

The open fields of England: rent, risk, and the rate of interest, 1300–1815

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What needs to be explained: the scattering of strips

The peculiar feature of farming in England until the nineteenth century was the scattering of strips. Instead of holding his twenty-four acres of land in a neat little farm, a tenant at Laxton, Nottinghamshire, in 1635 such as John Chapell held it in twenty-three separate strips, here and there, down toward the Westwood Common, in close to the village, over by the mill. So did his neighbors. The fields of Laxton were fragmented into thousands of strips, a chaotic quilt of holdings.

It is difficult to count the average number of strips nationwide, but an estimate is worth venturing, to bring definition to the chaos:

The essay is a reshaping of work done since 1972, and looks toward a fuller version, in a book forthcoming from Princeton University Press. The list of people who have contributed to my thinking would fill a telephone book. But even here I must single out my collaborator and friend John Nash and my adversary and friend Stefano Fenoaltea. The pieces drawn on include "The Enclosure of Open Fields: Preface to a Study of Its Impact on the Efficiency of English Agriculture in the Eighteenth Century," *Journal of Economic History* 32 (March 1972): 15–35; "Persistence of English Common Fields," in E. L. Jones and William Parker, eds., *European Peasants and Their Markets: Essays in Agrarian Economic History* (Princeton, N.J.: Princeton University Press, 1975), pp. 73–119; "The Economics of Enclosure: A Market Analysis," in Jones and Parker, eds., pp. 123–60; "English Open Fields as Behavior towards Risk," *Research in Economic History* 1 (Fall 1976): 124–70; "Risk and Open Fields: A Reply to Fenoaltea," *Explorations in Economic History* 14 (October 1977): 402–404; "Explaining Open Fields: An Exchange of Letters with Charles Wilson," *Journal of European Economic History* 8 (Spring 1979): 203–207; "Another Way of Observing Open Fields: A Reply to A. R. H. Baker," *Journal of Historical Geography* 5 (October 1979): 426–29; "Theses on Enclosure," in *Agricultural History: Papers Presented to the Economic History Society Conference at Canterbury, April 1983* (Agricultural History Society), pp. 56–72; [with John Nash] "Corn at Interest: The Cost and Extent of Grain Storage in Medieval England," *American Economic Review* 74 (March 1984): 174–87; "Scattering and Open Fields: A Comment on Michael Mazur's Article," *Journal of European Economic History* 9 (Spring 1980): 209–14; "Open Field System," in *The New Palgrave: A Dictionary of Economic Thought and Doctrine* (London: Macmillan, 1988).

BOSWELL: Sir Alexander Dick tells me, that he remembers having a thousand people in a year to dine at his house. . . .

JOHNSON: That, Sir, is about three a day.

BOSWELL: How your statement lessens the idea.

JOHNSON: That, Sir, is the good of counting. It brings every thing to a certainty, which before floated in the mind indefinitely.

Any account will have features of a fairy tale, but the best tales go something like this. Most people in England before the nineteenth century were villagers, living in roughly 8,500 clusters around a church. The typical village before the nineteenth century was two square miles or so, 1,300 acres, say, of which about 900 acres, the area of Central Park, would constitute the plowed land subject to scattering. The plowed land was divided into three (sometimes two) great fields subject to a communal rotation, called open fields because none of the holdings within them were enclosed by fences. Each great field had a different crop in the rotation wheat-barley-fallow. Not all villages scattered their strips in the open fields, and not all indeed had open fields, but in the Middle Ages the heavily populated lowlands away from the spine of west Britain, and the valleys even of the West, did have them and did scatter their strips.

Consider first the average acreage held. Perhaps eighty families lived in the village, some two or three hundred souls. The majority of the souls at the height of the system were tenants of the lord (such tenancies made them serfs, officially speaking), though freeholding was not rare. According to M. M. Postan's survey of 104 thirteenth- and late-twelfth-century manors, 45 percent of the holdings were minute, averaging 3 acres or so, on which a family could not have subsisted.¹ (The smallholders worked for larger landholders; half the adult population had no land at all: England had a rural proletariat well before modern times.) The smallholders occupied only 11 percent of the land of the village – a point about smallholders worth bearing in mind for later use. For present purposes the smallholders can be ignored. The share of the land they held was so small that they had little voice in the layout of the fields.

The bulk of the plowed land was held in virgates or half-virgates, traditional measures of land, plowable four or five times a year by a full team or by a half-team. Full virgaters (at 27 acres, say, on average;

Kosminsky suggests 30 acres) were 22 percent of the tenants in Postan's survey, and half-virgaters (at 13.5 acres on average) were 33 percent of the tenants. (Kosminsky's calculations from a royal survey of twenty-two thousand holdings in 1279 give similar results: The virgates of serfs and freemen were 22 percent, half-virgates 31 percent.) The average size of a tenancy above subsistence was therefore about 19 acres. This is the figure sought: The typical medieval tenant relying on his land for his bread would hold roughly 19 acres.²

Consider next the average number of strips per acre, to estimate how many strips the 19-acre average holding contained. The records are voluminous. In his pioneering work *English Field Systems*, for example, H. L. Gray extracted evidence from surveys of manors, church ("glebe") holdings, and grants of land from six hundred villages from the twelfth to the nineteenth century.³ He extracted it to detect crop rotations (the two-, three-, or *N*-field system). But a fifth of his evidence mentions the number of strips. For instance, at Claydon St. Botolph, Buckinghamshire, in the reign of Henry VIII an account of a 26½-acre holding mentions that in the three fields of the village the land was arranged into 15, 11, and 15 legal strips.⁴ Trimming away the cases outside the chief scattered-strip areas and the cases later than the seventeenth century gives ninety-six cases averaging 1.42 strips per acre. So: There were perhaps 1.4 strips per acre on 19 acres, or 27 strips on the average holding.

Consider finally the effective strips per legal strip. Chapell's twenty-three strips at Laxton tended to cluster together, at one place separated from each other by a single neighboring strip twenty yards broad, at another place laid end-to-end across a road. It went this way in the open fields. Christian Coxe in Llancadle, Glamorgan, in 1622 held 39 acres in twenty-seven nominal strips – that is, twenty-seven strips recorded in the field book.⁵ When only one foreign half-acre strip separated three of Coxe's, however, the three counted for farming purposes as one, though legally three. If the three strips had been different enough to warrant the bother, Coxe and his neighbor could have traded land to eliminate it. That they did not suggests the difference was small.

The adjustment for effective strips must be to some extent arbitrary.

² Kosminsky, *Studies*, pp. 35, 216, 223.

³ (Cambridge: Harvard University Press, 1915), pp. 23, 140, 307n, 309, 373, 389, 423–29, 549, and Appendix II.

⁴ *Ibid.*, p. 455.

⁵ M. Davies, "Field Systems of South Wales," in A. H. R. Baker and R. A. Butlin, eds., *Studies of Field Systems in the British Isles* (Cambridge: Cambridge University Press, 1973), pp. 504–505.

¹ M. M. Postan, "Medieval Agrarian Society in Its Prime: England," in M. M. Postan, ed., *The Cambridge Economic History of Europe*, vol. 1, 2d ed. (Cambridge: Cambridge University Press, 1966), p. 619; cf. E. A. Kosminsky, *Studies in the Agrarian History of England in the Thirteenth Century*, trans. R. Kisch, ed. R. H. Hilton (Oxford: Blackwell Publisher, 1956; published in Russian 1935 and 1947), p. 216.

Table 1.1. *Effective plots per legal plot at Laxton, 1635*

Holder	Acres of field	Legal no. of strips	Effective/legal
Thomas Tailer, Sr.	48	78	0.62
Thomas Hassard	34	73	0.60
Edward Kelsterne	28	45	0.73
Hugh Tailer	25	44	0.70
John Chapell	24	23	0.83
Robert Rosse	14	23	0.61
Average			0.68

Note: The acres exclude closes (big pieces of land outside the system) and town land for house, barn, and garden.

Source: C. S. Orwin and C. S. Orwin, *The Open Fields* (Oxford: Clarendon Press, 1938), pp. 137–42 and Part III (Survey and Maps).

If one takes a cluster of legal strips to be a single effective one so long as no more than a single foreign strip separated the cluster and no part was outside a radius of, say, 150 yards of the center, then Coxe's twenty-seven legal reduce to twelve or so effective strips. Applying the same criterion to the holdings of six men of Laxton suggests that the effective number was about two-thirds of the legal number (see Table 1.1).

So: The average holding of about 19 acres of plowland would contain $19 \times 1.42 = 27$ legal strips, or $19 \times 1.42 \times 0.68 = 18.4$ effective strips. That is to say, the number of effective strips was about the same as the number of acres, that same 19. Therefore in each of the three great fields the typical tenant would hold six or so effective strips, scattered about the field. Keep the six in mind, for the scale: In each of three open fields the six strips on average were scattered over 300 acres, a half square mile, a six-by-six assemblage of Midwestern city blocks, the area of Central Park below the Metropolitan Museum of Art. Each effective strip was about three city blocks from its nearest neighbor in the holding.

The scattering survived for a long time. The earliest origins of the system are obscure, but during the high Middle Ages it prevailed in lowland and Saxon Britain; even in the higher and Celtic lands to the west and north "runrig" was similar and common. Yet the open-field system was not simply a survival of custom lost in primeval mist. Joan Thirsk has noted that in Germany "it is possible to observe the gradual parcelling of rectangular fields into strips as late as the seventeenth and

even the eighteenth centuries," and the same may be said of Russia.⁶ The English evidence is similar, though new scattering ends earlier. In the thirteenth century the county of Kent and its neighbor Sussex had loose open-field systems. By the sixteenth century, however, Kent was entirely enclosed, with no scattering; yet parts of Sussex had developed a rigid and elaborate system of scattering.

Enclosure was going on in England from the fifteenth century, with or without official sanction. Even at the height of the system a village would have a ring of closes around its open fields. A German case of early enclosure occurred on lands owned by the Abbey of Kempton in Bavaria, on which consolidation, initiated by the peasants themselves, began in the sixteenth century, three centuries before it began in neighboring places.⁷ It is not reasonable, in other words, to view the open fields in the way Gonner did seventy-five years ago, as remnants of ancient racial patterns, bound by rules "consecrated by immemorial usage . . . [that] made conscious change well nigh impossible."⁸ On the contrary, conscious change was easily possible, away or toward a system of scattering.

The prevalence of scattering may be judged by what remained in England in 1700 – commercial and progressive England, at the dawn of the industrial age. Much is made of enclosure by act of Parliament, concentrated in a few great waves from 1760 to 1820; and indeed six million acres out of England's twenty-four million or so acres useful for agriculture were enclosed this way. The six-million figure may be high, because within a nominally "open" village, as was just noted, much land was "anciently" enclosed, though normally the ancient enclosures would not be recorded in the enclosure act.

On another and more important count, however, the six-million figure is too low, because it does not include land enclosed without parliamentary sanction. Gilbert Slater guessed in 1912 that during the eighteenth century some eight million acres beyond the six million had been enclosed by nonparliamentary agreement, and Michael Turner recently guessed seven million.⁹ J. D. Chambers reckoned on the basis

⁶ Joan Thirsk, "The Common Fields," *Past and Present* no. 29 (1964): 3–25, p. 3.

⁷ Alan Mayhew, *Rural Settlement and Farming in Germany* (New York: Barnes & Noble, 1973), p. 187.

⁸ E. C. K. Gonner, *Common Land and Inclosure* (London: Macmillan, 1912), p. 35.

⁹ Gilbert Slater, *The English Peasantry and the Enclosure of Common Fields* (London: Constable, 1907), pp. 63–65; Michael Turner, *Enclosures in Britain, 1750–1830* (London: Macmillan, 1984), p. 33.

of local evidence that in eighteenth-century Nottinghamshire fully 41 percent of the land was enclosed by private agreement as against only 25 percent by parliamentary act.¹⁰ A figure for all of England would have to come from a random sample of villages studied in similar detail. What looms through the statistical haze is that something over half of the agricultural land of England still needed enclosure in 1700: Out of the twenty-four million total, six million acres were enclosed after 1700 by parliamentary act and perhaps an equal acreage by agreement. The share of land is in any case an underestimate of the more relevant figure, the share of employment, or still better of farming output, because the places of surviving open fields were cultivated rather than grazed. By any measure, much of England remained to be enclosed in 1700. The open fields had survived for centuries.

Enclosure was not so simple as sheep eating men. A hardy fable supposes that the sixteenth century was the great age of enclosure, grazing land absorbing plowlands. The timing in the tale is wrong. Grazing land in the sixteenth century was falling, not rising, since population was rising swiftly and new mouths demanded to be fed. Edwin Gay used official inquiries into the matter to show that under 3 percent of the cultivated land of England was enclosed from the middle of the fifteenth to the end of the sixteenth century; one could accept a higher figure and still forsake the old fable.¹¹ In the eighty years since he wrote, no persuasive evidence has been offered to the contrary. Enclosures by agreement went on apace, it seems, in the late fourteenth and early fifteenth centuries, then again in the seventeenth century. Far from being the great age of enclosure, the sixteenth century was a lull. To repeat, there was much left to be done by the eighteenth century. English open fields survived into modern times.

The scattering survived in other parts of Europe still later. The classic open field had dominated Northern Europe in a swath from the middle of England across northern France and Germany, with a northern extension into Scandinavia and through the north Slavic lands to the Urals. The breadth of its hold suggests that the peasants approved. Since the English example of the eighteenth century, followed shortly by Sweden and France, one government after another in Northern

Europe passed laws designed to eliminate scattering by force, persuasion, or subsidy. Yet its end was achieved painfully slowly. The Dutch were still passing acts in the 1920s and 1930s making consolidation compulsory if favored by a majority in a village and offering large subsidies (all the costs incurred in the attempt, for example, if the consolidation was not voted and achieved).¹² Nonetheless in the 1950s Dutch consolidation was not complete. France was still consolidating villages in the 1930s and 1950s. The first of many general consolidation acts in Germany was passed in Hannover in 1848 – the date can stand as an emblem for the association of consolidation with progressive politics – yet to this day the farms in many parts of Germany are scattered, if no longer subject to the medieval correlates of scattering.¹³ In Poland, too, the land is still scattered, because not collectivized. And the Stolypin Reforms in Russia before the Revolution did not eliminate scattering there.

Scattering of some sort has not been confined in modern times to the regular open-field areas of northern Europe. In the early 1960s Folke Dovring estimated that “at least one-third, and probably over half, of the agricultural land in Europe would need re-allocation or consolidation in order to do away with the technical disadvantages of bad layout, including among these the constraint to conform with neighbours in farming operations.”¹⁴ In 1969 the OECD delivered a similar judgment, observing that during the early 1960s in Spain the average number of separate plots per farm was 14 and in Germany 10, both countries having roughly a third of their farms with 10 plots or more.¹⁵ The median number of plots on Czechoslovakian farms in 1938 was 30, and on Portuguese farms in 1940 it was 26.¹⁶ Around 1950 in parts of Greece the farms had 50 to 100 (official) plots per farm, and ten years

¹⁰ J. D. Chambers, *Nottinghamshire in the Eighteenth Century* (London: P. S. King, 1932), p. 149; cf. R. I. Hodgson estimates, quoted in Turner, *Enclosures*, p. 35, that 56 percent of enclosure in County Durham was voluntary.

¹¹ E. F. Gay, “Inclosures in England in the Sixteenth Century,” *Quarterly Journal of Economics* 17 (1902–1903): 576–97.

¹² Philine R. Vanderpol, “Reallocation of Land in the Netherlands,” in Kenneth H. Parsons, R. J. Penn, and P. M. Raup, eds., *Land Tenure: Proceedings of the International Conference on Land Tenure and Related Problems in World Agriculture Held at Madison, Wisconsin, 1951* (Madison: University of Wisconsin Press, 1956), pp. 548–54.

¹³ Mayhew, *Rural Settlement*, pp. 178–99.

¹⁴ “The Transformation of European Agriculture,” in H. J. Habakkuk and M. Postan, eds., *The Cambridge Economic History of Europe*, vol. 6 (Cambridge: Cambridge University Press, 1965), pp. 630ff.

¹⁵ Organization for Economic Cooperation and Development, *Agricultural Development in Southern Europe*, Agricultural Policy Reports (Paris: OECD, 1969), pp. 18, 83.

¹⁶ Folke Dovring, *Land and Labor in Europe in the 20th Century*, 3d ed. (The Hague: M. Nijhoff, 1965), p. 20, with twenty other cases.

later not much had changed.¹⁷ In a backward part of Ireland in the 1960s the typical holding consisted of 60 scattered plots.¹⁸

Scattering occurs widely outside Europe, too. Among the farmers of east central Tanzania in the late 1960s "the ideal pattern is to hold a number of scattered fields planted with several crops."¹⁹ A similar system can be found elsewhere in Africa and in Latin America. It is common in Asia. Indian concern with scattering, embodied at the state level in a series of consolidation acts, is sixty years old; but the problem (for so it is viewed by planners) remains.²⁰ A 1969 survey team of the Asian Development Bank, noting the prevalence of scattering in Japan, Korea, Taiwan, Indonesia, Thailand, Pakistan, and India, argued that "the basic cause of operational inefficiency on small farms is the poor farm layout. . . . A farm of one hectare may be divided into more than a dozen small fields."²¹ Scattering is not a merely English and medieval phenomenon.

Why it is a puzzle: the inefficiency of scattering

If scattering were not so obviously hurtful to average output it would not be puzzling for the economic point of view. Farmers put designs on their barns and use Mail Pouch tobacco, and no economist objects. It is only when the farmers commence throwing away a big share of output that the economist becomes alarmed.

The question that must be answered is the extent to which scattering threw away output. The best way to answer it would be to look at output before and after enclosure. Unhappily one cannot get such statistics on output, or at least one cannot for a large enough range of farms to make an estimate believable. The English statistics on output during enclosures are poor because there was little reason for a farmer to keep records. (By contrast, in the Middle Ages the statistics of yields are excellent, at least on the lord's farm, because strict account-

ing was needed to check stealing by agents of the lord.) Yields per acre do seem to have risen somewhat in the eighteenth century, during parliamentary enclosure (and in the seventeenth century during voluntary enclosure), but other and more important things were happening as well, especially the introduction of Dutch methods and New World crops. The statistics on yields are uncertain and uncontrolled. For the little they are worth, the estimates of rising yields from all causes range from a mere 10 percent per acre over the eighteenth century (and the new agriculture cost *more* in labor) up to 61 percent.

The way around the obstacle is the theory of rent. The value of the increased output, if any, had to accrue to someone as income. If an enclosure was productive it would raise the rewards to inputs of labor, capital, and land. Labor and capital, however, could move between the enclosing village and the rest of the world. Their mobility prevented the enclosure from increasing their prices. More labor and capital would be hired in a more productive village, but merely at the going prices of labor and capital. Land, however, cannot move. Its price would be increased by enclosure. In fact, all the increased productivity of the village, net of the opportunity cost of the labor and capital brought in, would be earned by the landlord.²²

Happily, the change in rent does the job better than the more obvious and less obtainable measures of increased output. It reflects only the net improvement, not the higher output from a mere piling up of labor and capital. And it reflects as it should the farmers' expectations, not their achievements. A little economic theory goes a long way here, valorizing evidence otherwise merely ornamental. The theory was familiar of course to Ricardo and other observers of English agriculture during the enclosure movement. It was after all the basis for their dismal prediction that the land would pay the taxes imposed on agriculture but would also collect the improvements.

The evidence on rents is ample. It can best be catalogued by source, proceeding from journalistic assertion to the records of actual holdings. The journalistic assertions can be ranged from earliest to latest, giving a (misleading) impression of chronological depth. The 1534 edition of Fitzherbert's *Book of Husbandry*, for instance, asserted that "by the assent of the lords and the tenants every neighbor may exchange lands with [an]other. And then shall his farm be twice so good in profit to the tenant as it was before."²³ The tenant would then be

¹⁷ Euthymios Papageorgiou, "Fragmentation of Land Holdings and Measures for Consolidation in Greece," in Parsons et al., eds., *Land Tenure*, pp. 543-48; Kenneth Thompson, *Farm Fragmentation in Greece: The Problem and Its Setting*, Research Monograph Series, no. 5 (Athens: Center of Economic Research, 1963).

¹⁸ John C. Messenger, *Inis Beag: Isle of Ireland* (New York: Holt, Rinehart & Winston, 1969), p. 27.

¹⁹ T. O. Beidelman, *The Karugu: A Matrilineal People of East Africa* (New York: Holt, Rinehart & Winston, 1971), p. 18.

²⁰ S. K. Agarwal, *Economics of Land Consolidation in India* (Delhi: Chand, 1971).

²¹ OECD, 1969, p. 645; cf. Setsuro Hyodo, "Aspects of Land Consolidation in Japan," in Parsons et al., eds., *Land Tenure*, pp. 558-59.

²² A more formal argument appears in McCloskey, *The Applied Theory of Price* (New York: Macmillan, 1985), pp. 488f.

²³ Master Fitzherbert, *The Book of Husbandry* (1534), ed. W. W. Skeat (London: English Dialect Society, 1882), p. 77 (I have modernized the spelling).

willing to pay twice as much in rent, too, unless "profit" means exactly "net of rent." Norden's *Surveiors Dialogue, Very Profitable for All Men To Peruse, But Especially for Gentlemen . . . Willing To Buy, Hire, or Sell Lands* reckoned enclosed land at 50 percent greater than open. Half a century later Samuel Fortrey put it at three times greater.²⁴

The precision and the variation are misleading. The figures are always rounded and undocumented, and their definitions are now uncertain. *The City and Country Purchaser and Builder* said about 1667 that "enclosed lands in many places doth yield half as much, or as much more, as lands in common fields."²⁵ But is "yield" the yield of rent (a sense that the *Oxford English Dictionary* last records in 1582) or a yield of grain (a secondary but growing sense in the seventeenth century, two centuries before it reassumed its monetary garb as the yield on bonds)? In the latter and more probable case the sum left over for the residual claimant, the landlord, would be larger still. But no matter. These are mere rough guesses, the statistical equivalents of saying, "Enclosure increases rent mightily – more than conservatives might suppose."

Similar figures in the next century might be drawn from the pamphlet literature, though the pamphlets are of course biased. The pamphlets were written against enclosure or in favor of it, and the ones that mention the improved rents are in favor. When Henry Homer, a commissioner in charge of enclosures and an enthusiast for the practice, sets "the general improvement of the field" from the landlord's point of view at a doubling, one cannot give the assessment much weight.²⁶ One can give more weight to observers later in the century, after the propaganda war in favor of parliamentary enclosure had been won. It is worth quoting at length, for instance, the advice William Marshall, a respected writer on agricultural subjects, gave to landlords in 1804 ("inclosure" means at bottom fencing, "privatization" in the modern jargon):

Among the circumstances which influence the marketable value of lands . . . their state with respect to inclosure is a matter of great consideration. Open

lands, though wholly appropriated, and lying well together, are of much less value, except for a sheep walk or a rabbit warren, than the same land would be in a state of suitable inclosure. If they are disjointed and intermixt in a state of common field, or common meadow, their value may be reduced one third. If the common fields or meadows are what is termed Lammas land, and becomes common as soon as the crops are off, the depression of value may be set down at one half what they would be worth, in well fenced inclosure, and unencumbered with that ancient custom.²⁷

One can also give weight to the generally sober, though still pro-enclosure, productions of the Board of Agriculture, a semiofficial group of agronomists who produced quarto drafts (1793–94) and octavo final editions (1796–1814) of *A General View of the County of X* for each British county. Many of the statistics are undocumented opinions, but the opinions nonetheless of qualified observers. Clark's quarto report on Herefordshire asserted, for example, that "no sooner is land inclosed, than it lets for nearly double the rent than it did when it was in common fields."²⁸ Pitt's octavo *Staffordshire* reckoned that "in all cases . . . common-field land is improved at least five shillings per acre by enclosure," the rent being from 10 to 30 shillings an acre after enclosure and after some inflation of grain prices.²⁹ Holt's quarto *Lancashire* reckoned a doubling or "in many instances" a trebling of rents immediately on enclosure, though this is probably enclosure from wasteland, not from land under the plow.³⁰ Unfortunately these were regions to the north and west of the main swath of open fields surviving. Only 4.3 percent of the area of Herefordshire and 3.3 percent of Staffordshire was arable enclosed by act of Parliament, as against 40 or 50 percent further east and south.³¹ But the opinions further east and south are similar. In his 1813 final report on Oxfordshire, for example, Arthur Young quotes a Mr. Davis of Boxham (unfortunately for present purposes, still another commissioner of enclosure): "In general, rents have been increased by the enclosures in Oxfordshire, reckoned at the first letting, nearly double; and much more after ten or twelve years."³² The first letting would be attributable to the promise of enclosure alone, the rises later perhaps to further improvements, or more probably to the rise in the price of grain.

²⁴ Norden 1607 and Fortrey 1663 (*Interest*) are quoted in E. M. Leonard, "The Inclosure of Common Fields in the Seventeenth Century" (1905), in E. M. Carus-Wilson, ed., *Essays in Economic History*, vol. 2 (London: Arnold, 1962), p. 236.

²⁵ Quoted in Joan Thirsk and J. P. Cooper, eds., *Seventeenth Century Economic Documents* (Oxford: Clarendon Press, 1972), p. 288.

²⁶ Henry S. Homer, *An Essay on the Nature and Methods of Ascertaining Specifick Shares of Proprietors upon the Inclosure of Common Fields*, 2d ed. (Oxford, 1769), p. 64.

²⁷ *On the Landed Property of England* (London, 1804), pp. 13–14 (italics deleted; mine added).

²⁸ John Clark, *Herefordshire* (1794), p. 74; cf. p. 70n.

²⁹ W. Pitt, *Staffordshire* (1796), pp. 26, 40.

³⁰ John Holt, *Lancashire* (1794), p. 51.

³¹ Michael E. Turner, *English Parliamentary Enclosure* (Folkestone: Dawson; Hamden, Conn.: Archon, 1980), pp. 180–81.

³² Arthur Young, *Oxfordshire* (1813), p. 94.

Not all testified to doubling on average. Davis in his quarto *Wiltshire* remarks that "the difference of rent and produce is not so great as in many counties," setting it at a third or a half.³³ In his quarto *Warwickshire* Wedge reports that in the forty years before his report the south and east of the county had been enclosed, producing "an improvement of nearly [that is, only] one-third of the rents, after allowing for expenses."³⁴ The expenses he puts at 45 shillings an acre (a reasonable figure) "when frugally managed; which, in many instances, was not the case," though there can be some doubt that it is appropriate to resubtract the costs from the increase in rents (which reflect net gain, after costs). Adopting his accounting, if rents before enclosure were about 10 shillings an acre and the interest in perpetuity to pay back the expenses of 45 shillings an acre were 6 percent, the implied rise in rents would be about 60 percent.

Other testimony from the *General Views* deals with particular enclosures, not with opinions "in general" or "in all cases" (see Table 1.2).

Late in the enclosure movement the doubling was the figure used for conventional purposes. For instance, the leading student of the enclosure movement, Michael Turner, cites a letter by John Fellows, commissioner for an unsuccessful attempt to enclose Quainton, Buckinghamshire, as using the doubling convention.³⁵ John R. Ellis quotes the parties involved in the enclosure of Aldbourne, Wiltshire, in 1805–1809 as using it.³⁶ In the General Enclosure Act of 1801 Parliament had shown it was well aware of the big capital gains to be had from enclosure, forbidding the enclosure commissioners to buy land in the village until five years after their work.³⁷ Even for the few fields unenclosed by 1844 a commissioner in charge of commuting tithes held out to a Select Committee on Commons Inclosure the prospect of a rise in rents from their level of 15 or 16 shillings per acre to 30 shillings "by the mere simple re-distribution of land" that was "now incapable of cultivation according to improved rules of good husbandry."³⁸

The best sources are account books of estates experiencing enclosure. The vigor with which estate studies have been pursued in England makes possible some general impressions. For an early instance,

Table 1.2. *Rises in rents immediately after enclosure, 1765–1805, from General Views by the Board of Agriculture*

Village	County	Date of enclosure	Rise in rent	Source
Elford	Staffs.	1765	"Trebled"	W. Pitt, <i>Staffs.</i> (1796), p. 41
Lidlington	Beds.	1775	83% (12s. to 22s.)	T. Batchelor, <i>Beds.</i> (1808)
Coney Weston	Suffolk	1777	Doubled	A. Young, <i>Suffolk</i> (1794), p. 53
23 villages	Lincs.	Before 1799	92% (rise in rent from £15,504 to £29,760)	Young, <i>Lincs.</i> , pp. 77, 83
Risely	Beds.	1793	90%–157% (7–10s. to 18–19s.)	Batchelor, <i>Beds.</i> (1808)
Milton Bryant	Beds.	1793	88%	Ibid.
Queensborough	Leics.	1793	92%–130% (10–12s. to 23s. "now")	Pitt, <i>Leics.</i> (1809), pp. 70–76
Dunton	Beds.	1797	113% (8s. to 17s.)	Batchelor, <i>Beds.</i> (1808)
Enfield	Middx.	1803	33% (£18,000 to £24,000) ^a	J. Middleton, <i>Middx.</i> (1807), p. 142
Wendelbury	Oxon.	ca. 1805	140%–167% (9–10s. to 24s., latter free of tithes)	Young, <i>Oxon.</i> (1813), p. 37

^aThe second figure is for 1805. He laments that "many have unfortunately adopted [he means 'retained'] the old plan" of a two-field rotation.

John Broad used the Verney family papers to extract most of the relevant statistics on the enclosure by agreement of Middle Clayton, Buckinghamshire, in 1654–56. The rent rolls in 1646 imply rents of about 8 shillings an acre (depressed perhaps by the Civil War: A surveyor's evaluation in 1648 had put them at 11.6 shillings an acre). The actual rent paid in the three years after the enclosure was 17.8 shillings per acre, a rise of 53 percent on 11.6 shillings and 123 percent on 8 shillings.³⁹

Sometimes, of course, enclosure was not such a good idea. Brenda Swann has given an eighteenth-century example.⁴⁰ A sixty-acre farm at

³³ Thomas Davis, Sr., *Wiltshire* (1794), p. 83.

³⁴ John Wedge, *Warwickshire* (1794), pp. 20f.

³⁵ Michael E. Turner, "The Cost of Parliamentary Enclosure in Buckinghamshire," *Agricultural History Review* 21 (1973): 35–46, p. 36.

³⁶ J. R. Ellis, "Parliamentary Enclosure in Wiltshire," Ph.D. thesis, Bristol University, 1972, p. 93.

³⁷ 41 Geo. III, c. 109, para. II.

³⁸ SP 1844, vol. 5, question 257.

³⁹ John Broad, "Sir Ralph Verney and His Estates, 1630–1696," D.Phil. thesis, Oxford University, 1973.

⁴⁰ B. A. S. Swann, "A Study of Some London Estates in the Eighteenth Century," Ph.D. thesis, London University, 1964.

Tempsford, Bedfordshire, owned by Jesus College rented at £30 in 1747. It was enclosed in 1777 at a cost of about seven years of such rents. After enclosure the college was able to lease it for three years at £45, an advance of 50 percent on the earlier rent, but a modest 7 percent return on the costs. Furthermore, after this first lease expired the college had to settle for leases of £40 and then of £36. At the last the rise in rents was only about 20 percent and the 1.9 percent yield on the investment was a full percentage point below the yield on consols.

A bigger case is the Longleat estates in Wiltshire from 1773–1808, analyzed by J. R. Ellis.⁴¹ Enclosure there produced *no* increase in rent. And at Warminster, for instance, rental surveys of 1781 and 1801, bracketing the enclosure of 1783, show a rise of 58 percent on land anciently enclosed, but a rise of only 28 percent on the newly enclosed lands.⁴² Yet it must have been peculiar land to fall in price relative to the other lands after enclosure. Recall the remark by the reporter on Wiltshire that “the difference of rent and produce is not so great as in many counties.” So it would seem. Ellis remarks that the earlier “rents” may have been mere notional figures, higher than equilibrium figures, with tenants being persuaded to accept holdings by the prospect of remissions and easy accumulation of arrears. We do not know.

A more typical figure was calculated from the Harcourt family papers by J. R. Walton, a rise in rents from £1,415 in 1773, a year before the enclosure of their lands, to £2,444 in 1777 – a 73 percent increase.⁴³ Swann’s work provides other examples. Rents on a farm owned by Jesus College of about ninety acres in Great Wilbraham, Cambridgeshire, rose from 9 shillings an acre in 1796 to 30 shillings an acre in 1802, after enclosure, a rise of more than 200 percent. Holdings of St. Bartholomew’s Hospital in Bottisham, Cambridgeshire, rented for £465 a year in 1794 and £1,100 in 1801, after enclosure, a rise of more than 130 percent; seven holdings in Northamptonshire “more than trebled” in rent after enclosure.⁴⁴

The holdings from St. Bartholomew’s of a Mr. Fiennes Trotman illustrate a number of points. Swann records that in 1753 he was granted a twenty-one-year lease on fifty-nine open-field acres at Heath,

⁴¹ Ellis, “Enclosure in Wiltshire,” pp. 119–25.

⁴² *Ibid.*, p. 135.

⁴³ J. R. Walton, “The Residential Mobility of Farmers and Its Relationship to the Parliamentary Enclosure Movement in Oxfordshire,” in A. D. M. Phillips and B. J. Turton, eds., *Environment, Man and Economic Change* (London: Longman, 1975), p. 241.

⁴⁴ Swann, “London Estates,” pp. 153f.; cf. pp. 167, 209.

Oxfordshire (with rights to graze a certain number of animals on a commons of eighty acres). Such long leases were usual, making rents a long moving average of the rack rent, though rack renting was not unheard of. The interpretation of the figures is not straightforward. The lease cost him a mere £4 per year on the holding in total but also a £160 fee in advance, an “entry fine.” At 6 percent interest (for which there is evidence in the accounts) the entry fine amounted to an additional £13.6 a year, giving a total of 6 shillings per acre. The usual formulas for evaluating an annuity apply. The formula needs to allow for the possibility of Trotman dying. Under traditional rules for leases, the lease expired if Trotman died, and if he died the day after the lease was signed the entry fine would not be refundable. Allowing for such an eventuality would of course raise the pre-enclosure rent. In 1772 the village was enclosed, with forty-seven acres of closes allotted to Trotman in exchange for his fifty-nine acres of open field. (The other acreage probably went as compensation to the holders of agricultural tithes.) His new lease of 1774 extended for fourteen and a half years, at £14 total, the same price per acre ($£17.6 \times (47/59) = £14$) as he paid before, “possibly [as] some compensation for the expenses he incurred in enclosing.”⁴⁵ These expenses, as we have seen, were large relative to annual rents. When in 1789 the lease expired, the new rent finally acknowledged the underlying value of the now-enclosed land: It rented for 11.9 shillings an acre, double the preenclosure level.

A difficulty with the figures for the late eighteenth century is that the price of grain was rising, especially during the wars of 1793–1815. Leases were often for twenty-one years (though the authors for the Board of Agriculture complained that many counties had annual or short leases), and a long lease would be a bad bet if the acceleration of inflation had not been foreseen. Enclosure gave the landlords an opportunity to withdraw the bets. Inflation of 1 or 2 percent per year does not look large by recent standards, but it sufficed. Pitt’s *Leicestershire* in 1809 noted that the Duke of Rutland’s rent had increased from 6 shillings an acre before enclosure to 18 shillings after, “in part produced by the enclosure, but in part certainly by a change of times and circumstances.”⁴⁶ Most of Leicestershire’s and Rutland’s enclosure took place before 1793, yet the 18-shilling figure was doubtless war-inflated.⁴⁷

In the thirty years before the 1790s, also, the price of grain had been

⁴⁵ *Ibid.*, p. 206.

⁴⁶ William Pitt, *Leicestershire* (1809), p. 15.

⁴⁷ Turner, *Parliamentary Enclosure*, p. 186, on enclosure in Leicestershire and Rutland.

rising somewhat relative to the price level. The chief landlord of Aspley Guise, Bedfordshire, enjoyed a rise in rents from £85 in 1759, on the eve of the enclosure, to £158 in 1781.⁴⁸ The rise looks less impressive when set beside the rise in the price of grain, from around 30 shillings per Winchester quarter to 45 shillings over the same span. The rent was the residual claimant, and would therefore rise more than the price of grain. The price of land, as Ricardo said, was high because the price of grain was high, not grain high because the price of land was high.

One possible way around the difficulty is to examine statistics on rents in open and enclosed villages, or on open and enclosed farms in different villages. Robert Allen has done so, using elegantly the data on a broad sample of large farms in the 1760s scattered through Arthur Young's tour books.⁴⁹ Some years ago I did a similar exercise with the mouthwatering statistics in Parkinson's *Rutland* (1808).⁵⁰ From the statistics on village differentials Allen and I both arrive at a low estimate of the rise in rent, much lower than the results from the time series. For instance, in my Rutland calculations the rent accruing to landlords in nine open villages was 14.9 shillings per acre as against 22.2 shillings in forty-four enclosed villages, a difference not far from the time series. As Allen and I have stressed, however, the "rent" relevant for productivity calculations must be the full economic rent, especially when comparing rents on farms in different villages, and must therefore include the poor rates and tithe. Including rates and tithes makes the figure for Rutland 21.9 shillings as against 26.0, a difference between open and enclosed villages of only 19 percent. (Attempts to control for land quality have little effect on the figures.)

The low differential is a puzzle. True, the "cross sections" have methodological difficulties of their own. The chief one is familiar from econometric studies of production functions, namely, that a "sample" of firms having to participate in the same market will be biased toward finding no differences of efficiency. The market pushes out the un-

usually inefficient, with the result that the open fields that survived must have been especially suited to openness. To put it another way, the sample is self-selected: Places do not become enclosed by accident. It is suggestive, for instance, that all the nine open fields surviving in the tiny county of Rutland (eighteen miles across at its broadest) were in the southeastern part of the county, in Wrandyke hundred.

A better approximation to cross-sectional control is provided by rents on enclosed and open land in the same village. These tend to return to a figure of a doubling (or a little less: 50 to 100 percent would be a persuasive range). In Batchelor's *Bedfordshire* the open fields of Cranfield rented for 10 shillings an acre, the enclosures for 20; in Eversholt the figures were 12 and 23 shillings.⁵¹ Pitt's *Worcestershire* (1813) reports "open field farms" at 20 shillings an acre (at the height of the wartime inflation), the same 20 for enclosed farms on inferior land, but 30 shillings, and a few 40 and 50, on better land.⁵²

Of course such figures could be doubted, as irrelevant to open fields in their heyday. If the purpose is to explain the persistence of scattering through the centuries from the thirteenth to the eighteenth, a selection bias of another sort is introduced by focusing on the differential at the end. Since open fields in the end disappeared, one would expect if anything that late differentials would be greater than early differentials. Open fields in the fourteenth century would be more productive relative to enclosed farms than in the eighteenth century.

Gregory Clark has recently shed light on the problem, using probate records for the farms of manorial lords during the fourteenth century. In eleven cases (mainly in Wiltshire) the rents on acreage outside the open fields of a village were 128 percent on average above those inside.⁵³ The true figure is probably somewhat lower: Clark notes that open-field acreage carried with it a right to graze on the stubble after the harvest, apparently not valued in the probate records; and the enclosed acreage would probably have been better cared for. It is comforting, though, to see that the voluminous evidence in the twilight of the system is not contradicted by the scraps of evidence available at its noon.

The rise of rent on an enclosure, then, was 100 percent notionally, and probably a little lower in practice. Robert Allen, again, has argued

⁴⁸ G. H. Fowler, "The Strip Map of Aspley Guise, c. 1745, with an Analysis of the Enclosure Award, 1761," *Quarto Memoirs of the Bedfordshire Historical Record Society* 2 (1928-36): 21-35.

⁴⁹ Robert C. Allen, "The Efficiency and Distributional Consequences of Eighteenth Century Enclosures," *Economic Journal* 92 (1982): 937-53, and "Enclosure, Capitalist Agriculture, and the Growth of Corn Yields in Early Modern England," University of British Columbia, Department of Economics, Discussion Paper 1986-39. Allen is writing a book on the subject.

⁵⁰ "Theses on Enclosure," *Agricultural History: Papers Presented to the Economic History Society Conference, Canterbury, April 1983* (Agricultural History Society), esp. pp. 69-71.

⁵¹ Thomas Batchelor, *Bedfordshire* (1808), p. 34.

⁵² William Pitt, *Worcestershire* (1813).

⁵³ From Gregory Clark, "The Cost of Capital and Medieval Agricultural Technique," Stanford University Department of Economics working paper, August 1986, Table 5, "Annual Value of Arable in Common and in Severalty," geometric average of ratios; the paper is forthcoming in *Explorations in Economic History*.

recently in a series of brilliant papers that contrary to the reasoning I introduced to the literature in 1972 the rise in rent does not measure a rise in productivity. As noted above, he reckons from a sample of 231 farms reported by Arthur Young in the 1760s (the selection bias that may afflict such samples has already been noted) that economic rent did *not* increase when a farm was enclosed. Why then did the rent paid increase? "Rents rose when villages were enclosed either because the efficiency of agriculture increased and hence the value of the land rose *or because open field rents were less than the value of the land and rents were raised at enclosure to eliminate the disequilibrium.*"⁵⁴ Allen is arguing that open fields rented below equilibrium.

It has long been recognized in the literature, as has been noted here, that parliamentary enclosure did truncate all leases in a village, and that in a period of accelerating inflation such as the late eighteenth century it is not strange to suppose that a parliament of landlords would enact a renegotiation of leases.⁵⁵ Yet Allen's argument and therefore his sample and method face the problem that the differential favoring enclosure seems to have been of long standing, not confined to the various French wars of the eighteenth century. However plausible would be a temporary disequilibrium in the 1760s, say, it would be odd for landlords to surrender land at rents below equilibrium for centuries. A landlord doing so would be spurning a doubling of his income. Such a man is not at any rate the grasping landlord of Ricardian theory or of Restoration comedy or of medieval poetry and preaching. The puzzle for future research will be to bring the Young sample into agreement with the other evidence, that landlords got higher rents from enclosures mainly on account of the higher productivity.

The physical rewards to enclosure, then, accrued to landlords. The change in rent divided by the value of total output will be the productivity change from enclosure. (Economists might worry that general equilibrium considerations would undermine the measure; but the statistics come out of a partial equilibrium experiment, the anticipated change in local rents from small changes in the nation's land.) Therefore, the productivity change in a village will be: the percentage change in rent (as estimated so far) multiplied by the share of the landlord's rent in total output (which remains to be estimated). The change in rent must be weighted by its importance.

⁵⁴ Allen, "Efficiency and Distributional Consequences," p. 939 (italics supplied).

⁵⁵ Compare McCloskey, "The Enclosure of Open Fields: Preface to a Study of Its Impact on the Efficiency of English Agriculture in the Eighteenth Century," *Journal of Economic History* 32 (March 1972): 15–35, p. 33.

Table 1.3. *Rent shares in total cost from circular letters of the Board of Agriculture, 1790–1813*

Date	Total cost (£)	Rent (£)	Share
1790	412	88	0.21
1803	548	121	0.22
1813	772	162	0.21

Source: Arthur Young's report of the results of the Board of Agriculture's circular letters, reported to the Committee on Petitions Relating to the Corn Laws (1814, "Evidence," p. 570).

The share of the landlord's rent (note that it is not the same as full economic rent including taxes) may be calculated in various ways. One way is to calculate it more or less indirectly from aggregate statistics. At the end of the eighteenth century the yield per acre of wheat was about 2.6 quarters (of 8 bushels each) per acre, barley about 4.2.⁵⁶ The price of wheat in the first decade of the nineteenth century was about 82 shillings per quarter, barley about 44 shillings per quarter. The rent of enclosed arable land was about 20 shillings, tithe-free (see Table 1.2 for some examples). Allowing for a fallow every third year gives:

$$\frac{20}{(0.33)(2.8)(82) + (0.33)(4.2)(44)} = 0.15$$

The other way to calculate the share of rents is more or less directly from farm accounts and contemporary testimony. Bowden's calculations in *The Agrarian History of England and Wales*, vol. 4, imply a share of rent of 0.14 during 1600–20, rising to double that in the 1640s.⁵⁷ Some such figure (that is, anything from 13 to 30 percent) seems to be typical. A dozen or so farm accounts 1790–1821 examined by Glenn Hueckel showed rents (apparently excluding taxes and tithes) of 23 percent of output.⁵⁸ In 1814 Arthur Young gave the estimates for a typical hundred-acre farm raising wheat shown in Table 1.3.

⁵⁶ Phyllis Deane and W. A. Cole, *British Economic Growth 1688–1959* (Cambridge: Cambridge University Press, 1964), p. 66, derived from the *General Views*; Allen's careful reestimation arrives at similar results ("Enclosure, Capitalist Agriculture," p. 47).

⁵⁷ Peter Bowden, "Agricultural Prices, Farm Profits, and Rents," in Joan Thirsk, ed., *The Agrarian History of England and Wales*, vol. 4, 1500–1640 (Cambridge: Cambridge University Press, 1967), pp. 653, 693.

⁵⁸ "War and the British Economy, 1793–1815: A General Equilibrium Analysis," *Explorations in Economic History* 10 (Summer 1973): 365–97, p. 385.

Table 1.4. *Rent shares for enclosed farms in Yorkshire, ca. 1823*

	Share of rent	Share of tithes and taxes	Rotation
Light soils	0.24	0.09	Turnips, barley, clover, wheat
Heavy soils	0.16	0.08	Wheat, clover, wheat, fallow

Source: J. S. Bayldon, *Art of Valuing* (1823), pp. 55, 68.

Bayldon's *Art of Valuing* gave the figures shown in Table 1.4 for hypothetical farms in 1823 – after enclosure, but after the French wars, too. The economic rent implied by these figures is 25 or 30 percent of the costs, but the rent to landlords – which is the relevant weighting on changes in rents to landlords – is lower. The correct figure is something between 13 and 30 percent, probably closer to the lower figure than the upper.

The consequences are as follows. Rents rose by 50 to 100 percent. Therefore efficiency rose by anything from $0.13 (50) = 6.5$ percent to $0.30 (100) = 30$ percent.

As usual in history (or in economics, if the truth be known), no heavy weight can be laid on the second or third digit in such estimates. Often enough the first is in doubt. The historical economist who lives by the second digit will die by the second digit. But what is clear is that the loss from open fields was not utterly trivial, 1 or 2 percent of output; nor was it immense, 50 percent. A defensible average for the eighteenth century would be, say, 13 percent, and something lower – perhaps 10 percent – for the centuries of prosperity in open fields. So be it.

This is no crushing burden of inefficiency. Little wonder. When inefficiencies become crushing the victims try to avoid them. One result of the light burden has long been known: The gains are so small that enclosure cannot be portrayed as the hero of the agricultural revolution.⁵⁹ If the gain from enclosure was 13 percent on villages still open in 1700, those were nonetheless only half of the villages. The gain to the efficiency of agriculture as a whole was therefore about $0.50 (0.13) = 6.5$ percent. This is small relative to the evident gains in agricultural productivity during the eighteenth century (though not to be sneered at, either). Likewise it is small relative to the 73 percent

The open fields of England

gain in overall British output per head from 1760 to 1830.⁶⁰ Around 1790 only 40 percent of income was earned from agriculture, and less from grain growing and cattle raising in open-field regions. This implies that enclosure raised national income less than $(0.40)(6.5) = 2.6$ percent. Three percent is not a contemptible return from the “mere simple re-distribution of the land,” but neither by itself does it bulk large in the nature and causes of the wealth of nations.

Why scattering depends on missing markets

The national burden of inefficiency would have been more significant in the Middle Ages, though still not overwhelming. When perhaps four-fifths of income was earned in agriculture and when most of the agriculture took place in open-field villages a sacrifice of 10 or 15 percent from failing to enclose would translate into something under 10 percent of national income, but not far under.

Why would a starving peasantry throw away 10 percent of its output? This is the central puzzle.

The facts impose a discipline on the solutions. It is not enough to offer an explanation peculiar to England, since many agricultures have scattered their holdings. Nor again is it enough to offer an explanation merely for why scattering began. Scattering began in New England in the first generation of settlement, imported by habit from old England in the early seventeenth century, but it did not persist and was gone entirely by the third generation. The persistence of scattering, not its literal origin, is the puzzle. Peasants could have scattered land originally for reasons as trivial as their reasons for the local cure for warts. What is puzzling is that they stayed with so costly a custom for so many years. Nor, finally, is it enough to explain how the system persisted without telling how it came to an end. “Sheer custom” would have this difficulty: that it would go on working past its term. Farmers are bound by custom ever, as we all are.

The history is illuminated at once by the most abstract of economic theories. The abstract theory, proven with varying degrees of plausibility by Arrow and Debreu, Francis Y. Edgeworth, and Adam Smith, is that in a market with no transaction costs, and in which therefore everything is for sale, efficiency is achieved. Regardless of who owns them at the start, resources end up in the hands of the people who

⁵⁹ See Allen, “Enclosure, Capitalist Agriculture,” p. 45; McCloskey, “Enclosure of Open Fields,” p. 35; and many earlier writers, such as Eric Kerridge, Chambers, and Mingay.

⁶⁰ Charles H. Feinstein, “Capital Formation in Great Britain,” in P. Mathias and M. M. Postan, eds., *The Cambridge Economic History of Europe*, vol. 7, *The Industrial Economies*, pt. 1 (Cambridge: Cambridge University Press, 1978), p. 84.

value them most. Income is maximized. Ronald Coase pointed out in 1959 to the astonishment of economists that the contrapositive of Smith's Theorem was therefore true: If inefficiency exists, then some market must be imperfectly realized, and it will matter who owns the resources at the start.

The historical point is this. Each explanation of scattering depends on a nonexistent or expensive market. If the market presumed to exist *does* exist, cheaply, then the explanation is wrong. The explanation cannot get to the conclusion, namely, an inefficient system of scattering. Take for example the oldest explanation of open fields, the alleged common plowing of the land. In 1883 Frederic Seebohm argued that the scattered strips were a consequence of the large number of oxen required to pull medieval plows. One contributor to the team, he said, would have the team for one day on his own land, another person the next day, and so on, distributing the penalty of inefficiently early or late plowing over the whole group.⁶¹ The explanation has proven hardy, perhaps because it has an attractive air of technological determinism, and because the heavy clay lands of Northern Europe were in fact prime areas of open fields. The Orwins, Warren Ault, M. M. Postan, and Michael Mazur adopted it.⁶²

It has difficulties, factual and logical. Joint plowing does not seem actually to have occurred, laming the theory at the starting gate. Ault, for instance, notes that cases before manorial courts make no mention of joint plowing, though they mentioned frequently other agreements among villagers (when the agreements were broken). Soon after Seebohm put forward the argument, Paul Vinogradoff noted that scattering occurred in regions with light soil, too, and on holdings large enough to support a full team.⁶³ Scattering long survived any documented need to share teams. Anyway, if plow teams came back to the village after a day's (really a morning's) plowing, as they often did, then there would be no advantage to laying out John's strips next to Richard's.

And, to get to the chief point, the coploughing explanation assumes

⁶¹ *The English Village Community* (London: Longman, Green, 1883), pp. 113ff.

⁶² C. S. Orwin and C. S. Orwin, *The Open Fields* (Oxford: Clarendon Press, 1938); Warren O. Ault, *Open-Field Farming in Medieval England* (London: Allen & Unwin, 1972), p. 20; M. M. Postan, *The Medieval Economy and Society* (Berkeley and Los Angeles: University of California Press, 1972), p. 49; and Michael P. Mazur, "The Dispersion of Holdings in the Open Fields: An Interpretation in Terms of Property Rights," *Journal of European Economic History* 6 (1977): 461-72.

⁶³ *Villainage in England* (Oxford: Oxford University Press, 1892), pp. 231ff.

that peasants could not rent oxen or plowing services from each other. This is false: They could and did. The missing market that supports inefficiency was not in fact missing.

Without pretending in this way to knock down serious scholarship in a few lines, the same point can be made of the other explanations, posing for them at least a problem to be researched. The explanations have proliferated, especially since economists have entered the field. An explanation with a flavor similar to Seebohm's, for example, has been put forward by Stefano Fenoaltea in papers critical of my work.⁶⁴ He has argued that the strips were scattered to spread not the oxen for plowing but the laborers for planting and harvesting. Fenoaltea cites with approval the argument of Charles Parain:

At the outset [of the open field system], when each plot needed at least a day's work, the scattering was rather more advantageous than not. A single tenant's holding [consolidated] all on one kind of soil would often require to be worked quickly, when the soil was in the right condition, and harvested quickly. Plots with different soils are ready for working at different times.⁶⁵

Again the argument has factual difficulties at the outset. Gregory Clark has recently calculated that the maximum cost saving from smoothing the peak was less than 1 percent of output, chiefly because only middling farmers would need *additional* labor for a consolidated holding: The small farmers needed no hired labor anyway, and the large farmers needed it regardless of the configuration of their holding.⁶⁶ But the main difficulty is that the argument supposes that hiring labor was especially costly. Fenoaltea agrees with other serious students of the matter that the myth of natural economy is false, and that the medieval West was saturated with markets in goods. But the same applies to labor. As was noted earlier, England had a large rural proletariat in the thirteenth and fourteenth centuries, people who lived by working on other people's land. There was nothing strange about hiring harvest labor. Fenoaltea's argument requires a bad market in labor, yet he offers scant evidence that the market in labor was anything but good.

⁶⁴ "Risk, Transaction Costs, and the Organization of Medieval Agriculture," *Explorations in Economic History* 13 (April 1976): 129-51, and recent unpublished work.

⁶⁵ Charles Parain, "The Evolution of Agricultural Technique," in M. M. Postan, ed., *The Cambridge Economic History of Europe*, vol. 1, 2d ed. (Cambridge: Cambridge University Press, 1966), p. 138 (Parain's text here is unmodified from the 1941 ed., p. 129).

⁶⁶ "Cost of Capital," pp. 39-43.

Carl Dahlman, in a tour de force of property-rights economics, has argued that common grazing was the key to scattering.⁶⁷ The common herd, he claims, was a source of economies of scale (this in contrast to most writers, who regard it as a source of economies of disease). To keep it together the strips were scattered, forcing a socialism of the herd on reluctant individualists. Gregory Clark has made a suggestion of a similar character, focusing on the economies of scale in fencing and on the individualized grazing that could go on within the fences.⁶⁸ Clark views the absence of fencing, not the presence of scattering, as the crucial feature of open fields. Both arguments, however, depend on a lack of market in grazing rights. Yet grazing rights were bought and sold with ease.

It is worth noting that any explanation that depends on the importance of animal products in medieval agriculture, as do Dahlman's and Clark's, is going to be in a certain amount of trouble from the start. English agriculture was a matter chiefly of grains, and to argue that advantages in the making of wool and meat and cheese led farmers to configure their grain fields in peculiar ways is probably a mistake. A serious estimate of the share of animal products in total product cannot be attempted here, but some back-of-the-envelope calculations illustrate the problem. Reckoning conservatively from the estimates of Gregory King in 1688 and the first crop returns in 1866, the close-packed population of England and Wales around 1300 worked on perhaps fifteen million acres of arable land, of which ten million were under crop.⁶⁹ Taking wheat and barley as the grain crops, and using yields and prices in southern England just after 1300, each acre would produce about 8.75 shillings' worth of grain.⁷⁰ The result is grain income of (8.75 shillings per acre) \times (10 million acres) = 87.5 million shillings for England and Wales, without including the value of straw or fallow grazing. The animals yielded much less. Robert Trow-Smith,

⁶⁷ *The Open Field System and Beyond: A Property Rights Analysis of an Economic Institution* (Cambridge: Cambridge University Press, 1980).

⁶⁸ See Clark, "Cost of Capital." Compare McCloskey, "The Economics of Enclosure: A Market Analysis," in E. L. Jones and William Parker, eds., *European Peasants and Their Markets: Essays in Agrarian Economic History* (Princeton, N.J.: Princeton University Press, 1975), pp. 145n, 149.

⁶⁹ Lord Ernle (R. E. Prothero), *English Farming Past and Present*, 6th ed., ed. and introduced by G. E. Fussell and O. R. McGregor (Chicago: Quadrangle Books, 1961), pp. 503, 512.

⁷⁰ Yields from J. Z. Titow, *Winchester Yields: A Study in Medieval Agricultural Productivity* (Cambridge: Cambridge University Press, 1972), p. 149; prices from W. H. Beveridge, "The Yield and Price of Corn in the Middle Ages," *Economic History* 1 (May 1927): 155-67.

the leading historian of British livestock husbandry, noted that in the Middle Ages "the cow was primarily the source of the plow ox and only incidentally the source of what milk she had to spare for the cheese vat and the butter churn after she had fulfilled her most important function."⁷¹ Cattle, in other words, were inputs into grain production, as was also the manure of sheep and cattle. Sheep were more important in their own right, but not enough to rise to much significance relative to grain. On the basis of export statistics of wool Trow-Smith put the national flock in 1310-11 excluding lambs at twelve million.⁷² Wethers earned half a shilling a year in wool, ewes less in total (their milk was worth 3½ pence).⁷³ The annual yield on sheep was therefore on a generous allowance some 6 million shillings. In other words, grain output was fourteen times more important.

A similar result can be achieved in another way. The average payer of tax in the thirteenth century would have been of above-average prosperity, yet had fewer than ten sheep, one or two oxen, two cows or calves, and a couple of pigs.⁷⁴ On his 19 acres (say), perhaps 60 percent of which was under crop in any year, he would produce (19 acres) \times (0.60 crop land/acre of holding) \times (8.75 shillings per acre of crop) = 100 shillings per year. But his sheep would yield him (10 sheep) \times (0.5 shillings per sheep) = 5 shillings per year. That is, by this reckoning the grain output on the average prosperous peasant holding was twenty times more important than the most important animal product.

The result accords with what is known of medieval diets. A laborer was supplied with five pounds of bread daily. Consider that as a steady diet. Miller and Hatcher write:

The average villager fed on large quantities of coarse dark bread, occasional dishes of pottage made primarily from oatmeal with a few vegetables or pieces of meat added to the pot when they were available, and copious draughts of weak ale made from the malt of wheat or more likely barley or oats. Families with a cow or ewes or goats would have a supply of milk, cheese and butter, and perhaps occasionally meat; but like the peasant's wheat crop, part of these animal products would have to be sold.⁷⁵

The animal products were not sold for other consumption but for rent and taxes, half of agricultural income in the fourteenth century. All

⁷¹ *A History of British Livestock Husbandry to 1700* (London: Routledge & Kegan Paul, 1957), p. 123.

⁷² *Ibid.*, p. 140.

⁷³ *Ibid.*, p. 17.

⁷⁴ Edward Miller and John Hatcher, *Medieval England: Rural Society and Economic Change, 1086-1348* (London: Longman, 1978), p. 153.

⁷⁵ *Ibid.*, p. 160 (5 lb); p. 159 (diet).

that could be reasonably asked was to get this day some daily bread, washed down with weak beer.

Though not a theory of scattering, one of the recent theories of the open fields depends heavily on a missing market (this time in land) and an exaggeration of the practical importance of animal products. It is the notion that open fields were cases of "overfishing." The argument rests in fact on a natural misunderstanding of the character of open fields, arising from their other name, "common fields." The terminology is confusing. The common fields were the open fields, plowed for crops, not the "commons," which were permanent grazing lands, frequently of an inferior and peripheral kind. To be sure, after the harvest was gathered the Lammas lands once under crop became common, in the sense that the common herd grazed on them. But otherwise they were as private as a suburban house lot.

Calling the open fields "common" makes them sound socialistic, or at least precapitalist. It makes them sound like a case of common property, to which the model of overfishing a lake applies. Garrett Hardin, a geographer, started this particular misapprehension in a classic paper in *Science* called "The Tragedy of the Commons," which drew on his notions of what things must have been like in England in olden times.⁷⁶ The model appeals in the abstract to both Marxist and procapitalist economists. B. D. Baack and R. P. Thomas (1974) have applied it from the capitalist side and J. S. Cohen and M. L. Weitzman (1975) from the Marxist side, reaching the same conclusion: What must have been wrong with medieval agriculture was that property was held in common (in those common fields); when in the sixteenth century, or perhaps in the eighteenth century, people started taking property seriously the inefficiency would of course disappear.⁷⁷

The difficulties with the argument are numerous. The overgrazing would reduce the value of the animal crops, but these have been shown to be small. No one claims that the supposed overgrazing would affect the grain crops. Theoretically speaking, the overgrazing is said to have been a prisoner's dilemma, in which excessive numbers of cattle trampled the grass, killing it permanently, just as overhunting of whales brings the population below the level at which it can reproduce. Agronomically speaking, this is not quite right. The chief technical

problem, however, is economic, namely, that the social milieu in which overgrazing is supposed to be taking place is unreasonable. The farmers of England are imagined to have tolerated big losses of grazing efficiency – a Cobb–Douglas specification implies a dissipation of two-thirds of the rent with as few as five graziers – yet not to have taken action. Theoretically the overgrazing model corresponds exactly to the Cournot model of oligopoly, term for term, and the criticism of the Cournot model therefore applies: No one would be so foolish as not to cooperate if cooperation were possible, which draws attention to the factual question of how easy cooperation was to achieve. Factually the Cournot/prisoner's dilemma model misdescribes villages in England: The farmers did in fact cooperate, because the existing institutions of the village or later of the king's court made cooperation easy. The common grazing land, whether the literal commons or the temporary common grazing on the open fields after the harvest, was "stinted," that is, limited in the number of animals allowed on it. The right to graze twenty sheep was attached to the Mill cottage and the right to graze three cows was attached to Tom's fifteen acres held of the lord in the open fields. The land was not overfished. A law of the sea was devised, village by village.

But the main problem with the overfishing argument is that it supposes that a market in land did not exist, that land in the Middle Ages was common property. It is difficult to convince educated people that this is not so. Somewhere early in their educations most people acquire a view of the Middle Ages prevalent in the nineteenth century, of the medieval economy as a "natural," nonmoney economy in which such a thing as owning land was foreign. Owning is supposed to have arrived with capitalism. Because of England's season of world eminence, English history provides the background for many other histories, and the freezing of attitudes toward medieval peasants in the configuration of around 1880 has therefore caused damage to people far removed from Oxfordshire and Kent.

Since the early years of this century medievalists have been fighting a losing battle against the popular notion that the Middle Ages was innocent of markets and that land was held communally. On sober consideration the subnotion that land was inalienable and common has never been very plausible: A society that marketed human beings and eternal salvation would be unlikely to have scruples about marketing land. But speculation is unnecessary, since the evidence of an active market in land among peasants is ample. Even serfs participated, though their lord taxed their gains and made certain that his ownership of their tenancies was not attenuated. M. M. Postan concluded that "the purpose of [the lord's] control was not to restrict, still less to

⁷⁶ "The Tragedy of the Commons," *Science* 162 (December 1968): 1243–48.

⁷⁷ Baack and Thomas, "The Enclosure Movement and the Supply of Labor during the Industrial Revolution," *Journal of European Economic History* 3 (Fall 1974): 401–23; Cohen and Weitzman, "A Marxian Model of Enclosures," *Journal of Development Economics* 1 (February 1975): 287–336.

destroy, the village market . . . [but] to profit from his villein's transactions."⁷⁸ Rosamund Faith, summarizing work on the subject by herself and Postan among others, argues that in open-field villages of the late fourteenth century "land changed hands rapidly and on a large scale. . . . The chief function of the manorial court began to be that of land-registry for the virtually free market in peasant holdings that had come into being."⁷⁹ Even in the thirteenth century she believes "there is ample evidence of an active peasant land market," though she argues that before the coming of the plague in the mid-fourteenth century the exchanges were "predominantly small scale, involving odd acres and plots, a process which only marginally affected the ownership and structure of the basic family holdings."⁸⁰ The churning of the land was natural in view of the varying fortunes of individual families. The life cycle would alter the amount of land a family could profitably work; further, peasants were mobile in and out of the village and up and down the social scale.⁸¹ In their survey Miller and Hatcher conclude that "the consequence was that the tenurial pattern of medieval villages, in the villeinage as well as in the free tenures, was in constant flux."⁸²

Land was alienable, then, and it was private. More evidence comes from manorial court rolls, in which the peasants are reported quarreling endlessly about their *private* rights to land.⁸³ Did John make a way through Richard's field in the West Ing? Let him be bound to pay 3 pence. Did Thomas come into the field at night, for what cannot have been good reasons? Let him, too, be fined heavily, and made to offer a bond that he will pay it. The court rolls have the atmosphere of a police court, but a police court in a society that values everything in money. No one went to jail; he or she paid. That others had rights over John's land did not make the land common: Rights of passage or rights of early plowing were pieces of property, too, and alienable. Property rights were complicated in the open fields, but vividly present

to the minds of the peasants as things to be bought and sold. The village land was no casually managed public park. A peasant owned unambiguously what he or she had planted – or rather what could be retained from the depredations of lord, church, and king. From the depredations of other peasants the owner had all the protection of the law. Haukyn the Active Man in *Piers Plowman* was no agrarian socialist:

If I go to the plow I pinch so narrow
That a foot of land or furrow fetch I would
Of my next neighbor, take of his earth;
And if I reap, overreach, or give him advice that reap
To seize to me with their sickle what I never sowed.⁸⁴

The private, alienable character of the land creates difficulties for other explanations of open fields, such as equality of inheritance or equality of the initial laying out of the fields.⁸⁵ F. W. Maitland asked in 1897, "Who laid out these fields?" and replied: "The obvious answer is that they were laid out by men who would sacrifice economy and efficiency at the shrine of equality."⁸⁶ Vinogradoff gave the usual formulation: "The only adequate explanation of the open-field intermixture . . . [is] the wish to equalize the holdings as to the quality and quantity of land assigned to [each peasant] in spite of all differences in the shape, the position, and the value of the soil."⁸⁷ Viewed merely as a theory of the origin rather than of the persistence of scattering, the egalitarian theory has difficulties well expressed in 1928 by George Fowler (who favored Seeböhm's coarctation theory): "I am not aware of any direct evidence in support [of the egalitarian theory]; and when one considers the handful of men who first settled in each township, and the abundance of land available, the theory seems to be unnecessary."⁸⁸ Nothing would be served, he was arguing, by distributing a free good equally. Furthermore, there is no evidence that medieval peasants were egalitarian as individuals or, as it is sometimes

⁷⁸ C. N. L. Brooke and M. M. Postan, eds., *Carte Nativorum*, Northamptonshire Record Society Publications 20 (1960), p. xlviii; compare D. Roden, "Field Systems in the Chiltern Hills and Their Environs," in Baker and Butlin, *Studies*, p. 356.

⁷⁹ "Peasant Families and Inheritance Customs in Medieval England," *Agricultural History Review* 14 (1966): 92.

⁸⁰ *Ibid.*, p. 86.

⁸¹ J. Ambrose Raftis, *Tenure and Mobility: Studies in the Social History of the Mediaeval English Village* (Toronto: Pontifical Institute of Mediaeval Studies, 1964).

⁸² Miller and Hatcher, *Medieval England*, p. 142.

⁸³ See, for example, on quarreling about land rights, Warren O. Ault, "Open-Field Husbandry and the Village Community, a Study of Agrarian By-Laws in Medieval England," *Transactions of the American Philosophical Society* n.s. 55 (October 1965).

⁸⁴ William Langland, *The Vision of Piers Ploughman*, the B text (ca. 1378), ed. A. V. C. Schmidt (London: Dent, 1978), passus xiii, 370–74 (p. 159) (modernized).

⁸⁵ Compare McCloskey, "Persistence of English Common Fields," in E. L. Jones and William Parker, eds., *European Peasants and Their Markets: Essays in Agrarian Economic History* (Princeton, N.J.: Princeton University Press, 1975), pp. 102–12.

⁸⁶ *Domesday Book and Beyond* (Cambridge: Cambridge University Press, 1897), p. 394.

⁸⁷ *Villainage*, p. 254; compare Vinogradoff, *The Growth of the Manor* (London: Allen & Unwin, 1911), pp. 175ff.

⁸⁸ G. H. Fowler, *Four Pre-Enclosure Village Maps*, Quarto Memoirs of the Bedfordshire Historical Record Society 2 (1928–36), pt. i, p. 4.

put to save the hypothesis, class by class. Holdings of village members varied radically from nothing at all to large holdings in several villages, serfs owning other serfs. It is hard to read Middle English literature and retain the view that the medieval peasantry was a band of brothers.

More important, viewed as a theory of the persistence of scattered strips, the egalitarian theory must deal somehow with the vigorous market in land. Scattering was an inefficient way of establishing equality. A community bent on equality might have chosen to simplify its task by distributing a bundle of strips drawn from all parts of the village land instead of adjusting the sizes of consolidated holdings to their quality. Inheritance by literal brothers often follows such a distribution to forestall backbiting. Yet after the original scattering had assured equality the peasants would benefit from trades to achieve consolidation – that is, they would benefit unless scattering had some advantage beyond equality. A peasant determined to acquire a consolidated holding could begin buying up contiguous strips, as occurred in the many cases of gradual enclosure by purchase. In other words, egalitarianism might have required scattering at the origin of the open fields, but it can hardly explain the scattering through eight or nine centuries of shifting ownership of land.

Open fields as behavior toward risk

A promising alternative is that strips were scattered to insure against disaster. The argument is that within a single English village there was enough variability to make it desirable to hold a diverse portfolio of strips.

The land and weather of England are notoriously variable, even over the two square miles or so of the typical village. A place with sandy soil on a rise would shed some year's excessive rain, yet one with clay soil in a valley would hold another's insufficient rain. An exposed place would have wheat likely to become tangled by rain and high winds at harvest but free of mold in a generally wet year. A sheltered place would be relatively immune from windy disasters but less dry and more moldy on that account. The average width of the English hailstorm is two hundred yards, one-sixth of the side of a typical field of three hundred acres; it cuts a swath of damaged grain through a consolidated holding three hundred yards on a side.⁸⁹ England has a

maritime climate and therefore feels sharp variations in temperature by altitude, and variations in the incidence of thaw and frost.⁹⁰ A place could be hit by birds, rust, moles, rabbits, thieves, flooding, insects, hunting parties, and wandering armies, to name a few more of the reasons an English peasant would value insurance, while another place close by would go free. A town dweller finds it hard to believe that crops could vary much over a small area; a country dweller does not.

When they have looked beyond peasant conservatism or peasant jealousy to explain why scattering persisted, a few historians and economists have come to risk aversion. The great French historian Marc Bloch was attached to an egalitarian theory but admitted, too, that "if the plots were dispersed . . . everyone had some hope of avoiding the full impact of natural or human disasters – hailstorms, plant diseases, devastation – which might descend on a place without destroying it completely."⁹¹ Among the reasons Hungarian peasants rejected consolidation in the 1850s was their fear that natural disasters would destroy a family's whole crop.⁹² Although regarded by its reporter as the prejudice of a benighted peasantry, the reason was given by a sample of villagers in modern Greece: "Why should the plots be all together? We are more secure this way: fire, bad weather, etc."⁹³ In 1970 John W. Thomas, an economist with the Development Advisory Service, was so bold as to ask peasants in what was then East Pakistan why they opposed consolidation, and found that their declared reason was protection against disaster, especially flooding that would leave untouched the higher plots (a mere six to ten feet above the rest).⁹⁴

Anthropologists have been less liable than most historians or economists (or government planners) to dismiss scattering as irrational. The Hopi Indians of the American Southwest in the 1930s scattered their plots of maize: The Katsina clan in one village held six plots scattered over a six-by-six-mile area. C. Daryll Forde explained:

This dispersal is of very great practical importance since it reduces the risk of crop failure; where the crop on one group of fields may wither from drought or

⁹⁰ Gordon Manley, *Climate and the British Scene* (Glasgow: Collins, 1952).

⁹¹ *French Rural History*, trans. J. Sondheimer (Berkeley and Los Angeles: University of California Press, 1966; first published in French, 1931), p. 255. Compare p. 233.

⁹² E. Molnar, ed., *Magyarország Története*, 3d ed., vol. 2 (Budapest: Gondolat, 1971), p. 37.

⁹³ Thompson, *Farm Fragmentation in Greece*, pp. 8, 170–73; cf. Papageorgiou, "Greece," p. 546; J. Roche for France, also in Parsons et al., eds., *Land Tenure*, p. 536; Hyodo for Japan, p. 559.

⁹⁴ Personal communication.

⁸⁹ F. R. A. Russell, *On Hail* (London: Stanford, 1893).

be washed away by floods there remains the chance that the others will be spared. In particular, disastrous floods rarely occur in all the flats in the same season. The lands close in to the mesa and those out in the middle are still more definitely reciprocal. In an abnormally wet year, when many of the latter are liable to be destroyed by the high floods, the scarp plots are well watered, while, on the other hand, in [a?] dry season when they in their turn are likely to be parched out, enough water is usually brought down by the streams to afford a harvest for the mid-valley fields.⁹⁵

Another anthropologist, Alan Hoben, argues that the scattering of plots by the Amhara farmer of Ethiopia "is highly desirable . . . for by providing him with fields of different qualities it enables him to diversify his crops and to reduce the risk of total crop failure." Repeated attempts to impose land reform on the Amhara, in 1967–68, for example, were bloody failures. As Hoben remarks, "If a program of land reform is to be effective it must be based on a model . . . illuminating the rational process through which people make decisions about land instead of simply attributing these decisions to the dead hand of tradition."⁹⁶ Anthropologists elsewhere have noted that risk aversion explains scattering, in Tanzania, for example, and south-western Switzerland and Brazil.⁹⁷ So have poets and prophets. The Merchant of Venice did not "think upon his merchandise," because

My ventures are not in one bottom trusted,
Nor to one place; nor is my whole estate
Upon the fortune of this present year:
Therefore my merchandise makes me not sad.

"Give a portion to seven, and also to eight," said Jesus, son of Sirach, "for thou knowest not what evil shall be upon the earth."

The question is whether giving a portion to six effective strips in one of three open fields made the peasant not sad by avoiding the evils of this earth.⁹⁸ The answer is that it did. A consolidated holding would

⁹⁵ *Habitat, Economy and Society* (London: Methuen, 1934), p. 234.

⁹⁶ "Social Anthropology and Development Planning: A Case Study in Ethiopian Land Reform Policy," M.S. thesis, Boston University, n.d. [ca. 1972], pp. 2, 11–12, 34.

⁹⁷ Beidelman, *Karugu*, p. 16; R. M. Netting, "Of Men and Meadows: Strategies of Alpine Land Use," *Anthropological Quarterly* 45 (1972): 132–44, p. 134; A. W. Johnson, *Sharecroppers of the Sertao* (Stanford, Calif.: Stanford University Press, 1971), pp. 69–72; and other evidence on Tanzania in articles by Hawkins and by Heijnen and Kates in Gilbert F. White, ed., *Natural Hazards: Local, National, Global* (London: Oxford University Press, 1974).

⁹⁸ What follows is a radical condensation of pp. 131–61 in McCloskey, "English Open Fields as Behavior Towards Risk," *Research in Economic History* 1 (Fall 1976): 124–70.

Table 1.5. *The average and standard deviation of medieval grain income on consolidated and on scattered holdings*

	When disaster is 50			
	Average income	Standard deviation	Distance from disaster	Frequency of disaster
Consolidated	110	48.4	1.24σ	Every 9.3 years
Scattered	100	34.7	1.44σ	Every 13.4 years

Source: Detailed calculations in McCloskey, "Risk," pp. 132–51.

have a higher average income but also a higher variance; the less productive but safer option was to scatter. If the scattering was very expensive and its reduction of risk small, then the deal would be a bad one. But for the conditions facing medieval peasants it was good in that it reduced the probability of falling below a disastrous level of income. The results are given in Table 1.5.

Some of the entries in the table are relatively straightforward. The 10 percent increase in productivity that might be expected from consolidation has been discussed at length above. The standard deviation on the index of 100 as the average yield is based on the ample evidence of medieval yields, especially Titow's magnificent compilation of yields 1209–1349 from the Bishop of Winchester's forty-odd manors in south-western England.⁹⁹ That the level of disaster was about 50 percent of average output can be established in various ways.¹⁰⁰ The simplest and surest derives from the widespread agreement among English medievalists that the subsistence holding for a family was about ten acres.¹⁰¹ If the average holding was nineteen acres, then subsistence income was about half of the average.

The exercise hinges, however, on the difference between the standard deviation of 34.7 observed on the typical scattered holding and the 48.4 claimed to hold on a consolidated holding. The variability on a holding depends on the correlation among strips. If the yields on strips move in lockstep from year to year, then scattering is useless.

⁹⁹ See *ibid.*, pp. 132–36.

¹⁰⁰ *Ibid.*, pp. 141–45.

¹⁰¹ Miller and Hatcher, *Medieval England* (pp. 147f.), mention Bennett, Kosminsky, Hilton, and Titow as authorities for such a figure, to whom may be added M. M. Postan.

The lower the average correlation of yields the lower is the variance on the portfolio of strips.

Call the variance of the entire bundle S^2 , the variance of the i th strip s_i^2 , and covariance between the i th and the j th strip s_{ij} . If the average output of each strip is defined to be 1.0, then s_i will be the coefficient of variation of the i th strip and S will be the coefficient of variation of total grain output. Supposing that each strip makes an equal contribution to output, the weight of each strip's output in the total will be $1/N$. Since the definition of the correlation coefficient, R_{ij} , is $s_{ij}/s_i s_j$, one can make the substitution $s_{ij} = s_i s_j R_{ij}$. With these bits of notation, it follows from the algebra of variances that:

$$S^2 = (1/N)^2 \left[\sum_{i=1}^N s_i^2 + \sum_{i=1, j=1}^N \sum_{i \neq j}^N s_i s_j R_{ij} \right]$$

The equation looks less enlightening than it is. The typical term of the first sum inside the brackets will be simply s^2 , the average variance (that is, s^2 , without a subscript, is the average of all the s_i^2). Further, because $s_i s_j$ will typically be close to s^2 , the average variance, the typical term of the second, double, sum will be $s^2 R$, the average variance multiplied by the average correlation coefficient. There are $N(N-1)$ of these in the double sum (not N^2 because terms with $i = j$ are excluded). The double sum can therefore be approximated by $N(N-1)s^2 R$. The upshot is:

$$S^2 = (1/N)^2 [Ns^2 + N(N-1)s^2 R] = s^2 [1 + (N-1)R]/N$$

Or, taking square roots,

$$S = s \{ [1 + (N-1)R]/N \}^{1/2}$$

This relation between the coefficient of variation of single strips (s) and of a bundle of strips (S) is approximate, but the inaccuracy can be shown to be trivial.

Observe that if $R = 1$ or $N = 1$, then $S = s$. That is, the coefficient of variation is not reduced if the yields of the various strips move in lockstep or if, equivalently, only one strip is held. When $R = 0$ the equation is simply $S = s/N^{1/2}$, the usual equation for the sample standard deviation. The risk falls steadily, though at slower and slower rates, as the number of strips rise. As N gets large then S approaches $sR^{1/2}$, this being the maximum effect of diversification in lowering the variability of income. When two types ($N = 2$) move exactly inversely ($R = -1$) then the variance is zero: By holding two such perfectly inversely correlated assets all of the variability of income is eliminated.

Most items in the equation are easily calculated from the Winchester yields and similar medieval sources. What is difficult is R . One sort of evidence is agronomical. R. A. Fisher's pioneering work *The Design of Experiments* was in large part devoted to a similar problem. One hears echoes of a cautious medieval peasant laying out long strips in a part of Fisher's advice for handling the problem: "Each [experimental] plot must . . . sample fairly the whole area of the block in which it is placed. It is often desirable, therefore, . . . to let the plots lie side by side as narrow strips running the whole length of its block."¹⁰² He remarks that an area as small as an acre has "considerably greater soil heterogeneity" than a quarter-acre.¹⁰³ His elaborate care to minimize the uncertainty due to such variation was justified by earlier spoiled experiments. In reporting the experiments in rotation on a field at Woburn beginning in 1881, for example, J. A. Voelcker complained repeatedly that despite its apparent uniformity "the soil of Lansome Field . . . has been found to be not really uniform enough and the land not level enough to make a really satisfactory experimental field."¹⁰⁴ Plots 1 and 4 were quarter-acres a little over a hundred yards apart, treated to precisely the same unfertilized rotation. Yet the average yield from the four crops of barley taken from 1885 to 1897 was 13 percent higher on plot 4 than on plot 1 (perhaps plot 4 was enclosed and plot 1 open). The correlation of yields on plots 1 and 4 was only .78, despite the care taken to cultivate the plots in the same thorough and expensive way. Even the more successful experiments in the continuous growth of barley in the Stackyard field at Woburn could produce a correlation coefficient of only .84 from 1877 to 1884 between the two unfertilized plots, 1 and 7, a hundred yards apart.¹⁰⁵ The correlation drops sharply for plots treated with different fertilizers but cultivated otherwise in an identical careful fashion. For example, the correlation at Rothamsted between yields of wheat grown continuously without fallow on plot 3 (unfertilized) and plot 2 (fertilized with dung) from 1844 to 1883 was only .55.¹⁰⁶ Plot 2 could stand for the fertilized

¹⁰² (New York: Hafner, 1947; first published 1935), p. 65.

¹⁰³ Ibid., p. 104.

¹⁰⁴ "The Woburn Experimental Farm," *Journal of the Royal Agricultural Society of England* 58 (1897): 258-93; 59 (1898): 622-55 and 678-726, p. 640, and "Report," *Journal of the Royal Agricultural Society of England* 45 (1884): 337-60, p. 360.

¹⁰⁵ Voelcker, "Woburn," pp. 722, 690-97.

¹⁰⁶ J. B. Lawes and J. H. Gilbert, "Report of Experiments on the Growth of Wheat for 20 Years in Succession on the Same Land," *Journal of the Royal Agricultural Society of England* 25 (1864): 93-185, and "On the Continuous Growth of Wheat on the Experimental Plots at Rothamsted during the 20 years, 1864 to 1883, Inclusive," *Journal of the Royal Agricultural Society of England* 45 (1884): 391-481.

infield and plot 3 for the unfertilized outfield in the runrig arrangement of upland Britain.

The experimental evidence, though, has the defects of its virtues. Cultivation was carefully controlled over a small area, but with the result that the effects of variations among plots, such as local attacks of mold and local peculiarities of drainage, were intentionally minimized. If the experimental evidence is relevant at all, it is to give upper bounds on the correlations to be expected in an agriculture lacking the knowledge or resources to achieve laboratory standards. The experiments suggest an upper bound on R of .70 or .80.

The best evidence on R is from open-field agriculture itself, scarce and ambiguous though the evidence is. Practically never do the records for a crop of wheat, say, specify yields in different parts of a village, yet this is what is wanted. Even so methodical a record keeper as Robert Loder, farming in Harwell, Berkshire, in the early seventeenth century, kept records on separate portions of his many different crops only for hay. On three crops of hay not more than a mile or so from each other the mutual correlations 1611–20 were .90, .66, and .37, giving an average of .64.¹⁰⁷ Loder interpreted a reduction in the crop from the Padocke in 1612 as “the loving and fatherly chastisements of the Lord my God,”¹⁰⁸ but the Lord did not lay on the lash everywhere: The yield in the Town Meade rose by over 50 percent in the same year.

In the absence of more evidence of this sort – which in any case could be expected to exist only in an age of literate and reflective farmers, and which therefore would be to some extent anachronistic – one must turn again to the medieval records of the manorial farms, the farms of the lord of the manor from which our evidence on yields always comes. Many manorial farms with records were close to others with records. This makes it possible to infer from the correlations between villages what the correlation might have been within them.

The procedure has difficulties, to be sure. The neighboring villages must be quite close, no more than three miles or so apart, to be relevant to the inside of anything but a long, thin village. Since few are less than two miles apart (measuring distances from church to church on the modern Ordnance Survey maps) and since, as will be shown in a moment, the correlation falls with distance, the calculated correlations may be too low to represent the correlation facing a peasant in

one open field in a village. On the other hand, since the manorial farm usually took the best land (bottomland in a valley, for example), the correlations may be too high, because the bottomland in one village may be more similar to the bottomland in another than to the land on the village hill. Although Twyford and Stoke are the most distant pair of the Bishop of Winchester's neighboring manorial farms considered below (3.3 miles church to church), the correlation of their wheat crops is the second highest observed, .84. If the manorial farms were consolidated and near the center of each village, then the observed high correlation would be misleading, for the centers of both are on the same bank of the River Itchen with the same (southeasterly) exposure relative to nearby hills.

The evidence, nonetheless, is suggestive. The first insight that can be wrung from it is that the correlation of yield of a crop between two villages, R , does fall as the distance between the two increases. Were this not the case it might be possible to achieve insurance without scattering, for if R were, say, .60 both at a distance of two hundred yards and two thousand yards a peasant could hold a sufficient diversity of land within a small area. One presumes that R would indeed fall with distance, and it is pleasing to have the presumption confirmed for the villages on the Winchester estates 1335–49. Choosing the dozen under 3.3 miles apart and setting aside the two pairs (East Meon–East Meon Church and Twyford–Stoke) that fall far off the fitted line for the good reason that they were in different parts of Hampshire from the others, the regression of R for wheat on miles of distance is:

$$R = .95 - .14 (\text{distance}) \quad r^2 = .66 \\ n = 10 \\ SEE = .07$$

For each mile of distance of one crop of wheat from another, therefore, the R fell 14 points. Errors in variables cannot be ignored, in particular the error in measuring crop distances with church-to-church distances. Reversing the regression to allow for the bias due to error leads to a coefficient of .22 rather than .14, a more powerful effect of distance on correlation.

The correlations would not, of course, go on falling indefinitely as distance rose. The correlations in six randomly selected pairs of villages (from ten to forty-five miles apart), compared in Table 1.6 with the correlations in close villages, imply a lower limit on R in Hampshire for the three major crops taken together of about .40. The last line in the table gives the probability of observing such differences by the chances of the sample if the correlations between pairs of the distant and near villages were in truth the same. That the distant

¹⁰⁷ G. E. Fussell, ed., *Robert Loder's Farm Accounts 1610–1620*, Camden Society Publications, 3d ser., 53 (1936), *passim*, e.g. pp. 5–6, 184.

¹⁰⁸ *Ibid.*, p. 36.

Table 1.6. Comparisons of correlations between yields in close and far villages, Winchester manorial farms, 1335-49

	Wheat	Barley	Oats	Average equally weighted
<i>Distant villages (N = 6)</i>				
Average R	.55	.15	.38	.38
(Standard dev.)	(.18)	(.23)	(.90)	(.09)
<i>Near villages (N = 9)</i>				
Average R	.68	.57	.66	.64
(Standard dev.)	(.15)	(.15)	(.22)	(.09)
Level of significance of difference	.074	.001	.01	.0001

villages have lower R 's is additional testimony to the inverse relationship between R and distance. By this test there is more room for skepticism about the testimony on wheat than on the other crops, although by the regression test less room. Regressions of R against distance work poorly for barley and oats, possibly because spring crops depend more than does wheat on variations of soil and the like within distances smaller than the mile-or-more minimum distance church to church in the Winchester estates.

This last possibility finds some confirmation in still another test of the inverse relationship between R and distance, relying on correlations between different crops. If correlations fall with distance one would expect correlations between crops of, say, wheat and barley to be lower between two close villages than within each village. For instance, one would expect the correlation of the wheat crop in Alresford with the barley crop in Sutton (these two crops being about one and a half miles apart) to be lower than the correlation of the wheat crop in Alresford with the barley crop in Alresford itself (these crops being closer: a mile or less apart). Remarkably (to someone with mature experience in such matters) the expectation is fulfilled (see Table 1.7). The differences between the within- and between-village correlations for oats-barley fall with greater distance (the correlations involving the winter crop, wheat, display no uniform pattern). Regressing the excess of the within-village correlations of oats and barley over the between-village correlation on the church-to-church distance in miles (d) for the seven pairs gives:

$$R_{\text{within}} - R_{\text{between}} = -.16 + .12 (\text{distance}) \quad r^2 = .61 \\ \text{SEE} = .07$$

Table 1.7. Correlations between crops within and between seven pairs of close villages, Winchester manorial farms, 1335-49

	Average correlations between			
	Wheat & barley	Wheat & oats	Oats & barley	Average of these
Within the villages	.39	.26	.43	.36
Between the villages	.35	.21	.32	.29

For each mile of distance, in other words, the oats-barley correlation falls twelve points further below the same correlation within a village. Notice how similar the coefficient is to the comparable coefficient in the wheat regression given above. That the difference would be negative (rather than what it should be, zero) when the distance is zero comes from extrapolating a straight line beyond the data (compare Gregory Clark's strictures, which make much of the point). A linear specification could easily be wrong for small distances, flattening out at distances below the observed minimum of the sample (1.5 miles, alas). The R^2 of $R_w - R_b = .008d^{2.72}$ is in fact a little higher, .65. In any event, the correlations do fall with distance.

The other insight that can be wrung from the experience of neighboring manorial farms is that the correlation for a single crop over the distances relevant to scattering in open fields is indeed about .60. Since the experimental correlations over small distances are not much above this level, the assertion is not surprising. On the neighboring Winchester estates, to be sure, the average (given in Table 1.7) is a little higher, about .64, implying a still higher figure at lower distances. Yet these manorial farms, as was noted earlier, were located on chalk soils, inherently less variable and hazardous in their response to the weather than the clay soils further north (on which open fields persisted longest). On the four Woodstock manors at about the same time located on the edge of the clay soils of the Midland plain, the average R was well below .60, as Table 1.8 shows. The average over the three crops for the six pairs (from 1.25 to 3.6 miles apart) ranges from 0 (for Combe-Wooton) to .52 (for Bladon-Wooton), the average over the six pairs for the three crops, from .10 (for oats) to .48 (for wheat). The overall average correlation is .24. The evidence justifies a choice of R as low as .60.

The rest of the argument requires mere manipulation of these findings. The coefficient of variation on manorial farms is observed to be about .46, and was of course the result of holding many diverse

Table 1.8. Correlations between yields of neighboring manorial farms of the Woodstock manors, 1243-49

	Combe			Handborough			Wooton		
	Wheat	Barley	Oats	Wheat	Barley	Oats	Wheat	Barley	Oats
Bladon wheat	.12								
barley		.60							
oats			-.29						
Combe wheat				.76					
barley					-.51				
oats						.046			
Handborough wheat							.50		
barley								.48	
oats									.37

Source: A. Ballard, "Woodstock Manors in the Thirteenth Century," *Vierteljahrsschrift für Sozial- und Wirtschaftsgeschichte* 6 (1908): 424-59, as compiled in B. H. Slicher van Bath, *Yield Ratios, 810-1820*, *Afdeling Agrarische Geschiedenis Bijdragen* 10 (1963).

The open fields of England

types of land. The manorial farms were themselves often scattered, and in any case were much larger than a peasant farm with a mere half-dozen plots in each field. Suppose the manorial farm contained fifteen types of land (it would make little difference if it contained ten or twenty), each having the correlation of .60 with the others on average. With such figures the expression derived above for the coefficient of variation of a portfolio,

$$S = s\{[1 + (N - 1)R]/N\}^{\frac{1}{2}},$$

translates into

$$.46 = c\{[1 + (15 - 1)(.60)]/15\}^{\frac{1}{2}}.$$

We have gotten down to the coefficient of variation on one type of land, c . It can be solved for in the equation, and here it is $c = .58$.

Now build back up to a peasant holding of nineteen acres. If a peasant had a crop on one type of land, the coefficient of variation, as just shown, would be .58. If he had only one crop that would be that. But peasants had two or three crops, wheat for the rent, barley for beer and black bread, and oats for porridge. On consolidated holdings the average correlation, R , of yields among crops was .36 (see Table 1.7, the end of the "Within the villages" row). So according to the formula just used, the coefficient of variation on the consolidated holding would be

$$S = .58\{[1 + 2(.36)]/3\}^{\frac{1}{2}} = .58(.76) = .44.$$

Applied to an average yield of 110 (relative to 100 on the scattered holding), the .44 implies a standard deviation of .44 (110) = 48.4, as given in the master Table 1.5. That is the consolidated row.

The scattered row uses the formula still again. If a scattered peasant holding had five types under one crop (it makes little difference if it has four or six: Five seems reasonable for the six effective plots per field) his coefficient of variation for that crop would be $.58\{[1 + 4(.60)]/5\}^{\frac{1}{2}}$ - notice how the correlation of yields, R , fits in. The result is .48. But again there are three crops. So reapply the formula for the last time:

$$.48\{[1 + 2(.29)]/3\}^{\frac{1}{2}} = .48(.73) = .347,$$

as again in the master table.

So: The table was correct. So: Scattering made sense. But after such measures a sensitivity analysis is surely in order. In forty-eight permutations of the variables R (from .43 to .73), disaster (from .41 to .60 of the average), the additional income with consolidation (from 7 to 13

percent), and so forth, only three yield a probability of disaster higher on scattered than on consolidated holdings.¹⁰⁹ Furthermore, when the model is supplemented by specifying the way productivity varies with the number of plots, the predicted number of plots can be derived. It is 6.2 plots per field, with variations from 5.3 to 11 for reasonable variations in the critical parameters.¹¹⁰

Risk aversion, in short, explains the open fields. A peasant who scattered his land was not behaving irrationally. He was buying insurance, and paying a reasonable premium. The open field was not egalitarianism or work spreading or a communalism of the herd or plow. It was behavior toward risk.

The costliness of alternative insurance: the storage of grain

The explanation in terms of risk aversion is not immune to the criticism leveled at the other explanations: Was the market missing? The market in question is insurance. Was there no insurance that could have saved peasants the bother of the expensive self-insurance of scattering their plots?

The operative words in the last sentence are "could have" and "expensive." Anything could have been. In some world the crops of medieval peasants could have been insured by State Farm Insurance Company or the United States Department of Agriculture. It misunderstands the scholarly task to merely imagine possibilities without testing them. There are dozens of possibilities, some more plausible than State Farm. Most social institutions have elements of insurance in them, for we live otherwise in a wildly uncertain world. The institution of the family, the greatest of insurers, *could* have helped a peasant in need; the Church could have, and was supposed to. The lord of the manor could have remitted rents in bad years, and he sometimes did. The whole village could have joined forces in a socialist commonwealth, achieving of course the variance of the village's output as a whole. It is easy to imagine why this could not have worked, for the reasons the numerous utopian communities in the American Midwest dissolved in the second or third generation – but that is more "could have," misunderstanding the role of economic theorizing.

The question is how expensive the self-insurance of scattering was compared to some alternative. If God is good, any alternative in use will do, because at the margin all must cost the same.

¹⁰⁹ Compare McCloskey, "Risk," pp. 152–53.

¹¹⁰ *Ibid.*, pp. 154, 158–59.

The one sort of alternative insurance we can know about is storage of grain. A man with seven years' worth of grain in his barn need not fear. Grain must be stored anyway until the next harvest. The issue is the carryover into the next harvest year, and it has been asserted that the carryover was large and cheap enough to obviate the need for scattering.¹¹¹

This proves to be incorrect. But bear in mind that if it were correct, not all self-insurance would therefore be foolish. One does not smoke in bed because one's house and life insurance are paid up.

The way to show that storage of grain was in fact quite expensive, more expensive than scattering plots, is to exploit the price statistics of Europe. Historians have been transfixed by the long-term averages, which tell little more than the value of money. They have overlooked the use of the price movements within a harvest year.¹¹²

If a manorial lord keeps his grain in store from December to January he will have to earn what it costs to store the grain for that month. If he does not expect to earn so much he will sell the grain early. Everyone similarly placed will do so, driving down the price in December and correspondingly raising it in January, until the equilibrium of entry and exit is reestablished. Imposing rational expectations (and recalling that it was this context, agricultural markets, in which John Muth first spoke out loud and clear), the observed prices should reflect on average the cost of storage per month. In the spring they will become unreliable as people get some information about what the next harvest will be like. But before the spring the price should march up at the cost of storage.

It does. In the thirteenth and the early fourteenth centuries we have from the pioneer in price statistics, J. E. Thorold Rogers, some twenty-seven thousand quotations of grain prices, two thousand of which are more or less precisely dated within the year.¹¹³ One can find numerous pairs of wheat prices at two dates within the same harvest year and in the same village. At Elham, Kent, in 1331, for example, the price of wheat rose from 6s. 8d. per quarter (eight bushels) in May to 6s. 10d. in July. There are 1,075 such wheat pairs in the Rogers data. They rise at 2.37 percent per month, irregularly (the standard deviation is 1.87 percentage points).

¹¹¹ Fenoaltea, "Risk, Transaction Costs."

¹¹² Another précis follows, here of D. N. McCloskey and John Nash, "Corn at Interest: The Cost and Extent of Grain Storage in Medieval England," *American Economic Review* 74 (March 1984): 174–87.

¹¹³ *The History of Agriculture and Prices in England*, vol. 1 (Oxford: Clarendon Press, 1866).

Something going up at 2.37 percent per month will rise at 32 percent per year. This is a high cost of storing grain – a third of the harvest, as against the 10 percent or so sacrificed by scattering in the open fields. Barley goes up at a higher rate in the data, too high to be quite believable; rye goes up at 4.17 percent per month, and similarly with minor grain – the grains the peasants ate seem to go up at about 4 percent per month, some 60 percent a year.

It can be shown that the cost of storage fell dramatically in more modern times. The same calculations can be performed on the prices from the Oxford town market 1618–44, yielding only 11.3 percent per year. For Namur, Belgium, we have data over most of the seventeenth century, 1614–92, and the August-to-June rise is 14 percent a year. In Diest in Belgium 1718–36 the rates of annual rise are 10.9 percent for wheat, 14.8 percent for barley, 14.5 percent for rye, 15.4 percent for oats, and 18.1 percent for buckwheat. In the nineteenth century the gradients are shallower still. Storage was not a cheap way to protect oneself from disaster in the Middle Ages but became so in modern times.

The fall in storage costs, incidentally, seems to be the result of an unheralded but large and important drop in interest rates from the fourteenth to the sixteenth century. Most of the cost of storage was the interest rate: that is to say, the opportunity cost of tying up 6 shillings in a quarter of wheat for a month. The high interest rates were of course pervasive, finding their way also into the prices and profitability of animals and land.¹¹⁴ Scattering was the cheapest way to insure because the interest rate in the Middle Ages was high.

The story of open fields

The fall of interest rates is one among many reasons that the diversification from scattering became less valuable in early modern times. The fall of interest itself bespeaks an improved capital market (for which there is direct evidence), and a good capital market is another substitute for self-insurance.¹¹⁵ One need not fear a bad harvest if the friendly local moneylender stands ready to repair the shortfall with a loan at moderate rates.

¹¹⁴ For animals, see McCloskey and Nash, "Corn," pp. 183–85; for land, see Clark, "Cost of Capital."

¹¹⁵ B. A. Holderness, "Credit in a Rural Community, 1660–1800," *Midland History* 3 (1975): 94–115; Elaine Clark, "Debt Litigation in a Late Medieval Village," in J. A. Raftis, ed., *Pathways to Medieval Peasants*, Papers in Mediaeval Studies 2 (Toronto: Pontifical Institute of Mediaeval Studies, 1981), pp. 247–82.

There were also direct reductions of risk in early modern times. The riskiness of plant disease and weather, for example, was being reduced by the introduction of new varieties of grain from the sixteenth century on.¹¹⁶ A red-stalked wheat was developed in the south Midlands in the early seventeenth century that was resistant to smut, a fungus that destroyed whole stands.¹¹⁷ Early-ripening barley was another among many other innovations in the seventeenth century that reduced risk, the risk – cricketers would say the certainty – of wet, cold springs in England.¹¹⁸

The advances in the control of water reaching the crop, beginning with floating (that is, repeatedly flooded) meadows in the seventeenth century and ending with clay-pipe underdrainage in the nineteenth century, reduced the risk of unseasonable rain. Drainage is especially difficult in clay soils. It is significant therefore that from 1650 to 1850 grain production moved off the clay lands, a move made possible in turn by new and cheap animal fodder, and its resulting manure, from turnips and swedes and clover.

Most powerfully, the new affluence of farmers that came in the seventeenth and eighteenth centuries, and the new opportunities for employment outside agriculture, reduced the value of insurance from scattering. For all the decline in real wages during the sixteenth century, the last medieval famine occurred in England in the 1590s (in Scotland the relief came a century later, in France a century and a half later). Gregory King believed that the farmers and lesser freeholders in 1688 earned about £50 a year.¹¹⁹ Yet eleven farmers of mid-Essex 1666–1743 held at their deaths movable wealth not including land and standing crops of twice this figure.¹²⁰ With such a store of wealth a harvest failure was less dangerous. Such men were comfortably well off, and it must be noted that most people did not share so largely in the increasing yields of grain. The thirty-acre farmers, however, were the men deciding whether or not an enclosure should go forward. Two or three centuries earlier they would have resisted enclosure; now they approved.

The enclosures did not take place immediately, of course.¹²¹ The

¹¹⁶ Eric Kerridge, *The Agricultural Revolution* (New York: Kelley, 1968).

¹¹⁷ Joan Thirsk, "Farming Techniques," in Joan Thirsk, ed., *The Agrarian History of England and Wales*, vol. 4, p. 168.

¹¹⁸ *Ibid.*, p. 170.

¹¹⁹ Thirsk and Cooper, eds., *Seventeenth Century Economic Documents*, p. 780.

¹²⁰ From F. W. Steer, *Farm and Cottage Inventories of Mid-Essex 1635–1749*, 2d ed. (London: Phillimore, 1969), p. 52.

¹²¹ For an elaboration and qualification of what follows, see McCloskey, "Economics of Enclosure."

land law was tangled, until, as Maitland put it in another connection, "the transcendent power of Parliament was called in to cut the Gordian knot." The knot was that owners and even tenants in a village could veto an enclosure under the common law. The common law quite reasonably required that a man be consulted before his property was meddled with. The intermixture of property in the open fields, however, made the reasonable rule an incentive to unreason. Enclosure was everybody's business and therefore, as the saying goes, nobody's business. A single holdout could block an enclosure, and could therefore demand all the gains. Anyone could, and all did.

Parliamentary procedures in the middle of the eighteenth century sharply reduced the height of this obstacle. They made enclosure dependent on merely a majority, not a unanimity. Enclosure was a landlord's enthusiasm. The hurt to laborers was small, and probably on balance a gain (the old notion that people were driven off the land and into factories by enclosure has long since been cast aside by the evidence, though like the notion of medieval communalism it survives). The hurt to small landlords may have been large, though the matter depends critically on when smallholders could sell out. If they could sell out at the right time they could profit from the doubling of the price of land that came with the doubled rent. But the gain to the rich from hurting the laborers or the small owners had nothing to do with the timing of enclosure. Large increases in rent, and quarrels with the holders of the tithe, not scraps of land purchased at bargain prices from widows or common lands stolen from the goose, motivated the owners to arrange at considerable expense for the redistribution and enclosure of the land. The poor were too poor to influence the juggernaut.

"Juggernaut" is too strong. After all, the decline of open fields was a long process, from the fifteenth to the eighteenth century, a land reform in slow motion. The reform was the other side of the system's long duration. To explain open fields satisfactorily one must give an account of why they declined, and to explain the decline one must give an account of why they flourished.

The explanation is a story of reasonable people – one hesitates to write "rational" because the word is so charged with political and methodological emotion; "reasonable" will do. It was reasonable for a medieval peasant to scatter his plots, because he lived dangerously and it was hard to arrange for a better way to be safe. Presently it became easier, and open fields lost their charm. By that time, however, they were expensive to eradicate. Much of the new husbandry could be

adopted on them anyway. At last the state – or, to be exact, an executive committee of the landed class – intervened, though even then with proper British regard for law and muddle.

The new story of open fields and enclosure does not have a novel moral. By now the moral that medieval people were canny and calculating has lost its novelty. Students of the matter have been saying it for eighty years. In 1971 David Herlihy spoke for many medievalists in declaring that "research has all but wiped from the ledgers the supposed gulf once considered fundamental, between a medieval manorial economy and the capitalism of the modern period."¹²² Where was Jack's brother peasant when Jack had to borrow at 20 to 50 percent per year? Where was the ancient Germanic community when he had to scatter his land for safety? Where was the tradition-bound unreasonableness of medieval men when their behavior danced to an R^2 ? "You know, Ernest, the poor in medieval times were different from you and me." "Yes, Scotty, they had less money."

¹²² "The Economy of Traditional Europe," *Journal of Economic History* 31 (March 1971): 153–64, pp. 154–55.