Agriculture, Innovation and the Origins of 'Capitalism"

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To the memory of Samuel Hartlib,

One of our civilization's great unsung heroes

Abstract

This essay offers an alternative, non-Marxist explanation for the rise of capitalism in England. Arguing that the essential feature of the modern economy is not its employment of free wage-labour but its propensity to innovate, its approach to the problem of capitalism is to explain the origins of this latter characteristic, to explain, in other words, why the relative technological stagnation of the Middle Ages gave way to the rapid advances of more recent centuries. Holding that medieval economic stagnation was due primarily not to a lack of competition but to the self-sufficiency of agricultural producers (which made them immune to the effects of falling prices), the origins of innovation are sought in the rise of the non-self-sufficient urban sector, inherently predisposed as it is towards technological change. England's first wave of urbanization being the result of the seventeenth-century agricultural revolution, the problem of the origins of innovation, and therefore of capitalism, reduces itself to the origins of this latter event. It is with this question that the bulk of the essay is concerned. Based on the pamphlet literature published by the so-called 'improvers'—the ones who first sought out and developed the new agricultural techniques—the essay attempts to explain their technological experimentation in terms of the social and intellectual conditions in which they lived, concluding that the poverty and desperation of the times was their chief inspiration.

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Preface

The present essay must begin with a confession. Its origins go back some three and a half years before these first words were being written, when a young undergraduate stepped into the office of a certain professor to enquire about taking a certain course. The student was a young, rather naive undergraduate, captivated by the seductive allure of academic Marxism. To this individual the world was a very simple place. In the course of its history society had passed through several stages, each clear and distinct. Primitive communism, slavery, feudalism and capitalism followed each other in succession, each characterized by a specific set of 'relations of production'. The progression through these stages was brought about by a process of class conflict in which each class strove to further its own economic self-interest. The final stage of history was to be the overthrow of the bourgeoisie and the advent of socialism.

The student, of course, was the present author, and the course was 'The Transition from Feudalism to Capitalism'. From the point of view of Marxism, the choice of topic was a natural one. Of all the events of history, the moments of transition from one historical stage to another were the most important; and of these, the rise of capitalism stood out as being both the most recent and economically the most powerful. Armed with absolute certainty that 'the history of all hitherto existing society is the history of class

struggles', the endeavor was to be little more than a matter of fleshing out the relevant passages of the *Communist Manifesto*. *A priori* knowledge of the world was to be confirmed by a brief, perfunctory examination of historical evidence.

As the course unfolded, however, it soon became clear that something was amiss. Far from being a simple and straight-forward matter, the further research progressed, the more complex the problem of the rise of capitalism began to appear. Trying to answer one question served only to unearth others. Moreover, nothing seemed to fit the Marxist model. There did not appear to be much class conflict between *any* classes let alone between a 'rising bourgeoisie' and an entrenched 'feudal nobility'; nor was it apparent why the distinction between serfdom and wage-labour should be given the critical importance that some accorded it. Above all, however, there did not appear to be any obvious reason why the English economy should have undergone a physical transformation at all. Reading the Marxist literature on the subject brought neither clarity nor satisfaction, and left the young student's vision of the world shaken.[1]

Though the seeds of an eventual rejection of Marxism had been sown, they were not to reach full fruition for several years. During this interval work began on the present essay, which originally set out to succeed where previous Marxist historians had failed. The goal was to create an account of 'the transition' that explained the rise of capitalism as an inevitable consequence of feudalism's internal laws of development. Though this

[1] For the Marxist historiography of the subject, see Karl Marx, *Pre-Capitalist Economic Formations*, trans. Jack Cohen (New York: International Publishers, 1965); Karl Marx, *Capital. A Critique of Political Economy*, 3 vols (New York: Charles H. Kerr, 1906-9), vol. 1, part 8; vol. 3, chaps. 20, 47; Maurice Dobb, *Studies in the Development of Capitalism* (New York: International Publishers, 1963); Rodney Hilton, ed., *The Transition from Feudalism to Capitalism* (London: New Left Books, 1976); Robert Brenner, 'The Origins of Capitalist Development: a Critique of New-Smithian Marxism', *New Left Review*, no. 104 (July-August 1977); T. H. Aston and C. H. E. Philpin, eds., *The Brenner Debate* (Cambridge: Cambridge University Press, 1985); Ellen Meiksins Wood, *The Origin of Capitalism* (New York: Monthly Review Press, 1999).

original ambition has long since been discarded, the influence of Marxism on this essay is nevertheless indelible. Its topic remains the 'transition from feudalism to capitalism', though now it would admit that 'feudalism' and 'capitalism' are concepts usually either so vague or so specific as to be meaningless, and that the interpretation of history as a series of economic stages is an intellectual prison from which one cannot escape too quickly. The alert reader will also notice a shift in style within the essay's body. The first section focuses primarily on economic matters, treating 'capitalism' as a more-or-less real conceptual category subject to a distinctive economic 'law' differentiating it from pre- or non-capitalist societies. The second part of the essay, by contrast, focuses almost entirely on the human mind, emphasizing how certain beliefs and experiences inspired individuals to make the voluntary decisions that were eventually to transform English society. The first part, unsurprisingly, was conceived earlier, under the influence of Marxism. The second represents the author's present, more mature historical perspective. If this gives the essay something of a split personality, the only thing that can be said in its defense is that history is a complicated affair, and no one set of factors—economic, cultural or otherwise—is likely to do it justice. Ideas developed under the influence of Marxism that the present writer continues to believe are of value have been retained and combined with more recent thinking and research. It is hoped that the final product, in addition to being idiosyncratic, will also prove insightful.

Before the argument of this essay can begin, a final word must be said about one of Marxism's ideological rivals: so-called 'post-modernism'. There is a striking similarity between the 'post-modernist' contention that historical knowledge can never be proved with absolute certainty, that in the end it amounts to nothing more than the subjective

opinion of individual historians, and the epistemological scepticism that rocked the philosophical world of the sixteenth and seventeenth centuries. The latter arose at a time of intellectual turmoil. The Reformation had shattered the philosophical world-view of the medieval Church, leaving the doctrines of a weakened Catholic church to contend with the growing challenge of its Protestant rivals. New beliefs conflicting with those of Rome became legion, multiplied as they were by the disunity of the Protestant camp and by the doctrine of the priesthood of all believers, which opened the door to a nearly infinite variety of interpretation. In defending their faith from this challenge, Catholic philosophers began to question the epistemological basis of the new Protestant theological doctrines, many of which, such as predestination, appeared to be based on nothing other than the personal conviction of individual believers. Eventually, these Catholic-inspired arguments developed into a full-blown 'sceptical crisis' that challenged the entire basis of human knowledge, even Catholicism and the veracity of the Bible itself.[2]

The parallels between early-modern scepticism and twentieth-century post-modernism are remarkable. Both emerged in periods of intellectual upheaval, scepticism during the Protestant challenge of the sixteenth century, and post-modernism during the Marxist challenge of the twentieth. Both arose in opposition to ideologies whose doctrines were based on the unprovable claims of their followers. And both responded to the challenge by undermining the certainty of all human knowledge, in both cases leading to a sceptical crisis.

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[2] On the history of philosophical scepticism, see Richard H. Popkin, *The History of Scepticism* (Berkeley, University of California Press, 1979).

In the future there may, perhaps, be an additional parallel. In the case of early modern scepticism, with the failure of René Descartes' heroic, if quixotic, attempt to save human knowledge from the sceptical abyss, the sceptics 'won' the debate.[3] No philosopher since that time has been able to establish the basis for absolute certainty beyond such trivialities as 'I think therefore I am'. Instead, a new empiricism emerged, which, admitting the impossibility of absolutely certain knowledge, accepted probability as a sufficient second-best. Scepticism, despite its triumph, quietly gave way to the inductive method that has become the foundation of modern science. And if the latter's success is any indication, uncertainty would seem to have been the best thing to have happened to human knowledge since monkeys learned to speak.[4]

Such may also be the fate of post-modernism. No argument put forward has successfully been able to re-establish the basis for absolutely certain historical knowledge. It would seem that the post-modernists, like their early modern predecessors, have 'won' the debate. The victory, moreover, is perhaps not undeserved. Post-modern scepticism, like its earlier counterpart, performed a valuable service by demolishing the dogmatic ideologies of the twentieth century. Yet now that this task has been completed, the time has come for it too to fade away. In its place must be erected a new historical epistemology based on a method of sober induction. All *a priori* assumptions and unprovable claims must either be stripped away or openly admitted for what they are. Assertions should be made only on the basis of empirical evidence, and should be claimed to be true only to the extent that such evidence is unambiguous. Contrary evidence must not be concealed but candidly admitted by the historian as a potential

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[3] Ibid., 172-213.

[4] Edgar Zilsel, 'Problems of Empiricism', in Giorgio de Santillana and Edgar Zilsel, *The Development of Rationalism and Empiricism* (Chicago: University of Chicago Press, 1941), 53-94.

weakness in his argument. Conclusions that follow from the evidence must be accepted, even if the historian dislikes them or they do not correspond with his political beliefs. The easy days when all a historian needed was elegant prose and profound ideas are gone forever. History must become a science. For those uncomfortable with the prospect of giving up the *terra firma* of certain knowledge the words of Sir Francis Bacon are worth remembering: 'if a man will begin with certainties, he shall end in doubts; but if he will be content to begin with doubts, he shall end in certainties'.[5]

Many historians, of course, have been practicing such methods for a long time, and to ignore their work would be to do them a grave injustice. Yet still others continue in the old ways. It is hoped that the present essay, its author having recently freed himself from an ideology based on *a priori* belief, will serve as a worthy example of the empirical method it advocates. Its main conclusions were drawn directly from the evidence, and were not even conceived before research began. While most of these conclusions, the author believes, are well supported by evidence, others (especially several relatively minor points) are less well supported, remaining somewhat more speculative than would have been preferred. They are included, however, as a spur to the reader's imagination and possibly to future research; and are never claimed to be more than what they are. In doing so this essay is heeding the advice of Lynn White, Jr.: 'It is better for a historian to be wrong than to be timid.'[6]

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[5] Sir Francis Bacon, *The Advancement of Learning* (Montana: Kessinger, [1994]): 31.
[6] Quoted in H. Floris Cohen, *The Scientific Revoluion. A Historiographical Enquiry* (Chicago: University of Chicago Press, 1994): v.

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Needless to say, all errors are my responsibility alone.

A Note about Source Materials

Except where more recent publications appear in the bibliography, all references to pamphlets and books printed in the sixteenth and seventeenth centuries refer to reproductions found in the extensive microfilm collections compiled and published by Alfred Pollard and Donald Wing.[1] Spelling and capitalization have generally been kept to the original except in cases where doing so would have rendered the text difficult to read (titles, however, have been kept in their original form). Where appropriate, the following rules of transliteration have been observed: u's have been changed to v's, uu's and vv's to w's, i's to j's, y's to th's, the occasional ß to ss's, and the old letter so-called 'leading s' (which resembles the modern 'f') has been replaced by its modern form. Y's that would now be i's and vice versa have in most cases been left unchanged. Somewhat more liberty has been taken with punctuation. Tedious use of commas has been reduced if not eliminated, and the semi-colon has been introduced to several texts whose authors either knew not how to use this prince of punctuation marks or whose printers had not the type-set to do so. In one instance a text has been rescued from punctuation purgatory by replacing forward-slashes (/) with modern commas. Italicization has been removed in

[1] Alfred W. Pollard, *Early English Books, 1475-1640* (Ann Arbor, Mich.: University Microfilms, 1938-); and Donald G. Wing, *Short-title Catalogue of Books Printed in England, Scotland, Ireland, Wales, and British America, and of English Books Printed in Other Countries, 1640-1700* (New York: Index Committee of the Modern Language Association of America, 1972-1988)

cases where special emphasis was not intended by the original author. Where numerical pagination does not exist, references have been made to folios instead. Although the folio number is typically found on the right-hand sheet, such references may refer to either of the two facing pages.

1 Introduction

In the centuries that followed the end of the Middle Ages the pace of change in all aspects of life in western Europe grew exponentially. The story, by now, has the familiarity of a cliché. In the Middle Ages the pattern of life remained more-or-less unaltered for hundreds of years. The great majority of people lived in the countryside, earning their subsistence from agriculture. A small segment of the population lived in the towns where they engaged in trade and small-scale craft production. Though culture, beliefs and even technology varied from country to country and century to century, a peasant, an artisan or a landlord plucked at random from the first millennium and placed in a new life in the first few centuries of the second, would likely have found himself in a familiar world. The great events of medieval history were by and large singular upheavals and disasters, man-made or natural, which, once they subsided, left the rhythm of life much as it had always been.

If long-term stability was the byword of the Middle Ages, rapid and unceasing change is what has come to characterize the post-medieval period. Since around 1450 almost every aspect of European society has undergone at least one, if not several, complete transformations. Religion, philosophy, culture, politics, and economic life have

all changed beyond recognition from what they were in the days of knights and chivalry. It was as if a long-dormant star suddenly exploded into a supernova.

To explain this transformation from the medieval to the modern world has long been one of the most basic problems of history. One of the earliest and most enduringly influential attempts to do so has been that of the Marxists. The basic tenet of the Marxist model is that history consists of a series of stages in the development of society, each representing a separate and distinct 'mode of production', characterized by its own set of social relations. The difference between the Middle Ages and the modern world, it is alleged, is the difference between two such 'modes of production', feudalism and capitalism. The 'mode of production' being the fundamental determinant of all aspects of economic, social and cultural life, to explain the rise of modernity one need only explain the rise of capitalism, an explanation to be sought in the class conflict and economic 'laws of motion' of feudal society. It is an approach to history whose elegant simplicity and superficial plausibility have given it in the past century and a half an influence remarkably long-lasting considering its speculative nature.

Things that sound too good to be true, however, usually are; and Marxism is no exception. As historians took up the Marxist hypothesis, both as proponents and critics, a number of problems quickly became evident. Many key historical events of the last five centuries cannot easily be explained in terms of the prevailing economic system. The shattering of the medieval Church, the development of printing, the voyages of discovery, the advance of military technology—all of these and many other important events fall into this category. Furthermore, among societies with similar economic systems, the most varied social, cultural and intellectual forms are to be found. Islam has always been

different from Christianity, Russians always different from Germans, and French cuisine always better than English. No economic differences can account for these and countless other distinctions.

However, while the shortcomings of the Marxist interpretation are clear, the case should not be overstated. The French and English Revolutions may not have been 'bourgeois' revolutions (or in the latter case even a revolution), Protestantism may not be a 'bourgeois' religion, but all of this does not mean that the rise of capitalism was an unimportant event. The insightful baby must not be thrown out with the doctrinaire bathwater, however voluminous the latter may be. If relatively few phenomena can be directly explained by the rise of capitalism, the latter event nevertheless has had a crucial role in setting the backdrop to the last several hundred years of history. In a broad sense it may be said that it was the increasingly wealthy economic environment that came to characterize Europe after 1500, and especially after the industrial revolution, that made possible many of the social, cultural and political changes that have come to distinguish modern life. When subsistence is scarce, when all of an individual's energy must be devoted to survival alone, the possibilities for variation in life are few. The same story becomes Everyman's story: one is born, learns how to farm, inherits the family's land, gets married, has a family, passes on the land to the children, and dies. In the past several centuries, however, unprecedented wealth has made the cultural possibilities of life (at least in the developed world) almost boundless. Everyman no longer exists; each is now a unique individual (if also perhaps a little more frivolous). Someone, for example, beginning his life as a child buried in toys, might grow up to become an unhappy teenager, have an identity crisis, experiment with drugs, get a body part pierced, work a

little (teaching English in Asia, of course), quit, have a child outside of marriage, have another identity crisis, enroll in a yoga class.... the reader gets the point.

The goal of explaining the rise of capitalism, therefore, retains some merit in the quest to understand the emergence of modernity, even if it is not the universal answer it once appeared to be. Yet it is precisely in explaining this event that the Marxist model runs into its most serious difficulty: no explanation for the rise of capitalism put forward by Marxists has been at once coherent, internally consistent, and capable of withstanding critical scrutiny. Medieval class conflict and the economic 'laws of motion' that supposedly governed the evolution of feudalism—the factors that Marxists have traditionally relied upon in their explanations—have both proved to be nonstarters.[1] In general, ideology and speculation have triumphed over research and evidence. In consequence, the Marxist explanations have gained little credence among non-Marxist historians.

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[1] Maurice Dobb, for instance, sees the origins of capitalism in the breakdown of feudalism, which, according to him, resulted from the inefficiency of that system, 'coupled with the growing needs of the ruling class for revenue' (owing to the costs of war and brigandage, the multiplication of vassals and retainers, the natural growth of noble families and the lavish expenses of their households, and the growth of trade which the fostered demand for exotic, expensive goods previously unavailable). Together, these internal 'forces' of feudalism 'promoted an increase in the pressure on the producers to a point where this pressure became literally unendurable'. Dobb, *Studies*, 42-6. This version of events, however, is unsubstantiated and unhistorical. Far from feudalism being subject to some 'law' of intensifying exploitation, conditions in the later Middle Ages were generally favourable to the peasantry, who enjoyed, in the words of one historian, a period of 'quiet prosperity'. J. L. Bolton, *The Medieval English Economy, 1150-1500* (London: J. M. Dent, 1980), 241. Robert Brenner also makes the argument that the critical juncture in the rise of capitalism was the breakdown of serfdom. This, however, he sees as the result not of feudal 'laws of motion' but of class conflict. In the period following the Black Death, he argues, the serfs won their freedom through revolt and flight. Robert Brenner, 'Agrarian Class structure and Economic Development in Pre-Industrial Europe', in *The Brenner Debate*, ed. T. S. Aston and C. H. E. Philpin (Cambridge: Cambridge University Press, 1985), 35. However, his emphasis on class conflict instead of demographical factors is arbitrary. In all likelihood both were essential preconditions—population decline in creating a shortage of labour, and 'class conflict' in preventing the lords from freezing rents at pre-plague levels. The most serious problem with Brenner's argument, however, is its premise that the creation of a free labour force was sufficient to bring about capitalism. For a critique of this assumption, see below, pp. 5-7.

An alternative explanation for the birth of the modern economy is therefore in order. The present essay is an attempt to provide one. It is an attempt to explain why between roughly 1500 and 1750 one particular country, England, set off down a path that would ultimately lead to the creation of Europe's first industrial society. Put negatively, it is an attempt to explain why medieval England did not remain medieval forever, as it perhaps might have done. Research has been confined to England for the reason that it was this country's precocious economy that first experienced industrialization. It was also considered that what explains an economic transformation in one country may not explain a similar process in another, and that any attempt to generate a pan-European model would consequently do more to obscure than to enlighten. While it is hoped that the conclusions herein drawn will provide insight into the development of other countries, it may very well have been the case that it was the appearance of the English example itself that inspired its imitation elsewhere.

In explaining the rise of capitalism in England, the first step must be to specify precisely what is referred to by this expression. Capitalism, like feudalism, is a problematic term; something easier to recognize than to define. The cigar-smoking factory owner, equipped with a top-hat and a golden pocket-watch, employing underpaid women and children to spin cotton in a sooty, steamy textile mill is easily recognized as a 'capitalist'; but precisely what makes him so is a more complicated matter. Marxists have traditionally claimed that the essential feature of capitalism is the employment of free wage-labourers; free, famously, in the double sense of being personally free to sell their labour, and 'free' of property (i.e., not owning any). The medieval peasants, so the story goes, were freed from bondage but stripped of their land, and hence driven into the arms

of the waiting capitalists who were eager to employ their labour in the new capitalist industries. Feudalism was the age of serfdom; capitalism the age of the free proletariat.[2]

Beyond its appealing simplicity, however, there are several problems with this version of events. In the first place, the supposed distinction between the serfdom of the Middle Ages and the post-medieval free-labour has been greatly over-simplified. Research conducted long ago by E. A. Kosminsky (himself a Marxist) and confirmed many times since, has shown that wage-labour was widespread in medieval times, perhaps even accounting for an absolute majority of all manorial labour.[3] If so, and if the predominance of wage-labour is accepted as the essential characteristic of capitalism, then as one historian put it, 'England was as 'capitalist' in 1250 as it was in 1550 or 1750.'[4] The utility of a definition that cannot clearly distinguish between economic life in the thirteenth and nineteenth centuries is, needless to say, dubious.

To this empirical objection may be added a further subjective one: the presence or absence of wage-labour, taken by itself, does not seem to capture the 'feel' or 'essence' of the medieval and modern eras. To demonstrate this, a brief digression into the counterfactual is in order. One may imagine a hypothetical society in which change comes so slowly that it is not noticed, where life is predominantly rural and agricultural, where technology is traditional and science nonexistent; but where a class of landowners own all of the land, which they cultivate with the use of wage-labour. By contrast, one

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[2] Marx, *Capital*, 1:785.

[3] E. A. Kosminsky, *Studies in the Agrarian History of England in the Thirteenth Century* (Oxford: Basil Blackwell, 1956), 283-318. In studying thirteenth-century data from fifteen hundreds in Huntingdonshire, Cambridgeshire, Oxfordshire and Warwickshire, Kosminsky found that 46 per cent of manorial demesnes had either negligible access to labour services or had no such access whatsoever. Furthermore, the quantity available to the remaining 54 per cent was often insufficient to meet manorial demand. In both cases the missing labour could only have been supplied by hiring for wages. For more recent studies confirming these findings, see the references in Alan Macfarlane, *The Origins of English Individualism. The Family, Property and Social Transition* (New York: Cambridge University Press, 1978), 148-9.

[4] Ibid., 195.

may envision a society that is urban, rich and dynamic, where each year the forces of competition bring new technologies and economic growth, where science is perpetually crossing frontiers not even imagined by previous generations; but whose economy is based on the unfree labour of slaves. Which of these two hypothetical societies is the more capitalist? The Marxists would say the former; common sense, however, is drawn to the latter.[5]

The Marxist definition of capitalism, then, seems rather unsatisfactory. In its place, the present essay will employ a different concept. From the point of view of historians trying to grapple with the problem of modernity, the most significant aspect of the economic transformation was the explosive increase in wealth and in the diversity of goods and services that it brought. It was this, as has already been suggested, that made possible the subsequent cultural transformation that altered European society beyond recognition. The key to understanding the rise of the modern economy, therefore, is to understand the forces of innovation that fuelled technological transformation. It was these forces that brought about the countless changes in the methods of production that culminated in the industrial revolution and made modern life possible. The present essay is an attempt to explain the emergence of these forces, to account for the modern economy's propensity to innovate, to unravel the mystery of how the profound economic conservatism of the Middle Ages blossomed into a spirit of innovation so dynamic that it would transform the entire world.[6]

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[5] It is of course true that both of these hypothetical societies are unhistorical (and perhaps even impossible). The point of this exercise, however, is merely to demonstrate that when wage-labour is isolated and removed from the image of modern society, that which remains still 'feels' very much like capitalism. Hence, the 'essence' of capitalism, the aspect of modernity that resonates loudest in the mind, that gives the modern world its defining flavor, must be something other than that which the Marxists suggest.

[6] This definition is similar to that of Joseph Schumpeter, who argued that the distinguishing feature of capitalism is its propensity for constant upheaval in the process of production, its incessant replacement of

Whether this will constitute an explanation for the rise of capitalism or not is left for the reader to decide. It should be remembered, however, that unless one adopts a Platonic, essentialist view of the universe, all terms and concepts are nothing but artificial creations of the human mind, not perfect, unambiguous essences existing apart from it. As such, each has validity only in so far as it has utility. Concepts are tools created to facilitate understanding of the real world as it is actually found and experienced. The onus is therefore on those who would define a concept to justify its parameters. Those still uneasy with the use made here of the word 'capitalism' might, perhaps, be placated by agreeing to discard it altogether in favor of the less ideological 'modern economy'. The concept of 'capitalism' has been used and misused so much in the past century that the term may have lost whatever value it once had. Its continued use in this essay is due not so much to its analytical integrity as to its widespread recognition. In any case, whatever is being explained, it is the origins of innovation that are the key to doing so. It is to this matter that we now turn.

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the old by the new, of the antiquated by the modern, a process he referred to as 'creative destruction'. Joseph A. Schumpeter, *Capitalism, Socialism and Democracy*, 3rd edition, (New York: Harper and Row, 1962), 83. Marx himself, in his less theoretical moments, employed a similar concept: 'Constant revolutionising of production, uninterrupted disturbance of all social conditions, everlasting uncertainty and agitation distinguish the bourgeois epoch from all earlier ones.' Karl Marx and Friedrich Engels, *Manifesto of the Communist Party* (New York: International Publishers, 1948), 12. Absent from this is the much vaunted wage-labourer.

2 Innovation and the Agricultural Revolution

It has long been a commonplace that the secret of innovation is competition.[1] When multiple sellers bring their goods to the same marketplace, buyers are enabled to choose from among them those whose products are most cost-effective. In this way, producers whose goods are inexpensive and of high quality are rewarded, while those whose products are costly and of poor quality are punished. The fact that sales and prices are not guaranteed forces producers to be constantly searching for new ways of improving efficiency so that their products remain competitive. At the same time, those who pioneer techniques and products superior to the best of what is currently available are able to reap untold fortunes by edging out their competitors. Competition, in other words, would appear to be the driving force behind innovation. The theory is simple, plausible, demonstrable, and for the most part true.

[1] Some economists, however, have suggested that it is monopoly, rather than competition, that is essential for innovation. In a perfectly competitive environment where profits tend to be low, so the argument goes, innovations requiring a significant initial investment in research and development will not be feasible. Only when a producer can expect to enjoy a period of monopoly in his new product or technique, in which time he can recuperate his initial outlay, will it become economical for him to make such an investment. (I owe thanks to Prof. Lipnowski for bringing this point to my attention.) See, e.g., Schumpeter, *Capitalism, Socialism and Democracy*, 89-90. For a modern, more technical rendering of this hypothesis, see Paul M. Romer, 'Endogenous Technological Change', *Journal of Political Economy* 98, suppl. (1990): S71-S102. However, while this argument is undoubtedly valid in certain cases (notably in the modern pharmaceutical industry), it amounts to a refinement rather than a refutation of the link between competition and innovation. For although innovation may require a limited monopoly, such a monopoly nevertheless exists within the broader framework of a competitive economy. It remains true that it is the normalcy of competition, and the lowered profitability this implies, that prompts firms to search for new products and techniques, to search, in other words, for a new monopoly. Were competition not the norm and profits always high, there would be no such impetus.

It is not, however, the full story. Were competition the only factor required for innovation, England would have undergone an economic revolution many centuries before it did, for its economy had long been highly commercialized, and its agriculture by no means uncompetitive.[2] In the medieval period, rents, taxes and tithes meant that individuals at all levels of the social hierarchy had to raise often large amounts of money in order to retain their positions in society.[3] The wealthy, furthermore, had luxurious lifestyles to maintain, involving often costly expenditures for food, drink, spice and clothing. When, for instance, the earl of Lancaster visited Leicester around the year 1270, some £223 were spent in supplying him with meat, fish, oats, bread, pastries, ale, spices, wax, coal and cloth. Even the poor had to pay for the household goods which they could not produce domestically: clothing, salt, pots and pans, and iron for their tools and farming implements.[4] All of these expenses had to be met through revenues earned primarily through the sale of agricultural products. One historian has estimated that in the early fourteenth century between 20 and 30 per cent of all bread grains were brought to market, while for wool the figure was nearly 100 per cent.[5] Moreover, unlike the case of urban crafts, in agriculture there were no guilds to impede competition: the number of buyers and sellers was simply too great.[6] A substantially free market, combined with the

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[2] For a recent survey of the commercial life of medieval England, see R. H. Britnell, *The Commercialisation of English Society 1000-1500* (Manchester: Manchester University Press, 1996).

[3] Such charges, of course, were not always paid in money. Sometimes, especially in the early Middle Ages, they took the form of labour services or payments in kind. However, as early as the Domesday Book, many rents and other dues were already being paid in money; and by the fifteenth century non-monetary rents had all but disappeared. Ibid., 34-43, 191-2.

[4] Edward Miller and John Hatcher, *Medieval England. Towns, Commerce and Crafts 1086-1348* (London: Longman, 1995), 139.

[5] Britnell, *Commercialisation*, 123. See also Macfarlane, *Origins*, 151-2; and N. S. B. Gras, *The Evolution of the English Corn Market from the Twelfth to the Eighteenth Century* (Cambridge, Mass.: Harvard University Press, 1915), 17-8.

[6] This, of course, is not to deny that agriculture in the Middle Ages was subject to many restrictions. On the contrary it was highly regulated, both at the local and national level, by custom and by law. From the point of view of this essay's argument, however, the important thing is not the presence or absence of regulation

sheer quantity of produce involved, meant that a brisk competition was a perennial feature of medieval agrarian life. And yet technological change was almost nonexistent.[7] Clearly, competition alone is insufficient to explain innovation.

In conventional economic theory, what makes competition such a potent spur to innovation is the threat of economic ruin faced by those who are inefficient. It is assumed that consumer choice is a force sufficient to make this threat a reality, drawing sales and profits away from those who do not merit them, to the benefit of those who do. However, a crucial factor is being overlooked. In order for a producer's existence to be jeopardized by competition, not only must he lose out in the marketplace, but his very survival must be dependent on success in that marketplace. In other words, he must be dependent on the market to supply the raw materials, means of subsistence, and other goods and services necessary to continue being a producer. In a modern economy, where the production of most goods requires the purchase of raw materials and capital equipment, this condition is almost always present. An automaker, for instance, must earn enough revenue to purchase all of the raw materials and parts that go into a modern automobile, as well as

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as such, but whether or not prices were controlled; or, more specifically, whether or not they were prevented from falling below a certain level. For the aspect of competition which spurs innovation is the financial loss that occurs when a producer lowers his price to match that of a more efficient rival.

N. S. B Gras, in his study of the English corn market, has demonstrated that artificial maintenance of high prices was generally absent in medieval England. While restrictions were often imposed on the sale of oxen and horses (owing to their use in ploughing the lord's demesne), the typical tenant, both free and customary, "sold his corn and his beasts not used for cultivation with little or no restriction." Ibid., 18-9. In fact, many of the regulations that were put in place in the corn trade were imposed precisely with the view of preventing threats to competition and keeping prices low. One of the most commonly enforced regulations was against 'engrossing', or monopolizing the supply of corn in order to inflate its price, whether by 'forestalling' (buying up grain before it could reach the market) or by 'regrating' (buying grain with a view to reselling it later for a profit). Laws against these practices continued into the seventeenth and eighteenth centuries. Ibid., 130-2. See also p. 68-72.

[7] This, of course, is not to suggest that technological change was entirely absent from medieval agriculture—only that it occurred at very slow rate. The adoption of the heavy plough, the horseshoe and horse-collar, and the three-field system of crop rotation were all important developments in their day. However, the sense of their importance is heightened by the very scarcity of such events; and it must not be forgotten that even with these technologies medieval agriculture remained remarkably inefficient, able to support only a small urban population. On technological change in medieval agriculture, see Lynn White, Jr., *Medieval Technology and Social Change* (Oxford: Oxford University Press, 1964), 39-78.

the factories, machines and labour power necessary to assemble them. If he does not, then he cannot continue to produce automobiles. Failure to effectively compete in the marketplace, in other words, places his existence as an automaker in jeopardy. In the same way, the existence of a producer in almost every modern industry is at the mercy of the market.

The same, however, cannot be said of a pre-modern economy in which most people earn their subsistence through farming. In pre-modern agriculture, most of what is needed for production is produced on the land itself. Seed is kept from the previous year's harvest, buildings are constructed from local timber, animals are fed from local grass or fodder that has been previously gathered, and, most importantly, the subsistence of those who work the land is provided by the harvest itself. Very little, in other words, must be procured from the market in order to maintain production, the most important exception being the handful of iron implements that cannot be produced domestically. This independence from the market makes agricultural producers largely immune to the pressures of competition. Economic survival is guaranteed so long as the harvest is successful. No matter how little produce is sold, no matter how low prices fall, competition with more efficient neighbours will never threaten an inefficient producer's existence, and therefore will never compel him to innovate.

This is true even when wage-labour is employed. For even though in this case the employer must earn enough money on the market to pay his labourers' wages, to the extent that these wages are in turn spent on agricultural products, the effect of market-dependence is neutralized. For if labourers buy the same products they produce, a fall in the price of those products means a corresponding increase in real wages. If more

efficient neighbours, for instance, drive down the price of grain, they also drive down the amount of money a less-efficient producer needs in order to pay a subsistence wage. The effect of competition, therefore, remains minimal. So long as a producer continues to produce enough grain and other necessities to meet the subsistence needs of his labourers, and so long as the price of wages does not greatly exceed the minimum level of subsistence (and therefore does not include a large amount of non-agricultural products), it makes no difference whether that subsistence is given directly the labourer or is first sold and then bought back by the labourer with his wages. In both cases, despite the appearance of the latter, production is self-sufficient and thereby shielded from the effects of competition.[8]

Whether or not competition will force a given industry to innovate, therefore, is a function of whether or not that industry is self-sufficient; and whether or not that industry is self-sufficient is in turn a function of what that industry produces.[9] In the modern economy the distinction is meaningless. All industries—even agriculture—are highly integrated with the rest of the economy, and, consequently, are forced to innovate in order to survive. In the pre-modern economy, however, the distinction is decisive. Generally speaking, pre-modern agriculture is self-sufficient, while urban industry, which must

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[8] Robert Brenner, in fact, comes close to realizing the importance of self-sufficiency in determining whether an economy responds to competition. He writes that in the Middle Ages, 'the serf lords were under no compulsion to produce at the highest level of efficiency. This was because they were not, in the last analysis, compelled to make a profit on the market in order to survive, since they could *directly*, without recourse to the market, supply their own basic ('subsistence') needs on their own demesnes with their peasants' labour.' [Brenner's emphasis.] Brenner, 'Origins', 44. For Brenner, however, the important factor is not self-sufficiency *per se* but the presence or absence of wage-labour: 'It is only with the emergence of free wage labour ... that production must be marketed to make possible reproduction.... Only then is there ... systematic pressure to accumulate and thus develop the forces of production.' Ibid., 50. For this reason Brenner comes close but ultimately fails to grasp the essence of the matter. This is an example of how Marxism's preoccupation with wage-labour has distorted and inhibited its explanation for the rise of capitalism.

[9] For a more detailed demonstration of this principle, including an exploration of the way in which partially self-sufficient producers are only partially shielded from competition, see the Appendix at the end of this essay.

obtain from the market its raw materials and labourers' subsistence, is not.[10] Being predominantly agricultural, the pre-modern economy will tend to stagnate as a whole. The small, potentially innovative urban sector is checked by the much larger rural sector which employs most of the population and constitutes the largest portion of the market. This and this alone was the fundamental reason why economic life from pre-history until the last few centuries was characterized by a glacially slow pace of development. Pre-modern economies, dominated as they are by agriculture, have an inherent tendency to stagnate, to reproduce themselves unchanged for generation after generation. The only way a society can break out of this cycle is by breaking the dominance of agriculture itself.

The key to explaining the rise of the modern English economy, then, is to explain the rise of the non-agricultural sector; and the key to explaining this is to explain the so-called agricultural revolution. Between roughly 1500 and 1850 English agriculture underwent a prolonged transformation that saw efficiency gradually improve. New techniques meant that more and more grain could be produced with each unit of labour. The growing abundance of subsistence fed an ever larger urban population which increased both in absolute numbers and as a portion of the whole. The steady rise of urbanization may be seen in Table 2.1:

[10] On the self-sufficiency of the medieval English manor, see Miller and Hatcher, *Medieval England*, 135-6; and the Appendix to this essay, pp. 82-83.

Table 2.1. Population Growth and Urbanization, c. 1520-1801 (thousands)

	c. 1520	c. 1600	c. 1670	c. 1700	c. 1750	1801
Population of England	2400	4100	4980	5060	5770	8660
Urban population	125	335	680	850	1215	2380
Urban %	5.25	8.25	13.5	17.0	21.0	27.5
London population	55	200	475	575	675	960
London %	2.25	5.0	9.5	11.5	11.5	11.0

Source: E. Anthony Wrigley, 'Urban Growth and Agricultural Change: England and the Continent in the Early Modern Period', *Journal of Interdisciplinary History*, 15 (1985), 688.

Note: An urban population is defined as any town with more than 5,000 inhabitants.

The level of urbanization may serve as a rough indicator both of the productivity of agricultural labour, and of the degree to which England's economy became dominated by the non-self-sufficient urban sector.[11] Between roughly 1520 and 1801, the urban population quintupled as a portion of the total and increased nineteen-fold in absolute terms. It was this demographic revolution that made possible the dynamism that came to characterize the English economy, and which, at the end of the eighteenth century, culminated in the industrial revolution.[12]

[11] On the treatment of urbanization as an index of agricultural productivity, see E. Anthony Wrigley, 'Urban Growth and Agricultural Change: England and the Continent in the Early Modern Period', *Journal of Interdisciplinary History* 15 (1985), 683-4. The level of urbanization in fact underestimates the degree to which the agricultural sector in early modern England declined as a proportion of total employment. This is owing to the fact that many families remained in the countryside though they engaged all or part of their time in industrial forms of work. This is the basic assumption of so-called proto-industrialization theory. See, e.g., Franklin F. Mendels, 'Proto-industrialization: The First Phase of the Industrialization Process', *Journal of Economic History*, vol. 32, (1972), 242, 254. For a recent survey of the literature on proto-industrialization, see Sheilagh C. Ogilvie and Markus Cerman, eds., *European Proto-industrialization* (Cambridge: Cambridge University Press, 1996), 1-11. See also Table 3.1 below for an estimate of the portion of the population employed in agriculture.

[12] On the link between the agricultural and industrial revolutions, see Phyllis Deane, *The First Industrial Revolution* (Cambridge: Cambridge University Press, 1965), 36-50; and Bruce M. S. Campbell and Mark Overton, 'A New Perspective on Medieval and Early Modern Agriculture: Six Centuries of Norfolk Farming c. 1250-c.1850', *Past and Present*, no. 141 (Nov 1993), 39.

The key to explaining England's economic transformation, then, is to explain why this agricultural revolution occurred. In other words, it must be explained why a sector which had long been self-sufficient suddenly became innovative; why innovation appeared before the apparent reason for it. It is to this problem that we now turn.

3 The Origins of the Agricultural Revolution

The timing of the agricultural revolution is a matter of some controversy. Some see it a phenomenon of the period from around 1750 to 1850, roughly contemporaneous with the Industrial Revolution.[1] Others see it as having occurred much earlier, in the early seventeenth and even sixteenth centuries.[2] Still others suggest a period somewhere in between, roughly between 1650 and 1750.[3] Faced with such discrepancies it is necessary to look more closely at the timing of agricultural change before any attempt can be made to explain its occurrence.

The notion of an early agricultural revolution in the sixteenth and early seventeenth centuries is based on the assumption that the key technological innovation that made it possible was the development of so-called 'convertible' or 'up-and-down' husbandry.[4] Eric Kerridge, the foremost proponent of this view, describes this new

[1] E.g. Mark Overton, *Agricultural Revolution in England: The Transformation of the Agrarian Economy 1500-1850* (Cambridge: Cambridge University Press, 1996); and Campbell and Overton, 'A New Perspective', 74. See also Deane, *First Industrial Revolution*, 36-50. For a survey of the literature on this subject, see Overton, *Agricultural Revolution*, 1-7.

[2] The classic work postulating an early agricultural revolution, emphasizing the period 1560-1673, is that of Eric Kerridge, *The Agricultural Revolution* (New York: Augustus M. Kelley, 1968).

[3] E. L. Jones, 'Agriculture and Economic Growth in England, 1660-1750: Agricultural Change', *Journal of Economic History* 25 (1965), 1-18; reprinted in *Essays in Agrarian History*, 2 vols, ed. W. E. Minchinton (Newton Abbot: David and Charles, 1968), 1:205-19.

[4] Other names include 'alternate husbandry', 'field-grass husbandry' and 'ley farming'. Kerridge, *Agricultural Revolution*, 181. In this essay it shall be referred to as convertible husbandry.

technique as the agricultural revolution's 'backbone'.[5] The basic idea behind convertible husbandry was that by periodically converting pasture into cropland and vice versa, over time all land would serve as both. The advantage of this was that the nutrient reserves accumulated while land was under grass became available to crops when it was broken up for ploughing. In this way the wastefulness of medieval husbandry practices, in which valuable nutrients lay dormant under permanent pasture while nutrient-starved arable land was continuously being exhausted, was avoided. Furthermore, temporary grass was superior to permanent in that periodical ploughing destroyed anthills and mole holes and improved drainage, lessening the risk of foot and liver-rot among sheep. Newly ploughed grassland also had a superior, more crumbly soil structure, allowing better root formation, drainage and breathing. Better crops and richer grass meant more animals, which in turn meant more manure. In all, the system of convertible husbandry would appear to represent a substantial improvement over medieval techniques.[6]

Other historians, however, disagree with this conclusion. Any benefits to be had from adopting convertible husbandry, they argue, would have been of only short-term benefit. After the first few years, yields would have fallen back to their previous levels as the newly-released stores of nutrients became exhausted and as soil acidity rose due to leaching and the breakdown of organic matter. Moreover, the time required to exhaust newly ploughed land is much less than the time needed to restore it, so that the initial gains in fertility made by switching to a convertible system could never be repeated. Re-establishing grass is also a difficult task, much easier said than done. In all, one suspects

[5] Ibid.
[6] Ibid., 204-7; Overton, *Agricultural Revolution*, 116-7.

that the relatively minor long-term gains to be had from such a system would scarcely have made the effort worthwhile.[7]

Furthermore, the extent to which convertible husbandry was a new technique is doubtful. Medieval examples of it abound. It was established in Norfolk by the fourteenth century, and in Sussex, Devon, and Cornwall by the thirteenth. Nationally it had become widespread by the fifteenth century.[8] The basic idea of convertible husbandry is even to be found among classical writers. Advising his readers on the best way of managing pastures, Columella, for instance, suggests that it is 'expedient to plough them up now and then for a grain crop, because such land after long idleness produces luxuriant crops'.[9] If convertible husbandry was the 'backbone' of the agricultural revolution, then the beginnings of this revolution must be sought long before the sixteenth century.

New or old, easy or difficult to implement, if convertible husbandry was the agricultural revolution's key innovation, then there should be plenty of hard evidence that productivity grew sharply in the period when it was allegedly put into practice. In fact the evidence strongly suggests the reverse—that agriculture progressed very slowly in this period. In Table 2.1 above it can be seen that the percentage of England's population living in towns grew very slowly before 1600 and grew only somewhat more quickly between then and 1670. The fastest period of growth came later, in the century and a half

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[7] Ibid., 117; Robert S. Shiel, 'Improving Soil Productivity in the Pre-Fertilizer Era', in *Land, Labour and Livestock: Historical Studies in European Agricultural Productivity*, Bruce M. S. Campbell and Mark Overton, eds. (Manchester: Manchester University Press, 1991), 63; and Jones, 'Agriculture and Economic Growth', 208. Kerridge himself acknowledges the difficulties of a convertible system. Eric Kerridge, *The Farmers of Old England* (London: George Allen and Unwin, 1973), 105.

[8] Bruce M. S. Campbell, 'Agricultural Progress in Medieval England: Some Evidence from Eastern Norfolk', *Economic History Review*, 2nd ser., 36 (1983), 43; Bolton, *The Medieval English Economy, 1150-1500*, 28-9, 243-5; Joan Thirsk, *Alternative Agriculture: A History from the Black Death to the Present Day* (Oxford: Oxford University Press, 1997), 19-20; and Christopher Dyer, *Lords and Peasants in a Changing Society. The Estates of the Bishop of Worcester, 680-1540* (Cambridge: Cambridge University Press, 1980), 125.

[9] Columella *Rust.* 2.17.3.

leading up to 1801, long after the period in which convertible husbandry is said to have been established. Even more damning to the notion of an early agricultural revolution based on convertible husbandry is the changing portion of the population engaged in agriculture, seen in Table 3.1:

Table 3.1. Portion of the English population engaged in agriculture, 1520-1850

Year	1520	1600	1700	1800	1850
Percentage	76	70	55	36	22

Source: Overton, *Agricultural Revolution*, 82.

Almost no change in the percentage of the population employed in agriculture occurred between 1520 and 1600. On the other hand, the following two centuries both witnessed substantial declines in agricultural employment, while the period from 1800 to 1850 saw a comparable decrease in only half as many years. Further doubt about the importance of convertible husbandry arises from an examination of cereal yields, Mark Overton has estimated the average yields per acre of English farms between c. 1300 and 1860. The results are summarized in Table 3.2:

Table 3.2. English cereal yields, c. 1300-1860 (bushels per acre, 1700 = 100)

Date	c.1300	c.1550	c.1600	c.1650	c.1700	c.1750	c.1800	1830s	1860
Wheat index	79	57	72	91	100	123	136	138	180
Cereal index	115	80	92	96	100	135	158	205	250

Source: Overton, *Agricultural Revolution*, 77.

Notes: Cereal index includes wheat, rye, barley and oat yields, weighed by crop proportions and crop prices relative to wheat. Figures for c. 1600 and c. 1700 are distorted by the poor harvests of the 1590s and 1690s.

In the period before 1650, when convertible husbandry is said to have brought about a revolution in productivity, yields grew only modestly. It was, rather, in the period after 1700, and especially after 1800, that the most substantial gains were made. The conclusion that convertible husbandry had at most a minor impact on productivity is

further reinforced when one considers that it was only one of many improvements made before 1650, and therefore cannot be given full credit even for the modest results that were achieved.[10] While it would be misleading to conclude that convertible husbandry was of no consequence whatsoever, it is clear, nevertheless, that what impact it did have was relatively small—hardly the revolution some have claimed it to be.

The same evidence that belies an agricultural revolution before 1650 would seem to suggest the occurrence of one after 1750. It was in this period, after all, when the growth of urbanization, the decline of agricultural employment and the rise of cereal yields all reached their greatest intensity. Indeed, from the point of view of demographic, economic and social transformation, it cannot be denied that these were the crucial years; and it is surely no coincidence that the Industrial Revolution occurred precisely at this time. However, the fact that the agricultural revolution achieved its full fruition in this period does not mean that the seeds of its development had not been sown at an earlier date. This, in fact, was the case: the trends that culminated in the impressive gains of the eighteenth and nineteenth centuries had much earlier origins.

Many innovations contributed to the growth of agricultural productivity between the sixteenth and nineteenth centuries, and indeed even earlier. New fertilizers were experimented with, and old ones used in larger quantities. Meadows were irrigated (or 'floated') in the spring to produce grass earlier, allowing more animals to be kept. Common-fields were enclosed, fens were drained, oxen were replaced by horses, implements were improved, better seeds were selected, and new breeds of animals were

[10] On other ways in which agriculture was improved, see below, pp. 21-24.

developed.[11] Convertible husbandry also played its part, but as just one among many potential improvements. Any given piece of land might have undergone one, several, all, or none of these changes; everything depended on local circumstances.

However, the most important development, which would eventually spread to all corners of the land and transform the practice of husbandry, was a series of innovations related to the incorporation of a number of previously ignored fodder crops into new systems of rotation. In the early seventeenth century, farmers began to experiment with clover, turnips and several other so-called 'artificial grasses' and root crops.[12] Gradually these became incorporated into systems of rotation typically involving one or several

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[11] On the growing use of fertilizers see Kerridge, *Agricultural Revolution*, 240-50; and idem, *Farmers*, 124-5. On the floating of meadows see idem, *Agricultural Revolution*, 251-67; idem, *Farmers*, 110-5; and Overton, *Agricultural Revolution*, 112-3. On the draining of fens see Kerridge, *Agricultural Revolution*, 222-39; idem, *Farmers*, 116-8; Overton, *Agricultural Revolution*, 89-90; and Peter J. Bowden, 'Agricultural Prices, Wages, farm Profits, and Rents', in *The Agrarian History of England and Wales*, vol. 5, *1640-1750*, pr. 2, *Agrarian Change*, ed. Joan Thirsk (Cambridge: Cambridge University Press, 1985), 7. On the replacement of oxen with horses see Overton, *Agricultural Revolution*, 125-6; Campbell and Overton, 'A New Perspective', 79; and White, *Medieval Technology and Social Change*, 62; cf., however, Kerridge, *Agricultural Revolution*, 38; and the present writer's reservations below. On the improvement of farming implements see Overton, *Agricultural Revolution*, 121-5; and Georges Duby, *Rural Economy and Country Life in the Medieval West* (Philadelphia: University of Pennsylvania Press, 1968), 109-10. For an early attempt to develop a drill plough, see Joan Thirsk, 'Agricultural Innovations and Their Diffusion', in *The Agrarian History of England and Wales*, vol. 5, *1640-1750*, pt. 2, idem, ed., 582-3. On the selection of seeds see Overton, *Agricultural Revolution*, 106-7. On the breeding of animals see ibid., 113. On enclosure see below, pp. 72-73.

The importance of the replacement of oxen with horses has likely been exaggerated (e.g. in White, *Medieval Technology*, 62). If the use of oxen continued into the sixteenth century and beyond, this was likely for good reason. Early commentators who had the opportunity of comparing the advantages and disadvantages of each came down, not infrequently, on the side of oxen. John Fitzherbert, for example, while acknowledging the greater speed and stamina of horses, believed that these advantages were outweighed by their many drawbacks. For horses 'be farr more costly to keep in winter: for they must have bothe hay and corne to eat and strawe for litter, they must be well shod on all four feet, and the gear that they shall drawe with is more costly than for the oxen, and shorter while it will last, and the oxen will eat but strawe and a little hay, the which is not halfe the cost that horses have." Furthermore, when it became old, an ox, unlike a horse, can be fattened for beef. In the end, he concluded, "all things considered, the plough of oxen is much more profitable than the plough of horses." John Fitzherbert, *The Boke of Husbandrie* (R. Pynson, 1523), fo. v. If at a later date oxen were replaced by horses this was likely not the result of a sudden discovery of their virtues but of the greater abundance of fodder that the new systems of husbandry were producing.

[12] An artificial grass refers to a crop grown for fodder in lieu of the 'natural' grass of meadows and pastures. It is sown deliberately and hence is 'artificial'. Technically, none of the artificial grasses, which include clover, sainfoin, trefoil and lucerne, are actually members of the grass family (Poaceae).

years of clover, a year of turnips, and several years of wheat or some other cereal.[13] The chief advantage of these new rotations was that they facilitated a much more efficient system of soil management. Clover and other legumes have the natural advantage of being able to fix nitrogen from the air.[14] This means that after growing in a field, clover will leave the soil richer in nitrogen than when it was planted, the more so if it is allowed to grow for several seasons and if at the end of this period all or part of the plant is ploughed in. Cereal crops, by contrast, do not fix nitrogen, and, in fact, especially in the case of wheat, deplete large quantities of it from the ground, leaving the soil exhausted. Because medieval agriculture was constantly depleting it from the perennially exhausted soil, nitrogen was for centuries the chief limiting factor in English agriculture.[15] By adding new nitrogen to the system, the incorporation of clover into arable rotations made it possible to overcome this most fundamental barrier to agricultural productivity.

The new systems of rotation had other advantages as well. By reversing the soil exhaustion caused by cereal crops, the need to fallow the land was eliminated. Furthermore, sowing fields with clover and turnips produced fodder in both larger quantities and of better quality, allowing more land that had once been left for pasture to

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[13] The most famous example of such a system is the so-called 'Norfolk four-course' in which growing clover the first year, wheat the second, turnips the third, and barley or oats the fourth. Overton, *Agricultural Revolution*, 117-21. Some doubt, however, has been expressed as to how often this system was actually implemented. Kerridge went so far as to call it 'spurious' and 'imaginary'. Kerridge, *Agricultural Revolution*, 32. See also pp. 296-302. Besides clover and turnips, the new systems of rotation could also include sainfoin, lucerne, trefoil, carrots or potatoes. M. A. Havinden, 'Agricultural Progress in Open-field Oxfordshire', *Agricultural History Review* 9 (1961), 73-83, reprinted in *Essays in Agrarian History*, W. E. Minchinton, ed., (Newton Abbot: David and Charles, 1968), 151; Jones, 'Agriculture and Economic Growth', 206; Kerridge, *Agricultural Revolution*, 269-80; and Thirsk, *Alternative Agriculture*, 47.

[14] Nitrogen is actually fixed not by the plant but by bacteria living in special nodules on its roots.

[15] On nitrogen as the chief limiting factor of agricultural productivity, see Overton, *Agricultural Revolution*, 107, 111; and Shiel, 'Improving Soil Productivity', 53. On the nitrogen-fixing properties of clover and other legumes, see Overton, *Agricultural Revolution*, 109-11; Shiel, 'Improving Soil Productivity', 53. Kerridge does not appear to have been aware of this capability of clover, which may account in part for the undue emphasis he gives to convertible husbandry. See Kerridge, *Agricultural Revolution*, 280-7.

be ploughed up and brought into the arable rotation.[16] Mark Overton even suggests that the elimination of fallowing and pasture land, which meant that at any given time the optimum proportion of ground being sown with arable crops was much higher before, may have been the greatest single advantage of the new systems, outweighing in importance even the fertility gained by the addition of new nitrogen.[17] More fodder also, of course, meant more animals, which in turn meant more manure. Stall-feeding allowed this manure to be collected and distributed where it was needed, rather than falling randomly on permanent pasture as typically occurred in the traditional system.[18] The new rotations also brought several other advantages. Sowing turnips helped to eliminate weeds, their broad leaves starving the latter of sunlight.[19] Clover and turnips, by interrupting the succession of cereal crops, also served to prevent the carry-over of disease.[20] Finally, cultivation the new crops demanded labour at times of the year different than that of cereals, allowing existing labour to be utilized more efficiently.[21] In all, the new systems of rotation made possibly a great increase in the efficiency of agricultural labour, allowing the barriers that for so many centuries had held back productivity and urbanization to be decisively broken through. This was the agricultural revolution's true 'backbone'.

An inquiry into the origins of the agricultural revolution, therefore, must begin with the first introduction and spread of these new crops. Clover (together with sainfoin and lucerne) had made its debut as a sown crop in England by the 1620s and 1630s, but

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[16] Overton, *Agricultural Revolution*, 113.
[17] Ibid., 121.
[18] Ibid., 109.
[19] Ibid., 117.
[20] Ibid., 116.
[21] Ibid., 127-8.

as of yet was only being grown on a very limited number of fields, usually as fodder for prize horses or some other like motive.[22] It was only in the 1640s and 1650s that clover was first advocated as a plant with serious agricultural potential. In the early seventeenth century, Sir Richard Weston, a gentleman farmer from West Surrey, had for many years been experimenting with new farming techniques, including the sowing of sainfoin. When the Civil War erupted he sided with the Crown, and, his property being sequestered in 1643 or 1644, was forced into exile in the Low Countries. It was here that he came into contact with the advanced husbandry that had long been practiced among the Dutch. In 1645 he put his discoveries on paper, ostensibly in the form of a testament to his sons, instructing them in ways of the new husbandry in case he should die before demonstrating it to them personally. Obtaining a copy of this anonymous pamphlet, Samuel Hartlib, a reform-minded German-Polish refugee from the Thirty Years' War living in London, published it in 1650. Over the next few months, all of his copies sold out, and he received sufficient encouragement to publish several more editions over the course of the following few years. However, although the country had now had its first exposure to the idea of clover as a mainstream crop, the plant did not have a serious impact until the 1660s, when it began to be incorporated into viable systems of rotation, helped in part by the detailed instructions made available in Andrew Yarranton's *The Improvement Improved*, published in 1663.[23] From this point forward, clover gradually

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[22] Thirsk, *Alternative Agriculture*, 47.

[23] On Sir Richard Weston, Samuel Hartlib and the early spread of clover, see Thirsk, *Alternative Agriculture*, 47; Mauro Ambrosoli, *The Wild and the Sown: Botany and Agriculture in Western Europe, 1350-1850* (Cambridge: Cambridge University Press, 1997), 306-7; Joan Thirsk, 'Agricultural Innovations', 545-57; idem, 'Seventeenth-Century Agriculture and Social Change', in *Land, Church and People. Essays Presented to Professor H. P. R. Finberg*, idem, ed., *Agricultural History Review* 18 (1970), Supplement, reprinted in *The Rural Economy of England: Collected Essays*, idem, (London: Hambledon Press, 1984), 188-9; A. R. Michell, 'Sir Richard Weston and the Spread of Clover Cultivation', *Agricultural History Review* 22 (1974), 160-1; and G. E. Fussell, *The Old English Farming Books from*

spread until it became a regular feature of English farms sometime in the eighteenth century.[24]

The origins of the turnip are similar. The plant made its first appearance in England in the late sixteenth century when it was publicized by foreign immigrants as a table food. Long grown as fodder in the Low Countries, turnips were first used as such in England (in East Anglia) in the 1630s. Recognition of the plant as a serious crop, however, came only after the publications of Weston and Hartlib, which described the Dutch methods of cultivating it. Substantial evidence of the crop's cultivation first appears in the 1660s, from which time the plant gradually gained popularity in tandem with clover.[25]

The mid-seventeenth century, then, was the crucial juncture in the history of modern English agriculture. It was at this time that the seeds that quite literally were later to blossom into the agricultural revolution, were first sown. Knowing when this happened, however, is only a part of the story; the real mystery is why. Why did English farmers who for so many centuries had been managing their land just as their ancestors had always done suddenly break with tradition? What moved the minds of these early pioneers to undertake experiments and search for new techniques? What made medieval

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Fitzherbert to Tull (London: Crosby Lockwood and Son, 1947), 41-4. For further biographical information on Hartlib, see G. H. Turnbull, *Hartlib, Dury and Comenius: Gleanings from Hartlib's Papers* (London: University Press of Liverpool, 1947), 1-34; and Charles Webster, ed., *Samuel Hartlib and the Advancement of Learning* (Cambridge: Cambridge University Press, 1970), 1-11. On Andrew Yarranton see Ambrosoli, *The Wild and the Sown*, 322. On the precocity of Dutch agriculture, see B. H. Slicher van Bath, 'The Rise of Intensive Husbandry in the Low Countries', in *Britain and the Netherlands*, J. S. Bromley and E. H. Kossmann, eds. (London: Chatto and Windus, 1960), 130-153.

[24] Kerridge's claim that 'by 1675 clover cultivation had become general' appears to be unfounded. Kerridge, *Agricultural Revolution*, 281. More reliable data on the spread of clover and turnips showing a slow but steady rise from around 1670 may be found in Overton, *Agricultural Revolution*, 100.

[25] Thirsk, *Alternative Agriculture*, 48; Fussell, *Old English Farming Books*, 42; Thirsk, 'Agricultural Innovations', 545; and Overton, *Agricultural Revolution*, 100.

conservatism give way, in agriculture, to a spirit of innovation and experiment, and hence make modern society possible? These are questions that must now be answered.

The most direct source of insight into the mentality of the seventeenth-century 'improvers' (i.e. those who sought 'improved' methods of husbandry) is to be found in the books and pamphlets that many of them published, which contain descriptions of the new techniques, results of experiments, and sometimes, here in a phrase, there in a paragraph, hints pointing to the rationale for the whole undertaking.[26] Reference has already been made to several of the more important of these works, including those written and published by Hartlib and his circle of reformers. The history of agricultural writing, however, did not begin with these seminal publications. Nor were all of an equal character. Rather, a long line of books and pamphlets descends back to the early sixteenth century, including everything from highly specialized tracts on individual crops to manuals outlining the entire art of husbandry. Attitudes towards innovation range from total conservatism to wholehearted endorsement.

Although the printing press reached England in 1476, it was not until the appearance in 1523 of John Fitzgerald's *Boke of Husbandrie* that agriculture became a subject of publication.[27] The earliest writings on the subject were generally of a conservative character. They aimed at providing their readers with advice on the efficient

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[26] On the printing press itself as a cause of the agricultural revolution, see below, pp. 51-56.

[27] Fussell, *Old English Farming Books*, 4. On William Caxton's establishment of England's first printing press, see N. F. Blake, *Caxton and His World* (London: Andre Deutsch, 1969). For the history of agricultural books in general see ibid.; and Donald McDonald, *Agricultural Writers from Sir Walter of Henley to Arthur Young, 1200-1800* (New York: Burt Franklin, 1908). For a study of seventeenth-century agricultural literature focusing on the works and lives of Gervase Markham, Walter Blith and John Worlidge, see Joan Thirsk, 'Plough and Pen: Agricultural Writers in the Seventeenth Century', in *Social Relations and Ideas. Essays in Honour of R. H. Hilton*, T. H. Aston et al, eds. (Cambridge: Cambridge University Press, 1983), 295-318

management of estates, but in doing so seldom strayed from traditional practices. In Fitzherbert's *Boke* and Thomas Tusser's *A Hundreth Good Pointes of Husbandrie* (1557), the two most important works on farming in the sixteenth century, there is not a hint of the excited language of discovery and improvement that was to characterize agricultural writing at a later date.[28] Tusser's *Hundreth Pointes*, for instance, a book written in verse for a society more accustomed to oral tradition than book-learning, begins with a rather serene note:

> A hundreth good points, of good husbandry,
> maintaineth good household, with huswifry.
> Housekeping and husbandry, if it be good:
> must love one another, as cousins in blood.
> The wife too, must husband as well as the man:
> or farewel thy husbandry, doe what thou can.[29]

'Merry Old England', medieval and unchanging, rather than a society struggling to transform itself, is very much the predominant flavour of this book. The 'good pointes' themselves consist of 100 (later 500) quatrains instructing the reader on the various events and tasks of the agricultural year. The methods described are traditional and could have come from any of the preceding centuries:

> In Marche sow thy barley, thy londe not too colde:
> the drier the better, a hundreth times tolde.
> That tilth harrowed finely, set seed time an end:
> and praise and pray God, a good harvest to sende.[30]

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[28] Tusser's *Hundreth Pointes*, together with his later expanded version, *Five Hundreth Pointes of Good Husbandrie*, has been recently republished. Thomas Tusser, *1557* Floruit *His Good Points of Husbandry*, Dorothy Hartley, ed. (New York: Augustus M. Kelley, 1970). For a discussion of the conservative nature of sixteenth century agricultural literature, see Andrew McRae, *God Speed the Plough: The Representation of Agrarian England, 1500-1660* (Cambridge: Cambridge University Press, 1996), 138, 146-51.
[29] Ibid., 25.
[30] Ibid., 39.

Having left the techniques of husbandry unchanged, Tusser's most enduring legacy may perhaps have been that bequeathed not to agriculture but to the English language, which inherited his book's two most famous and beautiful lines:

> Sweet April showers,
> Do spring May flowers.[31]

Agriculture's spring was still many years in the future.

Around the beginning of the seventeenth century, however, a new wave of agricultural writing began to appear. In these books and pamphlets innovation and improvement were to take centre stage. The art of husbandry was no longer something handed down from the past, to be preserved unchanged for future generations, but was now seen as something that could be changed for the better, something that could be improved. The century began modestly with such publications as John Norden's *The Surveyors Dialogue* (1607), a five-part book containing advice on the best way to manage land. The work is couched in traditional notions of man's place in the world, but envisions the possibility of improving man's earthly, agricultural, well-being:

> As the Earth ... was given to man: and man ... was enjoyned the care of earthly things ...; So it is not the least regard that men of whatsoever title or place, should have of the lawfull and just meanes of the preservation and increase of their earthly revenues.[32]

Traditional notions could even be recast into outright calls for improvement as in John Davies' ironical, almost brazen, quatrains 'Panegyricke' to Rowland Vaughan's *Most Approved, and Long Experienced Water-Workes* (1610), in which God's punishment for the sins of mankind are to be taken advantage of in implementing one of the most celebrated innovations of the seventeenth century (the floating of the watermeadows):

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[31] Ibid., 61.
[32] John Norden, *The Surveyors Dialogue* (London: [S. Stafford] for Hugh Astley, 1607), A3.

When on the Earth all soild in sinne did lie,
Th'almighties long-provokt inraged Hand
Emptied Heav'ns Bottles, it to purify;
And made that Flud that mud to countermand.

So, for like crimes, of late, we plagu'd have bin
With like O'reflowings, washing all away
That lay the Earth upon, or Earth within,
Within the limitts where this Deluge lay!

Which Inundations were for Earth unfit:
But he whose Hand and Head this Worke compos'd [i.e. Vaughan]
Shewes how to drowne the Earth to profit it:
And, being Ill, to make it Well-disposed.[33]

By the middle of the century the call for improvement had reached fever-pitch, with visions of what might be achieved running wild. Few writings exemplify the optimism and zeal of the Interregnum years better than Walter Blith's *The English Improver* (1649) the tone of whose subtitle is typical of the period:

> *Discovering to the Kingdome, That some Land, both Arrable and Pasture, may be Advanced Double or Treble; Other Land to a Five or Ten fold: And some to a Twenty fold Improvement: Yea some now not worth above One or Two Shillings per Acre, be made worth Thirty, or Forty, if not more.*[34]

For Blith, a member of Hartlib's circle, the 'usefulnesse' of husbandry was 'no lesse then the maintenance of our Lives, Estate, the Kingdome, Common-wealth, and world'; and the prospect its improvement represented 'little lesse then an addition of a new world'.[35] Blith's enthusiasm for improvement was so strong that it even coloured his interpretation of the Bible. God, he believed, was himself an improver, and man, after the fall, had been charged with being the same:

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[33] Rowland Vaughan, *Most Approved, and Long Experienced Water-Workes* (London: George Eld., 1610), B-B2.
[34] Walter Blith, *The English Improver, Or a New Survey of Husbandry* (London: J. Wright, 1649)
[35] Ibid., 6. Blith advocated, among other improvements, the floating of meadows and (in a later edition of his book) the cultivation of clover and turnips.

> God was the Originall and first Husbandman, the paterne of all Husbandry, and first projector of that great designe, to bring that old Masse and Chaos of confusion unto so vast an Improvement, as all the world admires and subsists from. And having given man such a Paterne both for precept and president for his incouragement, he makes him Lord of all untill the fall; And after that God intending the preservation of what he made ... Adam is sent forth to till the Earth, and improve it....[36]

In less than a century attitudes towards improvement had gone from being non-existent in the work of Tusser to the belief that it was an obligation to all Christians in that of Blith.[37] It was in this climate of intense enthusiasm for improvement, characteristic of virtually all mid-century publications, that the great discoveries of the agricultural revolution were made. The question is, what inspired this new mentality?

A number of factors that prompted this shift in thinking are evident in the books and pamphlets themselves. Their authors, generally an energetic and idealistic sort, were not shy about explaining their motives to the reader, most commonly in prefaces, introductions and dedicatory epistles. In these passages, a variety of themes are to be found, ranging from the most mundane to the most lofty. Several, however, occur again and again in book after book, and appear to have been of particular importance. The most prominent of these was a nearly universal desire to advance the well-being of the nation or 'commonwealth'. Gervase Markham, writing early in the century, hoped that his book,

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[36] Ibid., 5.

[37] A similar attitude towards improvement was expressed by Gabriel Plattes in his *The Profitable Intelligencer*:

> Christ saith, he that is not with me is against me, admitting of no neutralitie: and I say, that whosoever doth not according to his abilitie, and opportunitie, further this blessed work [i.e. improvement], more or lesse liveth in a destructive way to the Common-wealth, or body politick, whereof he is a member, though an unworthy one, and justly deserveth to be cut off after admonition, which an ingenious publication of this book will perform in such manner that whosoever shall fondly cast away any materials which will produce bread, cannot expect any other sentence at the great day of account, but the very same which all those are like to receive which have taken childrens bread and cast it to the dogs. (Gabriel Plattes, *The Profitable Intelligencer* ([London]: for T. U., 1644), A5.)

The English Husbandman, would be of 'much benefit for the whole Kingdome'.[38] Blith dreamed of a day when, helped by his book, 'Mens spirits will be raised to such Experimenting of the Principles of Ingenuity, as that we may see this Kingdome soone raised to her utmost fruitfulnesse and greatest glory.'[39] Cressy Dymock, a member of Hartlib's circle, wrote that if implemented his proposals would 'tend exceedingly to the prosperity, honour and plenty of this whole Nation'.[40] Sir Richard Weston, who more than any other deserves credit for first introducing the new clover and turnip husbandry, believed that the new techniques would be a boon not only to individuals, 'but also to the Publique benefit.'[41] Such remarks, of which these are but a small selection, are legion, to be found in almost every agricultural publication of the period.

The public-spirited sentiments of some writers appear to have bordered on modern feelings of nationalism. Hartlib, for instance, wrote that 'if Husbandry and Trade at home and abroad [i.e. in the colonies] be well regulated, all hands may be Employed, and where all hands are at work, there the whole strength of a Nation doth put forth its endevours for its own advantage'.[42] A remark contained in Nathaniel Fiennes' *St. Foine Improved* (1671) suggests that consciousness of international rivalries may have helped to encourage the search for an improved agriculture: 'This [the introduction of sainfoin] and the like improvements (if encouraged) cannot but make the Nation rich, populous and prosperous, as we see that of our Neighbours of France and Flanders are'.[43] Andrew

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[38] Gervase Markham, *The English Husbandman* (London: T. S[nodham] for J. Browne, 1613), A.
[39] Blith, *The English Improver*, A2.
[40] Sameul Hartlib, *A Discoverie for Division or Setting out of Land* (London: Richard Wodenothe, 1653), 2.
[41] Samuel Hartlib, *His Legacie: Or an Enlargement of the Discourse of Husbandry Used in Brabant and Flanders* (London: R. and W. Leybourn, 1652), [A4].
[42] Hartlib, *A Discoverie*, [A3].
[43] [Nathaniel Fiennes], *St. Foine Improved* (London: S. G. and B. G. for Nath. Brooke, 1671), 16. On the identification of Fiennes as the author of this anonymous text, see Ambrosoli, *The Wild and the Sown*, 329 n. 149.

Yarranton, the publication of whose *The Improvement Improved* (1662) was one of the key turning points in the spread of clover cultivation, in a separate pamphlet entitled *England's Improvement by sea and Land to Out-do the Dutch without Fighting, to Pay Debts without Moneys, to Set at Work all the Poor of England....* (1677) drew a specific link between improvement and England's political and military position vis-à-vis her neighbours. Increasing wealth through trade was to be the means by which the country would prevail against the Dutch: 'it appeared to me that although we could not beat them with fighting, yet on the other hand it was as clear to me that we might beat them without fighting; that being the best and justest way to subdue our Enemies.'[44] Though few of the book's proposals relate to agriculture, the fact that it was written by one of the agricultural revolution's leading figures makes it worth considering the possibility that England's foreign policy played a role in inspiring his interest in clover.[45]

While it would be an exaggeration to say that England had, in the seventeenth century, a fully modern concept of nationalism, the discovery of nationalistic sentiments among certain of the period's agricultural writers should not come as a complete surprise. Nationalism had been on the rise in England since the sixteenth century when the Reformation and the rise of a more powerful monarchy under the Tudors fostered a new and increasingly distinct national identity. During the Interregnum, when it was perceived that the national destiny had fallen into the people's hands, and when the need to reconstruct England's identity became a pressing necessity, nationalistic feelings were

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[44] Andrew Yarranton, *England's Improvement by Sea and Land* (London: R. Everingham for the Author, 1677), [c2].

[45] Yarranton did, however, urge the cultivation of flax as a means of advancing the linen trade, though this would not have had an impact on the food supply. Ibid., 47-8.

running at an all-time high.[46] For this reason, it is perhaps not a coincidence that many of the agricultural revolution's seminal works, especially those characterized by the most exuberant language invoking the national interest, were written in this period.

Concern among improvers for the well-being of society could also take other forms. A pamphlet of 1653 advocating the improvement of wasteland emphasized, among other things, the potential benefits to government finance. 'Such improvements', the author promised, would 'very much enrich and replenish the public purse' by 'bring[ing] in to the State's Treasury near one hundred thousand pounds *per mensem*'. This new revenue 'would so defray the charge of armies and navies, as to banish excise and assessments out of the nation as a superfluous overplus, thereby discharging the malcontented people from those ponderous and discontentful impositions.' [47] That the author of this pamphlet should, in the 1650s, have linked a scheme for increasing the government's revenue with its military expenditure was no accident. Owing to the adoption of costly new technologies of war (which some have termed a 'military revolution'), and owing to the need to maintain a large standing army, the Civil War in England was an extraordinarily expensive affair. In the 1650s no less than 90 per cent of government expenditure was being consumed by the military; and even at such a level, by 1659 the New Model Army's pay was £1.3 million in arrears and by 1660 £1 million was owed to the Navy.[48] In such circumstances it was only natural that public-minded individuals should have considered the nation's finances to be an issue of the greatest

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[46] Hans Kohn, *The Idea of Nationalism. A Study in Its Origins and Background* (New York: Macmillan, 1961), 157-8, 166.

[47] Joan Thirsk, ed., *Seventeenth-Century Economic Documents* (Oxford: Clarendon Press, 1972), 137. The author of this pamphlet, which is dated 31 October 1653, gave his name only as 'E. G.'

[48] Geoffrey Parker, *The Military Revolution: Military Innovation and the Rise of the West, 1500-1800* (Cambridge: Cambridge University Press, 1988), 12, 24, 61-2. See also Conrad Russell, 'Monarchies, Wars and Estates in England, France and Spain, c. 1580-c. 1640', in idem, *Unrevolutionary England, 1603-1642* (London: Hambledon, 1990), 124-33.

urgency. For this reason, any scheme holding out the prospect of a solution was bound to attract attention. In a manner that shall be encountered repeatedly in the coming pages, something very good came of something very bad; short-term financial crisis facilitated long-term economic progress.

While an inchoate nationalism and an acute fiscal crisis may thus have played a modest role in prompting the drive for agricultural reform, the most persistently recurring theme in seventeenth-century improvement literature was something quite different. The improvers, in the first instance, were motivated not by dreams of England's glory, but by the economic well-being of her own citizens, particularly the poorer sort. References to the endemic poverty of the times are numerous, and in almost every case the improvement of husbandry is seen as the obvious solution.[49] Blith argued that the improvement and conversion of 'Old, Mossy, Banky, Rushy, Filthy' pastureland into arable would 'maintaine many Soules in Labour, and Relieve many which are ready to be starved.' 'The Poore', he said, 'cry for it.' Traditional approaches to poverty, though noble, were inadequate; only a comprehensive improvement of the country's agriculture could provide a solution: 'To Build Hospitalls, feed and clothe the Poore and naked, is highly commended of all, and truly it is worthy of high Honour, being done Rightly, and to a Right End; But this Discoverie would enable the Poore to feed and clothe themselves and others also.'[50] The very title of Adam Moore's tract on enclosure is suggestive of a similar logic: *Bread for the Poor. And Advancement of the English Nation. Promised by Enclosure of the Wastes and Common Grounds of England* (1653). Through enclosure,

[49] The concern for the poor expressed by the improvers has been noted by other historians but has not been investigated in any detail. See, e.g., Webster, *Great Insauration*, 469; and Thirsk, 'Agricultural Innovations', 539.
[50] Blith, *The English Improver*, (a2), a2.

Moore claimed, 'we finde that the general improvement of the Wastes of this Nation will suffice to maintain fifteen hundred thousand people more then now they do, and encrease the worth of this Nation yeerly four Millions; And is not here *Bread for the Poor, and advancement of the English Nation?*'[51] In the same year Parliament was told by another pamphlet that improvement of the wastes 'would directly tend to the employing and setting to work many thousands of persons that are now idle, and such as some of whom by reason of poverty cannot [or] ... will not work.'[52] Examples such as these, in which improvement is seen as an act of charity, could be multiplied almost indefinitely. The same concern with poverty and its relief, repeated in virtually every seventeenth-century publication, is the predominant sentiment of the entire improvement genre.

That the alleviation of poverty should have been a high priority for seventeenth-century Englishmen is hardly surprising. With its population growing much faster than the nation's ability to feed itself, poverty had been on the rise in England since the beginning of the sixteenth century. Moreover, with the breakdown of the stable manorial communities of the Middle Ages and the abolition of the monasteries in the Reformation, the institutions that at an earlier date might have been able to soften the blow of economic hardship no longer existed. Consequently, the shortcomings of the post-medieval social structure laid bare, England found herself increasingly ill-equipped to deal with her growing economic and demographic problems. Poor migrants roamed the country by the legion, searching for work, committing crimes and spreading disease.[53] In the Tudor and

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[51] Adam Moore, *Bread for the Poor. And Advancement of the English Nation. Promised by Enclosure of the Wastes and Common Grounds of England* (London: R. and W. Leybourn for Nicholas Bourn, 1653), 29. Moore's emphasis.

[52] Thirsk, ed., *Seventeenth-Century Economic Documents*, 137.

[53] A. L. Beier, *Masterless Men: The Vagrancy Problem in England, 1560-1640* (London: Methuen, 1985), 30-1. For a discussion of the various causes of poverty in the Tudor era, see John Pound, *Poverty and Vagrancy in Tudor England* (London: Longman, 1978), 3-24.

Stuart period vagrancy became a top priority of public policy, prompting a string of legislation to deal with it.[54] Poor relief became a major institution, the number of Londoners receiving it tripling between 1550 and 1600.[55] Harvest failures between 1646 and 1651 and the general disruption of the Civil War years only made matters worse.[56] Faced with what was nothing less than a highly visible social catastrophe, it was only natural that anyone with a shred of social conscience would have grasped at anything promising relief. It became a nearly universal sense of public duty felt by the whole society, not least of all by the improvers whose writings display a keen awareness of the social crisis facing the country. Cressy Dymock, for instance, wrote in a letter published by Hartlib that 'I think no way can be found for a private man to shew himselfe a lover of his Countrey more, then by using all possible endeavours, seasonably to increase and produce that, *which the whole Nation may so much want, and in that want so miserably suffer*'.[57] Hartlib himself, in the pamphlet's epistle to the reader, expresses this same sense of good citizenship and hints at the desperation felt by English society to find a solution:

> Christian Reader, It is a common complaint that Trade doth decay and that the poor are multiplyed for want of employment. This complaint is a natural consequence and result of civil Warres, and of the unsettlement under which the Nation hath brought itself. The Remedy of it should be in the aime of everyone, to contribute towards the relief of Public Calamities.[58]

Not everyone who wished to see the poor relieved, however, needed such altruistic motives; for a lessening of poverty offered benefits to the prosperous and destitute alike. A concern with crime and disorder, for instance, seems to have been one

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[54] On the various attempts to cope with vagrancy, see ibid., 39-68; and Beier, *Masterless Men*, 149-69.
[55] Ibid., 40.
[56] Thirsk, 'Agricultural Innovations', 544, 553.
[57] Samuel Hartlib, *The Reformed Husband-Man* (London: J. C., 1650), 10. Emphasis added.
[58] Ibid., A2.

of the primary inspirations for Rowland Vaughan's efforts to develop his famed method of irrigating meadows:

> There bee within a mile and a halfe from my house every way, five hundred poore habitations.... As Wountes or Moles hunt after wormes, the ground being delveable; so these Idelers live intolerably by other meanes, and neglect their painfull labours by oppressing the neighbourhood.... [In] August, September and October, with that permission which the Lord hath allowed the poorer sort to gather the Eares of corne, they do much harme. I have seene three hundred Leazers or Gleaners in one Gentlemans corne-field at once; his servants gathering and stouking [i.e. stacking] the bound-sheaves, the sheaves lying on the ground like dead carcases in an over-throwne battle, they following the spoil not like soldiers (which scorne to rifle) but like theeves desirous to steale; so this army holds pillaging Wheate, Rye, Barly, Pease, and Oates.... Under coulour [*sic*; 'cover'?] of the last graine, Oates, it being the latest harvest, they doe with-out mercy in hotte blood steale, robbe Orchards, Gardens, Hop-yards and Crab-trees....[59]

Improvement of agriculture was to be the solution of this blight. 'If', he warned, 'Trades bee not raised [through the wealth that would be brought by floating the region's meadows], beggery will carry such reputation in my quarter of the country, as if it had the whole to halves.'[60] A concern with crime also appears to have been one of the factors acting upon Adam Moore. Enclosure of the nation's wastes, he believed, would create so much employment for the poor that:

> from the noisome and debased courses of Begging, Filching, Robbing, Roguing, Murthering, and whatsoever other Villainies their unexercised brains and hands undertake, they would (even gladly) be reclaimed and refined to loyall and laudable courses, as well for their own contenting reliefe, as the unspeakable comfort and honour of the whole State.[61]

Greater opportunities for employment would also have lessened expenditure on poor relief. Such is the tempting carrot that Blith held out to his readers when he claimed that the only cost of his new improvements, besides ingenuity, would be wages paid to poor labourers, people 'Whom thou mayst most gallantly relieve and maintaine, out of the very

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[59] Vaughan, *Water-Workes*, E3.
[60] Ibid.
[61] Moore, *Bread for the Poor*, 30.

profit of his [their] owne labour; Whom if though sufferest to want Imployment, thou must maintaine at thy owne proper cost and charges upon necessitie.'[62]

Poverty was also a potential source of political unrest, and relieving the one would therefore reduce the risk of the other. Such was evidently one of the concerns that prompted Arthur Standish to search for new methods of husbandry. Out of the nation's dearth of victuals, he claimed,

> too oft ariseth discontentments, and mutinies among the common sort, as appeared of late by a grievance taken only for the dearth of Corne in Warwicke-shire, Northampon-shire, and other places, about which time the mindes of many were molested: whereupon I tooke the first occasion to imploy my studie and travell [i.e. 'travail'] in this business, hoping by Gods helpe to prevent such inconveniences, as too oft doe spring out of the desperate tree of want.[63]

It would be hard to imagine a more direct link between the fear of social unrest and desire to improve agriculture. Standish's search for improvement, however, was not only an expression of the self-interest of those who had something to lose. Christian compassion was just as important to him as was reducing the threat of disorder:

> by the observing of these small directions, thou mayest perform some part of the cause of thy creation, by giving glory to thy Creator, honour, pleasure, and profits to thy king, countrey, and to thyselfe also, by feeling and relieving thy Christian brothers wants, and by a charitable industrie, thou mayest raise meanes to disburden them of their grievances, and in the end, by the mercie of our good God, thou maist be partaker of his loving promises in the Gospell, *Come you blessed of my Father, etc.* The which I crave for Jesus Christ his sake.[64]

To those schooled in the 'rising bourgeoisie' interpretation of the seventeenth century, what is most striking in all of this is the relative absence of what ought to have been the most important motivation for improvement: economic profit. That such a motive was absent, however, is not the conclusion reached by at least one historian.

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[62] Blith, *The English Improver*, a2.
[63] Arthur Standish, *The Commons Complaint* (London: William Stansby, 1611), B3.
[64] Ibid. Standish's emphasis.

Rather than seeing them as idealistic reformers motivated by their love for society, Andrew McRae argues that the improvers of the mid-seventeenth century represented a new breed of capitalist driven by economic self-interest. 'A language of individualism and pecuniary gain', he writes, suffused their literature, which represented a nascent 'discourse of capitalist development'.[65] In support of this conclusion, McRae assembles several quotations emphasizing the economic benefits to be had from improvement, while systematically ignoring everything else. For instance, McRae quotes Walter Blith (whose book allegedly 'typifies the agenda of agrarian improvement') as saying that 'all men are thirsty ... after profit and increase'.[66] What he does not quote, however, are Blith's many other remarks that convey quite the opposite impression. Who would ever guess, for instance, that in the very same book Blith could write that 'good husbandry is the sinnews and marrow that holds together the joints of common good' and that 'The Common-wealth is [now] low, and misery and penury will follow if we do not rouse the flaggard, and post after Industry, pursue all advantages of Improvements whatsoever'?[67] If Blith typified the 'agenda' of his generation of improvers, then theirs was an agenda quite different from the one portrayed by McRae.

To be sure, private economic gain was undoubtedly one of the improvers' motives. It could not have been otherwise. The outlandish promises of wealth made in the subtitle of Blith's book (above, p. 30) must have attracted many a buyer for reasons less noble than the author's otherwise high-minded language would suggest. Richard Weston offered his readers similar prospects of pecuniary gain: 'The whole Discourse shews you

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[65] McRae, *God Speed the Plough*, 160, 165. For his full treatment of the subject, see pp. 156-68.
[66] Ibid., 156. For the actual remark, which is a secondary clause of a much longer sentence on an unrelated subject, see Walter Blith, *The English Improver Improved, Or the Survey of Husbandry Surveyed* (London: John Wright, 1653), D.
[67] Ibid., [C3].

how to improve barren and healthy land, and how to raise more then ordinary profit thereof, by such ways and means as are not practiced in England, but as commonly in some parts of Brabant and Flanders.'[68] However, the fact that seventeenth-century farmers were attracted by the economic possibilities of improved agriculture does not make them capitalists. Nor does it even make them different from their predecessors. The desire for wealth is not a recent invention, unknown before the 'rise of the bourgeoisie'. Having ten bushels of grain has always been preferable to having five; two cows have always been more than one. This was as true in the Middle Ages as it is today, though now it may rank much higher among the priorities of life. If in this respect the seventeenth-century improvers are to be counted among the moderns, it must be shown that their acquisitiveness was greater than that of medieval man. McRae's evidence, however, does not bear this conclusion.

In fact, several of the improvers displayed attitudes that were decidedly un-capitalist. Most notable in this regard was the Hartlib circle, whose economic self-denial left little room for the profit motive.[69] New agricultural techniques, far from being private entrepreneurial opportunities, belonged firmly in the hands of the public whose collective interest superseded that of individuals. Concealment of new discoveries and know-how was accordingly singled out for disapprobation. Walter Blith, for example, decried those who

> pretend great Discoveries they can make, if they might have a Publique Stock to worke it, and a Patent for it, otherwise the Publique shall not share of their

[68] Hartlib, *His Legacie*, [A4].
[69] Cf. McRae, who claims that pecuniary gain was the Hartlib circle's primary motive. McRae, *God Speed the Plough*, 160.

> Inventions; and I believe some men are able to doe many things of great Advantage to a State; I wish they had more Publique Spirits....[70]

In a similar vein Gabriel Plattes wrote in a letter to Hartlib:

> When this Book is published, then I desire you to think of the best way you can possibly imagine that all the inhabitants of the whole Kingdom may have knowledge of it generally; for knowledge that concerneth the publick good, ought not to be concealed in the brests of a few.[71]

Not only did the Hartlib circle condemn the acquisitive practices of others, but they often failed even to make profits themselves. Hartlib himself complained that his devotion to the public good was 'a thankless office'.[72] Profit, indeed, was so far from his mind that he did not even own land on which to implement the improved techniques he was publicizing! Sacrificing everything for the sake of his convictions, he sank into poverty and died a forgotten man in 1662, a fate that also befell his friend and fellow improver Gabriel Plattes.[73] Altruism rather than avarice, love rather than cupidity—such was the ethos of these admirable men.

Less than capitalistic in their economic values, the improvers were no more bourgeois in their social outlook. While it is true that most supported enclosure of the commons and wastes, this does not necessarily signify the complete triumph of modern individualism. John Norden, for instance, (whose outlook, according to McRae, reflected

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[70] Blith, *The English Improver*, a2.

[71] Plattes, *The Profitable Intelligencer*, A2. John Dury, another member of the Hartlib circle, though one concerned chiefly with educational reform rather than improvement, went even further in demanding that reformers be guided by the right motives: 'all selfe seeking and the affection of some particular thing and way, whereby men desire to bee taken notice of, amongst other men for procuring a Publique Good; which they imagine to be good; that (I say) all such purposes are nothing but carnall Hypocrisie, which is inconsistent with the life of God: so that except there be a single purpose to seeke this Good absolutely for itself, that it may become common to all ... the indeavour will never reach the end for which it must be undertaken; nor receive a blessing from God....' John Dury, *A Motion Tending to the Publick Good of This Age, and of Posteritie* (London: F. L for Michael Sparke, 1643), 9. For similar attitudes expressed by Sir Cheney Culpeper, Robert Boyle and John Milton., see Webster, ed., *Samuel Hartlib and the Advancement of Learning*, 40.

[72] Hartlib, *A Discoverie*, A3.

[73] Webster, ed., *Samuel Hartlib and the Advancement of Learning*, 7-8, 63. Plattes died 'of want' in 1644. Fussell, *Old English Farming Books*, 40.

the new 'logic of the market') held an altogether traditional notion of property ownership, involving moral responsibilities as well as income:

> there is none but well considereth that how great or powerful soever he be in land revenues, it is brought in unto him by the labours of inferiour tenants.... And there is none of these inferiours, of ordinary discretion, but well knoweth, that what he injoyeth, is by the favour of his Lord in a sort: And therefore ought there to bee such a mutuall concurrence of love and obedience in the one, and of aid and protection in the other....[74]

Far from reflecting the 'logic of the market', Norden's philosophy is purely medieval, belonging to a world of patronage and fealty rather than trucking and bartering. The exploitation of tenants, rather than an economic imperative, was to this improver an egregious sin. 'Distastefull Avarice', he tells us, is 'the greatest blemish that can befall a man'.[75] Norden was a man traditional in everything except his husbandry, demonstrating that in the right circumstances someone who might be a feudal lord in one century could be a pioneer of innovation in another.

In fact, whether feudal or not, being a gentleman landowner was a virtual precondition for being an improver (despite McRae's claim that 'the principal interest group behind the movement was the rural 'middling sorts': the small freeholders and rising yeomen who were prepared to embrace the new world of commerce'[76]). With the exception of the German-Polish émigré Hartlib (who, although of aristocratic roots, owned neither land nor capital, living instead off the patronage of others) almost all

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[74] Norden, *The Surveyors Dialogue*, [A6]; McRae, *God Speed the Plough*, 161-2.
[75] Norden, *The Surveyors Dialogue*, [A7].
[76] McRae, *God Speed the Plough*, 168. Brenner's 'classic' 'landlord / capitalist tenant / wage-labourer structure', which he claims 'made possible the transformation of agricultural production in England', would also seem to be spurious. Brenner, 'Agrarian Class Structure and Economic Development', 49. Similar views are also expressed in Wood, *The Origin of Capitalism*, 75-7, Robert S. Duplessis, *Transitions to Capitalism in Early Modern Europe* (Cambridge: Cambridge University Press, 1997), 68, 176; and Jones, 'Agriculture and Economic Growth', 211.

seventeenth-century improvers were gentry.[77] And this was so for very good reason. Experimentation meant undertaking considerable risk. If a new scheme should fail, the entire year's crop could be lost or made worthless. Ordinary tenants, who had much smaller incomes and who had rents to pay, could not bear this kind of burden.[78] Only the rich could; especially those with multiple estates that could provide a natural buffer against the failure of an experiment on any particular one of them. Furthermore, adopting new methods often involved a considerable initial outlay, on a scale beyond the means of all but the very richest. Floating meadows, ploughing up pasture, and implementing new rotation systems were expensive undertakings. Rowland Vaughan, for instance, claimed to have spent some £2,000 floating his land, while Blith spent 'hundreds' improving his.[79] Moreover, returns were often not seen until years after the initial investment, if they were ever seen at all.[80] Freed from work and educated, the gentry also had the leisure to visit experimental farms and to read agricultural books, luxuries their generally illiterate and busy tenants could not afford. While ordinary farmers could slowly tinker with their husbandry, they could do so only within very narrow limits. Any given detail might be altered, but the total and abrupt reorganization demanded by systems that were more than

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[77] Thirsk, 'Plough and Pen', 301; and Kerridge, *Farmers*, 130-2. Some improvers, however, were the younger sons of gentlemen (e.g. Gervase Markham). Thirsk, 'Agricultural Innovations', 534-5. Hartlib's family was of German high-aristocratic stock, although his father had invested in a dye-works. Turnbull, *Hartlib, Dury and Comenius*, 2, 110.

[78] Thirsk, 'Agricultural Innovations, 542; idem, *Alternative Agriculture*, 28; and idem, 'Enclosing and Engrossing', in *The Agrarian History of England and Wales*, vol. 4, ed. idem (Cambridge: Cambridge University Press, 1967), 212. Lord Ernle quotes Jethro Tull as saying (in the eighteenth century) that if advised to sow clover, 'farmers would certainly reply "Getlemen might sow if they pleased, but they (the farmers) must take care to pay rents"'. Lord Ernle, *The Land and Its People*, chapter 3 (London: Hutchinson, 1925), reprinted as 'Obstacles to Progress', in *Agriculture and Economic Growth in England, 1650-1815* (London: Methuen, 1967), 56.

[79] Kerridge, *Agricultural Revolution*, 256. The Norfolk-four course was also expensive to implement. A. H. John, 'The Course of Agricultural Change, 1660-1760', in *Studies in the Industrial Revolution*, ed. L. S. Pressnell (London: Athlone Press, 1960), reprinted in *Essays in Agrarian History*, vol. 1, ed. W. E. Minchinton (Newton Abbot: David and Charles, 1968), 230. Blith, *The English Improver*, a.

[80] Thirsk, 'Seventeenth-Century Agriculture and Social Change', 187. Systems based on convertible husbandry or new crops often took many years to establish. Kerridge, *Farmers*, 127.

a sum of their parts, would have been impossible. The truly revolutionary innovations could only have come, and did only come, from the gentry. In agriculture poverty breeds conservatism.

If one group of historians have constructed their interpretation of the seventeenth century around a largely fictitious 'rising bourgeoisie', another has based theirs on an equally spurious 'puritanism'. Everything from the Civil War, to the rise of science and capitalism has at some point been credited to the doings of this supposed creed.[81] The agricultural revolution has been no exception. In his *Great Instauration*, Charles Webster argues that the puritans were the leading force behind improvement and dominated the pamphlet literature on the subject. To these individuals, he claims, improvement was part of a 'Great Instauration', an ambitious plan to reform society according to the precepts of the new science (itself, according to Webster, inspired by puritanism). The improvement of agriculture was to be one step in the creation of a new heaven on Earth, making England's wastelands as fruitful as had once been the Garden of Eden.[82]

Although at first appearing plausible, once Webster's theory is examined more closely it becomes rather less convincing. Its main shortcoming is that Webster provides very little real evidence either that agricultural improvement was the result of puritan beliefs, or that the bulk of the improvers were actually puritans. The root of the problem is that Webster does not appear to have a clear idea of what he means by 'puritanism'.[83]

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[81] For a recent work critical of this tendency, see William Lamont, *Puritanism and Historical Controversy* (Montreal and Kingston: McGill-Queen's University Press, 1996).

[82] Webster, Charles Webster, *The Great Instauration: Science, Medicine and Reform, 1626-1660* (London: Duckworth, 1975), 469. For his complete treatment of agriculture, see pp. 465-83. For a critical overview of the 'Merton Thesis' (the linking of Puritanism to the rise of science), see Cohen, *The Scientific Revolution*, 314-21. For the full debate, see I. Bernard Cohen, ed., *Puritanism and the Rise of Modern Science: The Merton Thesis* (New Brunswick, NJ: Rutgers University Press, 1990).

[83] Michael G. Finlayson, *Historians, Puritanism, and the English Revolution: The Religious Factor in English Politics before and after the Interregnum* (Toronto: University of Toronto Press, 1983), 42-76,

Despite the book's length of over five hundred pages, and despite the exhaustive research on which it is based, the term that presumably underlies its entire argument is never defined. The only clue comes in the introduction, when Webster tells his readers that the puritans 'formed the dominant element in English society in the middle of the seventeenth century.'[84] In the context of agriculture, at least, it seems that Webster is operating with the de facto assumption that anyone who was a Protestant was also a puritan, for the only improver not assumed to be such was the Catholic Richard Weston.[85] Casting his net so wide, Webster is able to claim in support of his argument anyone whose putative puritanism would serve that purpose. Consequently, his hypothesis becomes true by definition, but at the cost of being meaningless.

In his difficulty in defining puritanism Webster is not alone. Despite the importance of puritanism in the historiography of seventeenth-century England, despite its having been credited with so many of the period's achievements, no historian has ever been able explain precisely what theological beliefs united the diverse individuals who constituted this category. Nor can this failure be blamed on a lack of effort, for many have tried to do so.[86] The real problem is that the puritan theology being sought did not exist. There never was any distinct set of puritan theological beliefs, and no amount of research and analysis will find them.[87] Puritanism was neither Calvinism nor any other

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especially p. 74; and C. H. George, 'Puritanism as History and Historiography', *Past and Present*, no. 41 (1968), 96-104.

[84] Webster, *The Great Instauration*, xiii. By contrast, more recent research suggests that puritans never amounted to more than a small minority of the population. See, e.g. John Spurr, *English Puritanism, 1603-1689* (New York: St. Martin's Press, 1998), 78.

[85] Webster, *The Great Instauration*, 473.

[86] Even Weber admits that puritanism is a 'highly ambiguous word'. Max Weber, *The Protestant Ethic and the spirit of Capitalism*, trans. Talcott Parsons (New York: Charles Scribner's Sons, 1958), 96.

[87] C. H. George, 'Puritanism as History and Historiography', *Past and Present*, no. 41 (1968), 96-101; Michael G. Finlayson, *Historians, Puritanism, and the English Revolution*, 42-76; and Lamont, *Puritanism and Historical Controversy*, 1-3.

specific doctrine. It *is*, rather, a concept created by certain groups of nineteenth and twentieth-century historians to fit their usually Weberian or Marxist models, the product of what C. H. George refers to as a 'manic abstractionism'.[88] In its seventeenth-century usage, the appellation 'puritan' (the word 'puritanism' was rare) was usually a general term of opprobrium that could mean almost anything, employed in roughly the same fashion as the word 'left' in twentieth-century parlance. Treating 'Puritanism' as a distinct religious category, therefore, has about as much validity as would a concept of 'Leftism' that lumped together communists, anarchists, and social-democrats.[89]

Even allowing a very broad definition of puritanism that includes all who demonstrated above-average piety, Webster's argument would still fare poorly. Reading his chapter on agricultural reform, one would expect to find the improvers and their literature replete with spirituality and Christian zeal. The evidence, however, does not lend much support to this conclusion. The individual who may most plausibly be labelled a 'puritan improver' was Samuel Hartlib. There can be no doubt that he was deeply religious (from a Calvinist background, according to M. Greengrass[90]), and that he devoted as much time and energy to spiritual matters as he did to agricultural.[91] In 1639 a warrant was even issued for his examination in an investigation of 'Puritan rogues' (it is not clear if he himself was suspected of being such an individual).[92] However, devout though he may have been, even possibly a 'puritan', it is not clear that his work on agriculture was inspired by his religion, except perhaps in the general sense that

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[88] George, 'Puritanism as History and Historiography', 97.
[89] Finlayson makes a similar point in his *Historians, Puritanism, and the English Revolution*, 74.
[90] M. Greengrass, 'Samuel Hartlib and International Calvinism', *Proceedings of the Huguenot Society* 25 (1993), 466.
[91] Turnbull, *Hartlib, Dury and Comenius*, 34-5, 66-7, 76-7; and Greengrass, 'Samuel Hartlib and International Calvinism'. His work on educational issues was also tied to religion. Turnbull, *Hartlib, Dury and Comenius*, 36-66; and Webster, ed., *Samuel Hartlib and the Advancement of Learning*.
[92] Turnbull, *Hartlib, Dury and Comenius*, 20-1.

Christianity preaches the doing of good in the world and Hartlib certainly considered improvement to be 'good'. Moreover, if religion was his inspiration he was very efficient in concealing the fact, for the tone of his writings on the subject was predominantly secular. Other potential puritan improvers are few and far between. Although Gervase Markham foreswore drinking, gambling, extravagant dress and tobacco, and wrote several religious poems, his agricultural writings, like the improvement genre as a whole, were down-to-earth and practical.[93] At most it can be said that several improvers lightly sprinkled their pamphlets with biblical references and expressions of religious belief—enough to prove that most were not atheists, but little more. Even the remarks of Norden and Blith, quoted above, in which the mundane goal of improvement is justified in terms of the lofty aspirations of Christianity, rather than being proof of the spiritual foundations of the former may just as easily be interpreted as attempts at rationalization; remarks aimed at assuaging an increasingly pious society and perhaps also at providing a measure of relief from self-doubt.[94] Nor were Protestants like Norden and Blith the only improvers who drew a link between religion and agriculture. The Catholic Richard Weston urged his readers to

> lay the foundation of your Husbandry upon the blessing of Almighty God, continually imploring his divine aid and assistance in all your labours; for it is God that gives the Increase, and believing this is the Quintessence and soul of Husbandry. *But seek ye first the Kingdom of God, and his righteousness, and all these things shall be added unto you.*[95]

England in the seventeenth-century was a devoutly religious society. Religious belief, whether 'puritan', protestant, or Catholic, informed thought and action at all levels. What

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[93] F. N. L. Poynter, *A Bibliography of Gervase Markham, 1568?-1637* (Oxford: Oxford Bibliographical Society, 1962), 15, 17.
[94] See above, pp. 29-31.
[95] Samuel Hartlib, *His Legacy of Husbandry*, 3rd ed. (London: F. M. for Richard Wodnothe, 1655), 302.

would be more surprising than the discovery that improvers linked their work to religion, would be to find that they did not.

Far from being the chief inspiration for improvement, moreover, at least one improver was positively hostile to puritanism. To Rowland Vaughan, scathing in his denunciation of a local puritan preacher ('this counterfeit Puritane, this Machivillian, this politician and Usurer'), the label was a source of contempt. Vaughan, however, may have had a special reason for disliking puritanism. His scheme for floating his meadows involved the construction of weirs to dam the river Wye. These weirs, interfering with the movement of salmon stocks, drew an outcry from the population whose livelihood depended on fishing and legal action was taken against him. It appears likely that this preacher sided against Vaughan, and for this reason drew his ire.[96] If so, then at least in this one case, rather than being the ideological force behind improvement, puritanism was an obstacle in its way. Puritanism may also have been an obstacle to improvement insofar as excessive religious zeal absorbed the attentions of individuals who otherwise might have turned an eye to agriculture. It is hard to imagine someone like the puritan lawyer William Prynne, who wrote thousands of pages denouncing the vanity of contemporary hair-styles and the blasphemy of the stage (and who was prepared to have his ears cut off for these beliefs), being concerned with anything so mundane as agriculture.[97]

On balance, however, puritanism probably neither favoured nor hindered improvement, but was simply irrelevant. An individual puritan could have been an improver (though no clear case has been found), could have been a traditionalist, or could have given up agriculture altogether to follow his religious calling; all depended on

[96] Vaughan, *Water-Workes*, F3-F4, G3-G4, H4, I-I2. Vaughan's language is exceedingly convoluted in places, and the precise role played by this puritan preacher is somewhat ambiguous.
[97] Lamont, *Puritanism and Historical Controversy,* 17-9.

personality and the accidental way in which life is so often shaped. Even the more general phenomenon of Protestantism likely did not play a significant role in the development of agriculture, as is suggested by the case of Richard Weston. If he was the only Catholic author of improvement literature this was probably not because of some inherent predilection for economic efficiency among Protestants, but rather because Catholics constituted only a small minority of the population. If there had been more Catholics, there would have been more Catholic improvers. In all, Webster's theory, like most attempts to link religion to economic change, seems to have been the product of an overactive imagination and lax standards of historical evidence. It is fitting that even Francis Bacon, who lends Webster's book its title, was not a puritan.[98] Once again, ideology has outstripped evidence, generating much belief but little knowledge.

The improvers' stated objectives, then, are evident: serving the public interest was their main concern, capitalist-style profiteering and puritanism were not. A full explanation for improvement, however, must go beyond stated aims and explore the possibility that changes in the social, economic and cultural environment also played a part. Though reductionist arguments that explain ideas solely in terms of their context are no longer tenable, this does not warrant the opposite conclusion that there are no such links whatsoever. Truth is a balance between opposing exaggerations; and a major part of the historian's duty is to establish just where this balance lies. Improvement as a conscious objective of certain farmers has been treated above; its context is examined below.

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[98] Peter Urbach and John Gibson, 'Editor's Introduction', in Francis Bacon, *Novum Organum*, trans. Peter Urbach and John Gibson (Chicago and La Salle, IL: Open Court, 1994), xiv. The generally secular nature of Bacon's thinking is clear to anyone who has read his writings.

In principle any farmer in any century could have become an improver. The human mind has free will, and the individual's nominal ability to pursue whatever goals he wishes is unlimited. An individual revelation, however, does not make a revolution. An idea by itself, whether a new method of husbandry or a new religious doctrine, without a means of communicating itself to society at large, without a way of surviving outside the mind of its creator, can have little impact. It will flare up for a brief moment like a spark, but with a single death or the loss of a single manuscript it disappears forever. What has, in recent centuries, transformed the way in which ideas are recorded, giving to them both greater longevity and a heightened potential for self-propagation, is the printing press, first developed in the fifteenth century. The effects of this technological revolution, which made the spread of ideas infinitely easier, were profound. Innovation, to a degree hitherto impossible, became a major historical force with far-reaching consequences. Agriculture was to be one of its beneficiaries.

The importance of the printing press in the emergence of modernity has long been recognized. Elizabeth Eisenstein has forcefully demonstrated its crucial role in the rise of a 'permanent' Renaissance, the Protestant Reformation, and the development of modern science.[99] However, what has so far not been suggested is printing's importance in the agricultural revolution. Yet there are good reasons for supposing that its role in this event may have been no less decisive. The chief advantage of printing over script was the greater quantity of copies that could be produced at comparatively low cost. An idea of just how revolutionary this new technology was may be gained from the example of the Ripoli Press in Florence. This press, according to Albinia de la Mare, 'charged three

[99] Elizabeth L. Eisenstein, *The Printing Press as an Agent of Change* (Cambridge: Cambridge University Press, 1980).

florins per quinterno [five sheets of paper] for setting up and printing Ficino's translation of Plato's *Dialogues*. A scribe might have charged one florin per quinterno for duplicating the same work. The Ripoli Press produced 1,025 copies; the scribe would have turned out one.'[100] Cheaper books, moreover, meant more books. The scale of the increase was an order of magnitude. Before 1440, just before the appearance of printing, it has been estimated that less than 100,000 manuscripts were in existence. By 1500 the number of printed books was no less than nine million.[101]

With output at such a high level it was inevitable that agriculture would eventually become a subject of publication. In England, before the arrival of the first printing press in 1476, there was hardly a manuscript on agriculture to speak of. A few decades later, however, the first printed works on the subject began to appear. By the beginning of the seventeenth century the trickle had become a flood, with new publications and editions appearing almost every year.[102] Without this proliferation of agricultural literature, the fruits of the most ingenious innovations would have rotted on the vine, for printing alone was able to provide the framework necessary for a series of isolated improvements to blossom into a full-scale agricultural revolution. Technological advance, after all, is as much about the dissemination of existing ideas and innovations as it is about the creation of new ones. In fact, in a purely quantitative sense, the importance of imitation greatly exceeds that of invention, for while it is likely that any given technology will only be invented once or twice, it may be put into practice hundreds or

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[100] Quoted in ibid., 46.

[101] G. E. Fussell, *The Classical Tradition in West European Farming* (Rutherford: Fairleigh Dickenson University Press, 1972), 93. On the development of the first printing press in Mainz, Germany, see Pierce Butler, *The Origin of Printing in Europe* (Chicago: University of Chicago Press, 1940), 65-102, 140-2.

[102] Tusser's *Hundreth Pointes* (later *Five Hundreth Pointes*) alone went through twenty-three editions in the 81 years after it was first published in 1557. McRae, *God Speed the Plough*, 5. On the growing interest in books on agriculture including evidence from the inventories of private libraries, see Ambrosoli, *The Wild and the Sown*, 244-57.

thousands of times. Such is the pattern found throughout the history of technology, from the horse-harness, to the steam engine, to nuclear fission. Such was also the case in the diffusion of new methods of agriculture: the major breakthroughs were made independently on only a very small number of farms, yet eventually spread to all corners of the land. Richard Weston's discovery of the Dutch methods of clover and turnip husbandry, for example, may very well have been the single direct or indirect source of every instance of that system in England, for even when illiterate farmers copied the technique from their neighbours, they were likely copying something that had first been learned from a book. Indeed, one suspects that if neighbours played a significant role in the spread of new methods, they did so by lending out their books as much as by providing a visible example on their fields.[103]

Not only was printing required for the spread of new techniques once they were developed, but it was likely also a requirement for the process of invention itself. New ideas are seldom created in a vacuum. Generally, they result from the fusion of personal ingenuity with knowledge already present in society. A new innovation might represent only a slight improvement over existing techniques, but unless these techniques are known in full, in all their variations, it may not be made at all. With the profusion of books generated by printing, the quantity of information, and, just as importantly, the level of intellectual stimulation, grew exponentially. As much as practice and experience was lauded by the improvers, it was their increased exposure to ideas recorded in books (and indeed to other men's practice and experience recorded in books), that made their

[103] The case, however, should not be overstated. Weston himself reported that 'When your Neighbours see your Labors thrive and prosper ... when they once see your Crops, and somewhat understand that you do reap some benefit by them, they will come to you as to an Oracle to ask your Counsel.' Michell, 'Sir Richard Weston and the Spread of Clover Cultivation', 160.

own experimentation a realistic possibility.[104] The stimulating effect of printing, moreover, was not lost on contemporaries. Francis Bacon wrote that books

> cast their seeds in the minds of others, provoking and causing infinite actions and opinions in succeeding ages: so that if the invention of the ship was thought so noble, which carrieth riches and commodities from place to place, and consociateth the most remote regions in participation of their fruits; how much more are letters to be magnified, which, as ships, pass through the vast seas of time, and make ages so distant to participate of the wisdom, illuminations, and inventions, the one of the other?[105]

The participation of 'ages so distant' in the development of agriculture, in fact, would have been an accurate assessment had Bacon chosen to make it, for together with new books, printing meant a greater abundance of the old. As the industry grew, the agricultural writings of Cato, Varro, Columella, Pliny, Xenophon and others became accessible to ever larger portions of the reading public.[106] While classical agriculture left much to be desired even compared with medieval techniques, such writings nevertheless contain references to practices unknown in England in the seventeenth-century, including the cultivation of clover and turnips, to the fertilizing properties of legumes, and to the floating of watermeadows.[107] Though these references are not sufficiently detailed to have provided practical instructions for the reorganization of farms, they at least placed in the minds of readers the names of plants and the concepts that would soon play a revolutionary role. They also demonstrated that there was no single, universally correct

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[104] The irony that at the same time that they expressed indifference and even hostility towards the written word in favour of hands-on experience, the early figures of the scientific revolution relied on books to obtain much of their information and to publish their results, has been noted by Eisenstein. (Eisenstein, *Printing Press*, p. 471-8.)

[105] Bacon, *Advancement of Learning*, 48-9.

[106] On the English rediscovery of the classical agricultural tradition see Thirsk, *Alternative Agriculture*, 27, 31; and Ambrosoli, *The Wild and the Sown*, 244-57.

[107] References to the cultivation of clover include Cato *Agr.* 27, 54.3-4, 60; Varro *Rust.* 1.23, 2.1; Columella *Rust.* 2.10.24-8. References to the cultivation of turnips include Cato *Agr.* 6.1, 35.2; Varro *Rust.* 1.24; Columella *Rust.* 2.10.22-24. References to the fertilizing properties of legumes include Cato *Agr.* 37.2. Columella, however, is sceptical. Columella *Rust.* 2.10.7 and 2.13.1. References to the floating of meadows include Cato *Agr.* 8.1, 9.1, 149.1.

method of agriculture, that in times past and lands distant, unfamiliar techniques had prevailed. Realization of this may have helped to make English farmers aware that the methods to which they were accustomed were not inevitable, that other systems of husbandry might be possible. Moreover, there is a certain amount of evidence that when seventeenth-century improvers developed these new systems, they did so partly under the influence of the classics. Robert Child, one of Hartlib's correspondents, was aware of the ancients' use of lucerne (known to them as *medica*) as a fodder crop grown in ten-year leys.[108] Sir Richard Weston also appears to have been at least partially inspired by the ancients' attitude towards agriculture, which, he noted, was 'a thing much celebrated by Antiquity, and thought the noblest way to gather Wealth, for to employ such Wit and Money upon the Land, and by that means to augment his estate.'[109] Other references to classical authors, especially to Cato, may be found in the writings of Hartlib, Child, Weston and John Worlidge.[110] However, such evidence, while significant, is less than overwhelming. At most, increased exposure to the classics made a minor contribution to the agricultural revolution.[111]

If growing contact with the farmers of the past was one encouragement to innovation (albeit a minor one), growing contact with those of the present was another. One channel through which such communication could occur was, once again, the printed book. Books have the virtue of allowing ideas to travel over long distances, between people who otherwise cannot communicate. With the increased volume of literary output

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[108] Hartlib, *His Legacy*, 3rd ed., 70; Ambrosoli, *The Wild and the Sown*, 21.
[109] Hartlib, *His Legacie*, [A4].
[110] Ibid., 38; Hartlib, *His Legacy*, 3rd ed., 39, 300; and John Worlidge, *Systema Agriculturae* (London: T. Johnson for Samuel Speed, 1669), C2-[C4].
[111] For a more optimistic assessment of the impact of the classical influence, see Ambrosoli, *The Wild and the Sown*, *passim*.

that followed the development of the printing press, it became possible for agricultural techniques to spread to England from the distant corners of Europe. The Italian historian Mauro Ambrosoli, in his well-researched study of the subject, has documented a considerable flow of such ideas, both modern and ancient, from the Mediterranean to northern Europe. The chief medium for this was, of course, the printed book.[112] However, while some improvers may have made use of foreign ideas, there is little evidence that those who pioneered the new system of clover and turnip husbandry (namely Sir Richard Weston, several other members of the Hartlib circle, and Andrew Yarranton) were, to any significant degree, influenced by ideas emanating from southern Europe. The source of the new husbandry was not the Mediterranean but Holland; and the first description of it was written by an Englishman who had seen it with his own eyes. At most, it may be said that foreign literature arriving in the fifteenth and sixteenth centuries may have helped, by opening minds and stimulating thought, to prepare the intellectual ground for the real advances that were to come later.

While the impact of books arriving from the continent may have been minor, the same cannot be said of the long-distance spread of ideas in general. Europe in the sixteenth and seventeenth centuries was becoming an increasingly mobile society with an ever greater amount of cross-border travel.[113] Though most reasons for travel had nothing to do with the study of agriculture, an increasing international flow of people inevitably meant that a certain number of Englishman were exposed, directly or indirectly, to the

[112] For the case of England see ibid., 223-61.
[113] John Hale, *The Civilization of Europe in the Renaissance* (New York: Touchstone, 1995), 180-5.

alternative ways in which other Europeans farmed their land.[114] The most important case of this was undoubtedly that of Richard Weston. While one can hardly call his Civil War exile a vacation, it was nevertheless this experience that first opened his eyes—and consequently his nation's—to the advanced agriculture of the Dutch. Furthermore, Weston's encounter with continental methods was not unique. John Evelyn, in his travels to France and Italy in 1643-7, was sufficiently impressed by the horticulture he encountered to translate and publish a French book on the subject.[115] Samuel Hartlib received information from his correspondents about the French use of lucerne, sainfoin and trefoil which he published in 1652.[116] Robert Child, who had studied in Leiden and Padua and lived for a time in France and New England, reported in his 'large letter' to Hartlib information about the agricultural practices of France, Holland, Italy, Spain, Russia, and even China.[117] Hoping others might follow his example, he urged

> Ingenious gentlemen and Merchants who travel beyond [the] Sea, to take notice of the Husbandry of those parts (*viz.*) what grains they sow? at what times and seasons? on what lands? how they plough their lands? how they dung and improve them? what Cattle they use? and the commodities thereby? also what books are written of Husbandry, and such like?[118]

To the meticulous improver, a journey abroad was a unique opportunity, a chance to glean from a foreign land pearls of wisdom that might be put to use at home. The best of what others had to offer, it was hoped, gathered with care, would help set England on her new course.

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[114] For an introduction to the subject of English travel during the Renaissance including a discussion of the various potential motives for such travel, see Clare Howard, *English Travellers of the Renaissance* (New York: Burt Franklin, 1914).
[115] Thirsk, *Alternative Agriculture*, 44.
[116] Hartlib, *His Legacie*, 1-4, 84-9. See also idem, *A Discoverie*, 12.
[117] Hartlib, *His Legacy*, 3rd ed., 5, 39, 44, 53, 71-2; Sir Cheney Culpeper, 'The Letters of Sir Cheney Culpeper (1641-1657)', ed. Braddick, M. J. and M. Greengrass, in *Camden Fifth Series*, vol. 7, *Camden Miscellany 33* (Cambridge: Cambridge University Press, 1996), 324 n. 21.
[118] Hartlib, *His Legacy*, 3rd ed., 71.

Agriculture may also have been stimulated by greater mobility within England. A tour of the country's agriculture was the most important source of the material Arthur Standish compiled and published in his *Commons Complaint* of 1611. In the dedicatory epistle to this work he declared:

> What I shall herein set downe I proove by the best Schoolmaster, which is my long experience ... especially the four last yeares, wherein I have imployed my study and travell through some parts of most of the Countries [i.e. counties] of this Kingdome for this purpose, of having conference with many of the best Commonwealths-mean for my better understanding....[119]

The utility of travel within England was also recognized by John Norden. In his fictional dialogue between a surveyor and a bailiff the latter claims that one of the reasons men of his profession lacked competence in their trade was 'because they are not generally travelers to see other places'.[120] Enough Englishmen, however, *were* travellers; and this helped make possible the spread of new methods of husbandry.

One source of this new mobility may have been the population's changing demographic behaviour. If medieval life, as it is traditionally portrayed, was characterized by an extreme provincialism with most people living and dying within a very small radius of where they were born, by the seventeenth century this was emphatically no longer the case. In a number of recent studies, historians investigating individual localities have revealed surprisingly unstable patterns of habitation. In their investigation of two seventeenth-century villages, for instance, Peter Laslett and John Harrison found in both cases a high level of population turnover over a very short period of time. In Clayworth (Nottinghamshire), of the 401 inhabitants recorded in the village in 1676 just 158 remained in 1688. Of the 244 who disappeared only 92 had died,

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[119] Standish, *The Commons Complaint*, [C4].
[120] Norden, *The Surveyors Dialogue*, 210.

suggesting that 152 individuals (or just under 40 per cent of the population) had moved away in the intervening twelve years. Similar results were found for Cogenhoe (Northampton), where of the 187 inhabitants resident in 1616 only 94 remained in 1626.[121] One potential consequence of more frequent changes of residency was a greater flow of ideas across geographical boundaries, among them new agricultural techniques. However, until direct evidence is found of agricultural techniques spreading in this way, such a contention remains conjectural.

If printing and an increasingly mobile society helped spread specific innovations, then science helped to disseminate the *idea* of innovation as such. Hitherto, agricultural innovation has been examined in isolation, as something separate and unconnected with innovations that were occurring elsewhere in English society. In fact, however, agricultural improvement must be seen as part of a broader pattern of technological change. Occasioned by the growing impact of the scientific revolution, the early seventeenth century saw the emergence of what might be described as a 'mentality of innovation', a belief that it was within the realm of human potential to conquer and 'improve' nature.[122] The clearest expression of this new way of thinking is to be found in the writings of the man who, more than any other, was the father of modern science: Sir Francis Bacon. To Bacon the world was filled with unexplored technological possibilities: 'There is ... every reason to hope that there are still many very useful things, which have not so far been discovered, hidden from us in the bosom of Nature,

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[121] Peter Laslett and John Harrison, 'Clayworth and Cogenhoe', in *Historical Essays, 1600-1750. Presented to David Ogg*, ed. H. E. Bell and R. L. Ollard (London: Adam and Charles Black, 1964), 174, 176-7. See also Peter Laslett, *The World We Have Lost Further Explored*, 3rd ed., (London: Methuen, 1983), 75, 310; and Macfarlane, *Origins*, 64, 68-9, 71-8.

[122] Although his argument connecting the phenomenon with puritanism is dubious, Webster's *The Great Instauration* remains the best book illustrating the scientific culture of the mid-seventeenth-century improvers. See pp. 465-83.

having no affinity or parallel with things already discovered, but quite off the beaten track of our imagination.'[123] Through an empirical method nature's hidden secrets could be uncovered, allowing man to augment his 'power over Nature'.[124] Though Bacon's belief that the entire task of investigating nature would take 'only a few years' was rather naive, and though his own scientific speculations were mostly useless (he was an essentialist who believed, for instance, that the heat of a flame and the 'heat' of spicy food were two instances of a single phenomenon), his enthusiasm was nevertheless real and helped set in motion one of the most profound philosophical revolutions of all time.[125]

Of the influence of Bacon and his scientific philosophy among the improvers there can be no doubt. Several refer to him directly in their works. Blith praises his 'Naturall Historie' (i.e. the second part of the *Novum Organum*) as a book 'full of Rarities and Admiration for true Philosophie', 'A Sunne in the Theore' compared with which his own 'Moone-light' discoveries were 'but meane Experiences of the lowest Practique [i.e. 'practical'] Husbandrie'.[126] Cressy Dymock admired the ambition of Bacon's project but felt that it was too grand for his own modest capacity to contribute.[127] Hartlib himself envisioned his celebrated Office of Public Address as a 'put[ting] in[to] Practice the Lord Verulams [i.e. Bacon's] Designations', in order to contribute to the 'advancement of

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[123] Bacon, *Novum Organum*, 114.
[124] Ibid., 292.
[125] On Bacon's belief that the investigation of nature would be a short task, see ibid., 298. On his various instances of 'heat', see ibid., 144-7.
[126] Blith, *The English Improver*, [(a4)]. It is possible that 'theore' does not mean 'theory' (which Blith elsewhere spells as 'theorie') but the rarer 'theoria' which, according to the *Oxford English Dictionary* means 'contemplation' or 'survey'.
[127] 'I acknowledge the burthen too heavy for my shoulders', Hartlib, *A Discoverie*, 16.

Divine and Humane Learning, according to the Counsell and Designe of Lord *Verulam*, to whose structure ... every yeare some stones should bee added.'[128]

More important than explicit admiration for Bacon, however, was the de facto adoption by the improvers of his scientific method. In seventeenth-century improvement literature the language of empiricism was ubiquitous. The subtitle of Gabriel Plattes's *The Profitable Intelligencer* boasted that the book contained 'many rare Secrets and Experiments'.[129] Arthur Standish, in a passage that has already been quoted, declared that experience was 'the best Schoolmaster'.[130] Gervase Markham assured his readers that his knowledge had been gained through 'exact and assured experience', which, in his view, strongly reminiscent of Bacon, had greater potential than reason alone.[131] One can sense the depth of the improvers' inclination to experiment in the recently published letters of Sir Cheney Culpeper, a close associate of Hartlib. Culpeper, in addition to his agricultural researches, expressed a keen interest in the most diverse assortment of new technologies and gadgets, ranging from the practical (a new type of pen, saltpetre as a preservative for food) to the useless (wooden and leather guns, a perpetual motion machine). He even experimented with a primitive tank-like device designed to shield infantry from artillery bombardment (which he hoped would be useful to Parliament in its war with the King).[132]

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[128] Richard Foster Jones, *Ancients and Moderns: A Study of the Rise of the Scientific Movement in Seventeenth-Century England* (New York: Dover, 1982), 150. On Hartlib's Office of Address, see Turnbull, *Hartlib, Dury and Comenius*, 77-88.

[129] Plattes, *op. cit.*

[130] See above, pp. 58.

[131] 'There is no Artist or man of Industrie which mixeth Judgement with his experience, but findeth in the travell [i.e. 'travail'] of his labours, better and nearer courses to make perfit [i.e. perfect] the beauty of his worke than were at first presented to the eye of his knowledge.' Gervase Markham, *Cheape and Good Husbandry for the Well-Ordering of all Beasts, and Fowles, and for the Generall Cure of their Diseases* (London: T. S. for Roger Jackson, 1614), title page, ¶4.

[132] Culpeper, 'Letters of Sir Cheney Culpeper', 165-6, 179-80, 183, 319-22. On his efforts at agricultural experimentation, see 241-2, 264, 336.

For his part, the more realistic Hartlib demonstrated an empiricism admirable even by today's standards. 'If one Experiment fail', he urged,

> try a second, a third, and many: Look into Places and persons, note the Qualities of the Lands of other men, and compare it with your own, and where there is a resemblance, mark what the best Husband doth upon his land, like unto thine, if to prosper, practise it, and follow the example of him that is commonly reputed a thrifty understanding Husbandman. And by this means will Experience grow, and of one Principle of Reason, many Conclusions will proceed.[133]

By the early 1660s, when the Royal Society inaugurated its famous Georgical Committee for the study of agriculture, the application of science to husbandry was fast becoming the norm. A few years later, opening the first chapter of his comprehensive *Systema Agriculturae*, John Worlidge could jump unhesitatingly into the new, dry language of science that has since become all too familiar:

> Agriculture hath been (not undeservedly) esteemed a Science, that principally teacheth us the Nature, and divers Properties and Qualities, as well of the several Soils, Earths and Places, as of the several Productions or Creatures, whether Vegetable, Animal, or Mineral, that either naturally proceed from, or are artificially produced, or else maintained of or by the Earth.[134]

In the six or seven decades between Bacon and Worlidge the experimental method in agriculture had become virtually institutionalized. A technological dividend was inevitable.

All of this is not to say that science rather than a concern for the public good provided the chief impetus to the improvement of agriculture. Rather, the expression of such a concern in the form that it took was greatly facilitated by the empiricism and

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[133] Hartlib, *His Legacy*, 3rd ed., a4-A.

[134] Worlidge, *Systema Agriculturae*, 1. On the Royal Society's Georgical Committee, see Thirsk, 'Agricultural Innovations', 562-9. The Georgical Committee was created on 30 March 1664. On 23 June, at its first meeting, it resolved that 'the best endeavours should be used, to compose as perfect a History of Agriculture and Gardening as might be' so that 'it might be knowne what is knowne and done already, both to enrich every place with the aides that are found in every place, and withall to consider what further improvements may be made in all the practice of Husbandry.' Lennard, R. V., 'English Agriculture Under Charles II', *Economic History Review* 4 (1932), pp. 23-45, reprinted in *Essays in Agrarian History*, vol. 1, ed. W. E. Minchinton (New York: Augustus M. Kelley, 1968), 163-4.

culture of innovation that science helped to generate. In fact, far from agricultural innovation being the result of the Baconian philosophy, it may very well have been the case that Bacon himself was partly inspired by the same factors that motivated the improvers; for the same sense of public-spirited altruism so noticeable in improvement literature is also to be found in the writings of Bacon. In the famous introduction to his *Novum Organum*, entitled 'The Great Instauration', Bacon displays an attitude reminiscent of the Hartlib circle, hostile to the use of science for any self-interested end: 'I would address one general admonition to all; that they consider what are the true ends of knowledge, and that they seek it not either for pleasure of the mind, or for contention, or for superiority to others, or for profit, or fame, or power, or any of these inferior things; but for the benefit and use of life; and that they perfect and govern it in charity.'[135] Charity—the relief of poverty—was in fact as pressing an issue for Bacon as it was for Hartlib. The same consciousness of the economic misery of the times that so touched the improvers appears to have had a similar impact on Bacon. 'Let us hope', he says, that out of the marriage between the rational mind and empirical knowledge 'there may spring helps to man, and a line and race of inventions that may in some degree subdue and overcome the necessities and miseries of humanity.'[136] The festering swirl of poverty, crime and vice that was England in the seventeenth century weighed heavily upon the minds of all who witnessed it. The need for a solution was felt by all. Some looked to science, others to agriculture.

Changes in the intellectual climate, then, could have a profound impact on economic life. Without the intellectual tools provided by the scientific revolution, the

[135] Francis Bacon, *New Atlantis and the Great Instauration*, rev. ed., ed. Jerry Weinberger (Wheeling, IL: Harlan Davidson, 1989), 16. See also Bacon, *The Advancement of Learning*, 32.
[136] Idem, *New Atlantis and the Great Instauration*, 26.

improvement of agriculture might not have been possible. The rise of science, however, was not the only intellectual revolution from which agriculture would profit. Another was the rise of humanism. The direct contribution made by the re-emergence of the classics has already been examined. Humanism's full impact, however, was both more profound and more subtle. When at the end of the Middle Ages Europe began systematically to uncover its classical past, many became disillusioned with the present condition of their own societies. In comparison with the splendour of ancient Greece and Rome, they felt, contemporary Europe had little to offer. Its politics and religion were corrupt, its philosophy and learning stagnant, and its artistic output meagre. Europe, in short, experienced an identity crisis. The result, among many, was a desire to reconstruct society along classical lines, to restore at least a part of what had been lost (it was supposed) in the Middle Ages. Eventually this sentiment evolved into a kind of utopianism, a belief that Europe both could and should be rebuilt according to the most perfect model human reason could devise. First appearing in the Renaissance, this utopianism became a perennial feature of western thought. A constant striving for reform, a ceaseless iconoclasm, a total irreverence for all things traditional—undoubtedly much of the dynamism of western society springs from this frame of mind, awakened when the dust was blown from the covers of a few old books.

In England the most outstanding literary expression of this movement was Sir Thomas More's *Utopia* (1516).[137] Though its appearance preceded the improvers by a century, and though it paid scant attention to the subject of agriculture (although the Utopians are diligent in their husbandry and use the best methods to improve the fertility

[137] For a recent introduction to Renaissance humanism, see Charles G. Nauert, Jr., *Humanism and the Culture of Renaissance Europe* (Cambridge: Cambridge University Press, 1995). For the rise of humanism in England, see pp. 114-22.

of the soil[138]), its optimistic view of human potential nevertheless proved to be an inspiration for generations of improvers. In Hartlib's version of Utopia, brought to life in his *A Description of the Famous Kingdome of Macaria* (1641), agriculture takes centre stage. The Macarian parliament maintains a powerful 'Councell of Husbandry' to oversee the affairs of farmers. To ensure that land is managed efficiently there is a law requiring that one twentieth of every man's goods be devoted to improvement. Failure to employ the latest techniques elicits a fine; repeat offenders forfeit their land.[139] The style of this book is clearly in the humanist tradition, and indeed Hartlib acknowledges More's *Utopia* (together with Bacon's *New Atlantis*) as his model.[140] The humanistic utopian ideal, moreover, characterized the broader activities of Hartlib and the other improvers. Society, to them, was in need of being recreated, and the improvement of agriculture was to be the means of doing so. In principle it was both possible and desirable to reform husbandry and the world at large. The debt owed by these men to humanism is unmistakeable.[141]

If an increasingly scientific and humanistic intellectual climate helped facilitate the belief that agriculture could be improved through innovation, so did the obvious presence of other innovations in everyday life. In the several centuries preceding the first instances of the new clover and turnip husbandry, a number of important technological breakthroughs occurred in other areas of English and European society. The printing press, gunpowder, the compass (and the voyages of discovery that followed), together

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[138] Thomas More, *Utopia*, trans. Clarence H. Miller (New Haven: Yale University Press, 2001), 92. See also pp. 54-5.
[139] Samuel Hartlib, *A Description of the Famous Kingdome of Macaria* (London: for Francis Constable, 1641), 3-4.
[140] Ibid., A3, 9.
[141] Margo Todd makes a similar argument in the case of the so-called 'reformation of manners' of the late sixteenth and seventeenth centuries. This drive to eradicate vice and enforce a more rigorous Christian morality, she argues, was the product of an ongoing humanistic tradition whose goal was the creation of a more perfect society. Margo Todd, *Christian Humanism and the Puritan Social Order* (Cambridge: Cambridge University Press, 1987).

with several lesser inventions had a profound impact on the early modern mind. They demonstrated that the world need not be static, that human effort, if properly guided, could transform it for the better.[142] The importance of these discoveries in fostering this realization has long been recognized. J. B. Bury saw the new technologies as influencing such figures as Peter Ramus, Jean Bodin and Francis Bacon, helping to set the stage for the so-called 'idea of progress', the belief that human history represents an unending progression from primitive to more advanced modes of life, characterized by an ever more sophisticated science and technology.[143] Similarly, R. F. Jones saw the new technologies as helping to bring about the seventeenth-century 'revolt from the ancients', the liberation of science from the authority of the classics, especially the works of Aristotle, whose philosophical system formed much of the basis of medieval scholasticism. The geographical discoveries that followed the development of the compass, he noted, could not but help to expose the imperfections of classical knowledge which made no provision for the new continents. To Richard Eden, an Elizabethan writer of discovery literature, these revelations together with the inventions of printing and gunpowder, were proof that 'this our age may seeme not only to contende with the Ancients, but also in many goodly inventions of Art and wit, farre to exceede them.'[144] The influence of the new technologies on Bacon himself, whom Jones considered the key figure in the revolt from the ancients, is evident throughout his works. 'It is worth noticing', he wrote in his *Novum Organum*,

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[142] Gunpowder, of course, was a borrowing from China rather than an indigenous development of Europe. From the point of this essay's argument, however, its significance is the same: it demonstrated to Europeans the possibility of technological change.

[143] J. B. Bury, *The Idea of Progress: An Inquiry into Its Origins and Growth* (London: Macmillan, 1920), 35, 40-1, 51.

[144] Richard Foster Jones, *Ancients and Moderns*, 11-3.

> the great power and value and consequences of discoveries, in none more obvious than those three that were unknown to the ancients, and whose beginnings, although recent, were obscure and unsung, namely the arts of *printing*, *gunpowder* and the *compass*. For these three have changed the whole face and condition of things throughout the world, in literature, in warfare and in navigation. From them innumerable changes followed, so much so, that no empire, no sect, no star has been seen to exert more power and influence over the affairs of men than have these mechanical discoveries.[145]

Other references in Bacon's writings to new inventions and geographical discoveries are legion.[146]

The spirit of innovation that became so prevalent among seventeenth-century improvers, their belief that society's problems could be solved through new technology, doubtless owed its existence at least in part to these same discoveries that had such an impact on Bacon and the other fathers of science. The perception of an underlying similarity between geographical discovery and agricultural innovation may be observed directly in the person of Cressy Dymock:

> Not forgetting what an infinite increase of honour and wealth King Henry the Seventh lost or missed, by distrusting, and refusing the Offer of Christopher Columbus. And though I will not compare this [his proposal for improvement] in value to that; I may boldly say, that this may be more advantageous to the commonality, and every way more immediately proper and necessary for this Common-wealth.[147]

In countering the objection, raised by some, that if new crops were truly worth growing, farmers would have begun doing so long ago, Robert Child cited the example of modern discoveries. How do these sceptics know that the new crops are worthless? he asked;

> have they tried? Idlenesse never wants an excuse; and why might not our fore-fathers upon the same ground, have held their hands in their pockets, and have said that Wheat and Barley would not have grown amongst us? ... so many things are found out by us, altogether unknown to them [the ancients], not to speak of

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[145] Bacon, *Novum Organum*, 130-1.
[146] E.g. ibid., 113-5, 165, 225-6, 242; idem, *New Atlantis and the Great Instauration*, 13, 82; idem, *The Advancement of Learning*, 29-30.
[147] Hartlib, *The Reformed Husband-Man*, 11-2.

> Gun-powder and Printing, nor of the New-world and the wonders there, which notwithstanding are but of a few hundred years standing: I say twenty Ingenuities have been found even in our days, as Watches, Clocks, Way-wisers, Chains for Fleas, divers Mathematical Instruments, Short writing, Microscopes, by the which even the smallest things may be discerned, as the eggs, eyes, legs, and hair of a Mite in a Cheese: Likewise the Selenoscope [i.e. telescope], which discovereth mountains in the Moon, divers Stars, and new Planets, never seen till our days.[148]

The belief that discovery is a potential object of human effort, evident in these passages and throughout the improvement genre, was a conclusion drawn naturally from the example of discovery itself, though one usually arrived at unconsciously. When a society's technology is stagnant, when there have been no inventions of any note in recent memory, when there is no available evidence to suggest that change is possible, that other ways of doing things may be found, the very idea of innovation as an approach to problem-solving will simply not arise, even in the mind of an individual who in another century might be an Edison or an Einstein. It is a concept difficult to grasp for those who live in a time where rapid technological change is a part of everyday life, but it is a concept that nevertheless must be grasped if we are to fully understand the stagnation of medieval science. By the time of Hartlib and the other improvers of the mid-seventeenth century, Europe had already witnessed the first major breakthroughs of modern technology. Both science and agriculture were soon to benefit from the belief in technological potential that these would foster.

Of the major late-medieval and early-modern technological breakthroughs, one also contributed to agriculture in a more direct way. The compass and voyages of discovery not demonstrated the potential to expand human knowledge and capability, but also provided a part of the means to do so. Shortly after the discovery of the New World, several new crops along with reams of botanical information about hitherto unknown

[148] Hartlib, *His Legacy*, 3rd ed., 70.

species, began to flow across the Atlantic. Cotton, sugarcane, tobacco, silkgrass, Indian corn, kidney beans, pumpkins, squashes, watermellons, hemp and cranberries are only some of the newly discovered plants mentioned by Robert Child in his 'large letter' to Hartlib.[149] Of these, several would have a significant impact on English farming in the sixteenth and seventeenth centuries. From 1619 onward tobacco was grown by farmers all over the country, aided by the attractive returns it offered (albeit with a heavy input of labour). It continued to be cultivated until 1690 when falling prices combined with decades of government persecution aimed at protecting the Virginia crop succeeded in snuffing out the new industry.[150] The most important crop brought from the New World, however, was the potato. Introduced in the late sixteenth century, the plant was first advocated as an aphrodisiac and in its early years amounted to little more than a curious luxury for the well-to-do. An acre of potatoes, however, produces on average more than twice the calories of the same area of wheat; and once this potential was recognized, the plant quickly gained a following. By the end of the seventeenth century it had become a regular crop in the north-west of the country where the physical environment was suitable to it, and where it provided a welcome supplement to a local diet dominated by oats.[151] However, while these New World contributions to agriculture were significant (especially the potato), their overall importance should not be exaggerated. The most important new crops—turnips and the various artificial grasses—were indigenous to Europe and in some cases even to England itself. It was not the ingredients that were missing but the recipe. If

[149] Ibid., 69.
[150] Thirsk, *Alternative Agriculture*, 66.
[151] Overton, *Agricultural Revolution*, 102; Kerridge, *Agricultural Revolution*, 277-8; and Thirsk, *Alternative Agriculture*, 60.

the transatlantic voyages made any contribution in this regard it was in the manner already discussed: by helping to inspire a new mentality more amenable to innovation.

Thus far this investigation has focused on the beliefs of the improvers themselves and on the broader technological and intellectual trends that influenced them. An explanation for the agricultural revolution, however, would not be complete without consideration of one specific event whose contribution was as crucial as it was accidental: the English Civil War. The importance of Sir Richard Weston's wartime exile to the Low Countries has already been discussed. In this story, illustrative of the accidental nature of history, an event which in itself had nothing to do with agriculture or its improvement, revealed to England, for the first time, the new agricultural techniques that would ultimately spark a revolution. While counterfactual speculation is always problematic, it would perhaps not be much of a stretch to imagine that without this fortuitous event (if a war can ever be fortuitous), the spread of the new husbandry could have been delayed by many decades or even longer. Indeed, its full importance in propagating the new husbandry may possibly have been much greater. By disrupting normal life, by setting in motion countless soldiers, refugees and exiles, the Civil War may have played an indispensable role in spreading, within England, new ideas and methods to men who otherwise would never have been exposed to them.[152] Further evidence is needed, however, before any definitive conclusion can be reached.

Whatever its role in the spread of new techniques, the Civil War's importance in another regard is unmistakable. Reading the improvement literature of the 1640s and 1650s, it is clear that the political and military turmoil of the period was one of the calamities that demonstrated to Englishmen the urgent necessity of reforming their

[152] This possibility has been suggested by Joan Thirsk. Thirsk, *Alternative Agriculture*, 273 n. 48.

society. In a passage that has already been quoted, Hartlib suggests that the decay of trade and multiplication of the poor was 'a natural consequence and result of civil Warres'.[153] The solution was to be an improved national husbandry. Gabriel Plattes similarly hoped that through improvement, 'the Inhabitants of England in generall, will recover the Wealth of the Kingdom now so miserably wasted by these unnatural Wars, and make it the most flourishing Countrey in the world.'[154] The turmoil of the 1640s and 1650s may also have provided a certain amount of encouragement to the new scientific movement. Thomas Sprat, the Royal Society's first historian, wrote in 1667 that:

> The late times of Civil War and confusion, to make recompense for their infinite calamities, brought this advantage with them, that they stirr'd up mens minds from long ease, and a lazy rest, and made them active, industrious and inquisitive: it being the usual benefit that follows upon Tempests and Thunders in the State, as well as in the Sky, that they purify and clear the Air, which they disturb.[155]

In general, inasmuch as they provide society with an opportunity to reorganize itself, periods of upheaval and disruption represent a positive force in history. While the importance of the Civil War in this regard should not be exaggerated, it is surely no coincidence that the twenty years between 1640 and 1660 saw all of the key breakthroughs in the development of the new husbandry as well as the publication of more literature on improvement than had ever been published before or would be published for many decades to come. Once again, something very good came of something very bad.

The present essay began by questioning the approach to history that sees historical events solely as the products of underlying economic factors and class conflict. Thus far, the seventeenth-century agricultural revolution has been explained by phenomena

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[153] See above, p. 37.
[154] Plattes, *The Profitable Intelligencer*, A.
[155] Quoted in R. F. Jones, *Ancients and Moderns*, 228-9.

completely independent of these elements. Yet to end here and deny that these factors had any importance whatsoever would be an exaggeration, if only a slight one. The so-called enclosure movement has long been considered, by some, to have been a key precondition for the establishment of new agricultural methods.[156] The argument, in its usual form, is that in common-field (or 'open-field') agriculture, where every family's land was integrated into a single system of husbandry, it was virtually impossible to arrive at a mutual agreement to adopt new techniques. With every individual having, in effect, a veto, the most conservative practices inevitably prevailed.[157] Supporting this argument is the fact that many contemporaries came to the same conclusion: the commons were inefficient and had to be enclosed if progress was to be made. Adam Moore, for instance, claimed that

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[156] This is to be distinguished from the Marxist interpretation of enclosure which sees its importance primarily in the dispossession of peasants and the creation of a free labour force that it supposedly entailed. See, e.g., Wood, *Origin*, 83-4. There are, however, several problems with this interpretation. In the first place, in the sixteenth and early seventeenth centuries, when 'primitive accumulation' (the creation of a labour force through enclosure) is alleged to have occurred, research has shown that a minimal number of people were actually displaced. It has been estimated that between 1455 and 1637, no more than 1200 square miles of land was enclosed, possibly dispossessing no more than 35,000 people. (Pound, *Poverty and Vagrancy*, 11.) In later years, when its pace quickened, rather than throwing people off the land, enclosure typically involved an *increase* in employment; for the new techniques with which it was associated tended to be labour intensive. Deane, *First Industrial Revolution*, 44. Even in the sixteenth century, Tusser could argue in favour of enclosure on the grounds that it meant 'More work for the labouring man'. Tusser, *His Good Points*, 179. Furthermore, enclosure seems to have been the work of peasants as often as lords. Rather than being a profound epic of class conflict, the picture of enclosure that emerges from at least one contemporary observer is politically mute:

> This great Improvement [enclosure] meeteth with the greatest difficulties and impediments; amongst which none appears with a bigger face than the several Interests and diversity of Titles and Claims to almost every Common-field or waste Land in England; And although (by many) the greater part of the Interested Persons are willing to divide and enclose it, yet if but one or more envious or ignorant persons concerned oppose the Design; or that some or other of them be not by the Law under a capacity of assuring his Interest to his Neighbor, the whole must unavoidably cease, which hath proved a grand Obstruction, and hath been frequently complained of. (Worlidge, *Systema Agriculturae*, 12.)

The most serious flaw with the Marxist argument, however, is that there is no evidence that at any time a shortage of wage-labourers inhibited industrial growth.

[157] Overton, *Agricultural Revolution*, 164-5. See, however, his reservations on p. 167 and cf. Havinden, 'Agricultural Progress' and J. A. Yelling, *Common Field and Enclosure in England, 1450-1850* (London: Macmillan, 1977), 146-70.

> The principall and only means then to ripen the fruit of new hopes is *Enclosure*, and distribution of the Lands to private owners, which being appropriated to their particular uses, will then be cleansed and purged of the former deformities, and so fully improved by their carefull industry, that it will undoubtedly yield them such advancement thereby, and consequently reliefe to the *Republike*, as hereafter ensueth.[158]

While there can be no doubt that the common fields represented a drag on efficiency, and that any widespread adoption of new methods of husbandry required a different system of land-holding, it does not follow from this either that the seventeenth-century agricultural revolution was the result of enclosure or even that the latter was a necessary precondition for it. For while some twenty-four per cent of the country's agricultural land underwent enclosure in the seventeenth century (just two per cent was enclosed in the sixteenth), 45 per cent had already been enclosed by 1500.[159] What was needed was not universal enclosure, but the existence of enough privately managed land owned by wealthy gentlemen to make experimentation possible. More than enough—nearly half of all arable land—was in such a condition long before the first signs of technological change. In fact, it may very well have been the case that such land always existed, that there was always enough private manorial demesne-land to have made experimentation possible, *had it been the objective of its owners*. Until the seventeenth century, however, it was not their objective; and it is the transformation of this attitude, rather than any evolution of property rights, that needs to be explained.

Finally, while all of the causes of the agricultural revolution discussed above may be assembled into a single, more-or-less coherent narrative, there nevertheless remains a certain element of that something which fits no theory, which submits to no explanation: chance. From time to time the proverbial apple falls on the proverbial head; a new

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[158] Moore, *Bread for the Poor*, 13. See also Thirsk, ed., *Seventeenth-Century Economic Documents*, 144-5.
[159] Overton, *Agricultural Revolution*, 148.

discovery is made, not as the capstone of some grand historical process but as an inexplicable fluke. Hugh Platt, writing about a new method of setting corn (a precursor to modern seed-drilling), envisioned some such origin of this practice:

> Happily some silly wench having a fewe cornes of wheate, mixed with some other seed, and being carelesse of the worke shee had in hand, might now and then instead of a Raddish or Carret seede, let fall a wheate corne into the ground, which after branching itselfe into manie eares, and yeelding so great increase, gave just occasion of some farther triall.[160]

One need not accept Platt's conjecture to recognize that the occurrence of innovation is always to some degree accidental. Although there were very good reasons why the seventeenth-century should have witnessed a surge of experimentation and improvement in the seventeenth century, the ultimate success of the agricultural revolution was never guaranteed. A certain amount of luck was required: luck that silly wenches occasionally spilled their corn, and luck the Civil War brought Sir Richard Weston to greener pastures in the Netherlands.

[160] Sir Hugh Platt, *The New and Admirable Arte of Setting of Corne* (London: Peter Short, 1600), A2.

4 Conclusion

'At all times', wrote Johan Huizinga in his classic history of the waning Middle Ages, 'three different paths ... have seemed to lead to the ideal life.' Religion with its forsaking of the world, progress with its amelioration of earthly conditions, and the dream with its escape into the realm of fantasy—three different paths, one common objective. In the Middle Ages, argued Huizinga, the first and last of these predominated. In the monasteries earthly existence was renounced, while in the courts men lived in a dream-world of aristocratic make-believe, a life 'gilded by chivalrous romanticism, ... disguised in the fantastic gear of the Round Table.' The concept of progress, fundamental to modern society, was nowhere to be found:

> The idea of a purposed and continual reform and improvement of society did not exist. Institutions in general are considered as good or as bad as they can be; having been ordained by God, they are intrinsically good, only the sins of men pervert them.... Legislation in the Middle Ages never aims consciously and avowedly at creating a new organism; professedly it is always opportunistic, it only restores good old law ... or mends special abuses. It looks more towards an ideal past than towards an earthly future.[1]

In economic life, all of this began to change in the seventeenth century, the result of decades of hardship and deprivation. After many generations of expansion, England's population by this time was beginning to exceed the land's capacity to sustain it. The

[1] Johan Huizinga, *The Waning of the Middle Ages*, trans. F. Hopman, (London: Penguin, 2001), 36-9.

breakdown of the medieval manor and the decline of hospitality occasioned by the dissolution of the monasteries meant that the safety-net that once might have eased the effects of scarcity, was no longer in place. Instead, the poor took to the highways by the thousands, veritable armies of beggars, prostitutes and criminals. England was fast becoming a savage land, racked war and upheaval, riven by poverty and corruption; a place where the pessimism of Hobbes could come all too naturally, where life truly was nasty, brutish and short.

The strain of all this on communities, on law and order, and, most importantly of all, on consciences, was more than England could bear. To those who cared about their society, to those with the slightest sense of compassion and humanity, the status quo could no longer suffice. Something had to be done, some change had to be made, some new path had to be found that would lead England out of the wilderness. Public-spirited men grasped at anything that promised relief. Some, like Gerrard Winstanley, looked to a more equitable distribution of wealth, a levelling dream presaging modern communism.[2] Others looked to religion, hoping that a 'reformation of manners' would give England the moral discipline needed to survive a difficult period.[3] The men portrayed in this essay, however, looked to an altogether different solution: relief through the improvement of agriculture. New methods of husbandry, it was hoped, would provide food and employment for the poor, and would make England once again prosperous. Propelled by the desperation of their times, these men sought their panacea, and found it. In doing so

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[2] Christopher Hill, *The World Turned Upside Down: Radical Ideas during the English Revolution* (New York: Viking, 1972), 86-120; McRae, *God Speed*, 110-31.

[3] On the reformation of manners, see Martin Ingram, 'Reformation of Manners in Early Modern England', in *The Experience of Authority in Early Modern England*, ed. Paul Griffiths, Adam Fox and Steve Hindle (New York: St. Martin's Press, 1996), 47-88; Keith Wrightson, *English Society 1580-1680* (London: Hutchinson, 1982), 149-221, *passim*; and Todd, *Christian Humanism*.

they changed the world forever. In history as in art, the most miserable moments are often the most creative. England's curse became her blessing.

The blessing of the agricultural revolution, however, was not only economic—it was also intellectual. In pursuing agricultural development as a solution to the problem of poverty, the seventeenth-century improvers were the first to see economic progress as something that could better society, something that could ameliorate the human condition, something, indeed, that could bring happiness. This was the first case in history of self-conscious economic development, the first time that what is now referred to as economic growth was seen as an essential instrument of social policy, a device that could enhance the well-being not only of individuals but of society as a whole. As such, Hartlib and the other improvers were the forerunners of modern economists, both liberal and Marxist. Theirs is an intellectual legacy as crucial as it has been neglected. To them is owed not only the technological basis of modern society, but also one of its principal, founding ideas.

In this way, both physically and intellectually, the economic Middle Ages came to an end. Medieval conservatism, believing that institutional perfection lay in the past rather than the future, gave way at last to the modern spirit of innovation, to the belief that the road to the sublime takes an earthly course, that life must be transformed rather than transcended. The chivalrous dream, once of Jerusalem and Granada, was now the dream of progress, of America and the New Atlantis. In the economic history of England, Hartlib and the other improvers of the seventeenth-century were the first to dream this dream; the first, indeed, to live it.

And in doing so, in accomplishing all that they did, what does it matter that the improvers acted inadvertently, that their intention was not to transform the world but merely to solve the localized, short-term problem of poverty in England? So often is a man's legacy something other than what he intends, something not even guessed at until death has forever silenced him! Machiavelli wrote *The Prince* not in order to found the modern discipline of political science, but to demonstrate his abilities to Lorenzo the Magnificent, from whom he hoped to obtain employment.[4] Christopher Columbus sailed west not with the intention of discovering a new world and founding a new civilization, but in order to find a cheaper way of importing spices. Likewise, the improvers began with their humble motives, but ended in creating an economic system the name and meaning of which they had not the faintest inkling. All of this proves not that the great personalities of history are undeserving of the name, but that life is unpredictable, that its triumphs are attained through mystery as often as merit, that far from the abstractions of teleological theory, real men are fragile vessels who respond to the world but imperfectly, who cannot know the future of humanity any more than their own, and who if they should change it, do so blindly, accidentally, unknowingly. In the judgement of history, serendipity is the cardinal virtue.

Good fortune, however, was not the only virtue possessed of these men. In a century often brutal and barbaric, their charity, their compassion for the poor, their devotion to the well-being of their society, stand in sharp relief to the cruelty, the intolerance, the violence that characterized so much of the world around them. Hartlib

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[4] Niccolò Machiavelli, *The Prince* and *The Discourses*, Modern Library College Edition (New York: Random House, 1950), xxviii, 3-4.

and the other improvers were good men in a cynical age, small pockets of warmth in an otherwise frigid atmosphere.

As such, they also offer a lesson to historians. In a pessimistic discipline, where the corruption of motives is too easily taken for granted, where economic self-interest is too often assumed to lie at the root of all human activity, the fathers of the agricultural revolution are a stark reminder that humanity is more complex than some of its critics are willing to admit. Samuel Hartlib, the most famous of them, sacrificed everything he had for the well-being of society, and in return died a pauper. To some, such a man may be difficult to fathom. And yet how many like him have filled the pages of history! How many martyrs there have been, how many fools and heroes have given their lives for a cause, for a belief, for love; indeed, how many Marxists—the most cynical of all—have died in war, in revolution, in prison! Poor is the man who lives only for money; poorer still the historian to whom mankind can do nothing else.

Appendix: Self-Sufficiency and the Impact of Competition

For those wanting a more detailed and systematic exploration of the notion that self-sufficiency shields producers from the effects of competition, the following remarks have been included.

The theory's basic assumption is that when a producer is self-sufficient, no matter how great the efficiency of his competitors, no matter how much their innovations may cause the price of his goods to fall, his business will remain profitable so long as he continues to produce enough to sustain his own process of production. His existence, in other words, will never be jeopardized by his inefficiency vis-à-vis his competitors.

To illustrate this, let us imagine two producers, each existing in entirely separate, closed economies, one producing grain, the other producing cloth. Each produces 100 dollars of his respective product, of which 80 dollars represents the cost of production and twenty dollars the final profit, giving a rate of return on the initial investment of twenty-five per cent (20/80 = twenty-five per cent). This may be expressed in the following two equations:

Grain producer: $80 Cost + $20 Profit = $100 Grain
Cloth producer: $80 Cost + $20 Profit = $100 Cloth

These equations may also be expressed in terms of the final profit:

Grain producer: $100 Grain – $80 Cost = $20 Profit
Cloth producer: $100 Cloth – $80 Cost = $20 Profit

For the sake of simplicity, let us suppose that in both cases the only cost of production is labour and that the labourers consume only grain, so that the 80 dollars in costs that both producers incur represent in each case 80 dollars worth of grain. Now let us suppose that owing to competition by other grain and cloth producers, the prices of both products fall by half (but that in the separate economy in which the cloth producer is operating, grain prices, and therefore costs, remain unchanged). The results would be as follows:

Grain producer: $50 Grain – $40 Cost = $10 Profit
Cloth producer: $50 Cloth – $80 Cost = $30 Loss

Because the grain producer produces the very product he needs for production, his costs fall in proportion with the price of his product. Consequently, his business remains profitable (in fact his rate of return is unchanged at twenty-five per cent). The cloth producer on the other hand, whose costs are unrelated to his final product, has suffered a calamitous blow, and, without a recovery of cloth prices, faces imminent ruin.

In this way, producers who produce the goods and services required by their own processes of production are shielded from the effects of competition, while those who are market-dependent are vulnerable to it. The degree to which a producer is vulnerable to competition depends upon on the degree to which he is market-dependent. In the case of total market-dependence, the producer experiences the maximum effects of competition. Even a relatively slight fall in the price of his commodity can drastically reduce his profits and threaten his survival. At the other extreme, where production is totally self-sufficient, it is impossible *not* to make a profit (though it might be quite small in absolute

terms). Let us suppose, for instance, that grain prices fall by 99 per cent. The effects on our grain producer would be as follows:

Grain producer: $1 Grain = $0.80 Cost = $0.20 Profit.

The profit has virtually disappeared, falling from twenty dollars to twenty cents—but it still exists. A producer in any other industry would have been ruined. The only way in which a completely self-sufficient producer can fail to earn a profit is by failing to produce at a level sufficient to maintain his current level of production; if he cannot produce enough grain, for instance, to feed his peasants or sow the next year's crops.

The examples given so far have been purely abstract. They have been simplified in order to make the underlying principles as clear as possible. Reality, of course, is much more complicated. It is doubtful that complete self-sufficiency has ever existed. Medieval English agriculture, both on the manorial demesne and on the smaller peasant plot, was always to a degree dependent on the market. Rents and taxes always had to be paid, and implements not produced in the home purchased. The self-sufficiency of the Middle Ages was relative rather than absolute. The precise degree to which agriculture was self-sufficient is difficult to estimate. Nevertheless, an approximation can be made. Peter Bowden has estimated the expenditures of a typical farm of 100 acres in c. 1700-1750. His results are reprinted in Table A.1:

Table A.1. Expenditures of a 100 acre notional arable farm, c. 1700-50

Expenditure	£.	s.	d.	%
Rent	76.	5.	0.	28.5
Maintenance and repairs	7.	12.	6.	2.9
Seed (wheat, barley, oats, peas)	33.	3.	6.	12.4
Soil dressings (lime, manure)	32.	16.	3.	12.3
Draught animals				
Feed (grass, hay, oats)	31.	4.	0.	11.7
Interest and depreciation	5.	13.	0.	2.1
Miscellaneous (litter, shoes, medicaments)	3.	0.	0.	1.1
Farm equipment	3.	11.	3.	1.3
Labour (ploughing, harrowing, carting, harvesting, miscellaneous)	71.	0.	10.	26.6
Marketing and other	3.	0.	0.	1.1
Total expenditures	267.	6.	4.	100.0

Source: Bowden, 'Agricultural Prices', 88-9.

From this we can approximate the degree to which an eighteenth-century farm was self-sufficient. If we assume that rent, farm equipment and 'miscellaneous' draught-animal expenditures represent entirely external costs; that half of the value of soil dressings, maintenance and repairs, and 'marketing and other' had to be supplied by the market; and that one-quarter of labour expenses represent goods and services that could not be produced on the farm, then the total degree of market dependence would be £120 15s 10d, or around 45 per cent. In the Middle Ages, when the urban craft economy was less developed, and when agricultural techniques were simpler, requiring fewer external inputs, the degree of market dependence would have been much less. We may suppose, rather arbitrarily, that it was around twenty-five per cent, a figure that may very well be too high.

Any model, therefore, that assumes perfect self-sufficiency, must be modified if it is to apply to medieval England. However, the same principle that self-sufficiency gives immunity to competition also applies to cases of partial self-sufficiency, albeit partially. The qualified formula is this: producers who are only partially self-sufficient are only

partially shielded from competition. Let us illustrate this with an example. Suppose there are six grain producers, each of whom in a given year produce 100 dollars worth of grain at a rate of return of 25 per cent:

100 Grain – 80 Cost = 20 Profit

The next year grain prices fall by 50 per cent. Each producer, however, has a different degree of self-sufficiency, and, in consequence, is affected by the fall of grain prices in a different way:

Table A.2. The effect of self-sufficiency on immunity from competition (50 per cent fall in prices)

Producer	% Self-sufficiency	Value of final product	Total Costs	Net Profit
1	100	50	40	10
2	80	50	48	2
3	60	50	56	-6
4	40	50	64	-14
5	20	50	72	-22
6	0	50	80	-30

One can see that the degree to which producers are shielded from competition is a function of the degree to which they are self-sufficient.

In this example, the price has fallen sharply (by half). Consequently, all but the most self-sufficient producers have suffered a loss. In a more realistic case, where the fall in price is less dramatic, the results are more modest. Table A.3 shows the effects on the same producers of a twenty per cent fall in prices:

Table A.3. The effect of self-sufficiency on immunity from competition (20 per cent fall in prices)

Producer	% Self-sufficiency	Value of final product	Total Costs	Net Profit
1	100	80	64	16.
2	80	80	67.2	12.8
3	60	80	71.4	9.6
4	40	80	75.6	6.4
5	20	80	76.8	3.2
6	0	80	80	0

In this case all producers remain at least marginally profitable, though the earnings of the less self-sufficient have declined sharply.

The degree to which a decline in price affects profitability is also a function of the initial rate of return. The above examples are based on producers with an initial rate of return on their investments of twenty-five per cent. Table A.4 shows the effects of a fall in prices of 50 per cent on producers whose initial rate of return is 100 per cent (50 dollars of investment yielding 50 dollars of profit).

Table A.4. The effect of self-sufficiency on immunity from competition (50 per cent fall in prices, 100 per cent rate of return)

Producer	% Self-sufficiency	Value of final product	Total Costs	Net Profit
1	100	50	25	25
2	80	50	30	20
3	60	50	35	15
4	40	50	40	10
5	20	50	45	5
6	0	50	50	0

A comparison with Table A.2 shows that the greater the initial profitability, the less a decline in prices will hurt producers at all degrees of self-sufficiency. In this example, even though the price has fallen by the same amount, all of the producers remain at least marginally profitable due to their higher initial rate of return.

To summarize, absolute self-sufficiency grants absolute protection from the effects of price competition. Producers who are only partially self-sufficient are only partially protected. The impact of this relationship is further modified by two additional factors. Firstly, the greater the drop in price, the sharper will be the fall in profits. Minor price declines can leave all producers profitable, whereas large declines generally leave only the most self-sufficient with a profit, and these only by small absolute margins. Secondly, the greater the initial rate of profit, the less will be the effects of a fall in price.

A high initial rate of return can leave even highly market-dependent producers with a nominal profit, even when prices have fallen sharply; whereas producers with lower initial rates may be ruined by a relatively modest fall in prices.

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