

Winchester Yields

A Study in Medieval Agricultural Productivity

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To anyone interested in the rural society in thirteenth-century England, the problem of productivity of corn – its general level, and its changes in the course of time – must be of considerable importance. This is so mainly for two reasons. Although it is not possible to calculate the amount of land per head of population at any time, it is a well established fact that a vast proportion of the English peasantry in the thirteenth century lived on relatively small holdings, and it is also almost certain that the amount of land per head must have declined in the late thirteenth century, for by then colonisation seems to have largely petered out while there were, as yet, no obvious signs that the upward demographic trend was coming to a halt.¹ The threat represented by this development to the standard of living of the greater part of the peasantry would largely depend on what happened to the productivity of their land.

It is unfortunately not possible, and never will be, to calculate yields of peasant holdings, simply because no documents exist enabling us to do so. It is however possible to make such calculations for some of the great estates, and there is no reason to assume that the findings for the demesne land could not be, subject to certain qualifications, applied validly to illuminate the problem of productivity on peasant land.

Secondly, if one turns one's attention to the great estates themselves, the problem of productivity is also important. It is a well established fact that on many English estates arable cultivation was shrinking, often drastically, from the end of the thirteenth century onwards, and this cannot be explained on the basis of price movements alone. The usual explanation of this development in terms of the greater profitability of rents over direct cultivation by the landlord is not entirely satisfactory either. There are numerous cases where the contraction of the arable is not accompanied by a corresponding increase in the tenants' land, thus implying abandonment, or changeover to other uses, rather than letting out. But even when the two (the contraction of the demesne and the expansion of the tenants' land) seem to correspond, the very fact of the preference for rents, in itself, needs explaining

¹ For a fuller discussion of this problem see J. Z. Titow, *English Rural Society 1200–1350* (1969), chapter III.

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Since on some manors there is hardly any letting out of demesne land at all, while on others it is very extensive, the landlord's decision to rent out the demesne clearly cannot be regarded as a *general* preference for rents but must be seen as a practical expedient dictated by specific conditions obtaining in each case. The knowledge of what happened to productivity in the relevant period is clearly an important consideration in trying to solve the puzzle.

The problem of medieval productivity of land has occupied historians for a long time; the earlier studies,¹ however, have been completely superseded by the appearance in 1927 of Lord Beveridge's study of yields on the estates of the bishopric of Winchester.² Though suffering from a number of minor inaccuracies, Lord Beveridge's study is without any doubt the best study of English medieval yields to date, and it has maintained this position without any serious challenge; the most recent discussion of yields, that of Professor Slicher van Bath,³ is merely a summary recapitulation of figures produced by other writers, and the discussion of yields in various monographs on individual estates published since 1927 is, in all cases, based on a far less satisfactory series of records.

The dominant position of Lord Beveridge's study can be fully appreciated only when it is realised how our knowledge of medieval yields is obtained. The raw data from which final calculations are made is derived from manorial account rolls in which, in the section 'Issue of the Grange' (Exitus grangie), quantities of grain produced and sown are recorded. For the results to be statistically worthwhile a good series of accounts is needed, for not only is it desirable to have returns over a long period, but it is also essential to have the accounts consecutive. This is so because medieval accounts ran from Michaelmas

¹ Particularly, R. Lennard, 'The Alleged Exhaustion of the Soil in Medieval England', *The Economic Journal* xxxii (1922), 12; 'Statistics of Corn Yields in Medieval England: Some Critical Questions', *Economic History* iii (1936), 173; and 'Statistics of Corn Yields in Medieval England, Some Additional Critical Questions', *ibid.* iii, 12 (1937), 325. See also references in M. Whitney, 'The Yield of Wheat in England during Seven Centuries', *Science* lviii (1923), 320, and M. K. Bennett, 'British Wheat Yield per Acre for Seven Centuries', *Economic History* iii, 10 (1935), 12.

² Sir W. Beveridge, 'The Yield and Price of Corn in the Middle Ages', *Economic History* i (1927), 155, also reprinted in *Essays in Economic History* 1, edited by E. M. Carus-Wilson (1954).

³ B. H. Slicher van Bath, 'De oogstopbrengsten van verschillende gewassen voornamelijk granen in verhouding tot het zaaizaad ca. 810-1820', *A. A. G. Bijdragen* ix (1963), 29, and 'Yield Ratios', *ibid.* x (1963).

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(29 September) to Michaelmas and the produce of any given year was recorded not in the account roll covering the period during which it was produced and harvested but in the following account covering the period during which it was disposed of; thus the quantity sown and the acreage under seed are recorded in one account roll and the quantity produced in the following one. Although thirteenth-century accounts survive for many estates, none presents such a good series as the Winchester collection and none is earlier than 1250, whereas those for Winchester estates survive from 1208.

With the publication of Lord Beveridge's figures, a far sounder statistical basis was given to the discussion of medieval productivity, but the nature of the discussion itself has also changed over time. It started with an attempt to explain fifteenth-century enclosures by soil exhaustion; it ended by becoming a controversy about changes in productivity in the course of the thirteenth and early fourteenth century. This new development was mainly the work of Professor Postan who argued strongly that the thirteenth-century yields were falling because the continuous expansion of arable cultivation at the expense of pastures and wastes reduced the animal population and the supply of manure for all the lands, while some of the lands newly brought under the plough were too poor to secure steady outputs over long periods of time.¹ This view ran counter to the most satisfactory (statistically) direct evidence of yields published so far, that of Lord Beveridge,² and was thus contested by some scholars. A sort of stalemate has now been reached and it would seem that the controversy in its present form can only be resolved by new evidence. No such evidence, however, has come forward since 1927, for although most monographs on individual estates published since that date include calculations of yields, these though useful as an indication of the general level of yields are too scrappy to serve as the basis for conclusions as to the changes in productivity.

New evidence, however, *can* be produced. Lord Beveridge's study of yields on the estates of the bishopric of Winchester is confined to only nine manors chosen at random. The fact that this represents but

¹ In a number of lectures, papers and articles; for the latest statement of Professor Postan's position see *The Cambridge Economic History of Europe*, vol. 1, new edition (1966), pp. 556-9.

² 'The Yield and Price of Corn in the Middle Ages.' Lord Beveridge's conclusion can be summarised as: virtually no change with, if anything, a slight tendency towards improvement.

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a small fraction of available material led me to believe that a new appraisal of Winchester evidence, this time *in toto*, would not perhaps come amiss. I am aware, of course, that conclusions based on a much larger sample than that used by Lord Beveridge may not necessarily be more representative of the country at large, but at least they will give us a much truer understanding of what was going on in the area covered by the Winchester estates. Those who are not convinced of the need to have the whole of the Winchester evidence examined may perhaps be swayed by the following comparison of Professor Slicher van Bath's most recent figures for England (mostly Beveridge's) with my own calculations (for the same periods), which illustrates quite clearly how differences in the size of the sample may lead to very different results indeed.

TABLE I *Yields per measure of seed*

	Professor Slicher van Bath		Titow	
	No. of calculations	Average yield	No. of calculations	Average yield
Wheat ^a				
1200-49	39	2.9	411	3.8
1250-99	60	4.2	887	3.8
1300-49	111	3.9	1,555	3.9
	—		—	
	210		2,853	
Barley ^b				
1200-49	41	4.4	417	4.4
1250-99	65	4.9	844	3.5
1300-49	110	4.1	1,436	3.6
	—		—	
	216		2,697	
Oats ^c				
1200-49	42	2.2	438	2.6
1250-99	62	2.4	837	2.3
1300-49	104	2.4	1,476	2.2
	—		—	
	208		2,751	
Mancorn ^d				
1200-49	0	—	86	3.9
1250-99	1	6.0	183	3.1
1300-49	5	4.9	372	2.9
	—		—	
	6		641	

^a B. H. Slicher van Bath, 'De oogstopbrengsten van verschillende gewassen voornamelijk granen', p. 97, table 2a.

^b *Ibid.* p. 100, table 2c.

^c *Ibid.* p. 101, table 2d.

^d *Ibid.* p. 104, table 2i.

Before discussing the findings of the Winchester evidence examined *in toto* it may be useful, for the benefit of readers unfamiliar with manorial documents, to describe briefly the nature of the evidence and the problems arising out of its peculiarities.

The Winchester estates comprised some forty to fifty manors¹ concentrated mainly in Hampshire but with important outliers in Somerset, Wiltshire, Oxfordshire, Berkshire, Buckinghamshire and Surrey.² The area covered by them is thus quite considerable. They also offer considerable variety in terms of size and soil conditions.³

The layout of the accounts is uniform throughout for all the manors of the bishopric but minor changes in accounting practices occurred from time to time and so care must be taken not to overlook such inconsistencies. The section of the accounts most relevant to our purpose is the Grange Account in which the official responsible, usually the reeve or a *granatarius*, gave an account, crop by crop, of all the in-coming items followed by all the out-going items. The following extract for the Hampshire manor of Woodhay is a fairly typical example of a grange account in the Winchester account rolls:

[Woodhay 1255]⁴

Issue of the Grange Likewise he renders⁵ account for 55 quarters and a half, 2 bushels, of the total issue of the old grain with the increment of the granary. Sold: all, of which three quarters (were) second-grade wheat.

¹ One has to be somewhat vague as to the total number of manors constituting the estates of the bishopric, since some of the manors were composite and were at first accounted for as a single unit but had eventually separate accounts for each of their constituent parts. Thus, for example, the manor of Wargrave was eventually accounted for as four separate units and the manor of Taunton as six separate units. For the purpose of this study I have added all such sub-manors together and I have also excluded manors which were not part of the estate throughout the period covered by this study; this gave me the total of thirty-nine manors (including Esher).

² See Appendix A.

³ Some idea of the relative size of Winchester demesnes can be gained from the total area under seed given in Appendix L. Since different soil conditions are already reflected in the general level of yields and in higher proportion of inferior crops (see Appendix K) I have not deemed it necessary to discuss them further.

⁴ Hampshire Record Office, Eccl. Comm. 2/159296. For the Latin text see Appendix O.

⁵ This could be extended into 'they render' equally well, but the singular form seems more appropriate.

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- This year's wheat Likewise he renders account for 17 quarters of the total issue of wheat with the increment of the granary. And for 5 quarters, 1 bushel and a half, of wheat (received) as churchscot. And for 63 quarters, by estimate, remaining in stacks. Total: 85 quarters, 1 bushel and a half. Of which, sown over 61 acres and a half, in the field of Wydecumbe and Wodeflood, 15 quarters, 3 bushels and a half, per acre 2 bushels. (Given) as a customary due to 1 hayward, 1 bushel. Sold: 6 quarters and a half, 1 bushel. And 63 quarters, by estimate, remain in stacks.
- Beremancorn Likewise he renders account for 96 quarters, 2 bushels, of the total issue of the grange of beremancorn with the increment of the granary. Of which, sown over 66 acres by the perch, in Wydecumbe and Mancroft, 28 quarters and a half, per acre 3 bushels. Given to 1 servant guarding the pastures and fields of Woodhay and Ashmansworth, 6 quarters and a half. Sold: 61 quarters, 2 bushels.
- Barley Likewise he renders account for 42 quarters and a half of the total issue of the grange of barley with the increment of the granary. Of which, sown over 24 acres by the perch, in Medelfeld, 8 quarters and a half, 3 bushels, that is, per acre 3 bushels. Given to 4 ploughmen,¹ 20 quarters and a half. Sold: 8 quarters.
- Oats Likewise he renders account for 115 quarters and a half of the total issue of the grange of oats with the increment of the granary. Of which, sown over 98 acres by the perch, in the field of Medelfeld, 48 quarters and a half, 3 bushels, per acre half a quarter. In provender for 2 cart-horses from the feast of St Hillary until the Finding of the Holy Cross, for 17 weeks, 5 quarters and a half. In provender for 2 plough-horses for the same period, 3 quarters. In sustaining oxen, 10 quarters, by estimate in sheaves. (Given) as a customary due to 1 hayward, 1 bushel. Sold: 48 quarters.
- Peas Likewise he renders account for 1 quarter, 3 bushels

¹ 'Dyers' in the MS; quite clearly an error for ploughmen.

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of the total issue of peas. Of which, sown 3 bushels.
Sold: 1 quarter.

Vetches Likewise he renders account for 2 quarters of the total
issue of vetches. Sown, 1 quarter. Sold: 1 quarter.

This extract does not, of course, exhaust all the possibilities in so far as the in-coming and out-going entries are concerned, but no single extract can illustrate them all. The following is a schematic presentation of in-coming entries which may be encountered under each crop:

- 1 Grain remaining from preceding year.
- 2 Issue of the grange (*exitus grangie*), with, or without, the increment of the granary. The increment was the difference between produce measured in heaped bushels as it entered the granary after threshing, and the total quantity of grain dispensed from the granary measured in struck bushels.¹ Sometimes, as in the early accounts, the issue of the grange was already entered with increment included, or, as in later accounts, it was calculated in struck bushels as well and there was no increment accordingly.
- 3 Grain received from outside.
- 4 Grain received from the peasants in various customary dues.
- 5 Grain bought.
- 6 An estimate of grain given to manorial servants in sheaves.
- 7 An estimate of grain given to manorial servants as sown acres.
- 8 An estimate of grain given to animals in sheaves (usually applicable to oats only).
- 9 Poor-quality grain separated mechanically from the better quality grain. This is most commonly met with in the case of wheat and the inferior grain (*curallum*) is usually entered in a paragraph on its own, following the main entry: thus, although it may not appear under the main entry at all, it must nevertheless be added to it when calculating total produce.
- 10 An estimate of grain, if any, remaining unthreshed into the next accounting year. In the earlier accounts this is usually given *after* the out-going entries and must be added to other produce when calculating total produce. In later accounts it is usually given both

¹ This is the traditional definition of the increment. It is valid for the Winchester estates at a later date, but I now believe that in the early part of the century the increment may have been the difference between fully heaped and less-fully heaped bushels.

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on the in-coming and the out-going side and care must be taken not to count it twice when calculating total produce.

- 11 *Oneratio*, a quantity of grain in which the accounting officer was amerced to bring the total to an expected figure. This type of entry is nearly non-existent on the Winchester estates before 1350 but almost constant thereafter when it can be very substantial indeed.

It will be seen from the above outline that to calculate total produce in any given year it is not enough to take the *exitus* only¹ (though it may frequently be the largest or the only item on the in-coming side); other entries which are in the nature of produce must be added to it and those which are not, ignored. Thus items (2), (6), (7), (8) and (9) must be added together to obtain total produce and particular care must be taken not to overlook *curallum* and any corn left unthreshed if not already included on the in-coming side.

Three other points must be made in this context. Total produce calculated from manorial accounts is total produce *less* tithe which was normally collected in the fields; on one or two occasions when it was deducted after the grain had reached the granary I have subtracted it from the total for consistency's sake. Secondly, in the first half of the thirteenth century it was a not uncommon practice on the Winchester estates to sell the corn, partly or wholly, *in grosso*, that is, before it was threshed. When this happened, no calculations of total produce are possible and such years have to be disregarded, but the grange accounts sometimes forget to mention partial sales *in grosso* thus giving the impression that the account records the whole of the produce; checking against the sales of grain in the income part of the account brings such omissions to light and should be carried out as a precautionary measure. Finally, a practical problem arises in connection with estimated quantities of grain remaining unthreshed into the next year. Is one to count them at the estimated value, i.e. as given in the current account, or at the exact value as given in the following account? The quantities entered in the following account are usually somewhat lower than the previous year's estimate; this is probably due to the more exact nature of the measurement, but it could also be due (as it is on rare occasions explicitly stated to be) to loss and deterioration of grain which had lain in stacks for a long time. Since the former possibility seems more likely

¹ This is a trap into which Professor Gras has fallen when calculating yields for his appendix 1. See N. S. B. Gras, *The Evolution of the English Corn Market* (1916).

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than the latter I have counted unthreshed corn at the measured value as given in the following account; when such accounts are missing one is forced to use the estimated value despite its explicit inexactness.

On the out-going side of the grange account only two items are of interest to us in this context: the quantity of grain sown and the number of acres over which it was sown. It is over the latter that we again encounter a serious problem. The Winchester accounts, though they do not always make it explicit, use two different acres: the measured acre and the customary acre.¹ Up to 1232, and occasionally after that date, acres in the grange accounts are unqualified but it appears on examination that they must have been in fact customary acres on practically all the manors. In 1232 all manors of the bishopric went over to recording their acreages in the grange account in measured acres, but a number of them reverted to the old practice subsequently and continued in it until 1320. On most Winchester manors the customary acre was roughly half the measured acre but on a few manors the disproportion was much greater. Since, however, it is impossible to convert customary acres into their measured equivalents with any degree of exactitude, calculation of yields per acre should be, in my view, restricted to years in which measured acres are used. Observance of this restriction limits considerably the number of years for which calculation of yields per acre can be made and this is the main reason why this study is made primarily in terms of yields per seed. An additional reason is that the medieval administrators of the Winchester estates themselves seem to have thought in terms of yields per seed rather than per acre; whenever they made calculations of yields on the margins of grange accounts, as they did frequently in the late thirteenth and early fourteenth centuries, these were invariably multiples of seed.

III

To detect changes in productivity one needs a series of figures, and to this end I have divided the period 1209–1349 into four shorter ones: 1209 to 1270, 1271 to 1299, 1300 to 1324, and 1325 to 1349. The choice of the first period may seem unorthodox but I see no point in accepting the conventional division into quarter-centuries. Such a division is purely mechanical; what is needed here is a division not into periods of

¹ *Acra mensurata per perticam*, or, more usually, simply *acra per perticam*, and *acra sicut jacet*. See Appendix Q.

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equal numbers of years but into periods with roughly equal numbers of years *for which calculations can be made*. Because of the many gaps in the documents in the early thirteenth century the conventional division into quarter-centuries would not be suitable. The selection of the period 1209 to 1270 as the first one has also this additional advantage that it coincides almost exactly with the period of expansion of the Winchester estates as a whole.¹ If, therefore, early thirteenth-century ploughing up of grasslands did in fact – as has been claimed² – lead to an eventual fall in productivity of demesne lands, one would expect this to be reflected in the yields of the following two periods.

When average yields for these four shorter periods are calculated they provide us with a sequence of four figures which give some indication of change in productivity. I have calculated such averages for each manor for all cereal crops grown regularly (i.e. those grown sporadically have been disregarded): in most cases this means wheat, barley and oats, but on ten manors mancorn, on three manors drage, and on three manors rye, have been added. The averages of individual crops for each period have been averaged arithmetically to give a Combined Average Yield, and it is these combined averages that I have used as a criterion of overall change in productivity on individual manors. I have calculated yields *per seed* and *per acre* but since calculations *per seed* give a much fuller series (for reasons which have already been mentioned) they occupy a position of greater prominence in my argument, and my classification of manors into those with lower, and those with improved productivity is based on them.

In so far as the description of change is concerned I have used the position in my first period (1209 to 1270) as a yardstick with which to measure change. Whenever, for at least two consecutive periods after 1270, yields were poorer than in the first period I have considered this

¹ The period of the greatest expansion of the Winchester demesne, as a whole, was 1221 to 1269 when the total area under seed in any given year stood at anything between 12,500 and 14,000 acres. The highest peak within this period fell between 1227 and 1237 when the area under seed stood at between 13,500 and 14,000 acres. In the years 1245 to 1269 the area under seed stood at between 12,500 and 13,400 acres. The year 1269 was the last year when it just topped the 13,000 mark. Afterwards it declined steadily; it was below 11,000 acres from 1284 onwards, below 10,000 acres from 1310, and below 9,000 acres after 1321. (All these totals are approximate since they include conversions from customary acres and allowances for missing or damaged manors.)

² M. M. Postan, *Cambridge Economic History of Europe*, vol. 1, pp. 556–9.

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to be the case of deterioration; whenever they were higher, I have considered it to be the case of improved productivity.

It has been suggested to me that averages weighted by acreage are preferable to simple arithmetical averages when calculating changes in overall productivity. This view does not, however, seem to me valid. If one were after the changes in total production, then changes in relative importance of various crops would be a relevant factor, but it is not a relevant factor in so far as productivity as such is concerned. With weighted averages, calculated on an annual basis, every change in relative acreages *automatically* affects the results *whether any change in productivity had taken place or not*. Anybody can verify the validity of this statement by a simple calculation. Let us postulate a field sown with a high-yielding crop (let's say wheat) and a low-yielding crop (let's say oats). Let us further postulate that the productivity of that piece of land over two consecutive years remained constant but the ratio of the two crops to each other was changed. On the assumption of constant productivity the yield per measure of seed of each crop will remain the same in both years. The overall productivity calculated as a straightforward arithmetical average will also be the same, but the overall productivity calculated as a weighted average will show considerable change up or down (according to which crop predominated) which we know by definition not to have taken place.

The suggestion that weighted averages should be used to evaluate changes in overall productivity must, therefore, be rejected as leading to a distortion of the results so obtained; however, in so far as it represents uneasiness over certain aspects of the use of unweighted averages, it should not be dismissed out of hand. It must be conceded that the use of unweighted averages may also be misleading. Productivities of individual crops frequently change in the opposite direction; productivity of one crop may go up while that of another may go down. When, to evaluate overall change, a simple average of period averages of individual crops is calculated, it is arithmetically possible for the resultant figure to show change in the direction followed by one crop only, and if the area under that crop constituted but a fraction of the total area under seed it would be wrong to describe overall change in terms of the change in the quantitatively least representative element. For example, it is not uncommon on the Winchester estates to find an improvement in the yield of wheat and a deterioration in that of barley

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and oats. The combined area under barley and oats could easily be greater than that under wheat forcing us to conclude, in such a case, that improved yields could only be obtained over a small fraction of the total arable, yet it is mathematically possible for the unweighted combined averages, in such a case, to indicate an overall improvement.

To overcome this difficulty I have calculated average acreage under each crop for each period and, in the case of divergent trends in yield figures of individual crops, I have, by combining the acreages of the crops moving in one direction and comparing them with the combined acreage of the crops moving in the opposite direction, obtained a rough-and-ready touchstone of the dominant tendency. This method of using unweighted combined yield averages, checked against the tendencies of individual crops, and considered in the light of the relative importance of crops displaying divergent tendencies, seems to me to offer the best way to determine the dominant trend. It has two advantages over the use of weighted averages: the productivity of each crop is measured in terms of its own performance, and the relative importance (in terms of their respective acreages) of crops displaying divergent tendencies is neither ignored nor introduced into the calculation of yields as a distorting element.

IV

So much for the method; what are the findings of the more complete investigation of the Winchester yields? Firstly, the general level of productivity of all crops appears to have been very low by any standards, but particularly so by comparison with modern yields.¹ Secondly, when changes in productivity are considered, deterioration in yields is found to be far more common than improvement. Thirdly, a striking difference between the behaviour of wheat and that of other crops is disclosed.

Table 2 brings out quite clearly the low general level of yields prevailing on the Winchester estates.

The low level of yields generally can also be illustrated in terms of manorial averages, as in Table 3.

¹ I have attempted a comparison between medieval and modern yields in Appendix P, but it must be stressed that this comparison is offered as a *very rough guide only*, since the modern estimates have not been adjusted for possible differences in seed rates and since modern averages are far more representative of their respective areas than are my medieval ones.

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TABLE 2a *Gross yields per seed, 1209-1349: number of calculations falling into each category as a percentage of the total*

	× seed										
	0 to 0·99	1 to 1·99	2 to 2·99	3 to 3·99	4 to 4·99	5 to 5·99	6 to 6·99	7 to 7·99	8 to 8·99	9 to 9·99	10 or more
Wheat ^a	0·14	5·4	21·8	31·7	22·9	11·0	4·5	1·6	0·7	0·14	0·12
Mancorn ^b	3·4	13·7	37·3	26·6	10·2	3·7	2·3	0·3	0·7	—	0·18
Rye ^c	—	3·0	10·3	30·5	28·6	14·8	7·9	3·4	1·0	—	0·5
Barley ^d	0·3	5·5	24·4	33·4	21·4	9·1	4·0	1·1	0·3	0·3	0·14
Drage ^e	0·8	11·8	33·9	31·1	16·9	3·5	2·0	—	—	—	—
Oats ^f	1·8	33·6	49·7	12·1	2·1	0·5	0·2	—	0·04	0·04	—

^a 100% = 2,855 calculations. ^b 100% = 707 calculations. ^c 100% = 203 calculations.
^d 100% = 2,697 calculations. ^e 100% = 254 calculations. ^f 100% = 2,751 calculations.

TABLE 2b *Gross yields per acre (in bushels), 1209-1349; number of calculations falling into each category as a percentage of the total*

	0 to 7·9	8 to 11·9	12 to 15·9	16 to 19·9	20 to 23·9	24 to 27·9	28 to 31·9	32 to 35·9	36 to 39·9	40 to 43·9	44 to 47·9	48 or more
Wheat ^a	35·0	44·6	16·1	3·6	0·4	0·2	—	0·05	—	—	—	—
Barley ^b	7·3	25·1	31·9	20·4	8·4	4·2	1·2	1·0	0·1	0·2	0·05	0·05
Oats ^c	25·9	44·1	21·6	6·7	1·2	0·3	0·2	0·05	—	—	—	—

^a 100% = 2,199 calculations.
^b 100% = 2,072 calculations.
^c 100% = 2,156 calculations.

TABLE 3 *Number of manors with the period average 1209-1349 falling into each category*

	× seed						Per acre (in bushels)					
	0 to 0·99	1 to 1·99	2 to 2·99	3 to 3·99	4 to 4·99	5 to 5·99	0 to 7·9	8 to 11·9	12 to 15·9	16 to 19·9	20 to 23·9	24 to 27·9
Wheat	0	0	3	23	11	3	5	32	4	0	0	0
Mancorn	0	0	6	3	1	0	0	9	0	1	0	0
Barley	0	0	3	26	8	4	0	6	24	7	1	2
Oats	0	5	33	3	0	0	1	33	5	2	0	0

Or, taking the period average for 1209-1349, no manor of the Winchester estates had a higher, or lower, average than those shown in Table 4.

Winchester yields

TABLE 4 *Highest and lowest yields in terms of manorial averages for the whole period 1209-1349*

	Highest ^a	Lowest	Highest	Lowest ^a
	Per seed (× seed)		Per acre (in bushels)	
Wheat	5·34(71)	2·61(73)	13·8(55)	5·8(20), or 7·0(64) ^b
Mancorn	4·42(69)	2·51(77)	16·8(37)	8·3(52)
Barley	5·55(69)	2·79(75)	27·6(52)	11·0(60)
Oats	3·40(70)	1·79(51)	16·0(50)	7·5(47), or 8·3 (66) ^b

^a In brackets number of calculations going into each average.

^b The lowest figure with a fuller run of calculations.

In so far as changes in overall productivity per seed are concerned¹ an examination of combined period averages shows a deterioration on twenty-seven manors² and an improvement on seven.³ The position on the remaining five manors is somewhat indeterminate; comparisons with the first period cannot be made for Esher and East Meon Church, and Wield, Fonthill and Rimpton do not seem to display any definite trends.⁴

To say that there was a deterioration on most manors does not, of course, mean that there was necessarily a *progressive* worsening in productivity, though this was indeed the case on seven manors.⁵ The most usual pattern was for the yields to reach their lowest level in the last quarter of the thirteenth century and then to improve gradually,

¹ The summary in this section is based on the data presented in Appendix K.

² Fareham, Bitterne, Waltham, Twyford, Stoke, East Meon, Hambledon, Beauworth, Cheriton, Crawley, Mardon, Farnham, Burghclere, High Clere, Ecchinswell, Ashmansworth, Woodhay, Overton, North Waltham, Harwell, Morton, West Wycombe, Wargrave, Adderbury, Witney and Taunton. To these one should add Downton, for although its average for the third period is not lower than that of the first period (thus giving us a run of at least two lower figures to qualify, in terms of our initial definition, for a clear-cut case of an overall deterioration) in terms of acreages, deterioration in the third period is more pronounced than improvement.

³ Alresford, Sutton, Ivinghoe, Bishopstone and Knoyle. To these must be added Bentley and Brightwell, in view of the acreages involved in deterioration and improvements, though they are not such clear-cut instances of improvement in terms of the combined averages.

⁴ At Wield and Rimpton the combined averages go up and down again; at Fonthill they go up in the second period and then come down to their original level again. These patterns are reflected, in each case, in acreage figures and it is these latter which make it difficult to accept any of these manors as an instance of improved productivity.

⁵ Twyford, Stoke, Beauworth, Mardon, Overton, North Waltham and Witney.

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sometimes failing to reach,¹ and sometimes reaching and surpassing,² the level of yields in our first period. Yet another group of manors³ shows a progressive decline in productivity right up to the second quarter of the fourteenth century followed by an improvement in that quarter.

When period averages of individual crops, rather than the combined averages, are considered, the following results emerge. Of the twenty-seven manors whose combined averages show a lowering of productivity, fourteen manors⁴ show a deterioration in all the crops, eleven manors⁵ show an improvement in wheat and a deterioration in the remaining crops, one manor⁶ shows a rise in wheat, fluctuations in rye and a deterioration in drage and oats, and one manor⁷ shows a deterioration in wheat and barley and an improvement in oats. On the seven manors whose combined averages show improved productivity there is less regularity in the behaviour of individual crops. Sutton shows an improvement in all the crops. Knoyle and Brightwell have a deterioration in one crop (oats and rye respectively) and an improvement in all the remaining ones. Alresford and Bishopstone show fluctuations in one crop (barley and oats respectively) and an improvement in the remaining crops. Ivinghoe has an improvement in wheat, no changes in oats, and a deterioration in barley. Bentley has an improvement in wheat and a decline in barley and oats.

Thus, it is quite clear that, on the whole, wheat was doing much better than other crops, as Table 5 helps to bring out.

The better performance of wheat is also seen quite clearly when annual average yields for the estates as a whole are plotted;⁸ those of wheat are seen to fluctuate around a fairly stable secular trend, those of barley and oats around a markedly downward trend.

¹ Fareham, East Meon, Morton, Wargrave, Adderbury and Taunton.

² Bitterne, Hambledon, Cheriton, Harwell and Downton.

³ Waltham, Crawley, Farnham, Burghclere, High Clere, Ecchinswell, Ashmansworth, Woodhay and West Wycombe.

⁴ Twyford, East Meon, Crawley, Mardon, Farnham, Burghclere, High Clere, Ecchinswell, Woodhay, Harwell, Morton, West Wycombe, Wargrave and Ashmansworth.

⁵ Fareham, Bitterne, Waltham, Stoke, Hambledon, Cheriton, Overton, North Waltham, Witney, Taunton and Downton.

⁶ Adderbury.

⁷ Beauworth, but the improvement in oats was only in yields per seed; there was a definite decline per acre.

⁸ See Appendix N.