

Elements of Sustainable Agriculture: The UK Experience, 1840–1940

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Abstract

As an illustration of the value of an historical context in appraising contemporary issues in rural management, the paper cites evidence of a concern for sustainable farming during the period 1840–1940, as revealed in the 'expert' guidance offered on the general topics of high farming, the grassing down of land, specialization, and land utilization. For the most part, the challenge was not so much to find general panaceas, but rather to pursue those forms of husbandry most suited to the mosaic of local conditions encountered in each part of the countryside.

POLICIES for the use of the UK countryside are again the subject of intensive debate, both at a governmental level and among the various user-interests and commentators, including those working in the media, who believe they have some claim to make prescriptions. Among the many initiatives taken, there have been extensive discussions among, and between, agricultural, environmental and socio-economic scientists, under the aegis of their respective research councils. The agricultural historian has been a notable absentee.*

The value of such an historical perspective was illustrated in a paper in the *Journal of the Royal Agricultural Society of England*, in 1985, when Dr E J T Collins took conservationists and ecologists to task for regarding the inauguration of the ploughing-up campaign of the Second World War as the benchmark from which to measure change in the agricultural environment. A longer time perspective was needed. Whilst the rural landscape may have been less intensively exploited between 1870 and 1940, Collins argued that many of the changes since 1940 were in effect a resumption of trends that had begun to develop

in the seventeenth and eighteenth centuries. Through the destruction of the commons, reclamation, and the adoption of tighter systems of crop and animal husbandry, the British landscape became second only to the Dutch in western Europe, in being so tamed and intensively worked. If the years of agricultural depression after 1870 are regarded as the 'middle past', when progress was interrupted and perhaps reversed, the decades since 1940 may be seen as a time when lost ground was regained and surpassed.¹

As the intensity of post-war management practices has come under close scrutiny, and all sectors acknowledge the need for more sustainable forms of development, an historical perspective may similarly be relevant. A voluminous literature already exists on British agriculture, following what is perceived to be the massive change-over in farming systems since 1940. Through its almost complete dependence on industrial (off-farm) inputs, post-war farming is perceived to have become qualitatively different from what had gone before. Not only was ground regained, but the area already under cultivation was used much more intensively. In scenic and wildlife terms, there was a transformation both

* I am grateful to the Society for inviting me to speak at its Winter Meeting of 1993, and thereby causing me to explore further the subject of 'sustainability', and for the very constructive comments of referees on the present paper.

¹ E J T Collins, 'Agriculture and conservation in England: an overview, 1880–1939', *JRASE*, 146, 1985, pp 38–46.

within and beyond the previous limits of cultivation.²

It is not the purpose of this paper to retrace the last fifty years of upheaval, but rather to explore the extent to which elements of concern for 'agricultural sustainability' can be found in the publications of agriculturalists over the previous century. As reviews published for the Economic and Social Research Council have emphasized, there is little consensus as to what constitutes a sustainable farming system. An agricultural scientist might define it as the position where the farmer can pass onto 'his grandchildren the farm in good working condition, together with a respected position in the community'. More generally, it may be perceived as maintaining food production in the long run without degrading the resource base. It must not only be economically viable and environmentally benign, but it should protect the social and economic well-being of those involved in the production process.³ Prescriptions for achieving that end might vary from seeking improvements, say in soil conservation and nutrient recycling, to the making of wholesale changes in the farming system. Whereas the agricultural and environmental policy-maker and scientist are typically responsible for the former, the 'green' movement has attracted considerable notoriety in putting forward more radical solutions.

As Marsh and Gould have demonstrated, historical precedents may be found for 'green radicalism' in the late nineteenth century. Then too, there were strident calls of 'back to nature' and 'back to the land'. Through their writings and other ventures, John Ruskin, William Morris and Edward

Carpenter gave expression and leadership to a wider dissatisfaction with urban-industrial life, of which 'modern' farming was seen to be a product.⁴ This paper will not focus on their activities, but rather on the search for greater sustainability within what today would be regarded as the agricultural sciences. The focus will accordingly be on the textbooks and guidance given more generally to landowners and occupiers, through the professional and academic literature. In 1891, for example, the Royal Agricultural Society of England commissioned the agricultural botanist and agricultural correspondent of *The Times*, Dr William Fream, to write such a textbook, according to a schema drawn up by leading figures of the society. The book, *Elements of Agriculture*, fell into three parts, the soil, the plant and the animal. As a simple diagram demonstrated, the soil grew the crop that fed the stock which produced the manure required to keep the soil 'in good heart'. Year by year, the soil

doles out from its vast stores of insoluble matter small quantities dissolved in water, and therefore available as the food of crops, and to these the farmer adds contributions of his own in the form of natural and artificial fertilisers.⁵

The challenge was not so much to find a general panacea, but rather to pursue the form of husbandry most suited to the mosaic of local conditions encountered in each part of the countryside.

I

Disruption of any kind is likely to lead to reappraisal, if only as a means of building up defences against those who might seize such times of weakness to launch an attack. In that sense, the impact of the books, *The Theft of the Countryside*, in 1980, and *This Land is our Land*, in 1987, reflected both

² R Westmacott and T Worthington, *Agricultural Landscapes; a Second Look*, Cheltenham, Countryside Commission, 1984; Nature Conservancy Council, *Nature Conservation in Great Britain*, Peterborough, Nature Conservancy Council, 1984; C J Barr, R G H Bunce *et al*, *Countryside Survey 1990*, HMSO for Department of the Environment, 1991.

³ R K Turner, ed, *Sustainable Environmental Management*, 1988; I Hodge and J Dunn, *Rural Change and Sustainability. A Review of Research*, Swindon, Economic and Social Research Council, 1992.

⁴ J Marsh, *Back to the Land. The Pastoral Impulse in England, from 1880 to 1914*, 1982; P C Gould, *Early Green Politics. Back to Nature, Back to the Land, and Socialism in Britain, 1880-1900*, Brighton, 1988.

⁵ W Fream, *Elements of Agriculture. A Text-book*, 1892.

the skills of their author, Marion Shoard, as a polemicist, and the perceived vulnerability of vested interests, as they became increasingly unsure of their future.⁶

A sense of the alarm and bewilderment felt by those who practised farming, some hundred years earlier, was conveyed by Albert Pell, in two papers published in the *Journal of the Royal Agricultural Society*. Pell lived in Northamptonshire, where he rented some 280 acres, which he managed together with over a thousand acres that the family owned in the Isle of Ely. He acquired further wide-ranging insights into the problems of agriculture as a member of parliament, and through his governorship of Guy's Hospital estates and membership of the Council of the Royal Agricultural Society. Attracted into farming by the 'new and interesting discoveries and developments in agriculture' associated with such figures as J B Lawes at Rothamsted, Pell perceived landowning to be a business that ought to be studied scientifically.⁷ At a time of increasing competition for markets from America and India, and fierce attacks on the supposed advantages of landowners, the priority for him was an enquiry of the most practicable kind into what made land so valuable. Although 'the extraneous influence of the surrounding capital and labour of an industrious and populous society' might make an appreciable contribution, far deeper, historical roots had to be examined. Far from representing some kind of 'unearned' increment accruing to owners, the capital sums invested by owners frequently exceeded the market value of the estates on which they had been expended. Whilst a title to land might be coveted like no other form of property, it became only a boon or gift, in Pell's judgement, when

conveyed after 'somebody else had made it fit to use'.⁸

In an article, 'The making of the land in England: a retrospect', published in the *Journal of the Royal Agricultural Society* in 1887, Pell described both the striking improvements made to the condition of the land and the circumstances in which they had come about. In his words,

We in England are at the present day but the heirs or successors to others, who, whether they derived their original title in the wilderness and waste by patent, grant, conquest, diplomacy, or communal inheritance, generally got nothing, apart from wild animals and minerals, for the expenditure of toil and capital in the development of their acquisition, but the chance of remuneration.

Landowners had been required to erect farmsteads, provide shelter in the form of hedges and walls, and improve the soil through drainage, warping, claying and marling. There was 'but a small portion of rural England' that had not benefited from these costly operations, conducted entirely at the expense of successive owners of land.

Whilst the first execution of such work had all the charm of conquest about it, and attracted the praise of admiring citizens, much less notice was taken of the continued investment required to maintain the value of the original capital. In the same way as the cost of beacons, buoys and lights must be included as a charge on coastal sea voyages, so the landowner must take close account of the costs of maintaining fences, renewing tile drains, and repairing the fen banks and drainage machinery. As Pell remarked

While the field laughs with grain, it is more than possible that the owner groans at the cost of its artificial fertility.

Too often he finds it

would have been better to have left the down unbroken, the copse ungrubbed, the gorse and heather to bloom in peace, the sullen clay

⁶ M Shoard, *Theft of the Countryside*, Aldershot, 1980, and *This Land is our Land: Struggle for Britain's Countryside*, 1987.

⁷ T Mackay, ed, *The Reminiscences of Albert Pell*, 1908.

⁸ A Pell, 'The making of the land in England; a retrospect', *JRASE*, 23, 1887, pp 355-74, and 'The making of the land in England: a second retrospect', *JRASE*, 10, 1899, pp 136-41.

undrained, the boulders where they lay on the moor, and the grand homestead in the architect's office.

Of the thousands of cases where 'an artificial depletion of income' had taken place, Pell cited the examples of the estates of J M Heathcote on the edge of the Huntingdonshire fens, Lord Leicester at Holkham in Norfolk, the earl of Bathurst in the south-west, and an unnamed estate on Shap Fell. Over an 87-year period, the sum of £218,446 had been expended by the Heathcote family on an estate that extended from the higher lands of Oxford Clay to the fenlands, where the bed of the former meres now supported grain crops, and substantial farmsteads replaced the duck decoys. If the same sum had been invested at 4 per cent interest, the income for 1886 would have exceeded that of the whole estate in that year by £1400. As Pell pointed out, even if none of the improvements had been attempted, tenants would still have been found to keep the land in a reasonably productive, and therefore profitable, condition.

II

Present-day analysts have been no less ambitious in making full use of historical knowledge to press a particular perspective. Whilst none too impressed with the eighteenth and nineteenth centuries (the drainage of the unique Whittlesea Mere in the Huntingdonshire fenlands and clearance of Hainault Forest in Essex occurred in the same year, 1851), the main purpose of Oliver Rackham's book, *The History of the Countryside*, published in 1986 was to highlight the implications of the fact that more environmental change had occurred in the UK since 1945 than for any comparable period over some twenty centuries. Almost every rural change had extended what was already commonplace, at the expense of what was wonderful, rare, or had meaning.⁹

⁹ O Rackham, *The History of the Countryside*, 1986, pp 26-7.

The Canadian historian, Colin Duncan, has been no less diligent in taking a large sweep of history to demonstrate the scale of recent and almost unremitting human folly. His purpose was not so much to repair oversights in the existing literature, but to provide 'a new overall context' focused on the environmental content of 'the remarkable socio-legal arrangements' for English soil husbandry, whereby the land itself was perceived to be all important. Far from its being an optional 'extra', a grasp of its perceived importance was fundamental to interpreting the course of events up to 1815, and the relatively spurious nature of what was achieved thereafter.¹⁰

From such a premise, Duncan constructed a chronology, whereby the seventeenth and eighteenth centuries were characterized as a time when most landowners granted leases for several lives. Through their substantial security, tenant families had an abiding interest in the productivity of the soils they worked. Only with the trend towards letting farms for terms of years in the late eighteenth century did the introduction of restrictive covenants become more necessary. Often referred to as 'the custom of the country', they sought to impose the husbandry practices that generations of trial and error had found most relevant and suited to local conditions. The marked fluctuations in market conditions during the early nineteenth century, and later rise of incomes during the period of high farming, manifested themselves, according to Duncan, in the nearly standard adoption of annual leases. The decline in the profitability of arable, relative to livestock, production after 1873, which led to the great 'grassing

¹⁰ C A M Duncan, 'Agriculture and the industrial teleology in modern English history: an essay in historiographic provocation and sociological revision', in Donald H Akenson, ed, *Canadian Papers in Rural History. Volume VII*, Ontario, 1990, pp 335-62; C A M Duncan, 'Legal protection for the soil of England: the spurious context of nineteenth-century "progress"', *Agric Hist*, 66, 1992, pp 75-94.

down' gave rise to destructive bouts of tenant-right agitation, as farmers strove to escape from every form of restriction. Instead of meeting head-on the dilemma of revitalizing soils under a system of shorter leases, or exploring how the new off-farm fertilizers and feeding-stuffs might be grafted on to old rotations, a highly-sustainable system of local recycling seemed no longer relevant. Almost thoughtlessly, what Duncan calls 'the worldly-wise fine-tuning' of soil-husbandry to local conditions was abandoned.

Such interpretations of the chronology of farming change are likely to stimulate even closer scrutiny of data sources. Detailed covenants may be found in leases for even the sixteenth century. In some localities and periods, the existence of covenants may deceive, in as much as they may have been a legal device that had little direct bearing on what actually happened on the land. For the nineteenth century, Thompson has warned of how the absence of written prescriptions should not be taken as proof of disarray in the relations of landlord and tenant. In practice, customs of the tenant-right variety could have provided protection for the reasonably efficient and prompt rent-payers, long before given statutory effect from 1883 onwards.¹¹

Duncan characterizes the historians' response to the trends towards annual leases (effectively tenancies at will) as like that of cheer-leaders. They have assumed the unpredictability of market conditions made such leases inevitable, and therefore beyond criticism. More insidiously, they have tended to assume new farming methods were necessarily better, and that flexibility was therefore good a priori. For his part, Duncan and many other writers may have assumed too easily that a family farm can be trusted, through its greater sense of security, to act as a natural steward, hus-

banding resources as a legacy for the next generation. As recent studies of the political economy of soil erosion in the USA have further emphasized, there are more immediate priorities, especially where fierce competition for markets means low profits per unit of production.¹²

III

Any probing of the motives and resources of those directly responsible for the land raises questions as to the relevance and quality of any 'expert' advice sought or given. Guidance might come from many directions, and perhaps most prestigiously through parliamentary enquiries. At the invitation of the Royal Commission on the depressed condition of the agricultural interest, Pell and the agricultural writer, C S Read, made a 93-day tour of the USA and Canada in 1879. Although acutely aware of how little they had seen of the continent, their report highlighted the extraordinary difficulties that even resident 'experts' might have in forecasting the permanence and nature of American competition for British markets.¹³

On the plains and farms of the states and territories in the upper catchment of the Missouri and Mississippi, the report found 'a display of activity and energy beyond comprehension', as emigrants pushed further west. As yet, they were 'only breakers of the soil'. Whilst through human diligence the earth might continue to be productive, much of that produce was likely to be consumed locally as the vast deposits of coal were developed beneath the Missouri basin, centred on Kansas City. Nor was nature invariably kind. Although the fresh unexhausted soils, level surfaces, and absence of stones made it easier to use

¹¹ F M L Thompson, 'The second agricultural revolution, 1815-1880' *Econ Hist Rev*, 2nd ser, 21, 1968, pp 62-77.

¹² L Swanson, 'Agro-environmentalism: the political economy of soil erosion in the USA' in S Harper, ed, *The Greening of Rural Policy. International Perspectives*, 1993, pp 99-118.

¹³ BPP, 1880, XVIII, *Royal Commission on the Depressed Condition of the Agricultural Interest. Reports of the Assistant Commissioners. Joint Report of Mr Clare Read and Mr Albert Pell*, pp 1-14.

modern machinery, and grain might be 'manufactured' by 'a scourging course of cropping', cultivators also had to contend with severe winters, dangerous droughts, insect pests and, in the prairies, a shortage of good water. With plenty of land available for nothing, it seemed the American stockman might pose the greater threat to British farmers. Much of the western country was, however, poorly watered for the better class of stock. Production costs would rise as the plains became more settled, land was allotted, and free range terminated.

Turning to the 'expert' advice given as to how British farmers might respond, Duncan found it ironical that the beneficial effects of leys were rediscovered as increasing tracts of arable were grassed down. He cited the guidance given by Elliot and Stapledon, but his overriding object was to emphasize the folly of not seizing this as the further pretext for returning to longer leases. In his view, there was no need to fuss endlessly in a scientistic way about soil fertility. If given time, land under ley farming could perfectly well solve its own problems. A sound farming system in which locally adapted practices are institutionally protected would have no need of persons other than those 'well versed in local farming'.¹⁴

Such observations raise the question as to how the term, 'scientism' (as defined as an overweening belief in the relevance and utility of scientific method), might be applied to those in the nineteenth century, who invested, say, so much effort in chemical analysis. Even to contemporary observers, considerable advances were being made. Over a 20-year period, the manufacture and sale of artificial manures had, in the words of Augustus Voelcker, the consulting chemist to the Royal Agricultural Society, developed from 'a venturesome speculation' to 'a legitimate well-regulated business' of gigantic dimen-

sions. By the 1860s, it was timely to warn of the dangers of uncritical reliance on the tables of the analytical chemist. A purely theoretical base could not suffice. As Voelcker emphasized, a practical knowledge was also required. In papers published in the society's journal, he demonstrated the variability of soils in retaining the substances that encouraged plant growth.¹⁵

The need to avoid any kind of prescriptive approach was also emphasized by J B Lawes in his evidence on tenant right, given to the Royal Commission on the depressed condition of the agricultural interest in 1881. Whilst tenants should be given greater freedom of cropping, the landlord should retain powers to prevent everything being taken off the farm without anything being put back. In his judgement, the most pressing need was to ensure tenants were fully compensated for anything introduced as capital to the land that remained of value after the lease expired. When challenged by the commissioners to lay down some ground rules as to what freedoms and compensation might generally be accorded to tenants, Lawes adamantly refused. The agricultural scientists' role was rather to help the individual farmer to know how best to respond to local circumstances.¹⁶

In a lecture to the London Farmers' Club in 1870, on the subject of soil exhaustion in relation to landlords' covenants, Lawes found it anomalous that, in a century that had witnessed so much change, so little thought had been given to the actual course of cropping in any district. There were little or no data on the wisdom of enforcing strict adherence to a fixed rotation by crops. It was as if the system established by

our forefathers was proof against all improvement, in spite of the vastly improved means of mechan-

¹⁵ A Voelcker, 'On the commercial value of artificial manures', *JRASE*, 23, 1862, pp 277-86.

¹⁶ BPP, 1881, XVII, *Royal Commission ... Agricultural Interest, Minutes of Evidence*, qq 57, 648-56 and 57, 661-3.

¹⁴ Duncan, 'Legal protection for the soil of England', pp 9:-4.

ically working the soil and enormous increase in our resources of elements of fertility.

As Lawes emphasized, any consideration of the appropriateness of a particular form of husbandry to a locality, farm or field had to begin with the 'condition' of the soil, namely the elements of fertility that caused the land to produce crops within a specific period of time, and whose absence might result in the soil becoming rapidly exhausted. 'Condition' implied more than natural or standard fertility – a naturally fertile soil might be out of condition, and a naturally poor soil in high condition. That additional fertility was achieved through the skilled exertions of the farmer, whether at his own free-will or through the device of covenants.¹⁷

Whether the immediate pretext was the compilation of an analytical table, or debate as to tenant rights, the outcome over the course of the century was an appraisal of unprecedented rigour of the whole farming system. Every experiment at Lawes' Rothamsted Experimental Station, in Hertfordshire, whether on arable or grass, demonstrated the impossibility of removing anything from the soil without reducing its natural fertility. In Lawes' words, 'The first step of agriculture is exhaustion'. Losses could only be arrested by robbing somebody else's land in order to replenish the soil in question. In evidence to the Royal Commission, in 1881, Lawes dismissed as academic any argument as to whether the replenished fertility was natural or artificial. They were the same ingredients, but in different form. Nitrate of soda might be an artificial manure, but it was the nitric acid in the natural soil that had been wasted and was now applied as a food to that soil. The crucial point was not its 'naturalness', but the quantity and character of what was applied. Two and two did not make four in manuring. Whilst most farmers realized

the proportional benefit of manuring declined as more manure was applied, a great deal of further research was required before 'a standard of perfection' was achieved in prescribing the amounts required to meet specific objectives.¹⁸

From an analysis of the results obtained from trials carried out over a 30-year period, on wheat and barley rotations, and permanent meadow at Rothamsted, Lawes found that both farmyard manure and artificial manures could be used to maintain the condition of the land. When active nitrogenous manures, such as Peruvian guano, ammonia salts or nitrate of soda, were applied in the moderate quantities usually employed, the unexhausted residues left in the soil after the removal of a crop had little effect on succeeding crops. Rapecake, bones and other purchased organic manures, that yielded up their fertilizing elements comparatively slowly, might continue to have an appreciable effect throughout a rotation. The effects of farmyard manure might be even more marked. Any effects of mineral manures, such as phosphates and salts of potash, would be too slow and gradual to be detected.¹⁹

IV

In evidence to the Royal Commission in 1881, Lawes was at pains to emphasize there were limits to the amount of protection high farming could afford the farmer. The fact that such advocates as J J Mechi had invested more than they recovered from the land did not mean, however, that the farmer, who showed greater understanding and judgement, was precluded from making as much profit from his capital as he had in the past. Lawes himself had adapted to circumstances by putting down a quarter of his farm of 500 acres to

¹⁷ J B Lawes, *Exhaustion of the Soil in Relation to Landlords' Covenants*, 1870.

¹⁸ BPP, 1881, XVII, qq 57, 644-7, 57, 683-96 and 57, 697-700.

¹⁹ Lawes, *Exhaustion of the Soil*, p. 16.

grass by 1881, so as to economize on costs.²⁰ In 1875, the *Journal of the Royal Agricultural Society* published fifty-five reports from different parts of England and Wales on 'The laying down of permanent pasture and the increase in the length of time arable land was left under artificial grasses', compiled in response to a questionnaire distributed by the society. As many found, it was 'not one of those processes which turns in the ready penny and gives quick returns'. The most widely-read prescription for laying down pasture, written by an estate owner in Kent, Faunce de Laune, emphasized the need to select and sow the right seed-mixture.²¹

The paper was the immediate stimulus for trials carried out by Robert Elliot, on his estate of Clifton Park in Roxburghshire. The results further emphasized the importance of good soil husbandry. Elliot reasoned that, as agricultural competition from other countries and developments in manufacturing and mining in Asia made it harder for Britain to earn the revenue needed to import cheap food, the only recourse was to adopt those forms of husbandry that required little or no input of fertilizers, and yet sustained the fertility of the soil. In seeking to meet that challenge, in his book, *The Agricultural Changes required by these Times and how to carry them out*, Elliot again emphasized how there was no general rule. The wisdom of the conclusions reached by Lawes had, however, been borne out by trials at Clifton, in so much as the most important aid to productivity was not, strictly speaking, the chemical composition, but the physical condition of the soil, its permeability to roots, power of absorbing and radiating heat, and above all its ability to absorb and retain moisture. The key to profitability

was not so much costly manures or subsoil ploughing, but 'a scientific rotation of crops' that included large crops of red clover and other nitrogen-collecting plants capable of sustaining as many stock as possible. The close-turf enriched by some four years of manure, when ploughed in, would provide ample physical conditions for growing a succession of four years of crops, without recourse to artificial manures, except for a small supply to stimulate turnip growth.²²

Whilst Sir George Stapledon, the agronomist most closely associated with ley farming in the twentieth century, paid handsome tribute to the stimulus he had derived from Elliot's work, the strength of any lineage should not be exaggerated. As Stapledon conceded, there were key elements of Elliot's work that were overlooked. He and others had, for their part, made fresh and quite unexpected discoveries. Most strikingly, they had discovered the resilience and competitive abilities of wild white clover and other indigenous species.²³ Common to all this work was, however, the emphasis placed on the intense variety of conditions brought about by the interaction of climate, soils, and plant and animal growth. Here, the agronomists' observations were increasingly informed by the surveys, trials and experiments of early ecologists. Stapledon was an associate member of the British Vegetation Committee, and founder member of the British Ecological Society, the world's oldest ecological society (founded in 1913).²⁴ Following his appointment as director of the Welsh Plant Breeding Station at Aberystwyth, in 1919, Stapledon in turn demonstrated to agronomists and

²⁰ BPP, 1881, XVII, qq 57, 598 and 57, 701.

²¹ M Evans and T Bowstead, 'Report on laying down land to permanent pasture', *JRASE*, 11, 1875, pp 442-509; F de Laune, 'On laying down land to permanent grass', *JRASE*, 43, 1882, pp 229-64.

²² R H Elliot, *The Agricultural Changes required by these Times and how to carry them out* (reprinted as *The Clifton Park System of Farming and Laying Down to Grass*, 1943).

²³ R G Stapledon, 'Introduction', in R H Elliot, *The Clifton Park System*, pp 5-16.

²⁴ R Waller, *Prophet of the New Age: the Life and Thought of Sir George Stapledon*, 1962; J Sheail, *Seventy-five Years in Ecology: the British Ecological Society*, Oxford, 1987, pp 54-6.

ecologists alike what could be achieved, through systematic, well-resourced inquiry, in terms of elucidating 'the distribution, acclimatization and evolution of plants'.²⁵

In the event, the impact of ecological concepts and techniques on such activities as grassland husbandry in the inter-war years proved disappointing. This in part reflected the difficulties of persuading farmers to apply the results of any kind of research to their everyday management of the land. Writing of the earlier experiments at Rothamsted, of which he was director between 1902 and 1912, A D Hall warned farmers not to expect 'to see demonstrations of the most profitable means of growing this or that crop'. The trials were designed to discover how plants grew and obtained their nutriment from the soil, so as to arrive at a set of principles for general application. It was for the farmer, through his immediate advisers, to adapt these principles to his own practical conditions and translate them into pounds, shillings and pence.²⁶ Even in the few cases where such interpretive help was available, the depressed state of farming deterred many farmers from seeking it. The exhilaration of post-war reconstruction soon gave way to 'the great betrayal' of the industry in the early 1920s. As soon as there were signs of recovery, and of explicit encouragement being given to grassland improvement, Stapledon responded by collaborating with a leading agricultural adviser, J A Hanley, in writing a guidebook, *Grassland: its Management and Improvement*, only to see farmers further disheartened by the even deeper recession of 1929–33.²⁷

²⁵ R. G. Stapledon, 'Cocksfoot grass (*Dactylis glomerata* L): ecotypes in relation to the biotic factors', *Journal of Ecology*, 16, 1928, pp 71–104; J. Sheail, 'Grassland management and the early development of British ecology', *British Journal for the History of Science*, 19, 1986, pp 283–99.

²⁶ A. D. Hall, *The Book of the Rothamsted Experiments*, 1919, pp vii–xii.

²⁷ R. G. Stapledon and J. A. Hanley, *Grassland, Its Management and Improvement*, Oxford, 1927.

V

Daniel Hall began his book, *The Soil. An Introduction to the Scientific Study of the Growth of Crops*, with the words, 'the whole business of agriculture is founded upon the soil'. From a crude 'chemical' belief that the soil was simply 'a nutritive medium', agriculturalists had discovered in the nineteenth century how it was also 'the seat of a number of physical processes' affecting the supply of heat, air and water, as well as 'a complex laboratory peopled by many types of lower organism'. In reconstructing such advances in knowledge, Hall was at pains to stress the modesty of what had been achieved. There had been no immediate increase in the productivity of the land. As farming, the oldest and most widespread art, had long since found, the seasons and the vital processes of living organisms were stubborn facts, 'unshapable as yet by man with all his novel powers'.²⁸

In common with such sciences as geology and ecology, the soil scientist had begun by classifying soils as a means of discovering the processes that determined differences in soil type, and how they might be manipulated in the interests of farming. The inherent resources of the soil might be less important than the way the soil dealt with such materials as supplied under cultivation. If it were on the one hand 'a great reservoir of plant food', the soil was, on the other hand, a 'manufactory'. By feeding to British livestock linseed, maize and cotton seed grown overseas, some of the wealth of the virgin lands was being transferred to more highly-farmed parts of the world. Such transfers of wealth from one estate, nation or part of the globe to another emphasized the importance of an economic input to the debate as to what constituted 'sustainability'.

C S Orwin had been one of the earliest

²⁸ A. D. Hall, *The Soil. An Introduction to the Scientific Study of the Growth of Crops*, pp vii–ix and 1.

students to take a course at Wye Agricultural College, and had for many years been a land agent. At his instigation, Hall successfully persuaded Oxford University to sponsor a research institute in agricultural economics. Appointed its first director in 1913, Orwin was able to renew, in more explicitly economic terms, Lawes' challenge to the centuries-old assumption that the only way of sustaining fertility was by a crop rotation designed to produce cereal crops through the integral pursuit of arable and animal husbandry.²⁹

Even in the depths of the depression, farmers had failed, for whatever reason, to capitalize on the new-found knowledge of the chemist and biologist. They had remained locked 'over head-and-ears' in tradition. In his book, *The Future of Farming*, published in 1930, Orwin highlighted the achievement of the few pioneers. Near Sawbridgeworth in Hertfordshire, John Prout and his son had demonstrated at the farm scale, between 1864 and 1913, what Lawes and J H Gilbert had found on their trial plots at Rothamsted, namely that, with a judicious application of artificial manures, corn crops could be grown continuously and the land kept 'in good heart'.³⁰ A further and continuing example was provided by George Baylis in Berkshire who, since 1875, had succeeded in short-circuiting the most costly element of corn production, namely the growing of crops to feed the livestock that had to be managed in order to provide the dung needed to grow the crops for sale. By substituting applications of ammonia and phosphates in artificial manures for that previously derived from livestock, Baylis was able to reduce production costs to such a level that it was worthwhile to use as much of the land as

possible for growing crops for direct sale. The income enabled him to hire or purchase over twenty farms, amounting to some 22,000 acres in all.³¹

Orwin had not only the communicative skills to publicize such ventures, but an unrivalled opportunity to highlight their implications. By the time he retired in 1945, nearly every university had established a department of agricultural economics. The Ministry of Agriculture had an economics branch. Almost all were led by men who had received their initial training at Oxford. Each had been encouraged to re-appraise even the most basic assumptions of farming. As Orwin emphasized, in his book of 1930, the experience of the decades of agricultural depression had illustrated how the most successful farmers were those who specialized in one or two products, say milk and cheese production or market-gardening and fruit-growing. As Orwin reasoned, the depression itself had been instigated by overseas' producers who were able to concentrate all their energies on one commodity. Unencumbered by a diversified production system of the kind most English farmers clung to, they had found it easier to eliminate both direct costs and forms of waste to the very lowest point. It followed that if English farming, and rural life generally, were to be more prosperous, the most economic production and marketing of commodities had to be pursued through specialization.³²

VI

As Orwin wrote, in 1930, there was no industry that appealed so widely to popular interest and imagination as that of farming. In his volume, *The Land: Now and To-morrow*, Stapledon perceived a revolution taking place in 'the national attitude towards nature and the countryside', most

²⁹ J Cripps, 'Charles Stewart Orwin', in E T Williams and H M Palmer, eds, *The Dictionary of National Biography*, 1971, pp 783-4.

³⁰ C S Orwin, *The Future of Farming*, Oxford, 1930; J Prout, *Profitable Clay Farming*, 1881; W A Prout and J A Voelcker, 'Continuous corn growing in its practical and chemical aspects', *JRASE*, 66, 1905, pp 35-51.

³¹ C S Orwin, *A Specialist in Arable Farming*, Oxford, 1930.

³² Orwin, *The Future of Farming*, pp 19-20.

obviously in the urban rather than rural population. A love of nature was latent in everyone, and the town worker was showing increasing determination to share the 'pleasure and beauties' of the countryside, through camping, cycling and walking. It was more than a matter of fresh air and exercise. Properly appreciated and used, the countryside might enrich the culture of the nation. In that sense, the use of land for promoting physical health and mental balance might become even more important than food production. Within that larger context, it was even more important that land should be perceived as the property of posterity.³³

Such aspirations did not necessarily imply any conflict with farming. As John Dower, the author of the official report on *National Parks*, remarked in 1945, the remaking of a prosperous British agriculture was 'the most urgent need for the next ten years of our national life'. Given proper care for the landscape effect of 'matters of detail', the fuller cultivation advocated by Stapledon and others should enhance, rather than diminish, the scenic effect. Whereas extensive areas of the Lake District and Yorkshire Dales country had benefited from being turned 'brown side up', comparable areas in North Wales and the Peak District, where there had been neither ploughing nor tidying up, had retained their distinctly neglected and desolate look.³⁴

Within this larger perception of farming in the countryside, it was entirely appropriate that disciplines beyond the agricultural sciences should contribute. In an article on 'Nationalism and land utilization in Britain', published in the *Geographical Review* in early 1937, the geographer, L Dudley Stamp, explored the implications of the abandonment of the free-trade policy that had dominated British foreign policy

for almost half a century. Quotas and monopolistic boards were already being established, so as to plan and 'rationalize' agriculture. Stapledon's calls for a 'reconditioning' or 'stepping-up' of farming, district by district, from top to bottom, were beginning to be heeded. Through his influential advocacy, proposals were being made to disc-plough and re-seed even the hillsides of the uplands. For Stamp, such initiatives emphasized the need 'to analyze Britain's resources and discover how they may be utilized for the benefit of the whole country'.³⁵

As those before him, Stamp drew consciously on firsthand observation made overseas, and the fresh insights brought by visitors to his own country. He toured the USA extensively in 1934. In the same volume of *Geographical Review*, under the heading, 'Is nationalism promoting erosion?', the Californian geologist, Charles F Shaw, warned of the dangers of making concessions to popular demand for greater self-sufficiency. Whilst the prospect of war might seem to justify such concessions, they might be neither good politics nor good economics in the longer term. During an excursion through the UK countryside, that followed the Third International Congress of Soil Science in 1936, participants had been assured that there was little erosion from the gentle English rainfall. From 'critical observation', Shaw could see for himself differences of up to 4 ft in the height of the soil surface above and below the walls and hedges that cut across many slopes on the chalk and other types of higher ground. For a self-sustaining programme of nationalism, it was essential that crops should be grown on the lowlands, and the uplands reserved under grass for animal feed and protection from soil erosion.³⁶

³³ R G Stapledon, *The Land: Now and To-morrow*, 1935, pp 5-8.

³⁴ Minister of Town and Country Planning, *National Parks in England and Wales*, HMSO, Cd 6628, 1945, p 21.

³⁵ L D Stamp, 'Nationalism and land utilization in Britain', *Geog Rev*, 27, 1937, pp 1-18.

³⁶ C F Shaw, 'Is nationalism promoting erosion?', *Geog Rev*, 26, 1936, pp 149-50.

Stamp was uniquely placed to comment on trends in land use. Since the late 1920s, he had established and directed a 'Land Utilisation Survey'. Through its annotated and coloured sets of Ordnance Survey 6-inch scale sheets that recorded the use of the entire land surface, 'a snap-shot of pictures of Britain' had been provided for the years, 1931-35, which would serve 'as a standard of comparison with the past and a basis for planning for the future'. Free from any 'political colour' or 'ulterior motives', it provided an objective basis from which to determine how the 'reconditioning' of the countryside might proceed.³⁷ In a schema, published as a table in the *Geographical Review*, Stamp sought to set out the consequences of Stapledon's advocacy of progressively upgrading the productivity of each type of land use (Table 1). Only heath and moorland might undergo radical change. A third of this was regarded as suitable for disc-ploughing, seeding and rolling for conversion to good grassland, and a further third for afforestation. The remaining third, comprising such scenic areas as North Wales, the Lake District and Central Highlands, should be 'consecrated to public use as national parks and for private shootings'. If such changes were associated with the setting of higher nutritional standards in the diet, the requirement for home-grown fruit and vegetables, and home-killed meat, would provide not only ready markets but would necessitate the large-scale 'reconditioning' of Britain's agricultural resource.³⁸

The Land Utilisation Survey was the principal source of reference in the evidence submitted by the Royal Geographical Society to the Royal Commission on the geographical distribution of industrial population in 1938. The evidence recalled how some 800,000

acres, representing 2 per cent of the land surface of England and Wales, had been developed for industry, housing and air-fields since 1918. Whilst well-drained, gently-undulating land, ideal for intensive cultivation and market-gardening, made up only 5 per cent of the total agricultural area, it was also the easiest and cheapest land to develop for other purposes. Finding no official source of reference, the Royal Commission invited Stamp to prepare a land fertility map, as a guide to the optimal location of industrial and other uses of land.³⁹

In the text that accompanied 'A tentative land fertility map of England and Wales', published in *Nature* in 1939, Stamp argued that the most certain guide in a long-settled countryside was the current and past use of land. Through trial and error, farmers had identified the optimal use of soils. For the most part, there had been remarkable stability, with almost all changes in agricultural use concentrated on soils of intermediate value. Using data from the Land Utilisation Survey as a guide, four categories were discerned, the land of highest agricultural value being defined as that used or suitable for market-gardening. Land of high agricultural value comprised the major ploughlands, first-quality grassland, and major stretches of good grassland. Land of intermediate value was categorized as the most suitable for designation as building land, or for its amenity value (especially poor heath). A fourth category of low agricultural value included moorland and rough hill-pasture, heath and lowland rough-pasture, and coastal marsh pastures and saltings.⁴⁰

Stamp became Chief Adviser on Rural Land Use to the Ministry of Agriculture in June 1942 and, in his book, *The Land of Britain: its Use and Misuse*, he recounted

³⁷ L D Stamp, 'Planning the land for the future', *Town and Country Planning*, 5, 1937, pp 118; J Sheail, *Rural Conservation in Inter-war Britain*, Oxford, 1981, pp 162-9.

³⁸ Stamp, 'Nationalism and land utilization', p 14.

³⁹ E C Willatts, 'Geographers and their involvement in planning', in R W Steel, ed, *British Geography 1918-1945*, 1987, pp 100-16.

⁴⁰ L D Stamp, 'A tentative land fertility map of England and Wales', *Nature*, 143, 1939, pp 456-9.

TABLE I
Possible changes in land use in Great Britain, as indicated by LD Stamp in 1937

<i>Present use</i>	<i>Percentage</i>	<i>Use after reconditioning</i>	<i>Percentage</i>	<i>Total percentage</i>
Arable – intensive (market gardening, etc)	2	→ Arable – intensive (market gardening, etc)	2	5
Arable – farm crops	20	{ → Arable – intensive → Arable – farm crops → Orchards and fruit	3 16 1	
Permanent grassland – first class	10	{ → Arable – farm crops → Grassland – first class → Grassland – other	10 16 5	16
Other	21			
Rough grazing in enclosed fields (derelict or idle permanent grass)	9	→ Permanent grassland	9	22
Heathland, moorland, and other rough grazing, mostly unenclosed	26	{ → Permanent grass → Recreational, sporting, national parks → Forest and woodland, for timber	8 9 8	
Forest and woodland:				11.5
For timber	2.5	→ For timber	3.5	
Other economic	1	→ Other economic uses	2.5	2.5
Scrubland and uneconomic	3	→ Uneconomic	0.5	0.5
Orchards and fruit	0.5	→ Orchards and fruit	0.5	0.5
Residual (housing, industrial, roads, etc)	5	→ Residual (allowance for improvement of housing, etc)	6	6

how, in consultation with agriculturalists and the Soil Survey of England and Wales, a land fertility map was published for the whole country at a scale of 1:625,000, based on a ten-fold classification.⁴¹ It was a powerful tool in arguing for more conscious planning of the 'mosaic' of activities in the countryside – for those areas most suitable for a particular use or livelihood to specialize in that direction, whether it be farming, forestry, housing, industry or recreational development.

VII

Each generation rewrites its history. The first self-conscious environmental histories, mostly published in North America in the

1970s, have been described as the outcome of a moral purpose, with strong political commitments. As they matured, they took on the dimension of a scholarly enterprise.⁴² Farming is bound to be prominent in such histories. It provides an outstanding test-bed for assessing human competence in environmental management. As Orwin commented, it is, together with forestry, the only primary industry that comes close to having the capacity to create self-sustaining wealth. Whereas coal-mining or iron-smelting bring the world's resources surely, if not measurably, nearer to the point of exhaustion, the recuperative powers of the soil

⁴¹ L D Stamp, *The Land of Britain: its Use and Misuse*, 1948.

⁴² D Worster, ed, *The Ends of the Earth. Perspectives on Modern Environmental History*, 1989.

hold out the possibility of food being produced for all time.⁴³

For some, the writing of environmental history is to draw on hindsight to set out what went wrong as an urgent warning to present and future generations. Often drawing on perspectives and information, not available to land users of the time, critiques have been written as to the abuse or abandonment of otherwise benign management-practices. The approach of this paper has been to draw on examples from both immediately before and during Collins' 'middle past' of 1870–1940 in demonstrating how commentators and 'expert' advisers sought to bring fresh insights as to how the productivity of the land might be sustained. If Pell was concerned with over-investment, Lawes with manures and fertilizers, Elliott and Stapledon with grassing down, Orwin with specialization, and Stamp with land utilization, all revealed a degree of concern with both the physical and the socio-economic environments within which landowners and occupiers had to operate. The writings of Albert Pell reveal an acute awareness of the fragility of what had been achieved in terms of raising and sustaining the productivity of late-nineteenth century farmland. The analyses made of the trials and experiments, conducted to an unprecedented degree of rigour at Rothamsted, and the manner in which they were developed by others, reveal not so much the thoughtlessness of a generation that had lost its way, but rather a generation that challenged long-held assumptions. Stimulated through the shifts in market conditions, and major advances of understanding as to the processes by which crops flourish, it set out to discover whether the most effective ways of securing sustained development were being practised.

A sense of geographical and historical curiosity pervades the writings of the

period. As Stamp remarked, in the first lines of his paper of 1940 on the 'Fertility, productivity and classification of land in Britain', few areas of comparable size in the world could exhibit such a variety of physical conditions. Orwin found recognition of that variety in the fact that farming was the most diversified of industries.⁴⁴ Intrigued by the enterprise that men of wealth had brought to the land during the Industrial Revolution, 'when farming really mattered to the nation', Orwin wrote a pioneer study of the reclamation of the Exmoor Forest, both for its own intrinsic interest and as a means of interpreting how the present-day countryside had evolved. Published in 1929, the volume recounted how some 20,000 acres of wild moorland were converted to farmland. At first, there were vain attempts on the part of the owner to grow corn in the impossible climate. Tenants from the more fertile parts of the country came and went, pursuing with greater success a more mixed style of farming. Gradually, by a process of trial and error, a system evolved that was suited to the potentialities of the locality. Local farmers came to occupy the farmsteads that their predecessors had created with so much toil and money.⁴⁵ Not only did Orwin put 'historical flesh' on the kind of retrospective appraisal attempted by Albert Pell and others of his earlier, disillusioned generation, but the case study illustrated how a mosaic of land uses had come to mirror, through long usage, what Stamp perceived to be the fertility of the land.

Whilst describing such figures as Elliot and Stapledon somewhat pretentiously as proto-ecologists, some environmental historians might dismiss their efforts as being largely irrelevant, in as much as any lasting solution to the uncertainties of agricultural markets could only come through leaving

⁴³ Orwin, *The Future of Farming*, p 1.

⁴⁴ L D Stamp, 'Fertility, productivity, and classification of land in Britain', *Geog Jnl*, 96, 1946, pp 389–412; Orwin, *The Future of Farming*, p 39.

⁴⁵ C S Orwin, *The Reclamation of Exmoor Forest*, 1929.

everything to the micro-organisms of the soil. The same historians tend to perceive the task of conserving desired landscapes and wildlife at the present day as similarly a question of leaving it all to nature. Even if such faith were warranted, it would take decades, if not centuries, for such recolonization to occur. Such counsels of passivity have rarely been heeded, at least willingly, by those responsible for managing the rural environment. Rather, the challenge has been to see whether, through deeper understanding of the processes involved, goals might be realised more quickly.

The challenge, as taken up in the nineteenth century in respect of farming, may now provide a perspective for present-day efforts to sustain, rehabilitate and, in some cases, re-create wild plant and animal communities. The establishment and management of species of, say, the wetlands,

heathlands and herb-rich grasslands require the same kind of scientific rigour that agricultural scientists strove to apply from the time of the first Rothamsted experiments. Not only do ecologists have a large backlog of research to make up, but the complexity of managing such plant and animal communities is even more daunting.⁴⁶ A history of how the concepts and techniques of the agricultural sciences came to be developed, and of how knowledge was disseminated and applied, by those who directly worked the land, may further emphasize the challenge of developing a more informed base from which to tackle the uncertainties encapsulated by the concept of 'sustainable development' in the late-twentieth century.

⁴⁶ J Sheail, 'The re-establishment of wetland habitats - a search for guidelines', *The Agricultural Engineer*, 47, 1992, pp 71-3.