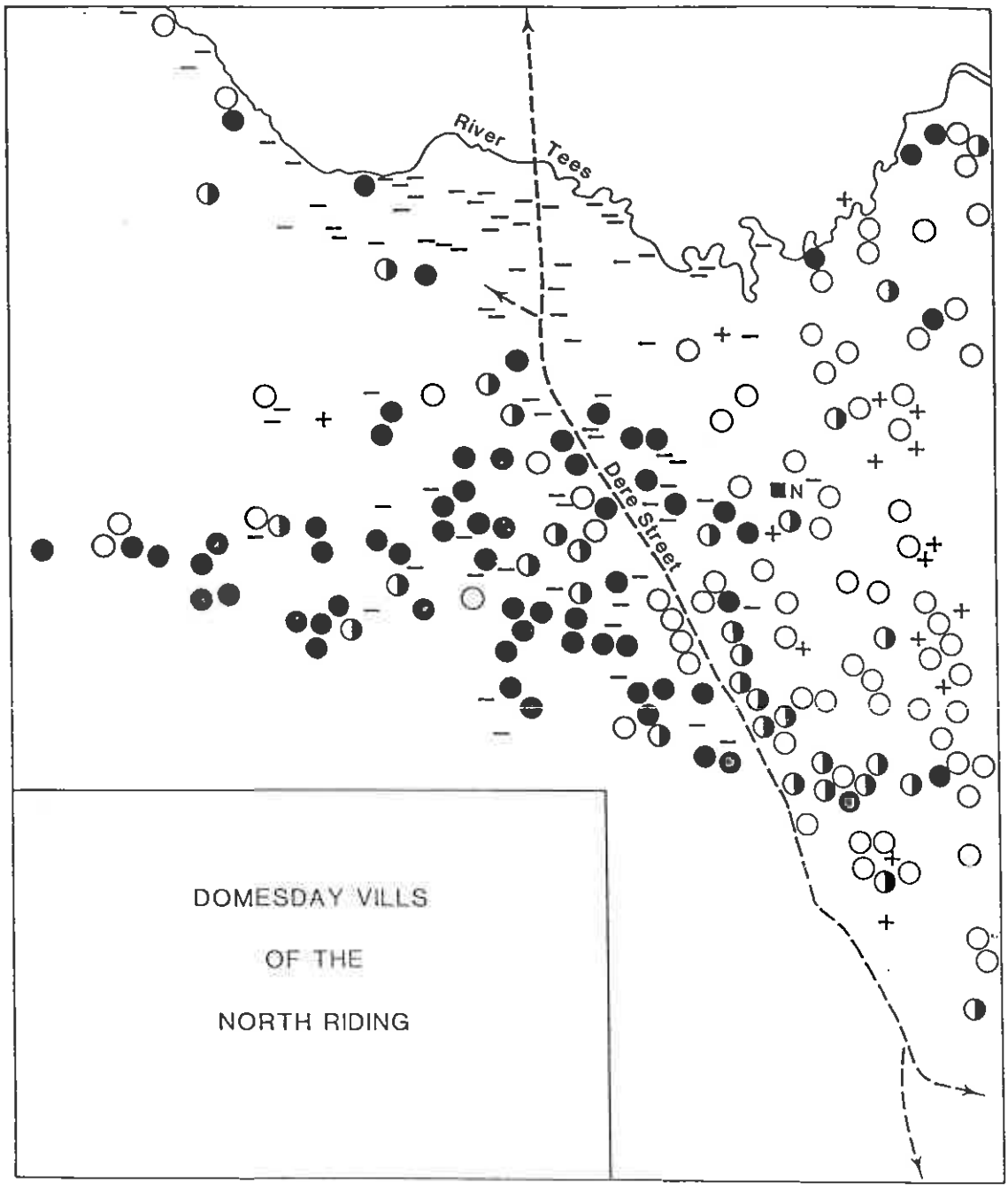
With regard to the large number of vills whose c:p ratio falls somewhere between 2:1 and $1_{1/2}$:1 (3:2), one can only repeat that, where both two-field and three-field systems were of such frequent occurrence, it is almost unthinkable that there would not be a considerable number which contained an intermixture of the two. If a 3:$1_{1/2}$ system lay alongside a 3:2 one, what other device could the assessors have adopted in the case of Nunnington than of conflating the two at 6:$3_{1/2}$? Nevertheless we must not ignore the possibility that, although a 5:3 assessment may well indicate a 2:1 and a 3:2 alongside each other in the same manor, the possibility of this being a perfectly logical way of denoting a manor with a normal two-field system where, inevitably, three ploughs had to be in use for part of the season, cannot be ruled out. On MAP 4 all such vills have been shown with the hybrid symbol, whatever the reality may have been.

Anomalous Ratios

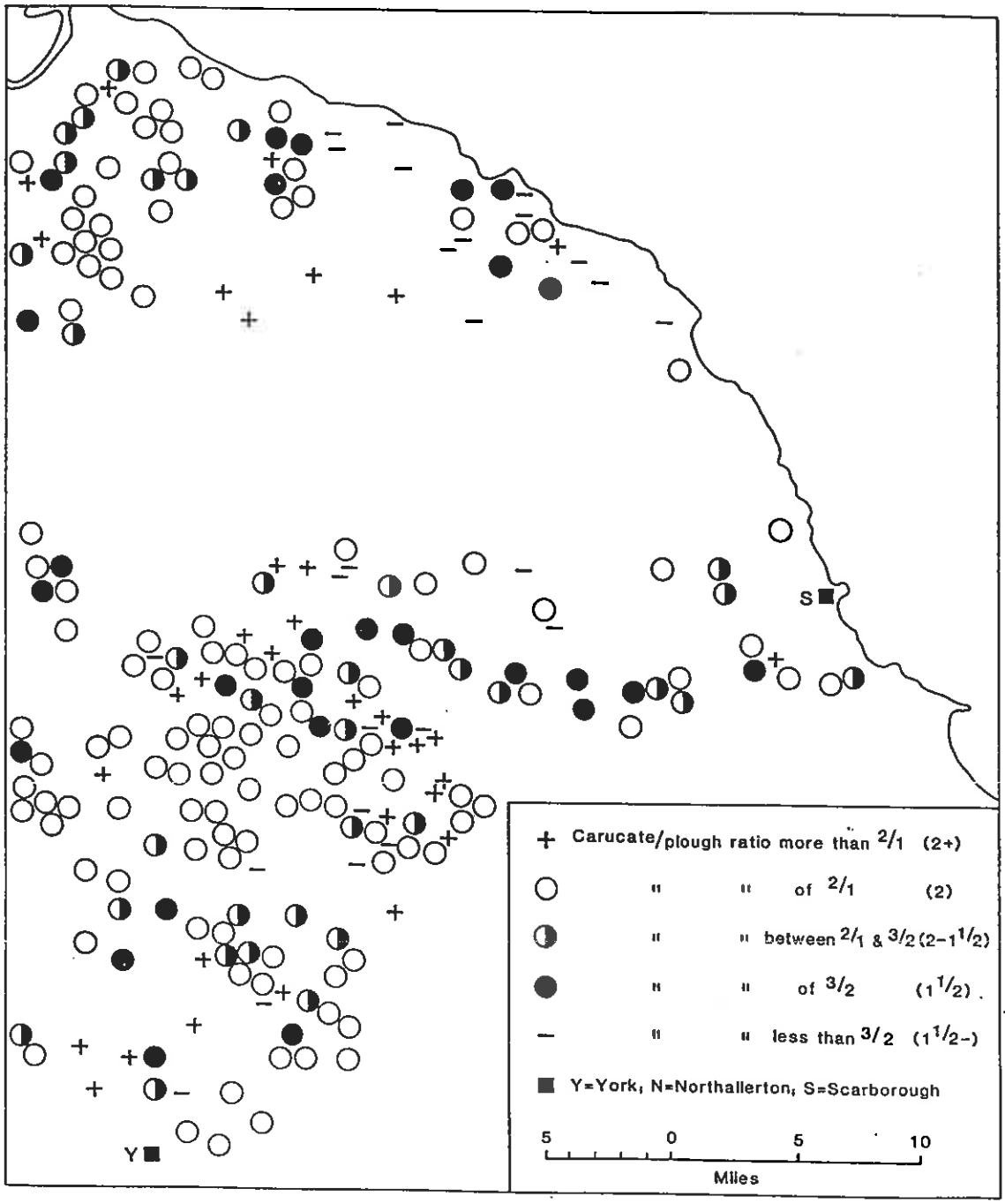
Two apparently anomalous groups of vills, accounting for 29.5 per cent of the total, await attention. First there are those with an excess of carucates over ploughteams (ratio exceeding 2:1), and secondly, those with a seeming deficiency of carucates (less than $1_{1/2}$:1).

There are 48 of the former, and exactly 24 of them have ratios of either 3:1 or 5:2. A further twelve have ratios like $2_{1/2}$:1 or $2_{3/8}$:1 (ie. having 2 carucates 3 bovates with only one ploughteam). All of these may have suffered a generalisation downwards to the nearest whole number of

MAP 4



- CARUCATE: PLOUGHTEAM RATIOS



ploughs; however, examination of their distribution (MAP 4) leads one to suspect that they may have been vills with unusual rotations. Most of them are concentrated in two zones: (a) the northern fringes of the North York Moors and the slopes of the Hambleton escarpment, and (b) from Malton northwestwards to the western end of the Vale of Pickering. The first group contains manors like Westerdale, Morton Grange, Arncliffe (in Cleveland), Osmotherly, Kepwick, Boltby, Cowesby, Sutton-under-Whitestone-Cliff, Lealholm and Danby; the second includes Amotherby, Old Malton, Swinton, Strensall and West Lilling. All the former are moorland-edge settlements and all the latter are noted for their spreads of sandy land. If infrequently-cultivated outfield persisted anywhere in the North Riding it might surely have been expected here. What could be more likely than that, in a manor which was assessed with a 5:2 ratio, two carucates were regularly cultivated by one ploughteam as 'infield' with two-field rotation, while the other three were cultivated in a longer term rotation by the other team? Similarly, a manor denoted as having a 3:1 ratio could well have devoted half its ploughing time in any one year to half its 'infield' carucate, and spent the other half ploughing up half of one of its two 'outfield' carucates.

Finally, there is that group of vills with an anomalous 'deficiency' of carucates to ploughs. There are 91 in all, but 30 of them are entirely within the limits of what one might expect if the assessors were making reasonable generalisations. Thus we have six with a ratio of 4:3 and five with 5:4. Given three-field rotations, arithmetically, they would have had 4:2$_{2/3}$ and 5:3$_{1/3}$ so, quite reasonably, they could be deemed to require (indeed, actually found to have) three and four ploughteams respectively. But by far the most numerous in this group are those vills with equal numbers of geld carucates and ploughteams (the ones which Isaac Taylor deemed to be the ones with two-field systems). In the North Riding there are 47 cases, varying in size from the ten vills with 1:1, up to the outliers of West Gilling (f309a) where a group of eighteen vills were said to have '...together 71$_{1/2}$ carucates to geld, and as many ploughs are possible there. Now entirely waste.'

On the face of it, within our scenario, these manors and soclands with a 1:1 ratio seem inexplicable. What rotations were being practised in, say, Great Smeaton (f309b) where there were '...six carucates to geld; six ploughs possible...'? The immediate answer is that, in a large percentage of them, there were no rotations at all because they were 'waste' at the time of the Domesday assessment. In fact 21 of the 47 were 'waste' and nearly all the remainder were greatly reduced, with hardly any population. Much more significant is that, of these 47 vills, 43 were concentrated in two areas, one in the far north-west and the other in the far north-east. The first

lay north of Catterick and Richmond on both sides of Dere Street as far as the Tees and then westwards up to Barnard Castle and Bowes. It included Earl Edwin's great manor of Gilling with its many berewicks. It was being held after the Conquest by Count Alan, and it may well be relevant to note that a small group of about half a dozen of his relatives and retainers (among whom Enisant Musard featured prominently) had charge of this near-deserted area. It is a field of mere speculation as to what reports were made to the Domesday assessors, but if there is one area in the North Riding where the community's memory of its history and traditions had been irretrievably lost, it must have been here. If, for some reason, the TRE geld record was also incomplete, then the anomalous assessments can be explained [22]. By 1086 the carucates concerned would have been abandoned for seventeen years and scrub invasion over wide areas must have been dense if not impenetrable. Even if there were those present who knew something about Northumbrian traditions and land systems, it is very unlikely that they would be able to say whether this or that vill formerly had a two-field or a three-field rotation. And to Normans like Count Alan and his minions who had much more profitable lands in other parts of the Kingdom which they knew more intimately, it could have seemed quite reasonable to equate one geld carucate with one ploughteam.

In passing one might also note that the most anomalous of all the North Riding TRE entries is to be found here. For Gilling itself we have the remarkable statement that 'Earl Edwin had one manor of four carucates for the King's geld, in which sixteen ploughs are possible.' (f309a). It is difficult to regard this as anything but a mistake, and one recollects that the whole of this entry for the land of Count Alan is one which is mentioned particularly by Sally Harvey in her illuminating comments on the sources of DB [23]. She points out that the first 300 or so place-names on Count Alan's list are in exactly the same order in the full DB account (f309a-313a) as they are in 'The Summary' (f381a,b). What more likely than that the latter is an earlier list which provided the bare information of 'carucates for geld' and which still determined the basic order of presentation. All that happened was that further information (such as it was, and when available) was added to this list. One cannot imagine a task in which scribes would be more likely to make unchecked mistakes, and it is interesting to note that, three lines down the list below Gilling, comes Moulton with its sixteen carucates! (f381b).

The other area in which 1:1 ratios predominate is the one comprising much of the dissected terrain around Whitby. Many of the vills here are either 'waste' or partly depopulated, though the over-all impression is not quite so stark as in the above. This is mainly due to the fact that the King's manors of Normanby (2:2), Roxby (1:1), Ugthorpe (4:4) and Boulby (1:1), are not actually denoted 'waste'.

However, they are not said to have any population either, so there is no reason to think that they had not been divested of their population just as effectively as the vills around them. Again, this could be an area where the corporate memory had been lost.

This outright rejection of Isaac Taylor's view that 1:1 ratios should be taken to indicate two-field systems should not be read as a discourteous dismissal of his work on Yorkshire Domesday. His depth of knowledge of the history of open field in Yorkshire has probably never been surpassed. He was probably unfortunate in that the majority of his work was on the East Riding where, on the richer lands of Holderness and on the lower slopes of the Wolds, he encountered many vills which are given unambiguous 1:1 ratios in DB. Because these were so numerous, and because he leaned heavily on field-name evidence, he formed the opinion that the 1:1 ratio had deep significance. Reading his work it is easy to be drawn into a misplaced confidence that two-field and three-field arrangements are phenomena whose presence in the distant past can be diagnosed with confidence. The present writer, after many years of studying field-patterns, field-names, and land documents in the North of England can assert categorically that he has NEVER discovered one item of hard evidence which demonstrates that a particular place had either a two-field or a three-field rotation in the eleventh and twelfth centuries: everything has either to be inferred, either by retrospective extrapolation from estate maps of the sixteenth century or later, or by drawing tentative conclusions from forms of words used in earlier documents. Even Boldon Book makes no explicit statements about two-field and three-field rotations [24].

What Taylor can perhaps be credited with is the identification of a category of land holding which may have become common in the East Riding by the eleventh century -a category in which the ancestral rotation of crops in monocultural fields was already breaking down. There is nothing inherently unlikely about this because there is evidence from a host of records that individual cultivators were persistently breaking the rules by appropriating bits of the fallow field for their own purposes. Instead of changing a two-field into a three-field rotation, for instance, is it not possible that, in places, they began to use the fallow field to obtain a variety of crops in what should have been the fallow year? Provided the community had sufficient elbow-room for this not to inconvenience the majority, one can imagine that the land could pass into a kind of severalty quite rapidly - though perhaps only temporarily. The point at issue here is that if the assessors encountered a situation where this process was in full flood, they might have been fully justified in judging that all the carucates were under the plough every year and that a great many ploughs were in usage in a truly 1:1 situation. On the high quality land of Holderness this

would probably have had the greatest chance of success even with the poor fertilisation techniques of medieval agriculture.

All this seems possible but, sadly, there is another point which Isaac Taylor overlooked. Just as the 1:1 ratios are markedly localised in the North Riding, particularly on the lands of Count Alan, so are they strongly localised in the East Riding. Even more unfortunate, they are almost entirely concentrated according to owner, and one of them, Drogo de Bevrere, seems to have been holding Holderness in a very similar way to that in which Count Alan was holding the far northwest of Yorkshire. A proper statistical assessment has not been carried out but, merely by inspection, it is clear that the 1:1 ratios are nearly all located on the lands of four land holders: Robert and Berenger of Tosny (f314a,c), Drogo de Bevrere (f323c-325a) and Odo the Crossbowman (f329d). Not only do nearly all the lands of these four have 1:1 entries, but there are hardly any 1:1 entries for the lands of all the other landholders in the East Riding. The correlation is overwhelmingly strong and suggests that this phenomenon had more to do with the eccentricities of recording than with realities on the ground. In final support of this, one might add that the only other significant group of vills in the North Riding with a 1:1 ratio - Lastingham (1:1), Spaunton ($6_{1/2}$:6), and Dalby (3:3) - was also in the hands of Berenger of Tosny (f314a).

The Fairness of Geld

One of the main criticisms levelled at Isaac Taylor's scenario was that it would have been seen to be unfair: two vills with very different amounts of land under the plough would have been assessed at the same rate. It is important to take this criticism seriously even though the situation which DB seems to describe quite openly is far from fair. Could it be fair if, in two manors not far from each other, one had 'six carucates to geld, land for four ploughs' and the other 'six carucates to geld, land for three ploughs'? If the carucate to geld was the unit of 'rateable value', and different ploughs yielded roughly the same amount of corn per annum, it could not be fair to levy the same tax on three ploughs in one place and four in another.

It is important to question whether an eleventh century land tax, if it were (necessarily) to be simply stated and easily applied, could ever have been seen to be fair on all counts. It must have occurred to those who first levied this kind of tax, almost from its earliest days, that there were two main ways of doing it: it could either be based on crop area or on total arable area. Of the two the latter would surely have been the most stable criterion from the point of view of verification on the ground: an area of ploughland was easily identifiable even in winter and in the fallow year. On the other hand the area under crops

would vary a little from year to year and, most important, it would certainly change a great deal if the rotation was changed. On first consideration it may seem very unfair to have taxed both two-field and three-field manors on the basis of total arable area; it may appear grossly unfair to have taxed an upland-edge manor with a lot of outfield and, say, a 5:2 c:p ratio, on the same basis. However, this is not necessarily so. Improved land for animal grazing was often in short supply and must have been greatly valued: after all, a few centuries later Tudor proprietors allowed whole manors to tumble down to grass because animal farming was seen to be more profitable than a corn-growing tenantry. It is not being suggested that eleventh century economic conditions were the same as those in Tudor times, but the same principle may well hold in large measure, and it is far from certain that medieval husbandmen would regard it as an unwarranted imposition to have their fallow taxed. Weeds grow very fast and, to the medieval beast, many of them must have seemed passably edible! In certain circumstances one can well imagine the holder of a bovate on a manor with a 3:2 c:p ratio viewing a neighbour on a 4:2 one with some envy. Indeed, can we be sure that, either communally or severally, the tenantry did not frequently foster grassy vegetation on some of their fallows in order to take off a greatly-prized hay crop? This would certainly have been easier and less resented if the fallows were large.

It may well be a very significant point that this method of taxation would have given flexibility to the system. If a community was increasing in size, and more corn was becoming a necessity, changing from a two-field to a three-field system, of itself, would have had no adverse tax repercussions. The same would have been true with land-use changes in the opposite direction. Presumably the one thing which would have increased geld liability would have been a significant expansion of the open fields onto new land. This may not be without significance in the light of what has already been said regarding the stability of the open-field area from the eleventh century onwards.

The Map

In conclusion one can only draw attention to the distributions which emerge when Domesday vills, classified according to the precepts that have been discussed, are put onto a map of the North Riding (MAP 4). The writer himself must admit to some surprise at the picture which unfolded. The dominance of two-field systems from York northwards up the eastern side of the Vale of York, and swinging eastwards into Cleveland, was not anticipated. Even less expected was the pronounced concentration of three-field systems from Wensleydale eastwards to Ripon and almost to Thirsk and Northallerton, as well as along the northern side of the Vale of Pickering. These are prominent features quite apart from the more unusual ones already

discussed. Although, for the reasons given, the exact interpretation to be given to many individual c:p ratios can be debated when they are viewed in isolation, when all are plotted together in this way, the emergence of a pattern with such clear-cut features is surely an indication of real contrasts on the eleventh century landscape.

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