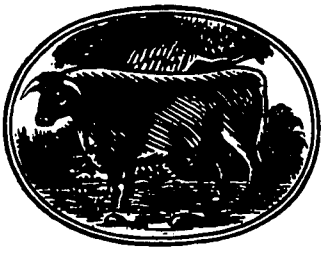
THE AGRICULTURAL HISTORY REVIEW



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PROSPECT BOOKS

THE NEAT HOUSE GARDENS

Early market gardening around London

by

MALCOLM THICK

This is a case study of the stretch of land on the bank of the Thames now occupied by Millbank, devoted in the late-17th and 18th centuries to market gardening and was called the Neat House Gardens.

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Although market gardens have been acknowledged and made reference to in literature, there has been no detailed study of their earliest manifestation. Market gardening was, of course, essential to the capital's food supply. With limited transport, food needed to be produced close to the point of sale. Before the railways, therefore, much of the London's hinterland was dominated by cash-crop agriculture for the markets. The techniques involved in raising vegetables outside of, or early in their season, and to ensure profitable and rapid succession of crops, were necessarily more sophisticated than the usual dig-and-delve husbandry.

The book uses surviving manuscript evidence to describe the topography of the gardens, the techniques of the gardeners and their economic success. By use of many illustrations and maps, greater depth is given to the sometimes scanty manuscript material.

Malcolm Thick did his doctoral research in agricultural history, specializing in vegetable husbandry in early modern England. He wrote the relevant chapter in the *Cambridge Agricultural History of Britain* and has written many articles on vegetable consumption and production.

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THE AGRICULTURAL HISTORY REVIEW

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The Origins, Interactions and Causes of the Cycles in Grain Prices in England, 1450–1812

By SUSAN SCOTT, S R DUNCAN and C J DUNCAN

Abstract

Conventional time series analysis of the English wheat price series, 1450–1812, reveals a short wavelength (period 5–6 years) and a medium wavelength (period 13–16 years) cycle throughout this time, although they developed strongly only at the end of the sixteenth century. The comparable cycles revealed in the series of oats and barley prices are strongly coherent with wheat prices ($p \ll 0.01$), that is the different grain prices responded together. Multivariate analysis and time series analysis show that the medium wavelength oscillation in wheat prices correlates with weather conditions: low winter and summer temperatures are the most significant factors. Both may have a direct effect on the growth and harvesting of the crop, but cold winters may also have indirect effects by establishing a generally cold spring and summer. High winter rainfall is of secondary importance. However, the short wavelength (period 5–6 years) cycle in wheat prices is not significantly correlated with weather and it is suggested that it is driven by economic factors, the short-term effects of a good or bad harvest (autoregressive effects) and possibly by regular epidemics of fungal pathogens of grain. The significance of the 5–6 year oscillation in driving corresponding mortality cycles and of producing cycles of susceptibility which maintained the epidemics of lethal infectious diseases is discussed.

GRAIN prices in past centuries were subject to violent fluctuations from one year to another, although some regularity in the longer-term movement of prices has been discerned. The prime cause of these annual fluctuations has been ascribed to the weather which, in the short run, largely determined the supply of agricultural produce and this dependence on the weather ensured that agricultural prices fluctuated more markedly than other prices. Modern economic systems are provided with a number of built-in stabilizing influences but these conditions were largely absent in England in the sixteenth and seventeenth centuries, and the dramatic fluctuations in grain prices had to be endured as one of the penalties of a backward economic system, in particular the consequence of the inelasticity in demand and supply conditions which distinguished arable agriculture from most other economic activities. In England, drought was normally advantageous to the wheat harvest and, unless prolonged, was seldom a cause of failure among the other cereal crops because of the predominance of heavy moisture-retaining clay land over lighter sandy soils. However, the disastrous harvest of 1637 was apparently the result of excessive drought. The main danger to cereal crops is believed to be prolonged rainfall in summer accompanied by an almost total absence of sunshine when crops failed to ripen and yields were poor. An excessively cold winter and spring were also harmful to the wheat harvest but had little effect on spring-sown barley, oats and pulses.[1] Wigley and Atkinson[2] have analysed the mean soil moisture deficit for Kew during the growing season from 1698 and, in contrast with the above, conclude that drought conditions are those that lead to poor crop yields. They suggest that an agricultural drought is determined largely by conditions that lead to stunted growth or even wilting of crop

[1] P Bowden, 'Agricultural prices, farm profits, and rents', in J Thirsk, ed, *The Agrarian History of England and Wales: IV*, 1967, pp 617–34.
[2] T M L Wigley and T C Atkinson, 'Dry years in south-east England since 1698', *Nature*, 265, pp 431–34.

plants; these are a combination of dry soil and a continuing high level of evapotranspiration which the crop is unable to maintain by withdrawing water from the soil. This combination leads to a consistently high soil moisture deficit over the growing season.

Any study of the fluctuations in grain prices is dependent on the pioneering work of Hoskins who provided an analysis, decade by decade, from 1480 to 1759. He suggested that really bad harvests came one year in six, agreeing closely with the popular belief in the sixteenth century that a bad harvest came once every seven years. His examination of harvest sequences revealed no discoverable rhythm and he suggested that good or bad runs were not basically because of weather-cycles, although short-term climatic fluctuations may well have been implicated. He believed that the underlying factor was that of yield ratios in an agrarian economy that worked normally on a very fine margin between sufficiency and shortage. Hoskins has concluded that for the vast majority of the population these short-term fluctuations in the cost of food 'were infinitely more important than the long-term movements to which economic historians have always paid such assiduous attention'.[3]

The significance of meteorological variables in determining grain prices in Europe has previously been tested for the period between the mid-sixteenth and mid-nineteenth centuries. This modelling was based on monthly estimated measurements of temperature and precipitation and distinguished between weather and non-weather effects. Subsistence crises were triggered by the combination of a cold spring and a rainy midsummer whereas, in the long run, grain prices were more closely related to the intensity and duration of trade cycles.[4]

Spectral analysis and autoregressive models of agricultural prices in pre-nineteenth-century Europe show that the prices of all cereals and potatoes rose simultaneously in subsistence crises and that regional fluctuations in the prices of cereals existed in Germany because of differences in production, commercialization and consumption practices.[5]

The existence of long wavelength cycles with a period greater than 30 years in the prices of cereals in Europe from the sixteenth to the twentieth century has been studied by statistical analysis. Such cycles would be clearly different from the short-run fluctuations described by Hoskins. Only weak indications of such long waves were found although there was strong evidence of cycles with 10–13 or 15-year periods which seemed to be caused by clusters of unfavourable events in population, climate, structures of production and modes of behaviour. There was no evidence of a relation, as had been suggested, between these medium wavelength oscillations and sunspot activity.[6]

Two theories have been advanced to explain the fluctuations of grain prices: firstly that demand remains constant but rigid and cannot adapt itself to fluctuations in the harvest, and secondly, that the amount of grain offered to the market is subject to fluctuations by producers who consume a certain amount of their own harvest. Subsistence farming and the instabilities of supply and demand must be included in these models of the grain market. During good harvests subsistence farmers reduce their purchases in the market and increase the amount of grain they offer to it; during

[3] W G Hoskins, 'Harvest fluctuations and English economic history, 1480–1619', *AHR*, 12, 1964, pp 28–45; *idem*, 'Harvest fluctuations and English economic history, 1620–1759', *AHR*, 16, 1968, pp 15–31.

[4] C Pfister, 'Fluctuations climatiques et prix cerealiers en Europe du XVIe au XXe siecle', *Ann Econ Soc Civil* 43, 1988, pp 25–53.

[5] B Roehner, 'Liaison entre les conjonctures de prix des produits de base: le cas de l'Allemagne au XIXe siecle', *Hist and Mes* 6, 1991, pp 31–49.

[6] R Bos, G van Dijk, C Kruyt and H K Roessingh, 'Long waves in economic development', *AAG Bijdragen, Neth*, 28, 1986, pp 57–92.

bad harvests they increase their purchases in the market and reduce the amount of grain offered. It is concluded that the perceived demand on the market does not reveal as much as the total demand including subsistence farming.[7]

We see from the foregoing that there are considerable differences of opinion concerning the external factors that drive possible cycles in grain prices. Our objective in this paper is to provide an interdisciplinary and statistical study of the annual prices of grains in England from the fifteenth century by time series analysis, a technique that is described in more detail in the next section. By this means, we hope to clarify the most important factors that determined the price of grains and thereby amplify previous work, particularly that of Hoskins, and to provide a framework for future research.

I

In this paper we present the results of a study of the series of national grain indices and prices by time series analysis, a valuable statistical and computing technique for distinguishing and describing cycles (or oscillations) in any long-run data series. It is, therefore, applicable for the quantitative analysis of many aspects of historical demography and has the advantage that a number of conventional programs for use on a PC are available. A very simple oscillating series of grain prices is illustrated, diagrammatically in Figure 1; the time between two successive peaks is termed the wavelength or period (λ) of the oscillation and in the example is obviously 5 years. The frequency of the oscillation is the number of cycles in a standard time, in this case one year. Since the wavelength is 5 years, the frequency is 1/5 of a cycle per year (ie frequency = 0.2 cycles/year = $1/\lambda$).

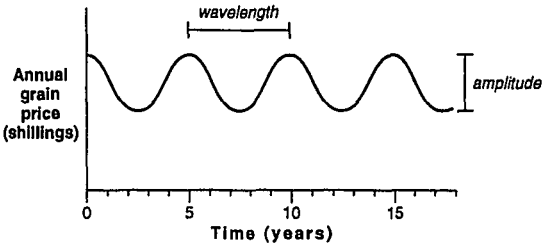


FIGURE 1
Diagram of a very simple oscillation in grain prices to explain the basic characteristics of a cycle in a data series: wavelength (λ, measured in years) = time between two successive peaks; frequency = $1/\lambda$ (measured in cycles per year); amplitude of oscillation (measured in shillings) = difference in grain price between a peak and a trough.

Obviously, grain prices and other real biological and demographic series are more complex; the complications encountered may include: i) the series may be compounded of two or more separate and independent, oscillations; ii) the frequency of any one oscillation may vary over long periods of time; and iii) considerable annual variation may introduce 'noise' which effectively blurs the underlying oscillation(s). An example of the wheat price index, 1450–1600, is shown in Figure 2A which shows a clear change in the long-term trend and in the size (amplitude; see Figure 1) of the oscillations in about 1540.

Although perfect data series are preferred for any study, time series analysis is particularly concerned with the identification of the wavelength and timing of an oscillation and the significance of its correlation with other cycles rather than with the absolute values of the amplitude of the peaks of the cycles. In this way, small variations in grain prices between different regional markets do not affect the overall conclusions of the analysis. In any event, Granger and Elliott[8] concluded from their study of three different regions in the eighteenth century that the speed of response of prices to changes in

[7] J-P Simonin, 'Les fluctuations des marches des grains al'epoque moderne', *Hist and Mes*, 5, 1990, pp 181–211.

[8] C W J Granger and C M Elliott, 'A fresh look at wheat prices and markets in the eighteenth century', *Econ Hist Rev*, second ser, 20, 1967, pp 257–65.

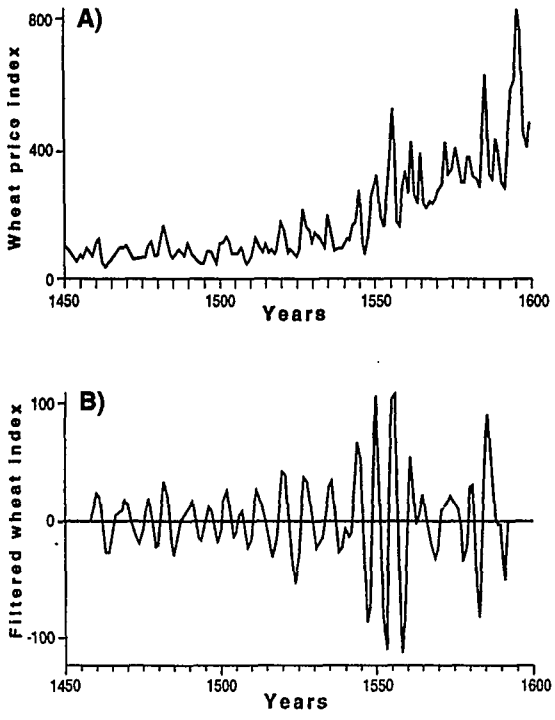


FIGURE 2
National wheat price index early years, 1450–1600. A: unfiltered data series (note rising trend and emergence of short wavelength oscillations during 1550–1600); B: filtered to reveal short wavelength oscillations.

supply and demand was similar and that the three different markets could be treated as one.

A number of different sub-programs are available in time series analysis. Firstly, spectral analysis determines the relative importance and wavelengths of the different cycles contained in the series. An example is shown in Figure 3A wherein four peaks corresponding with four separate cycles are detected in the wheat price series, 1600–1812; the greatest power is shown by the long-term trend (unmarked, wavelength approximately 128 years) and the three other, major cycles are indicated by arrows.

Once an oscillation has been identified, a filter which removes other cycles and noise can be designed and the filtered oscillation at the desired wavelength can be displayed. An example of the filtered, short wavelength oscillation in wheat prices is shown in Figure 2B.

Coherence and cross-correlation function programs allow the significance of the interrelationships between two oscillations to be determined. For example: does a cycle in seasonal temperatures drive the oscillation in wheat prices? Figure 4C, working with filtered data, shows the strongly negative correlation of the medium wavelength oscillations in summer temperature and wheat prices at zero lag (ie at 0 years), that is, high wheat prices were associated with low summer temperatures in the same year.

In this paper we consider the underlying causes of the grain price cycles in England and have determined i) the origins of the short wavelength oscillation in the wheat, oats and barley series; ii) the interaction between the cycles in the different grain series; and (iii) the effect of weather and other factors in driving these cycles. We show that both a short wavelength and a medium wavelength oscillation can be detected by conventional time series analysis in the national wheat price index, but only the medium wavelength oscillation correlates significantly with weather conditions and we suggest other factors that may contribute to the short wavelength oscillation.

II

Seasonal mean temperatures in central England (°C) for 1659–1811 were taken from Manley,[9] and seasonal rainfall at Kew from 1697–1811 as percentages of the 1916–50 averages were taken from Wales-Smith;[10] winters include the month of December from the previous year. The national grain price indices, 1450–1749

[9] G Manley, 'Central England temperatures: monthly means 1659–1973', *Q J Roy Meteorol Soc*, 100, 1974, pp 389–405.
[10] E G Wales-Smith, 'Monthly and annual totals of rainfall representative of Kew, Surrey, from 1697–1970', *Meteorol Mag*, 100, 1971, pp 345–62.

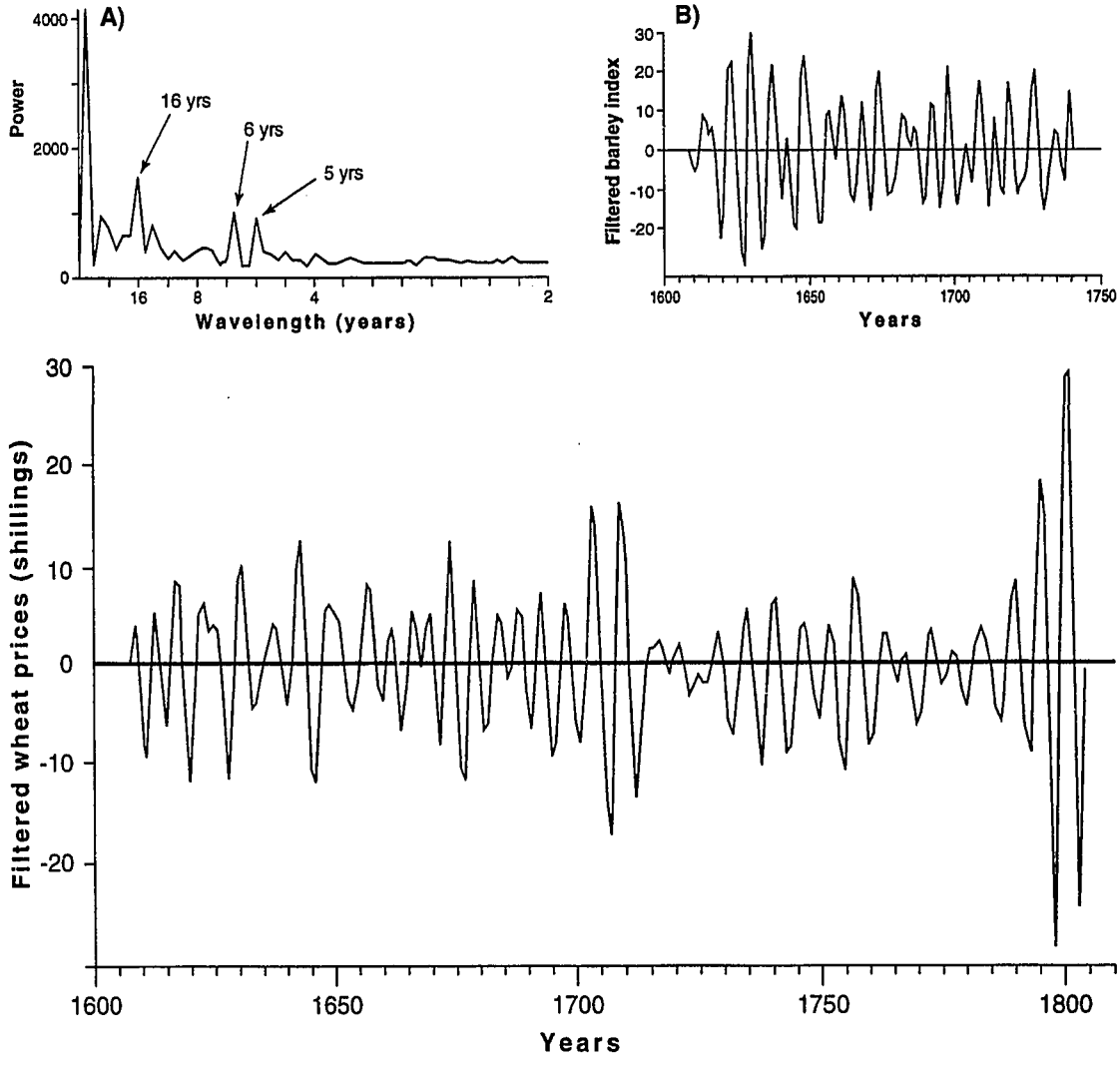


FIGURE 3

Wheat prices (shillings), 1600–1812 filtered to reveal short wavelength oscillations. Insets A: spectrum of data series (note short wavelength cycles 5 and 6 years and medium wavelength cycle at 16 years); B: short wavelength cycles in filtered barley index, 1600–1749.

(wheat, barley and oats) were taken from Bowden;[11] the baseline for 1450–1649 was the mean grain price for 1450–99; the baseline for 1650–1749 was the mean value over these years. Absolute wheat prices (shillings), 1600–1812, were taken from Stratton.[12] Time series analysis was carried out using the program of Shumway[13] and details of further statistical tests are given in the Appendices.

III

The national wheat price index for the early years, 1450–1600, is shown in Figure 2A and the genesis of the oscillations

[11] Bowden, 'Agricultural prices', pp 593–694; P Bowden, 'Price of arable crops', in Thirsk, *Agrarian History: IV*, pp 815–21; and *idem*, 'Agricultural prices, wages, farm profits, and rents', in J Thirsk, ed, *The Agrarian History of England and Wales: V (ii)*, 1985, pp 1–117.

[12] J M Stratton, *Agricultural Records AD 220–1968*, 1970.

[13] R H Shumway, *Applied Statistical Time Series Analysis*, Wisconsin, 1988.

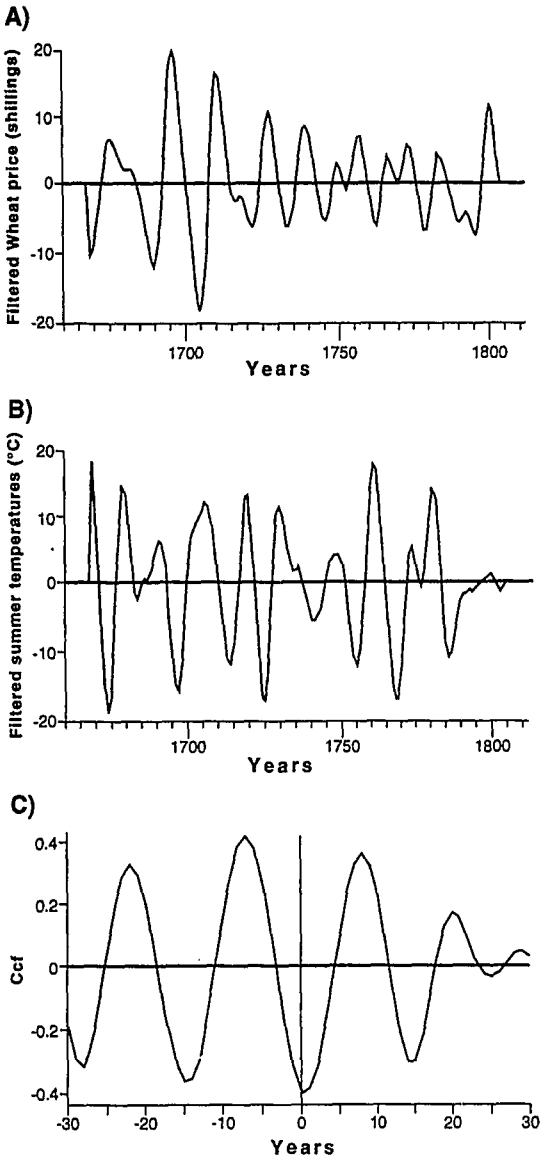


FIGURE 4
Filtered medium wavelength oscillations in wheat prices and summer temperatures, 1659–1812. A: wheat prices (shillings); B: summer temperatures (°C); C: cross-correlation function, summer temperatures against wheat prices (ccf = −0.4 at zero lag; abscissa = lag (years)).

can be seen clearly. Before 1550 the cycles were of low amplitude and spectral analysis of this period shows a dominant oscillation of wavelength of 8 years. This low amplitude, short wavelength oscillation is shown after filtering in Figure 2B. A medium wavelength oscillation in the wheat price index for these early years before 1550 is also detectable; its wavelength varies from 10 to 16 years. After 1550 the earlier stability is lost, the index shows a clear rising trend (Figure 2A) and the oscillations emerge at relatively greater amplitude: spectral analysis of the period 1550–1600 shows a short wavelength oscillation and a weaker medium wavelength oscillation. The emergent short wavelength oscillation after 1550 has a wavelength (or period) of 6 years and is shown after filtering in Figure 2B. In summary, the low-amplitude short wavelength oscillation with a period of 8 years during 1450–1540 changed sharply into a 6-year oscillation with much greater amplitude after 1540, as is clearly shown in Figure 2B.

The two types of oscillation in the wheat price index (short- and medium-wavelength) became more regular and were well-established after 1600. Data for wheat prices (rather than the wheat price index) are available after this date and spectral analysis for the whole of the succeeding period, 1600–1812 (Figure 3A), shows the short wavelength (5 to 6 years) and the medium wavelength (16 years) cycles. The short wavelength oscillation after filtering is shown in Figure 3B; a more detailed analysis of the series shows that the wavelength was predominantly 6 years during the early years (1600–1670) but stabilized thereafter at 5 years (Figure 3). The amplitude of the cycles was reduced during 1710–1790. The strong medium wavelength cycle also found during 1600–1812 is described in greater detail below.

The national indices for oats and barley prices are quoted for the period 1450–1750[14] and their patterns of oscillation corresponds closely with that of the wheat prices (shown in Figure 2) and with

[14] Bowden, 'Price of arable crops', pp 815–21, and 'Agricultural prices', V, pp 1–117.

each other. Thus, prices of both barley and oats also remained steady for the first 100 years (1450–1550) with low amplitude, short wavelength oscillations (period = 6 years); after 1550 the index showed a rising trend with the short wavelength oscillations (period = 6 years for barley and oats) developing strongly over the next fifty years, corresponding with the pattern in wheat prices. A medium wavelength oscillation with period of 12/13 years was detectable during 1450–1600 in barley prices but not in oats (Table 1). During the period 1600–1750 these oscillations were firmly established and are clearly seen after filtering (filtered barley index shown in Figure 3B). The wavelengths are 7 and 13 years in barley and 6 and 14 years in oats.

IV

The apparent correspondence between the different grain price indices was tested on the raw data on the coherence program and the cross-correlation function was determined from the filtered series. The results are summarized in Table 1 which shows that the oats and barley indices synchronize closely with the wheat series; both are strongly coherent in the short and the medium wavebands ($p \ll 0.01$). The filtered series synchronize in both the short and medium wavelengths (except for single examples of +1 years and −1 years: see Table 1); the cross-correlation function values confirm the significance of the correspondence. A similar analysis showed that the barley and oats series also strongly cross-correlated. We conclude that the annual price indices of the three grains are strongly interdependent and oscillate together.

This finding confirms previous accounts; Bowden concluded that the short-term movements in the prices of wheat, barley, oats and rye were broadly similar because each grain was in some degree a substitute for the others, while any extremes of climate in spring or summer affected the yield of all.[15] The graph of the prices of wheat, beans, peas and oats at Lincoln, 1543–1620, shows these commodities moving in close sympathy with each other.[16]

V

The possibility that wheat yields and hence prices were influenced by weather conditions during the growing and harvesting seasons has been explored by conventional multivariate regression analysis; data series for seasonal temperature are known from 1659 and for seasonal rainfall from 1697. Analysis of seasonal temperatures (winter, spring, summer and autumn) against wheat prices for the complete period 1659–1811 shows that it is only winter temperatures ($p = 0.046$) that had a significant effect; that is, low winter temperatures are associated with high wheat prices. When this effect of temperature is studied in different periods, the importance and significance of the effect of winter temperature rises: 1659–1780, $p < 0.01$ and in 1700–1750, $p < 0.002$. Additionally, a large negative coefficient was obtained from the analysis for summer temperature, suggesting that low temperatures in this season may affect wheat prices. Multivariate analysis for the period 1659–1780 of winter and summer temperatures shows that both have a significant effect on wheat prices (winter temperatures, $p = 0.01$; summer temperatures, $p = 0.005$). These findings have been confirmed by time series analysis and, in particular, the correlation with seasonal temperatures in the different wavelength oscillations has been explored.

i) *Winter temperatures.* Spectral analysis of the winter temperature data series for the period 1659–1812 shows a dominant medium wavelength oscillation which has a period of 13 years. When the winter

[15] Bowden, 'Agricultural prices', IV, pp 626–7.
[16] Hoskins, 'Harvest fluctuations, 1480–1619', pp 40–41.

TABLE 1

Synchrony of short and medium wavelength oscillations in grain prices

Cohort	*1450–1550*				*1550–1600*				*1600–1750*			
Wheat: short	*Wavelength (yr)* 8				*Wavelength (yr)* 6				*Wavelength (yr)* 6→5			
medium	10–16				21				14→16			
Ccf with wheat:	*Period (yr)*	*Lag (yr)*	*ccf*	*p*	*Period (yr)*	*Lag (yr)*	*ccf*	*p*	*Period (yr)*	*Lag (yr)*	*ccf*	*p*
Barley – short	6	0	0.6	0.001	6	+1	0.6	0.001	7	0	0.8	0.001
Oats – short	5	0	0.7	0.001	6	0	0.7	0.001	6	0	0.6	0.001
Barley – medium	12	0	0.5	0.01	13	0	0.5	0.01	13	0	0.9	0.001
Oats – medium	ND	−1	0.55	0.001	ND	−1	0.55	0.001	14	0	0.9	0.001

Upper section of table shows cycles in wheat prices; lower sections shows cross-correlation of identified oscillations in barley or oats prices with wheat prices. Note high significance of coherence between both short and medium wavelength oscillations. Arrows (wheat prices) indicate progressive change of wavelength during 150-year cohort.

Ccf = cross-correlation function. ND (oats) indicates that no medium wavelength oscillations detectable by linear filtering, although good ccf and p values were obtained between the two series.

temperature and wheat price series are filtered to reveal medium wavelength oscillations, they cross-correlate negatively, that is, low winter temperatures are again associated with high wheat prices in the same year.

ii) *Summer temperatures.* Spectral analysis of the annual summer temperature series shows a peak in the medium waveband at 14 years. The coherence program which tests the significance of the correlation between summer temperatures and wheat prices shows that the two series correspond negatively, that is, low summer temperatures are associated with high wheat prices in the medium wavelength oscillation. The association is significant throughout the period 1659–1812 ($p<0.05$) but is particularly significant during the earlier years, 1659–1780 ($p<0.01$). Figures 4A and B show the two series (wheat prices and summer temperatures, 1659–1812) filtered to show the medium wavelength cycles; the two series cross-correlate negatively (Figure 4C) confirming the results from the coherence program. We conclude tentatively that these results suggest that, in the medium waveband, both low winter and low summer temperatures are directly associated with poor yields and high wheat prices, with summer temperatures probably having a more significant effect.

iii) *Principal component analysis of seasonal temperatures.* Low (or high) winter temperatures may well affect subsequent spring and summer temperatures and this effect has been tested by principal component analysis and the results are described in Appendix 2. In brief, we conclude from this study that the annual wheat price is correlated with the weather conditions in that year. Multivariate analysis suggests that low winter and summer temperatures have the dominant effect but analysis indicates that low winter temperatures may also be acting indirectly by causing low summer temperatures. Low summer temperatures probably affect harvest yield directly by causing adverse growing conditions. Thus, time series analysis suggest that these effects of seasonal temperature are detectable in the medium wavelength oscillations of the wheat price series (period about 14 years; Figure 4) but are less strongly associated in the short wavelength oscillations.

iv) *Effect of rainfall and drought conditions.* Multivariate analysis shows that seasonal rainfall had a smaller effect on wheat prices; the significance and values of the coefficients are lower (Appendix 3). However, as Wigley and Atkinson[17] have suggested, it is not the level of precipitation but the soil moisture deficit that may have the greater effect on plant growth. Their data series for mean soil moisture deficits during the growing season at Kew, 1698–1812, has been tested by time series analysis. Spectral analysis shows major peaks at wavelengths of 3 and 5 years; the 5-year oscillation shows weak cross-correlation and coherence with wheat prices but at 1-year lag and with the two series being negatively correlated, that is, low wheat prices were associated with drought conditions, the converse of the expectations of Wigley and Atkinson. We conclude that rainfall and soil moisture deficit had only limited effects on the medium wavelength oscillation in wheat prices.

VI

Spectral analysis of the data series for winter or summer temperatures reveals smaller and secondary peaks of wavelength 5 years in both. These short wavelength cycles also cross-correlate negatively with the corresponding cycle in wheat prices (shown in Figure 3), that is, again low temperatures synchronize with high wheat prices. This finding was confirmed by analysis with the coherence program and we conclude that the short wavelength cycle in wheat prices correlates with these low seasonal tempera-

[17] Wigley and Atkinson, 'Dry years', pp 431–34.

tures but the effect is less marked than in the medium wavelength cycles. As we describe above, a short wavelength oscillation in soil moisture deficits during the growing season (May–August) is detectable but, paradoxically, a good growing season (reflected in low wheat prices) was apparently correlated with drought conditions. We conclude that rainfall and moisture deficits in the soil are of only limited significance in the short waveband.

The multivariate regression analysis program was then re-run including the data on seasonal rainfall and soil moisture deficits in addition to seasonal temperatures but no significant coherence was found in either the medium or short wavelength cycles of the wheat prices and we conclude that winter rainfall has an effect only on a simple annual basis.

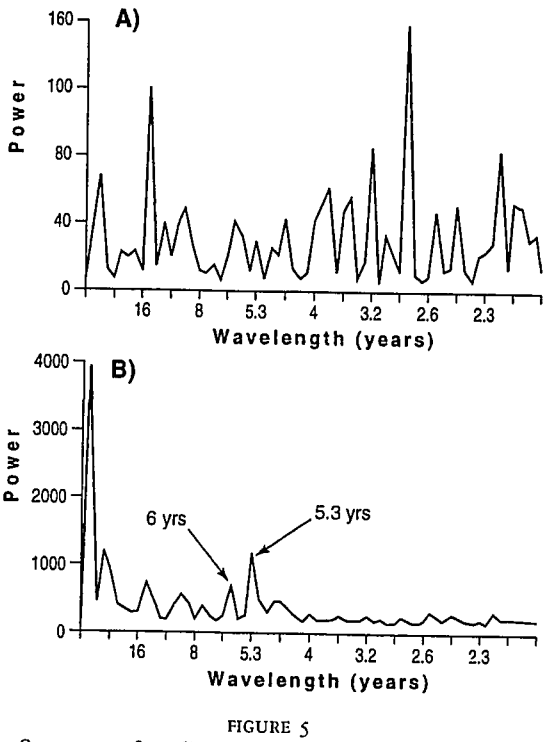


FIGURE 5
Spectrum of predicted wheat prices calculated from regression equation (see Appendix 3). A: predicted wheat prices; B: actual wheat prices minus predicted wheat prices (residuals). Note short wavelength oscillation in residuals at 5 and 6 years.

VII

Multivariate analysis showed that certain seasonal weather conditions had strong effects on the annual wheat price, particularly on the medium wavelength cycles. Using this analysis it is possible to construct a regression equation which predicts, theoretically, the wheat price in any year, based on the seasonal climatic conditions for that year if it were influenced only by weather (Appendix 3). Thus, the predicted wheat prices have been calculated for the period 1697–1811 in this way and spectral analysis of this theoretical price series (Figure 5A) shows the medium wavelength oscillation, confirming that this cycle in wheat prices can be explained as the consequence of weather conditions. However, spectral analysis of the predicted price series does not show the 5–6 year cycles seen in the real price series (Figure 3); this is considered further in Appendix 3 and it is suggested that the short wavelength cycle (period 5–6 years) may not have been *directly* linked to climatic conditions and that there were other factors producing this oscillation in the wheat price series. It is suggested that wheat prices in the *short term* were influenced for economic and agricultural reasons by the prices declared in the preceding year, the so-called autoregressive effects. This hypothesis was confirmed by re-running the multiple regression of the wheat price series, winter and summer temperatures against wheat prices in the preceding year. The temperatures now have reduced significance whereas the autoregressive term is significant at $p = 0.0005$, indicating the 'carry-over' effect of prices into the subsequent year.

There are therefore two different types of cycles in the national wheat price series, medium wavelength (approximately 16 years) and short wavelength (5–6 years); it is the former that is most closely affected

by weather conditions (particularly low winter temperatures) whereas the short wavelength cycles in grain prices are primarily driven by other factors.

VIII

Cycles in the wheat price series. The short and medium wavelength cycles in national wheat prices emerged clearly at the end of the sixteenth century and multiple regression and principal component analyses suggest that weather had a significant effect on prices, presumably via an effect on crop yields. Low winter and low summer temperatures are significantly associated with high wheat prices which presumably are usually associated with poor crop yields. Inspection of the results suggests that the association with winter temperatures is more significant than with summer temperatures, although principal component analysis indicates that its effect may be mainly indirect, that is, a cold winter establishes a cold growing and harvesting season during spring and summer. It has been shown that the colder the winter the greater the month-to-month temperature variability.[18] The significant association of high wheat prices with low summer temperatures is probably direct. The effect of seasonal rainfall appears to be of secondary importance on the medium and short wavebands and is effective only on a simple annual basis, that is, heavy rain at a specific period in summer could ruin a harvest.

However, the present study shows that these effects of weather operate mainly on the medium wavelength oscillation in English wheat prices, whereas the short wavelength oscillation is less significantly related to weather conditions. Comparison of the real annual wheat price index with that predicted from the equation derived from multivariate analysis confirms that the medium wavelength oscillation, but not the short wavelength oscillation, is driven by weather conditions.

What then are the other causes of the short wavelength cycles in wheat prices? Such an index of prices is partly artificial and is driven by economic factors as well as by grain yields in the fields at harvest time. Cycles in oats, barley and wheat prices were synchronous and oscillated together; if one grain was in poor supply the prices of the others were driven up also. The poor were prevented from substituting cheaper grains and the failure of the crops had a ripple effect that was felt throughout the economy. Appleby also noted that all grains rose symmetrically in price, preventing the labouring poor from switching from their usual bread grains to cheaper grains and thereby staying alive.[19] Harrison also recognized that in years of high prices all prices rose, although not to the same extent.[20] Obviously, major transient (non-cyclical) weather events can contribute to a bad harvest in any one year (eg scorching of the oats crop in Lancashire in 1762). Hoskins[21] suggested that the cyclical disposition of grain prices was not basically because of weather-cycles but to the underlying factor of yield-ratios.

One bad harvest, by reducing the yield ratio to dangerously low levels, tended to generate another because of the scarcity of seed-corn, and it has been suggested that this effect was cumulative until a change in the weather pattern broke the sequence and restored the normal balance between bread-corn and seed-corn.[22] Wrigley[23] noted the relationship between grain prices and the size of the harvest and suggested

[18] S W Tromp, *Biometeorology*, 1980.

[19] A B Appleby, 'Grain prices and subsistence crises in England and France, 1590–1740', *J Econ Hist*, 39, 1979, pp 865–87.

[20] C J Harrison, 'Grain price analysis and harvest qualities, 1465–1634', *AHR*, 19, 1971, pp 135–55.

[21] Hoskins, 'Harvest fluctuations, 1620–1759', pp 17–18.

[22] Hoskins, 'Harvest fluctuations, 1620–1759', pp 17–18; Bowden, 'Agricultural prices', IV, p 634.

[23] E A Wrigley, 'Some reflections on corn yields and prices in pre-industrial economies', in J Walter and R Schofield, eds, *Famine, Disease and Social Order in Early Modern Society*, 1989, pp 235–78.

that fluctuations in price may reflect the level of grain stocks carried over, varying with the abundance of the harvest, and not on the runs of deficient and abundant harvests.

These are so-called autoregressive effects in which the grain price is strongly influenced by the price in the preceding one or even two years. An autoregressive term included in the multiple regression in the present study (see above and Appendix 1) is highly significant ($p=0.0005$) and a second autoregressive term is also significant ($p=0.012$) showing that the wheat prices in the two preceding years have detectable effects.

The closer the farmer operates at subsistence level, the larger the number of years in which he will have no surplus to sell and must therefore enter the market as a buyer at high prices. For the sixteenth and seventeenth centuries, the English agrarian economy operated on a very fine margin between sufficiency and shortage, and where a society consumed almost all of its annual output within a year, fluctuations in the harvest must have possessed overriding economic significance. Such economic factors could have made a major contribution to the clear short wavelength oscillation in grain prices that emerged strongly at the end of the sixteenth century, but it seems that other regulatory mechanisms were probably implicated in generating such a regular oscillation.

Rust and other parasitic infestations of grain crops. Fungal diseases such as mildew, loose bunt and rust were the major scourge of cereals and frequently destroyed whole crops. Periodically, severe and chronically damaging cereal rust epidemics have plagued mankind. Could these fungal diseases be a contributory factor to the short wavelength oscillations observed in grains prices? Rust has the ability to cycle between alternate hosts and, like other fungal diseases, can display endemic and epidemic conditions.

If conditions remain constant from year to year, the fungal epidemic will settle down and the infection rate will remain constant but any departure from uniformity would cause an increase in infectivity and the threat of an epidemic. For instance, depleted stocks of seed corn following a fungal epidemic and a deficient harvest would decrease the amount of plant host available to the pathogen during the next season. Each year without an epidemic would increase the proportion of seed corn available for planting and the number of susceptible host plants, until conditions were suitable for an explosive epidemic resulting in a much reduced crop yield. In this way, the process would be self-perpetuating and these 'boom and bust' cycles have been described and account for many of the most damaging epidemics of cereal diseases.[24]

During the early periods of agriculture of the seventeenth and eighteenth centuries, the outbred wheat would show wide genetic variability with differing degrees of susceptibility to fungal attack; one of the major ways of developing this protection is by a thickened cuticle to prevent fungal entry. The farmer would, unconsciously, use a form of selective breeding in that the seed corn from a harvest during a severe fungal attack would, inevitably, tend to come from the resistant varieties of wheat plants that had survived to maturity. Consequently, a greater proportion of resistant grains would be sown and resistant plants would be harvested in the following year. However, the fungus would, in turn, have been developing more active penetrant strains and so the boom and bust cycle of fungal epidemics would tend to develop. Severe rust epidemics would be less likely to recur the year following an outbreak and they would have an inherent periodicity dependent upon the time taken to

[24] R G Priestley, 'Detection of increased virulence in populations of wheat yellow rust', in P R Scott and A Bainbridge, eds, *Plant Disease Epidemiology*, 1978.

build up a sufficient number and density of susceptible hosts.

We suggest, therefore, that the regular short wavelength cycle in grain prices was not greatly affected by cycles in the weather (unlike the medium wavelength oscillation) and that the peaks of the oscillations were sharpened by economic and autoregressive factors and possibly by regular epidemics of fungal diseases.

The effect of oscillations in grain prices on population dynamics. The question of the effects of food supply, famine and inalnutrition on the demography of England in earlier centuries has been considered in detail by Livi Bacci.[25] Here we are specifically concerned with the subliminal effects of the short wavelength oscillation in wheat prices (period = 5–6 years) on the population dynamics of single communities. We have shown that in the period 1550–1812 (when parish registers provide an excellent data base for the study of population dynamics in a single community) a short wavelength mortality cycle can be detected by conventional time series analysis in the parish of Penrith, Cumbria, and in other parishes. These mortality cycles synchronize and cross-correlate with the short wavelength cycle in the grain prices; high wheat prices are associated with high mortality. The community at Penrith from 1550–1750 was living under marginal conditions and experienced poor nutrition and even famine; the population was in steady-state under density-dependent control and was particularly sensitive to fluctuations in the quality and quantity of the food supply.[26] Neonatal and postneonatal mortality cycles correlated closely with wheat prices during pregnancy or during the first year of life respectively.[27] Furthermore, smallpox developed as a lethal disease after about 1650 and the community at Penrith experienced regular five-yearly epidemics which synchronized with the peaks of the cycles in wheat prices.[28] However, the 5–6 year oscillation in grain prices has been shown to have more far-reaching effects: it caused a corresponding oscillation in susceptibility which sustained the regular epidemics of lethal infectious diseases such as smallpox and whooping cough in London and other large cities in the seventeenth and eighteenth centuries.[29] These findings confirm the conclusion of Hoskins that for the bulk of population the short-term fluctuations in the cost of food were much more important than the longer-term movements of grain prices.[30]

[25] M Livi Bacci, *Population and Nutrition*, 1991.

[26] S R Duncan, S Scott and C J Duncan, 'Time series analysis of oscillations in a model population: the effects of plague, pestilence and famine', *J Theoret Biol*, 158, 1992, pp 293–311.

[27] S Scott, S R Duncan and C J Duncan, 'Infant mortality and famine: a study in historical epidemiology in northern England', *J Epid Comm Hlth*, 49, 1995, pp 245–52.

[28] S R Duncan, S Scott and C J Duncan, 'An hypothesis for the periodicity of smallpox epidemics as revealed by time series analysis', *J Theoret Biol*, 160, 1993, pp 231–48.

[29] S R Duncan, S Scott and C J Duncan, 'The dynamics of smallpox epidemics in Britain 1550–1800', *Demography*, 30, 1993, pp 405–23; *idem*, 'Modelling the different smallpox epidemics in England', *Phil Trans Roy Soc B*, 346, 1994, pp 407–19; *idem* 'Smallpox epidemics in cities in Britain', *J Interdiscip Hist*, 25, 1994, pp 255–71; C J Duncan, S R Duncan and S Scott, 'Whooping cough epidemics in London, 1701–1812: infection dynamics, seasonal forcing and the effects of malnutrition', *Proc R Soc Lond B*, 263, 1996, pp 445–50.

[30] Hoskins, 'Harvest fluctuations, 1620–1759', p 20.

APPENDIX 1

Non-stationarity in the wheat price series

Possible problems with non-stationarity were addressed as follows. For a signal to exhibit weak stationarity it has to satisfy two criteria: i) the mean remains constant and ii) the autocorrelation function (acf) remains constant (ie they are both independent of time). The programs employed, including the coherence procedure, involve detrending so that the mean equals 0. These analyses therefore satisfy criterion i) above. Where the acf does not remain constant over long periods of time, the data series have been subdivided into cohorts and the short-wavelength oscillations were found to have a stable acf and the cross-correlation and coherence tests have been applied to the cohort. Finally, the series have been filtered specifically to

remove periodic factors. The wheat price series can be described by the following equation:

$$\text{wheat}(t) = \mu - \alpha_1 \text{ winter } \text{temp}(t) - \alpha_2 \text{ summer } \text{temp}(t) - \alpha_3 \text{ autumn } \text{temp}(t) + \alpha_4 \text{ winter } \text{rain}(t) + \alpha_5 \text{ summer } \text{rain}(t) + \alpha_6 \text{ autumn } \text{rain}(t) + \eta(t)$$

where $\eta(t)$ is non-white noise. Analysis of the residuals indicates that they can be modelled by an ARIMA process, driven by white noise,

$$\eta(t) = \beta_1 \eta(t-1) + \beta_2 \eta(t-2) + e(t) - e(t-5)$$

where $\beta_1 = 0.72$ and $\beta_2 = -0.006$ and where $e(t)$ is white at the 99.5 per cent level (Box and Pierce test). We conclude that the major non-stationary term is the periodic component of wavelength five years, the short wavelength oscillation.

APPENDIX 2

Principal component analysis of the interaction of seasonal weather conditions

The major effect of a cold winter might be to cause a generally cold growing and harvest year, rather than a direct effect on the crop. When the spring temperature data series is regressed on the winter temperature series as predictor, the two files are significantly correlated ($p < 0.0005$). The summer temperature series is also significantly correlated with winter temperatures, $p = 0.006$. Autumn temperatures are not correlated with winter temperatures. Thus, the association between high wheat prices and low winter and summer temperatures, shown above, may indicate a sensitivity of the prices to a generally cold year.

This possible interaction of the independent variables has been checked by principal component analysis of the annual data series of the four seasonal temperatures. Only principal component 1 (PC1) had an eigenvalue (variance) >1 which accounts for 53 per cent of the total variance; the coefficients of PC1 were winter = 0.862, spring = 0.401, summer = 0.232, autumn = 0.206. When the component score, calculated from the co-variance matrix, is regressed with the wheat price series, only PC1 is significant ($p = 0.019$). We conclude from principal component analysis that the annual wheat price is correlated with the weather conditions in that year. Multivariate analysis suggests that low winter and summer temperatures have the dominant effect but the coefficients of PC1 indicate that low winter temperatures may also be acting indirectly by causing low summer temperatures.

APPENDIX 3

Predicted wheat prices series

Multivariate analysis shows that spring rainfall and spring temperature were completely without significant effect on wheat prices. Consequently, the analysis was re-run with these two variables omitted; the analysis of variance now shows that the overall regression is significant ($p < 0.001$). The predicted wheat price can be determined from this analysis as follows: wheat price (shillings) = 79.9 + (0.027 × summer rain) + (0.0262 × autumn rain) + (0.0783 × winter rain) − (2.05 × summer temperature) − (0.48 × autumn temperature) − (3.61 × winter temperature). Note the high coefficients (and relative importance) for summer and winter temperature.

The regression equation can be used to predict the annual wheat price if it were influenced only by weather, and the predicted wheat prices are calculated for the period 1697–1811 from the derived coefficients and the annual mean seasonal temperatures and rainfall for that year. Spectral analysis of this calculated series shows dominant oscillations of 3 years and 14 years (Figure 5A), but does not show the 5–6 year cycles seen in the real price series (Figure 3A). The predicted and real wheat price series were coherent in the 8–16 year ($p < 0.025$) and the 3-year waveband ($p < 0.05$) suggesting that these cycles in wheat prices can be explained as the consequence of weather conditions.

When the predicted annual wheat prices are deducted from the real prices, the resulting data (residuals) should represent those factors that were less related to climatic factors. Spectral analysis of this recalculated series now shows a 5–6 year cycle (Figure 5B) and it is suggested that this short wavelength cycle in prices may not have been *directly* linked to climate.

Sir Henry Hobart: A New Hero of Norfolk Agriculture?[1]

By ELIZABETH GRIFFITHS

Abstract

This article challenges the pre-eminent role attributed to west Norfolk landowners in the late seventeenth and eighteenth centuries, and argues the case for east Norfolk landowners and their prior contribution to the development of Norfolk agriculture and estate management in the seventeenth century. Their personal involvement and sustained commitment to the idea of improvement started in the 1600s and lasted until the end of the century. This 'century of improvement' divided into four stages: the selection and reorganization of properties as a pre-condition to improvement from the 1600s to the 1620s; the consolidation and expansion of estates and enterprises which lasted until the mid-1640s; the period of reconstruction and experimentation which followed the Civil War and continued through the long recession until the mid-1690s; and finally, the standardization and simplification of estate management which was completed by the 1720s. These stages reveal the significance of organizational, political and cultural factors on the development of estates and agriculture. This paper will focus on the first two stages, and most particularly the achievements of Sir Henry Hobart of Blickling, between 1596 and 1625, who emerges as a 'new hero of Norfolk agriculture'.

THREE of the heroes of the eighteenth-century agricultural revolution, Coke, Townshend and Walpole, came from the good sand region of west Norfolk, and are still much celebrated in popular accounts. Little notice has been taken of the claim made by William Marshall that their practices were simply an extension of standard routines long known on the fertile loamy soils of east Norfolk. 'The largest fortunes' wrote Marshall, 'have been made ... in West Norfolk, but not by any superior system of management [but because] the district had been subjected to the management of East Norfolk ... Viewing the state of husbandry in West Norfolk collectively, it is much beneath that of the District here described'. In short, the scale of improvement achieved in west Norfolk in the eighteenth century was impressive, but in Marshall's opinion, nothing was new or revolutionary about the methods adopted.[2]

Marshall's idea of a transfer of methods from the more fertile and populated parts of the county to the sandy and less accessible interior was shared by Nathaniel Kent and has gradually received more support from historians, although much of their evidence comes from those west Norfolk estates.[3] Work on the Walpole and

[1] Elizabeth Griffiths, 'The management of two east Norfolk estates in the seventeenth century: Blickling and Felbrigg 1596–1717', unpublished University of East Anglia PhD thesis, 1987. I wish to thank Joan Thirsk for her encouragement and assistance with this article, and Richard Hoyle for his helpful suggestions.

[2] William Marshall, *The Rural Economy of Norfolk*, 1787, responding to Arthur Young *The Farmer's Tour Through the East of England*, 1775. Marshall defined Norfolk husbandry as a farming system which included grass and roots in a four, five or six course rotation.

[3] N Kent, *General View of the Agriculture of Norfolk*, 1796, claimed that only farmers in the highly fertile area around the Norfolk Broads (Broadland on the map) 'could carry on a four course shift of wheat, turnips, barley and clover'. Elsewhere they incorporated a clover ley of two or three years, and on the poorest soils grew oats, rye and meslin as alternative grains. He reiterated Marshall's high regard for east Norfolk 'The prime parts of the county lie north and north east of Norwich ... equal in value to ... the Austrian Netherlands. It is unlucky for the credit of Norfolk, that this part ... is less known than any other part'. West Norfolk, described by Arthur Young in his first *Norfolk Tour* on account of three great houses, Holkham, Houghton and Raynham, is the part strangers are most acquainted with (p 9). Ignoring the combined experience of these renowned local agriculturists, Young wrote his *General View of the Agriculture of Norfolk*, 1804, as an ode to T W Coke: 'he is the fairest where many are fair ...'! (p 32). E Kerridge, *The Agricultural Revolution*, 1967, pp 81–85, 272–3; Naomi Riches, *The Agricultural Revolution in Norfolk*, 1937, pp 38–42; B A Holderness, 'East Anglia and the Fens', in J Thirsk, ed, *Agrarian History of England and Wales: V (i), 1640–1750*, 1984, pp 197–238.

Townshend papers, whose estates lay wholly in west Norfolk, has shown that from the 1660s heathland and open field arable were enclosed to fatten lambs more efficiently for the Kings Lynn and Norwich markets.[4] Fodder crops – turnips and clover leys – were used to support higher stocking rates, which increased fertility and permitted the use of more intensive rotation. The owners implemented this system, expensive in terms of hedges, ditches, 'stubbing out firrs' and additional labour, where it was worthwhile and as capital would allow. By raising corn yields, diversifying into alternative products, streamlining farms and management procedures, Col Robert Walpole and Viscount Horatio Townshend maintained and actually increased the profitability of their estates, during the prolonged period of depressed corn prices. It is now accepted that investment by estate owners and the improvements they effected in the second half of the seventeenth century laid the foundation for the expansion of agricultural production in the eighteenth century.[5]

Apart from a few scattered references, we know very little about east Norfolk landowners. What role if any did they play in the transfer of ideas from east to west? Marshall attributed the 'superior system' of husbandry in east Norfolk to the activities of 'independent yeomen' on their comparatively small farms 'inclosed, marled and plowed time immemorial'. If so, how did their methods become estate policy throughout the county? Marshall bemoaned the influence of landowners and the disappearance of those 'numerous little places of the yeomanry having fallen into the hands of men of fortune and being now incorporated with their extended estates are laid out into farms of such sizes as best suit the interest or the convenience of the present proprietors'. But was the contribution of these 'men of fortune' wholly negative? Marshall himself distinguished between those 'inclosed' parts of east Norfolk, where 'there are many ring-fence farms' and the husbandry was 'good' and 'very good', and the parishes with 'common fields' and 'intermixtures', where it was poor and 'middling'.[6] Is it not possible that landowners accelerated the process of exchange and enclosure, which enabled husbandmen to improve their methods?[7] No study has been made of estates in the region, and no leading figures have been identified to compare with the Cokes and their west Norfolk circle. Can this gap be filled? Are new heroes waiting to be discovered, to explain more fully the course of change in the seventeenth century, which established Norfolk as the foremost agricultural county?

I

Scarcity of material bedevils any study of east Norfolk estates. Unlike their west Norfolk counterparts, those in east Norfolk were relatively small, fragmented and, particularly in the vicinity of Norwich and Great Yarmouth, changed hands frequently. High land values increased the temptation to buy and sell with the result that possession seldom remained within one family for more than three generations. The paucity of material accounts for the continuing bias towards large west Norfolk estates, with their huge archives and the more easily perceived record of their

[4] J H Plumb, 'Sir Robert Walpole and Norfolk husbandry', *Econ Hist Rev*, 2nd ser, V, 1952, pp 86–89; H W Saunders, 'Estate management in Raynham in the years 1661 to 1686 and 1706, *Norfolk Archaeol*, XIX, 1945, pp 39–66; K J Allison, 'Sheep corn husbandry in Norfolk and Suffolk in the sixteenth and seventeenth centuries' *AHR*, V, 1957, pp 12–30; *idem*, 'Norfolk farming in transition' *Agriculture*, 64, 1957, pp 184–87; J Spratt, 'The agrarian conditions in Norfolk and Suffolk 1600–1750', unpublished London University MA thesis, 1939.

[5] C G A Clay *Economic Expansion and Social Change: England 1500–1750*, I, 1984, pp 81–91, 130–135; *idem* 'Landlords and estate management in England', in Thirsk, *Agrarian History, 1640–1750*, pp 162–251.

[6] Marshall, *Rural Economy of Norfolk*, I, pp 2, 9; II, p 271.

[7] Marshall praised the enclosure undertaken by William Wyndham III at Felbrigg: *Rural Economy of Norfolk*, II, pp 365–71.

Imaginative reform and heavy investment were not confined to the post-Restoration period, nor were they undertaken simply as a desperate measure to keep afloat in a period of falling prices. From the 1600s the Hobarts and Windhams were clearly committed to the idea of improvement. This was most evident from the surviving material for the purchase of Sir Henry Hobart's estate, but it was also apparent after Felbrigg changed hands with the family in 1608. On both estates, the owners carried out extensive surveys, reorganized holdings and drew up imaginative leases to promote improvement. The second generation built on these foundations, consolidating, expanding and developing new activities, such as bullock fattening. During the Civil War and Interregnum, the Blickling and Felbrigg estates, although they were unaffected by the hostilities and their owners fully supported the Parliamentary cause, suffered a long period of decline, with mounting debts and arrears. The reforms from the mid-1660s were as much about reconstruction as raising yields and diversifying to counter falling prices for corn. The fact that this recovery was achieved quickly and successfully, and that the owners were able to finance costly new ventures, including dairy farming on an extensive scale, point to the significance of the improvements effected in the first half of seventeenth century. Despite serious financial difficulties and the distraction of politics, the Hobarts continued to invest and innovate at Blickling throughout the recurrent crises of the 1670s and 1680s; for William Windham at Felbrigg the management of his estate was the centrepiece of his life. However, in the 1700s a century of personal involvement came to an end; it was most marked at Felbrigg where William and Katherine Windham had exercised the closest control over day-to-day management. The quality of records declined as standardized procedures became the norm. 'Particulars of every farme' were replaced by lists of tenants, kept by the full-time steward, Stephen Legge, as Ashe Windham disengaged himself from running the estate.[10] An overriding impression emerges from all the archives examined that a process which had started in the 1600s had been accomplished by the 1720s. Within that period *c* 1600–1720 four quite distinct stages of improvement can be discerned.

During the first phase of 'acquisition and reorganization', from about 1600 to 1625, properties were selected for their suitability for restructuring into commercial farms and units. The process continued into a second phase of 'consolidation and expansion' which lasted until the mid-1640s, when confidence petered out. Activity was not resumed until the mid-1660s, when the slide in corn prices and the neglect over the previous twenty years made further reforms a necessity. Landowners were forced to experiment with new farming and management systems. The success of this phase of 'recession and experimentation', which stretched to the 1690s, led to a fourth phase of 'standardization and simplification', which allowed landowners to delegate routine management and withdraw to a more leisured lifestyle. By the 1720s, the mechanism of a well organized, efficiently administered and highly capitalized estate was firmly in place ready to respond to the demands of the eighteenth century. Underpinning this edifice were the structural reforms undertaken in the opening decades of the seventeenth century.

These stages of improvement support Robert Brenner's thesis that the agricultural revolution was, in the first instance, about institutional and organizational changes, which facilitated massive capital investment by landowners and engineered a revolution in agricultural productivity by the late eighteenth century. But while Brenner

[10] From William Windham's Green Book: NRO, WKC 5/152 400 x.

offers a useful perspective to the mechanics of agricultural change, and it is hard to challenge his general proposition, he does not answer all the questions that need asking.[11] Why, for example, did landowners pursue the idea of improvement with such zeal in the 1600s? We are given a picture of landowners responding to prices, but little consideration as to how they made their judgements about prices in a period when information of that kind was not readily available. The evidence shows that many other factors were at work and need to be considered. As Mark Overton says, 'Mentalities and attitudes change, and while the market provided the essential stimulus to agrarian change, attitudes and expectations also had to change'.[12] The evidence from the Blickling and Felbrigg estates shows that this process started to happen from the 1600s. This paper will not attempt to cover all four stages; the emphasis will be on the first two phases of estate building, and the achievements of Sir Henry Hobart.

II

Sir Henry Hobart in his life, career and business affairs embodied the spirit of improvement. Born in 1560, he was the great-grandson of Sir James Hobart, Attorney General to Henry VII, who had migrated to Norfolk in the 1470s and established his family at Hales Hall, near Loddon.[13] Sir James settled his sons on small estates in the vicinity: Walter at Morley and Miles at Plumstead. Miles divided his estate between his heirs, but his elder son, Thomas, left both his share and his wife's small estate at Beeston to his eldest son; his younger son, Henry, receiving no landed inheritance, made the law his career. As a lawyer, Henry Hobart proved outstandingly successful. He served as Recorder of Great Yarmouth (1588–1603) and Steward of the City of Norwich (1596–1604) and represented both boroughs in Parliament: Yarmouth (1596–1604) and Norwich (1604–1610). In 1609, following his appointment as Attorney-General, the corporation of Norwich granted him the lease of Chapelfield House, in recognition of his services to the city. In 1613 he succeeded his neighbour in the county, Sir Edward Coke, as Lord Chief Justice of Common Pleas and in 1616, he followed another Norfolk man, Sir Francis Bacon, as Chancellor to the Prince of Wales, and assumed responsibility for the estates of the Duchy of Cornwall, working with such notable land reformers as John Norden. Through his public life Sir Henry would have been acquainted with current developments in the land market and the latest management techniques. However, although he enjoyed undoubted advantages and the enviable opportunities afforded to a man in his position, Sir Henry remained loyal to the Norwich area and retained his reputation for 'fairness and modesty'.[14] In 1614 he stated his desire to have his estate 'within the compasse of one shire for ease of management'.[15] Only in the 1620s did he venture outside Norfolk to purchase land in Lincolnshire on which to settle his fourth son, James. Overall, between 1596 and 1625 Sir Henry spent roughly £65,000 on land and built an estate worth £5350 (for details see Appendix).[16] In comparison Sir Edward Coke expended £100,000 on

[11] R. Brenner, 'Agrarian class structure and economic development in pre-industrial Europe', *Past and Present*, 70, 1976; *idem*, 'Agrarian roots of European capitalism', *Past and Present*, 97, 1982.

[12] Mark Overton, *Agricultural Revolution in England*, 1996, pp 202–6.

[13] J Gairdner, ed, *The Paston Letters*, 1983, v, 311: letter from John Paston to Margery at Swainsthorpe, 3 Feb 1478, 'for he purposeth henseforth during hys lyff to be a Norfolk man, and to lie within ii myle of Loddon'.

[14] E Foss, *A Biographical Dictionary of the Judges of England 1066–1870*, 1870, p 348; *Norfolk Official Lists*, 1890, pp 128, 141, 170, 180.

[15] NRS, 12970 27F5, Declaration of trust (1614).

[16] Between 1618 and 1625 Sir Henry spent £11,420 on rebuilding Blickling Hall. Between 1622 and 1625, he also laid out £3400 on estate repairs; granted loans of £6667; saved £4442; repaid debts of £1752 for his eldest son; purchased East India stock worth £1500; supported a family of 16 children, and houses in Norwich, London and Norfolk.

properties scattered across the Midlands, around his wife's estate in Suffolk, as well as his native Norfolk.[17] Sir Henry's exclusive approach offers a rare insight into the working of the land market in Norfolk, at that time, by a man with unusual skills and experience.

Unlike the famously avaricious Coke, Sir Henry was extremely circumspect and deliberate when it came to making acquisitions. Despite ample opportunity, adequate means and an intricate knowledge of the local land market, no evidence exists to show that he purchased any land before 1596 at the age of thirty-seven, when rising corn prices should have made land an attractive proposition.[18] Furthermore, his first purchase was not a small Broadland estate, as one might well have expected, but the major portion of Sir William Gresham's estate at Intwood, a few miles south of Norwich, where soils were light and land values low. The estate, however, had already been divided up into compact holdings; the extensive heathland offered much scope for improvement, and there existed the prospect of acquiring more of the estate in neighbouring parishes. In contrast, the Broadland region although very fertile and productive was plagued by fragmentation and intermixed ownership which made expansion and development difficult.

Sir Henry had an acute appreciation of the relative value of different types of property and made his selections with the utmost care. He directed his attorneys to survey possible acquisitions, and carry out searches into the nature of titles and tenures, identifying legal impediments and obstacles to improvement. He consulted local agents as to their viability and potential. On their replies he scribbled comments in the margins indicating his priorities and preferences: price and methods of purchase were crucial considerations, but most important was 'the scope for improvement' to which he constantly referred. Sir Henry also made a distinction between those properties purchased for 'profitte' and those acquired 'for ornament and convenyance', for which he was prepared to pay above the normal rate: prestige had its value too.[19] Not all Sir Henry's acquisitions met his criteria. As a major officeholder and recipient of crown lands his portfolio included properties which were less than ideal. Crown lands administered by local agents and often the subject of disputes by rival tenants led to dereliction, encroachments and fragmented ownership.[20] Lands received in repayment of loans and mortgages from family and friends, sometimes situated in Broadland, often possessed little potential. The principal properties which Sir Henry had chosen – Intwood and Keswick, Langley, Hevingham and Saxthorpe, Horsham St Faith's, Blickling, Wymondham and Weybourne – received the greatest attention. For these estates supporting material, dating back to the early sixteenth century in many cases, included surveys, valuations, details of earlier transfers and leases. The relative importance attached to the different acquisitions is further demonstrated by the subsequent management policy. The most careful leases were constructed for Intwood Hall, Langley Abbey and the new farms at

[17] C W James, *Chief Justice Coke: His Family and Descendants at Holkham*, 1929, app 1, pp 304–306, includes reference to James I and his insistence that Coke should buy no more land; Coke's petition to buy 'one more acre' led to him acquiring the earl of Exeter's estate at Castle Acre!

[18] Sir Henry's entry into the land market may have been influenced by his marriage in 1590 to Dorothy Bell, daughter of Sir Robert Bell, Chief Baron of the Exchequer; her dowry of £500 was a pittance compared to the wealth of Coke's two wives, and by 1596 they had four sons to provide for.

[19] Blickling: NRS, 8898 21F6.

[20] Just this situation had developed in Cawston, where disputes over grazing led to much litigation, and a unique set of maps drawn in the 1590s to support the various claims. These were the earliest visual surveys found during the research. An early seventeenth-century plan of Clement Herne's park at Haveringland shows the layout of a capital messuage with orchard, garden, hopground, dovehouse and a few closes surrounding the house, with the park situated further off, illustrating the type of arrangement Sir Henry sought to establish on his principal holdings: NRS, 27229 361 x 3; NRO, Ms 4521, Map Box E; NRS, 21404; NRS, 21399 Map Box A Haveringland; NRO, 29BCH.

Hevingham and Blickling Hall, while those for the Broadland properties contained only the most basic clauses. Clearly, Sir Henry devised a long term strategy for the former, while the latter were simply held as short term capital investments.

A brief analysis of the Intwood estate shows the type of improvement to which Sir Henry aspired. Intwood Hall and its land had been leased as a commercial unit since 1575, when Sir Thomas Gresham granted a twenty-one year lease to his kinsman William Reede of Beccles.[21] He divided the estate into two holdings, the hall with part of the demesne, and a farm based on 'the newe house called the Deyrey House' with a 'new barn, stables and oke-yard' and 710 acres. This included 400 acres of heathland, 161 acres in four closes, 34 acres of enclosed pasture and meadow, 64 acres of arable, sub-let to eight tenants, and 48 acres of woodland. Sir Henry took possession in 1596, and by 1606 when he leased the estate to his cousin Roger Hobart further improvements had taken place. The Great Heath had been reduced to 150 acres; twenty-four named closes had been created averaging 25 acres in size; a dovehouse and malthouse were built; and the rent had increased fivefold from £48 to £230 a year, or from an average of 8*d* to 5*s* per acre.[22] The 1606 lease included clauses designed to protect and develop the structure of the holding, mainly through the planting of woodland, and the laying down of pasture. A late 'hand over' meant that Sir Henry had to be compensated for the cost of husbandry undertaken, including, 'tyllinge, seedinge, muckinge, tathing and losse of profettes of somerlaies and new breakes to and for 120 acres ... sowen with rye and wheat this year'. The detailed costings and cropping arrangement for these four closes show the high level of management that could be achieved on well organized properties. When a dressing of muck doubled the cost of cultivation, expenditure had to be carefully weighed; on compact holding these calculations were more easily made, which reduced the risk and therefore increased the likelihood of investment in the first place. These four closes, receptive to capital investment, commanded improved rents of 6*s* 8*d* per acre.[23]

When Roger Hobart died in 1612 the estate, which by then amounted to some 1545 acres, was reorganized into four commercial farms – Intwood Hall (430 acres), Intwood Farm (257½ acres), Keswick Hall (630 acres), Colbyes Farm, Swardeston (181 acres), with the remainder divided between Swardeston rectory, Keswick Mill and a few bits and pieces leased by the bailiff 'year by year'. By 1655 the Swardeston lands had been grouped together in a single farm, the Intwood holdings amalgamated, and a further farm acquired in Keswick. This arrangement, neat and compact, can still be seen on the estate map of 1729.[24] But how successfully did this property perform? Between 1622 and 1655 rents continued to rise from £410 to £503, which included £66 10*s* 0*d* for the newly purchased lands. However, progress faltered in the early 1640s, and more seriously from the mid-1650s. Intwood, as with the other light soiled properties acquired by Sir Henry, succumbed quickly to any fall in corn prices or withdrawal of investment. The actual returns at Intwood in the late 1650s were amongst the lowest on the estate.[25] In the mid-1660s, however, when Sir John assumed a more active policy to counter a repeated collapse in corn prices, the simplified landholding structure with its well organized farms permitted a swift management response, which included enlarging the dairy enterprise, using turnips

[21] Intwood: NRS, 17811 41C3.
[22] NRS, 17190 32E6.
[23] NRS, 17190 32E6; see Griffiths, 'Norfolk estates', table 2·16, p 99.
[24] NRO, BCH 3.
[25] Estate accounts: NRS, 10191 25A1, 1622–25; NRS, 18147 33A3, 1632–41; NRS, 18145 33A3, 1641–47.

to compensate for limited pasture and soil fertility, and marling to improve soil texture. Although reform and investment did not prevent a decline in rents – for the amalgamated Intwood holding the rent fell from £175 to £125 by 1679 – the reorganization undertaken by Sir Henry Hobart created an estate of high capital value, which ensured its long term success. Intwood and Keswick were the last offlying properties to be sold by the Hobarts in 1793, very profitably to Norwich businessmen and bankers – the Unthanks and the Gurneys.[26]

Intwood and Keswick show the level of improvement possible of poor soils with well planned capital investment. Sir Henry's experience with his Broadland properties explains why the Hobarts deserted the most easterly – and fertile – parts of Norfolk. Sir Henry had acquired a collection of these properties, including quite substantial estates at Martham and Somerton from the crown, and church leases – at ancient rents – of the rectories at Barton, Neatishead, Hoveton and Ashmanaugh. He also received in repayment of loans his brother's estate at Beeston and the earl of Arundel's manor in Acle.[27] A map of Acle, drawn in 1633, highlights the problem facing improving landowners. It shows a modest holding of 95 acres, with a few closes around the manor site, but the greatest proportion widely scattered in the open fields, presenting a major obstacle to further enclosure and innovation.[28] A lease of 1617, for a 15½ acre farm in five pieces, simply states that the land should be 'mucked and somerlayed according to the custom of those fields'.[29] The situation at Martham showed, however, that even when a degree of rationalization had been achieved improvement proved elusive. The estate amounted to 452 acres, mainly leased in two holdings. The first consisted of the manor site with 100 acres in closes, 67 acres in 'fenne and great lands' and the rest in 'pieces'; and the second 200 acres in 'pieces'. Both holdings were leased to the same tenants for £118 each. In 1623, despite investment in building and repairs, the rent for both farms was rounded down to £200. At Somerton, Sir Henry made some attempt to develop the principal holdings, investing in a new granary for East Someton Farm; nevertheless, the farm failed in 1639. Between 1623 and 1639 the total rental for these two estates declined from £708 to £620: the four main holdings were entirely responsible.[30]

Why did rents decline at Martham and Somerton in the 1620s and 1630s, when other properties prospered at this time? The evidence suggests that, in the Broadland area, the investment of capital and amalgamation of farms beyond an optimum size was counterproductive. A basic problem facing large tenants in this region was that farming practices were labour rather than capital intensive. Once holdings exceeded a certain size the larger farmer was penalized by labour costs which on smaller holdings could be absorbed by the family unit. The fragmented nature of the holdings meant that larger owners gained little advantage from new buildings. The only solution was to embark on a programme of piecemeal purchase, but the very high land values made this an uneconomic proposition. Furthermore, large landowners with scattered possessions and professional commitments were doubly disadvantaged as they relied heavily on their principal tenants, who often served as bailiffs, to maintain high rent levels, which were based on sophisticated forms of husbandry.[31] As a native of the region, Sir Henry would have appreciated this dilemma. The Broadland properties were

[26] Griffiths, 'Norfolk estates', table 5·21, p 436.
[27] See Appendix.
[28] NRO, MS 4513/1, Cab II: Acle map, 1633.
[29] NRS, 8646 21C4.
[30] See note 25.
[31] Rents for arable pieces ranged from 7*s* 6*d* to 10*s* per acre; enclosures 12*s* 6*d*; meadow 13*s* 4*d*.

worthwhile as they had been obtained at bargain basement prices and could be used to endow younger sons, supplement jointures and dowries, and raise capital, but they were never the focus of serious management. Sir John Hobart disposed of them in the 1630s and 1640s to finance consolidation at Blickling and other more profitable ventures, including the purchase of the Wood Dalling estate, ten miles west of Blickling, and a large area of fenland at Stow Bardolph, which provided winter grazing for the Hobarts' bullock fattening enterprise in the late 1630s and early 1640s.

Sir Henry did not ignore the more fertile and established farming regions of the county; one of his most successful acquisitions was the Langley estate, south-east of Norwich in the dairying area much praised by Eric Kerridge. The Langley estate map of 1633 shows a large area of scattered strips in mixed ownership, but more than counterbalanced by the major portion of the estate which was enclosed and divided into two large holdings, the Abbey and the Grange.[32] The Hobarts enjoyed a long association with Langley, which borders their seat at Hales Hall, Loddon. During the sixteenth century, they had intermarried frequently with the Barneys who had owned Langley since the 1560s; Richard Barney from whom Sir Henry acquired the estate in 1608 was married to his cousin Elizabeth Hobart. The transfer, Sir Henry noted, was 'not a mere purchase, but in part out of Barney's good affection a gift'; Barney surrendered the estate in return for annuities for himself, his wife and three childless brothers.[33]

The Barney's financial difficulties originated in the long leases granted in the 1540s and 1550s.[34] In the late 1580s and early 1590s, Richard Barney purchased the remainder of the terms and re-let the estate on a fully commercial basis. In view of his later involvement, it is likely that he engaged Sir Henry's assistance at this stage. The estate amounted to some 970 acres, with 748½ acres divided between the two main holdings; four smaller holdings consisting mainly of blocks of marshland; a mill and a few tiny tenancies made up the rest. They leased the Abbey in 1592,[35] followed by the Grange in 1599.[36] The account for the Court of Augmentations shows that in 1539 the rent for these holdings, plus 80 acres of marsh, was £27 13*s* 4*d* or 8*d* per acre.[37] The new rent for the Abbey (304 acres) was fixed at £86 or 5*s* 6*d* per acre, and the Grange (444½ acres) at £100 or 4*s* 6*d* per acre. The 1592 lease included very detailed arrangements for the leasing and management of a dairy herd of '20 Northerne milche neat and 1 Bull' at 52*s* 6*d* each; and the requirement to leave 'sufficient fodder and wynter stover for the wyntering of sd 20 milche neat and 1 Bull'. In 1607 another dairy was established on 60 acres of marshland 'newlie enclosed'; the house called 'the Deyrehill' still survives on Langley Marshes.[38]

When Sir Henry took possession in 1603 he raised the rents still further to £115 for the Abbey or 7*s* 6*d* per acre, and £134 for the Grange or 6*s* per acre, and lengthened the term from three to twenty-one years.[39] As at Intwood, Sir Henry devoted his attention to reorganization and developing the infrastructure of the estate as a basis for further improvement. He paid for new buildings, but tenants undertook to repair and maintain them, as well as attending to fences, gardens, orchards and waters; they also agreed to protect pasture, plant trees and manage existing woodland. Noteworthy is the care with which Sir Henry chose his tenants. While he leased

[32] NRS, 21407 A, Blickling Mss; Langley map, 1630.
[33] The Hobarts sold Langley back to the Berneys in 1721: NRO, BEA, 2/33 433 × 2.
[34] NRS, 19978-84 43B6.
[35] NRS, 18346 33B4.
[36] NRS, 27319 387 × 8.
[37] NRO, Ms 20993 47C5.
[38] NRS, 19397 42A6.
[39] NRS, 19894 43B2.

Intwood to Roger Hobart, whose small estate at Morley and Deopham he had acquired, he assigned Langley Abbey to another cousin Edward Hobart, while Margaret Hobart took the lease of Hoveton rectory. Other principal holdings were leased by men of stature, often modest landowners in their own right, including the Dennys of Mettingham and Earsham who leased Langley Grange in the 1590s, and the Woods of Braconash and Pickerills of Cringleford who succeeded Roger Hobart. With 'honest and able' tenants Sir Henry did not need to specify farming operations; these could be safely left to their discretion.

Langley's performance repaid investment handsomely. Rents rose strongly from £394 in 1624 to £515 in 1641. By 1647 they had edged back to £494, reflecting the down turn in corn prices in the early 1640s, but through the Civil War and the recession which followed, rents and receipts held up comparatively well. The valuation of 1686 gives a figure of £450 which rose to £475 by 1696.[40] Plainly, this property proved resilient, and Langley withstood the economic adversity from the early 1660s more successfully than any other property on the estate. The crucial factor was the preponderance of pasture which could support profitable livestock enterprises, but even more important was its arrangement into enclosed and well established holdings. By the 1650s there were just three commercial units at Langley – the Abbey (385 acres) which had absorbed most of the small tenancies, the Grange (504 acres) and the 'new' dairy farm (129 acres). In 1651 Lady Frances Hobart paid for the rebuilding of the farmhouse in brick to supplement the investment in the barn and cowsheds made in 1607.[41] These three well-equipped, capitalized and organized farms provided the basis for a flexible and innovative husbandry. Indeed, from the late 1660s, methods, including the cultivation of turnips, long used at Langley to support the dairy and livestock enterprises were adopted at Intwood and on other light soiled properties, such as Horsham St Faith's, in an attempt to raise yields and facilitate diversification into dairying.

The evidence for this progression of ideas from well developed fertile holdings in east Norfolk, to less fertile holdings further west comes from a handful of agreements and leases drawn up in the late 1660s. The first document is the plan 'for the aby (Langley) to answer a profitt in lieu of rent' devised by Robert Dey, Lady Frances Hobart's attorney in 1666.[42] It included leasing a dairy herd of 30 cows at 45*s* each, with 102 acres allowed for their maintenance; in other words 3 acres for each cow, plus '12 acres of meadow for their Hay for their winter feed besides straw'. 'In tillage' Dey listed in order, 30 acres of wintercorn, 18 acres of pease, 33 acres of oats, 52 acres of barley, 16 acres of turnepps, 20 acres of somerlay' leaving 89 acres for 'mowing, keeping horses ... and young cattle ...'. There was also 'a full stock of Cattle uppon ye ground and 12 beasts at stake wth turnepps. All wch will make a great proportion of compost agaynst next seed time, in order to the well disposing thereof there shall be a large sumerly and ye other grounds left soe that they may fall in husbandly course wth severall grains according to the qualities and natures of the soil'. In this remarkable document we can see turnips being used, without comment, in rotation with corn crops as a preparation for winter wheat. Interestingly, the lease for the Abbey in 1669 does not refer to turnips, although leases for the Abbey at Horsham St Faith's (1666) and Swardeston Farm, both light soiled proper-

[40] See note 25; Griffiths, 'Norfolk estates', table 5·16, p 401.
[41] NRS, 20052 43C1.
[42] NRS, 10379 25A6. Dey stressed that the tenant had failed 'not by misfortune of the tymes, or ye illness of the penniworth ... but by unhappy encumbrances'.

ties, include detailed instructions as to their cultivation.[43] On the back of the Swardeston lease, the young agent, John Brewster scribbled a list of crops grown at Langley that year, and referred to 'The Turnepp Close 15 acres'. The fact that instructions were not included in the Langley lease, although we know turnips were used extensively, suggests that turnip culture was not an innovation at Langley, but it was at Horsham and Swardeston.[44] A further point: this policy was implemented by men like Robert Dey and John Brewster, both farmers in their own right. This shows how farmers, acting as attorneys, agents and tenants could influence the nature of the husbandry practised on great estates. The Hobarts, as lawyers and active politicians on the national stage, relied on these men to farm and administer their properties, which meant on this estate at least that their influence was pervasive. In the first half of the seventeenth century they pursued their own ideas as tenants on an individual and discretionary basis. In the second half of the century, often serving as agents, they implemented those methods as estate policy. Once these methods became policy they had to be enforced through leases and accounts. This encourages the false belief that methods, such as turnip cultivation, originated at that stage, when in fact the real innovation in the late 1660s was a new style of estate management which focused on more intricate record keeping and intervention in farming operations as a way of increasing efficiency, yields and profits.

Following the acquisition of Langley, which was probably an isolated stroke of good fortune, Sir Henry turned his attention once more to cheap, low grade land which offered more 'scope for improvement'. As his career progressed, Sir Henry's approach became much more ambitious and assertive. Hitherto he had been careful to select estates which, although they had potential, were already well organized and partially improved, but from 1608 he actively sought out neglected, unimproved and even derelict properties. This strategy may reflect a tightening of the land market, but it also reflected a strong philosophical conviction and a growing practical confidence in his ability to turn them into profitable concerns.[45] His plans came to centre around the Blickling estate, the ancient and disintegrating home of the Boleyn family, part of which had been inherited by Sir Edward Clere, whose fortunes were declining rapidly. The remainder had passed to Elizabeth I through her mother Anne Boleyn and was at the disposal of James I. With his contacts in the highest circles Sir Henry was in a strong position to pick these ripe plums. He also directed his agents to identify other properties in the area with a view to purchase. In this way Sir Henry acquired a string of properties on the sandy and heathland soils which stretch northward from Norwich to Holt.

Thomas Thetford's estate at Hevingham and Saxthorpe was the first of those purchased through the offices of another cousin John Hobart of Spitalfields. But while the former proved a success, the latter was a disaster; in theory it should have been the other way round. The Hevingham sale particulars (1608) show 905½ acres leased in 45 holdings, which suggest fragmentation on a massive scale.[46] However, three manor sites, including Rippon Hall, and four usefully sized hold-

[43] NRS, 16023 31F10 (referred to by Holderness, 'East Anglia', p 222); NRS, 21135 74X2.
[44] NRS, 3131 13B3.
[45] Sir Henry's desire to improve neglected land was not unique. Thirsk argues that the influence of classical authors and agricultural writers created a fashion for searching out derelict land in the early seventeenth century: J Thirsk, 'Making a fresh start: sixteenth century agriculture and the classical inspiration', in M Leslie and T Raylor, eds, *Culture and Cultivation in Early Modern England*, 1992, pp 20–24. Norden endorsed this trend by claiming that 'there is not a place so rude and unlikely, but diligence and discretion may convert it to some profitable end': J Thirsk and J P Cooper, *Seventeenth Century Economic Documents*, 1972, p 110.
[46] NRS, 1224 27C3.

ings, each with their core of enclosure – pasture, meadow and arable – accounted for 512 acres and provided the nuclei for further development.[47] In fact, the particular exaggerated the acreage by 105 acres as well as the number of holdings which paid a commercial rent, so the proportion of land contained within useful holdings was already quite high. By 1622 these farms, accounting for 583 acres, were divided as follows: 207½, 110, 90, 34, 33 and 20 acres, while the long tail of small holdings had been reduced to twenty-two. The total rental of £300 averaged *7s 6d* per acre, but this figure conceals a wide variation, with meadow and pasture commanding up to *11s 6d*.[48] Sir Henry took great care with the leases for these modest farms, ensuring that pasture was protected and extended – as at Intwood – and insisting as ever on the planting of trees. At Dudwick's farm 'a newe orchard' was to be planted with 'verie good frute trees ... where and when Sir Henry shall appoint'.[49] In the 1630s Sir John continued the process of improvement, cutting back the tail still further, buying pieces to consolidate existing holdings and raising rents to £357.[50] Sir Henry's judgement proved correct as Hevingham continued to perform as well as Langley through the 1650s and 1660s: the rent peaked at £305.[51] But from that time rents fell back to £291; the main casualty was the principal holding Rippon Hall, which suggests that the tenant, who served as Sir John Hobart's steward between 1654 and 1665, may have overfarmed the holding.[52] As we have seen at Intwood, these light-soiled properties required careful management if they were to remain successful. The delicate balance between pasture and arable had to be maintained; holdings quickly declined if tenants ignored covenants and good husbandry practices. Supervision was more likely within the framework of an effectively managed estate, but during the Civil War and Interregnum a weakening of control occurred on several properties, particularly those administered by John Tolke.

Saxthorpe provides the example of an estate where the delicate balance had been completely lost by oversimplifying the structure: in 1608 the entire holding of 828 acres was leased to a single tenant.[53] Attempts to break it up met with little success as rents never matched the 1608 valuation. In the sixteenth century it had formed part of Sir Christopher Heydon's sheep grazing empire before being turned over to arable: this process appears to have annihilated the type of structure still evident at Hevingham. The result was that there were no nuclei of enclosed pasture, meadow and arable around which to build new versatile farms. Nevertheless, the Hobarts persevered with Saxthorpe paying for new barns, repairs and marling in the 1670s; its value lay in its proximity to Blickling and it continued to supply the household with oats and barley.[54]

The properties bordering on heathland – Horsham St Faith's purchased from Sir Charles Cornwallis, and the crown lands at Cawston and Hevingham Park – posed

[47] N Kent occupied the principal site, Rippon Hall, where he wrote *Hints to Gentlemen of Landed Property*, 1776, and *General View of the Agriculture of Norfolk*, 1796. He offered an advisory service to landowners including William Windham III at Felbrigg, and Robert Marsham of Stratton Strawless and T W Coke. Sir John Hobart sold 'Strattonhall', another Hevingham site, to the Marshams in 1686. See R W Ketton-Cremer, *Felbrigg: The Story of a House*, 1962, pp 172–76.

[48] NRS, 10191 25A1.

[49] NRS, 27299/60 385 × 8.

[50] NRS, 8898 21F6.

[51] NRS, 18147 33A3; NRS, 18145 33A3; NRS, 10135 22F7.

[52] NRS, 8543 21B5. In 1647 on the death of Sir John Hobart, second baronet, the estate was divided between his daughter, Phillipa, who married her cousin John Hobart of Intwood, the third baronet, and his widow, Lady Frances Hobart, who survived until 1665. When the estate was re-united, Sir John appointed Robert Dey and John Brewster, who had managed Lady Frances' jointure of Langley, Wood Dalling and Wymondham, to manage the entire estate.

[53] Richard Burton estimated the acreage at 670 acres in 1622: NRS, 10191 25A1.

[54] NRS, 16019 31F10.

further problems. Grazing rights had been, and continued to be, the subject of various legal disputes, but in fact this added to their attraction as Sir Henry commented during the proposed purchase of Horsford Park, which lay adjacent to Horsham St Faith's, 'That it is fitte for me makes it less fitte for others'.[55] Sir Henry declined to make a purchase, sixteen years being too great a price, which suggests his awareness of the limitations of these properties, and particularly the difficulty of obtaining precise valuations. Cawston, in addition to disputes over grazing rights, had suffered through the negligence of crown agents. Tenants had been allowed to assert possession over their copyhold land and enclose pieces of bruery and open field at will, to the detriment of the demesne, and the possibilities for improvement.[56] Once the Hobarts started to encounter serious financial difficulties in the 1650s, these light-soiled properties, despite their proximity to Blickling, were the first to be sacrificed and by 1686 they had all been sold, an indication of perceptions at that time of their relative value.

Sir Henry's purchase of the neglected estate and dilapidated mansion house at Blickling proved to be his most ambitious venture. No other acquisition illustrates more forcibly his commitment to the idea of improvement. For this prestigious property, Sir Henry set aside all restraint, paying the vendor Lady Agnes Clere a capital sum of £5500, in addition to an annuity of £400, 'though it was more than she could make of it or he can'.[57] The structure of the estate was especially problematic, as much of the open-field arable had been lost to tenants on fixed copyhold rents at 8*d* per acre. Of the 950½ acres, the park and demesne accounted for 201 acres, the foldcourse and warren 400 acres, and depleted woodland 95 acres. In fact the only commercial holding was the alehouse leased with 132 acres. The remaining acres were leased in fifteen small tenancies some rented as low as 2*s* per acre.[58] The area enjoyed by the copyhold tenants – many of them textile workers living in Aylsham – amounted to over 1000 acres on the Aylsham side of the parish. This fragmentation proved very difficult and expensive to correct. In 1625 Sir Henry wrote to Sir James Fullerton, another member of the Prince's council, to petition the King on his behalf for the grant for Aylsham Lancaster 'lying next ... to my house in Norfolk'. It consisted wholly of 'rents copy and free whtout land soe yt that there can be noe improvement made of it'. He was prepared to pay 'what pence they shall set upon it for I seek it not for profytte but for ornament and conveyancye'.[59] Unfortunately, his death stopped the transaction and his son had to fight a long and costly battle against the tenants of Aylsham before the manor was secured. But it proved worthwhile as the estate continued to exert control and influence the development of the town. Sir John also had to expend huge sums buying up strips and holdings to enlarge the park on the Aylsham side. Not until the eighteenth century was a measure of success achieved, but even then the public road continued to pass in front of the house, which would have been as embarrassment to the newly ennobled Lord Hobart competing with his fellow peers at Houghton, Holkham and Raynham.[60] In addition to the problems with the estate, Sir Henry had to rebuild and refurnish the old medieval house,

[55] Horsham St Faith's: NRS, 12910 27E6; Hevingham Park and Marsham: NRS, 13718 28D; Cawston: NRS, 2599 12B1; Cawston Church: NRS, 23798 84 X 2; Horsford: NRS, 11122 25E5.

[56] Clement Herne, a substantial copyholder in Cawston, went to law to prove that fines were 'certayne' rather than 'arbitrable'; by this means he acquired portions of the Cawston estate, lying adjacent to his own estate at Haveringland: NRS, 27218 361 X 3.

[57] NRS, 11260 26A3.

[58] NRS, 16391 32C4.

[59] NRS, 8898 21F6.

[60] In 1730 Lord Hobart commissioned a map showing 'The Principall seats of the Gentry' with Blickling prominently displayed alongside the estates of Sir Robert Walpole, Viscount Townshend and Lord Lovell: NRO, BL 72, Cab III.

which cost him over £11,000. In 1624 he acquired more land to ensure its maintenance, and noted, 'Money I cannot give heere, but I give him [John] the Manner of Olton'.[61] At Blickling commercial principles did not enter Sir Henry's calculations: the improvement of this ancient estate, with its royal connections, set the seal on his achievement, and for this he was prepared to stretch his finances to the limit.

III

The situation Sir John Wyndham encountered when he inherited Felbrigg was very different. As early as the fourteenth century, the Felbrigg demesne had been one of the largest and most compact in Norfolk, and clearly had no requirement for Sir Henry's heroic style of management.[62] In 1608 the demesne extended to 648 acres of which 556 acres were enclosed arable, pasture and meadow, with only 90½ remaining in scattered 'pieces'. Sir John entrusted the estate to his steward, John Blinham until his son Thomas took possession in 1616. Blinman's accounts show the wide range of activities possible on such a flexible holding – corn, wool, lambs, bullocks, dairying, pigs, not forgetting the surplus from the beehives and the dovecote – and the level of profits achieved by such enterprises. Bullock fattening, for example, yielded 20*s* per acre compared to 9*s* for corn. These figures help to explain landowners' eagerness to reorganize the structure of their holdings, which would facilitate the retention of more livestock and the adoption of more flexible systems.[63]

However, despite the favourable conditions at Felbrigg, Sir John instructed John Blinman, to carry out a thorough survey. He was particularly concerned to ascertain the nature of the copyhold rents on the off-lying properties in Banningham, Colby and Tuttington, and on the Dilham estate, which lies further east on grade 1 agricultural land in Broadland. The accounts and leases show that, once again, careful distinctions were made. They concentrated management on those holdings where rents were unfixed, while copyhold land with fixed rents – much of Banningham – they effectively wrote off. Attention focused on those parts of the estate, principally the demesne and its peripheries, where no legal impediment obstructed improvement. The aim was, once again, to create large blocks of land which could be enclosed, planted, stocked, dunged and systematically rotated. In the 1620s and 1630s, Thomas Windham drew up leases with the most specific directions as to ploughing and laying down of pasture, implementing a system of up and down husbandry tailor-made to the requirements of particular holdings. Penalties of up to £3 per acre were imposed for overploughing.[64] When it came to making purchases, Thomas Windham pursued the same strategy as the Hobarts, consolidating around the core, paying almost any price for small farms and pieces. Unlike the Hobarts, the Windhams did not ignore their east Norfolk properties, buying up family farms of 40–50 acres as they became available. They directed major investment to large properties with potential, including the Beckham estate, west of Felbrigg, and off-lying estates in Suffolk and Essex.

IV

The Hobarts and Windhams[65] shared a desire to improve their estates and a general

[61] NRS, 12891 27E6; NRO, MC, 3/43–48 466X, MC, 3/51–53 466X; NRS, 10191 25A1.

[62] B M S Campbell, 'Field systems in eastern Norfolk during the Middle Ages: a study with particular reference to the demographic and agrarian changes of the fourteenth century', unpublished Cambridge University PhD thesis, 1975.

[63] NRO, WKC, 5/419 X.

[64] Many examples survive, but the leases for the East Beckham estate, purchased by TW in 1628 are particularly noteworthy: NRO, WKC, 5/30-45.

[65] Thomas Windham spelt his name with an 'I' rather than a 'y'; the Felbrigg Windhams continued with this style, but other branches of the family persisted with the old spelling.

appreciation that the first step in this process was the reorganization of their holdings. On both estates this was accompanied by costly building and planting programmes, as they developed parks and gardens to provide the setting for the new and vastly improved houses. Both families embraced a vision of aesthetic as well as commercial improvement. Their interest in the design of new farms, with their neat closes, hedgerows and copses, shows that they made little distinction between amenity and commercial land; indeed, the profitable and efficient management of farmland was perceived as the essence of the ideology of improvement. Thomas Windham showed how improvement was accomplished by a resident landowner supervising proceedings on a well established estate and on a relatively modest scale, while Sir Henry showed what could be achieved with ingenuity, appropriate skill and ample capital. Their zeal and commitment to the idea of improvement at this time was extraordinary and demands explanation. Why did the 1600s witness this flowering of interest and determination to modernize and reform landed estates? And why did Sir Henry's approach become so much more explicit after 1608?

It is unrealistic to detach Sir Henry's policy on his own estates from his experience as a crown official. Both were so closely associated and fertilized each other. Sir Henry had been involved for some time with schemes for land reform and improvement in a wider world than Norfolk. As a senior law officer he served on the Exchequer commissions, set up by James I and Robert Cecil as part of their efforts to reorganize the crown lands. These commissions carried out surveys and tried to establish proper valuations with a view to realizing the commercial potential of the estates. They had to enquire into 'concealments', which meant discovering defective titles, decayed rents, lost revenues and encroachments, which often led to controversy. In 1612 Sir Henry criticized the methods used for searching out encroachments on commons and waste, which he clearly regarded as symptomatic of the increasing ruthlessness of the Exchequer's approach. However, it did not prevent his appointment as Chancellor to Charles, when Prince of Wales, which gave him overall responsibility for the estates of the Duchy of Cornwall. The Duchy of Cornwall, reconstituted by Cecil as a separate entity in 1603, quickly gained a reputation for innovative management. In 1605 John Norden was engaged to carry out a comprehensive survey of the estates, and continued as Surveyor-General to influence the work of the duchy until 1625. Sir Henry served as Chancellor from 1616 to his death in 1625.[66] Indeed, it is possible that he enjoyed an earlier connection with the duchy, having served as MP for St Ives, one of the duchy boroughs in 1588, and that his expertise in land management was long established and widely recognized.

The approach of the early Stuarts to the management of the crown lands differed from that of Elizabeth I who had hesitated for political reasons to exploit the commercial potential of her estates. Burghley and Mildmay had considered it a virtue to live off 'old rents' and 'at peace with their tenants'.[67] James I, Henry, Prince of Wales, and Charles, in contrast, employed an army of lawyers, surveyors, local agents and projectors to modernize their estates. The crown itself rarely had the funds to invest in improvement; its role was to strip away the feudal restrictions and legal impediments and then sell the land with the prospect of improvement. Effectively the crown licensed landowners to do the same thing. Moderate men, like Sir Henry Hobart could now argue that reform was

[66] Graham Haslam, 'Jacobean Phoenix: the Duchy of Cornwall in the principates of Henry Frederick and Charles' in R W Hoyle, ed, *The Estates of the English Crown 1558–1640*, 1992, pp 263–96.

[67] R W Hoyle, 'Reflections on the history of the crown lands', in Hoyle, *Estates of the Crown 1558–1640*, p 436.

in the national interest and follow the example of their monarch. Many landowners had been evicting tenants, enclosing sheepwalks and taking advantage of copyhold tenants since the fifteenth century, but such action did not win approval. Roger Wyndham was ostracized for his behaviour at Felbrigg from the 1570s to the 1590s. 'Litigious to the point of mania', he brought scores of actions against copyholders challenging their titles and their nature although he met with little success. By the 1600s the climate had become more sympathetic to landowners; they could proceed with their surveys, acquisitions and reorganization in a thoroughly professional way, and in the full knowledge that their actions were in accordance with the prevailing ethos of the court. Although, none of our landowners proceeded against their copyhold tenants, preferring to 'write them off', buy them out – as Sir John did at Blickling – or select property where copyholders did not predominate as more realistic options for their purchases. Nevertheless, the crown's action in reforming its estates so explicitly at this time gave political leadership to the full scale commercialization of land management. In a hierarchical society, which fostered an emulative culture, the impact of this leadership on the mindset of English landowners was crucial.[68]

The message of improvement, advanced by the court, was reinforced by the literature of the 1590s and 1600s. Increasingly, writers, poets and scholars espoused and justified the case for agrarian reform. Anthony Low in his book, *The Georgic Revolution*, argues that the translation of Virgil's work in 1589, dramatically changed attitudes to agriculture. Edmund Spenser, through his poetry, revised the aristocratic ideal of leisure and grace to one that valued effort, persistence and hard won achievement. Virtue was equated with productive labour: vice was economic parasitism. In the context of the war with Spain he presented the agricultural reformer as hero and patriot, the saviour of the imperial homeland. He stressed the civilizing power of agriculture in taming empty and uncultivated lands, and the need for right minded Protestants to lead the British people to a new and better society.[69] Spenser's descendants developed the genre of the 'country house poem' to express these sentiments. Ben Johnson's 'To Penshurst', the most famous example, was a blatant attack on the vulgarity of the court and their prodigy houses, and a celebration of the virtues of country life. King James added his support, not only by issuing proclamations ordering landowners to return to the countryside and cultivate their estates, but by writing his own poetry. The estate poem could be used to advance a courtly or anti-court such was the potency of the Georgical message.[70] The Hobarts were very much part of this world. Sir Henry's eldest son, John, married Phillippa Sidney, daughter of Robert, second earl of Leicester to whom Johnson dedicated his poem, and in the 1630s Sir John and his second wife, Frances, the daughter of John Egerton, first earl of Bridgwater, often visited the family of Oliver St John, the recipient of Mildmay Fane's 'Thorp Place: a Miracle'. In the 1640s, Sir John corresponded with Samuel Hartlib, and engaged Dr Thomas Browne, the eminent philos-

[68] Thirsk and Cooper, *Seventeenth Century Economic Documents*, pp 122–23: in 'Reason in Favour of Enclosure' at Slimbridge, Gloucestershire, 1639, John Smith of Nibley, writing to his son, refers to the enclosing of 'forests, chases, wilds and wastes' by James I and Charles I, 'to the benefit of themselves and the general good of the commonwealth, both in the breed of serviceable men and subjects and of answerable estates and abilities ...'

[69] A Low, *The Georgic Revolution*, 1985, pp 13–98. Low's references to Spenser include, The Faerie Queen (1596), Mother Hubberd's Tale (1591) and 'a view of the Present State of Ireland' (1596).

[70] James I, 'Counsell for Ladies and Gentlemen' in A Fowler's *The Country House Poem*, 1995, p 101. See also Leah Marcus, 'Politics and pastoral: writing the court on the countryside, in K Sharp and P Lake, eds, *Culture and Politics in Early Stuart England*, 1994, pp 139–59.

opher, as his physician.[71] With these connections it is hard to imagine that they were not receptive to the cultural fashions of the day. Indeed, a letter survives from Sir Henry's grandson, Sir John, third baronet, to his cousin in Norwich dated 1666, in which he compares Milton's Paradise Lost with Spenser's poetry and that of 'Ye Antient Poets'; a fair indication of the type of education he had enjoyed in the 1620s and 1630s.[72]

Andrew McRae provides more evidence of changing mental attitudes, which he argues can be found in the new language of improvement. The shift from 'feudal corporatism' to 'economic individualism' had to be accompanied by a belief that private ownership and self interested behaviour were not only for the public benefit, but a civic duty. What emerged was a new agrarian discourse based on individualism and a heightened respect for private property and the market. Words such as 'improvement', 'thrift' and 'profit' acquired a pecuniary meaning and gained respectability.[73] As we have seen Sir Henry used these words liberally to explain and justify his motives and actions. He, along with other landowners, would have believed that the ancient texts provided the authority and justification for a commercialized agriculture. The full expression of this philosophy appeared in Richard Weston's 'Legacie to His Sons' written in 1645 and published by Samuel Hartlib in 1652:

> Certainly that man is worthy of Praise and Honour who being possessed of a large and barren Demeasne ... by his labour and industry produces extraordinary fruit ... redounds not only to his own particular profit but also the Publique benefit. It is a thing much celebrated by Antiquity and though the noblest way to gather wealth [is for one] to employ his Wit and Money upon his Land, and by that means augment his estate.[74]

By this time agricultural improvement had become a national – and indeed religious – crusade. Hartlib enlisted God's help that 'the National Husbandry of this Commonwealth should be improved to be able to bear necessary and Publique Burden with more ease to ourselves and to benefit Human Society'. Walter Blith called for a new phase of reform in 'The English Improver Improved', with his 'six newer pieces of improvement' to take improvement a stage further. In his address to Cromwell, he advocated positive steps to eradicate 'intermixed lands', 'unlimited commons' and 'tenants rights' – this was the mood of the 1650s.[75] The importance of literature on economic activity was that they endorsed at a crucial time a new economic and social reality based on the market. Literature and agricultural manuals played a vital role easing the way towards a general acceptance of the need for agrarian reform, and shaping new mental attitudes to agriculture. With the establishment of the Georgical Committee of the Royal Society in 1664, the transformation in these attitudes was complete. The case for agrarian reform had been made between 1600 and 1650; by the 1660s it was government policy and enforced through law.

While literature offered inspiration and determined the cultural context, men like Sir Henry Hobart converted these ideas into practice on the ground offering an example for others to follow. The capacity of these men to effect change was immense. Occupying a prestigious position at court,

[71] Hartlib Papers: folio 7/27/25A-B dated 4 July 1643; folio 23/19A-B undated (copies in University of East Anglia Library). Dr Thomas Browne, related by marriage to the Hobarts, came to live in Norwich in 1637, and continued to serve and counsell the family until his death in 1686: G Keynes, *Letters of Dr Thomas Browne*, VI, 1930.

[72] J M Rosenheim, 'An early appreciation of Paradise Lost', *Modern Philogy*, 75, 1978, pp 280–82.

[73] A McRae, 'Husbandry manuals and the language of improvement', in Leslie and Raylor, *Culture and Cultivation*, pp 35–62. For a fuller discussion see A McRae, *God Speed the Plough: The Representation of Agrarian England 1500–1660*, 1996.

[74] Sir Richard Weston's 'Legacie to His Sons' printed in S Hartlib, *His Legacie, or An Enlargement of the Discourse of Husbandry Used in Brabant and Flanders*, 2nd ed, 1652, after 'To the Reader'.

[75] Walter Blith, *The English Improver Improved*, 1655, under 'The Epistle Dedicatory'.

a recognized expert on land reform, hugely wealthy and prominent in the locality, Sir Henry was uniquely placed to influence domestic strategies. This type of leadership was not uncommon. Joan Thirsk argues that 'clusters of gentry' led by major officeholders were principal agents of economic change. She cites the example of the Guildfords of Rolvenden who used their influence at court to acquire leases, lands and positions for themselves, their family and friends, and brought home the latest ideas which greatly benefited the Weald of Kent in the late fifteenth and early sixteenth century.[76] We can see that Sir Henry performed a similar role in east and south Norfolk in the early seventeenth century. Within his own extended family circle, he loaned money, arranged mortgages, granted tenancies, engaged cousins as his agents in London and generally kept a watching brief over their concerns. In a period when interest in land reform was growing Sir Henry's advice and assistance will have been invaluable. Beyond his family, the community contained within his estate stretched across thirty parishes from the north Norfolk coast to the Yarmouth area and the Waveney valley in the south. The estate through its tenants and agents provided the mechanism for the transfer of husbandry methods from one region to another; it also elevated those practices associated, by William Marshall, with yeomen to the level of estate policy. In this process, Sir Henry provided the essential links. With his modest origins in east Norfolk, he understood fully the working of the local economy and the land market, from a perspective not far removed from that of a yeoman, and he knew that it offered little to a man with skill and ambition. The opportunities for expansion and improvement lay in the low valued sandy areas further west, lying to the north and south of Norwich; less fertile, but still within easy reach of growing markets. Intensive methods used in the east could be adopted to raise fertility and yields. But improvement on the scale envisaged by Sir Henry could only be achieved – and maintained – with vast amounts of capital. In his strategy for improving heathland and sandy soils by lavish investment, Sir Henry anticipated the activities of those traditional heroes of Norfolk agriculture by over a hundred years. It is clear that even the predecessors of Coke, Townshend and Walpole in the late seventeenth century, now presented as the true innovators, built on past experience and well established principles.

Seen from this perspective the first half of the seventeenth century becomes an important turning point in estate management and agriculture. Fundamental organizational reforms, the example of the crown, the activities of landowners with vision and means and a changing mentality towards agriculture expedited the development of a fully commercialized agriculture. Progress was interrupted by the Civil War, but resumed in a period of falling prices, requiring landowners to increase the efficiency of their estates and experiment with new ideas. The hard lessons learned from this experience lead to the simplification and standardization of procedures, completing a century of revolution in estate management, if not in agriculture. Throughout the century the movement was underpinned by the intellectual and practical commitment of landowners to the idea of improvement. Without their contribution it is difficult to see how infertile lands would have been brought into regular cultivation, and estates kept in good heart during the prolonged recession, ready to face the demands of the second half of the eighteenth century. In Norfolk, Sir Henry Hobart emerges as the decisive figure in this story. With his expertise as a land reformer, his wide ranging role in the

[76] J Thirsk, 'The fashioning of the Tudor Stuart gentry' *Bulletin of John Rylands Library*, 73, 1991, pp 69–85.

locality and his enviable connections at court, which he clearly used to the advantage of his native county, he provided leadership at a crucial time. His outstanding example and links between the intensive farming systems of the east and the less fertile part of Norfolk further west indicated the way forward for landowners intent on improvement. Sir Henry Hobart can fairly claim to be, if not 'the hero of Norfolk Agriculture', certainly one of the pioneers before Townshend, Walpole and Coke.

APPENDIX

Sir Henry Hobart's purchases and acquisitions 1596–1622

Date	*Property*	*Vendor*	*Price* (£ s d)	*Rent: 1622* (£ s d)
1596	Intwood and Swardeston Rectory	Sir William Gresham	3105 0 0 (estimate)	410 9 0
1601	Keswick, Colby's Manor Swardeston	Miles Branthwaite	2250 0 0	
ND	East Carleton (Sold to T Richardson £1100)	Sir Edwin Rich	3683 0 0	44 10 9 (sold, 1623)
1597	Manor at Acle	Tho Clere: 99 year lease	1100 0 0	71 2 9
1622		Earl of Arundel: reversion	1000 0 0	
1597	Barton Rectory Manors at Neatishean, Hoveton and Ashmanaugh	Bishopric of Norwich: 99 year leases	33 18 4 pa	166 6 8
1602	Estate at Martham and Somerton	Royal grant from Sir Edward Clere's estate	177 6 8	290 0 0 320 0 0
1606	Cringleford Mill	Norwich Hospital: lease	10 0 8 pa	26 13 4
1606	Manors at Morley and Deopham	Roger Hobart	900 0 0	191 8 10
1607	Land at Hethersett	Edward Flowerdew	unclear	131 13 4
1608	Estate at Hevingham Marsham and Saxthorpe Ketteringham Rectory	Thomas Thetford	8000 0 0	300 16 3 213 8 7 sold £800
1608	The Langley estate	Richard Barney	4000 0 0+ annuities	380 1 0
1609	Chapelfield House	Norwich Corporation 41 year lease	free gift	39 5 0
1610	Martham Rectory	Dean and Chapter, Norwich Cathedral: 99 year lease	20 0 0 pa	98 0 0
1610	Cawston and Hevingham Park	Royal grant from Sir James Bullen's estate	1454 0 0	90 8 1 78 18 2
1612	Estate at Horsham St Faith's	Sir Charles Cornwallis	7000 0 0 (estimate)	438 1 5
1613	St Faith's Fair	Whitmore and Sawyer contractors for crown	—	—
1616	The Blickling estate Hanworth Rectory	Lady Agnes Clere	5500 0 0+ annuity	332 9 4
1616	Land at Wicklewood	William Greene	1800 0 0	60 0 0
1617	Land at Horsford	Lord Dacre	exchange	
1619–23	3 manors at Wymondham	Sir Henry Clere	10,000 0 0	492 6 2
1622	Methwold Parsonage	Earl of Arundel	1000 0 0	100 0 0
1622	Manor of Aylsham Lancaster	Royal grant: 23 year lease	free gift	40 0 0
1623	Weybourne Priory	Lady Agnes Clere	1500 0 0	104 13 1

	Weybourne Hoope	Sir George Hastings	1950 0 0	123 1 6
1624	Manor at Beeston St Lawrence	Miles Hobart	1100 0 0	76 15 9
1625	Manor at Oulton	Anthony Page	1200 0 0 (estimate)	60 10 0
1625	Manor at Banham	Earl of Arundel	2000 0 0 (estimate)	150 0 0
ND	Land in Sotterley	Gilbert family?	no details	60 0 0
Total of Norfolk estate			*54,219 0 0*	*4846 19 6*
Lincolnshire estate				
1621	Estate at Bloxham	Sir Gregory Woolmer	17,338 6 8	300 0 0
1622	Manors at Halstead and Stixwold	no details	no details	200 0 0
Total of Sir Henry Hobart's estate			*55,952 0 0*	*5350 0 0**
Additional mortgages				
1622	Lopham and Fersfield	Earl of Arundel	3000 0 0	300 0 0
	Erith and Crayford	Sir Francis Fane	1450 0 0	100 0 0

* In addition, £10,000 should be allowed for annuities, leases, and no details.

An Extra Dimension? Lincolnshire Farm Buildings as Historical Evidence*

By P S BARNWELL

Abstract
The last decade has seen a growth of interest in historic farm buildings, but they have usually been seen as individual structures, and in isolation from other aspects of rural history. On the basis of a systematic survey of entire farmsteads in part of Lincolnshire, it is here suggested that the physical remains may contribute to understanding agrarian conditions. It is tentatively concluded that, if studied on a regional basis, farmsteads may provide evidence for the local realities which lie behind national agricultural trends and, more especially, that systematic examination of farmsteads can provide valuable evidence for a way of life soon to be lost to living memory.

IN 1993 and 1994, the Royal Commission on the Historical Monuments of England recorded over 250 farmsteads in five contrasting parts of England: north Northumberland, central Cheshire, south Lincolnshire, south Berkshire and east Cornwall. The main findings of the survey has been published elsewhere,[1] but the present paper seeks to examine the potential of the physical remains as evidence for agrarian history (in its widest sense), taking south Lincolnshire as a case study. The conclusions drawn are tentative, but it is hoped that they may stimulate debate concerning the links between farm buildings and social and economic history.

The area selected for the survey consists of two almost contiguous blocks of parishes which lie east of Grantham and south of Sleaford (Figure 1). Within those areas all the extant buildings of almost all the farmsteads with pre-1930s structures were recorded; there are a few eighteenth-century buildings, but most are nineteenth-century. Only the farms with the most fragmentary or heavily converted remains were excluded, and, unlike many previous studies of agricultural buildings, the unit of record was the complete farmstead, rather than individual buildings.

I

The eastern survey area contains four parishes on the Black Sluice Fen: each parish contains a large amount of fenland, at the west end of which, where the land rises very slightly, is the main settlement; beyond, is a smaller area of land, in places referred to as the Common. Much of the area is strong clayland, described in 1851 as 'stiff clay, harsh and difficult to work'.[2] The western parishes are entirely on the higher land, which is predominantly heavy, cold clay.

Enclosure was achieved shortly after 1800 – and some of it much earlier – but realization of its full potential was hampered by inadequate drainage, particularly

* I should like to express my gratitude to my colleagues, A T Adams, Colum Giles and D A H Richmond, who read drafts of this paper and suggested a number of improvements, as also did Dr S Wade Martins. I am also grateful for the comments of the participants in a joint conference of the Historic Farm Buildings Group and the Society for Landscape Studies, held in April 1995, at which I delivered an earlier version of the material presented here. None of those who have been kind enough to share their thoughts would, however, necessarily agree with my views. Finally, I should like to thank A T Adams for producing the illustrations.

[1] The reports, drawings and photographs of the farmsteads surveyed by RCHME as part of its project are available to the public through the Public Services department of the National Monuments Record (RCHME's archive), at the National Monuments Record Centre, Kemble Drive, Swindon SN2 2GZ. The findings of the survey are published in P S Barnwell and Colum Giles, *English Farmsteads, 1750–1914*, Swindon, 1997.

[2] J A Clarke, 'On the farming of Lincolnshire', *JRASE*, XII, 1851, p 268.

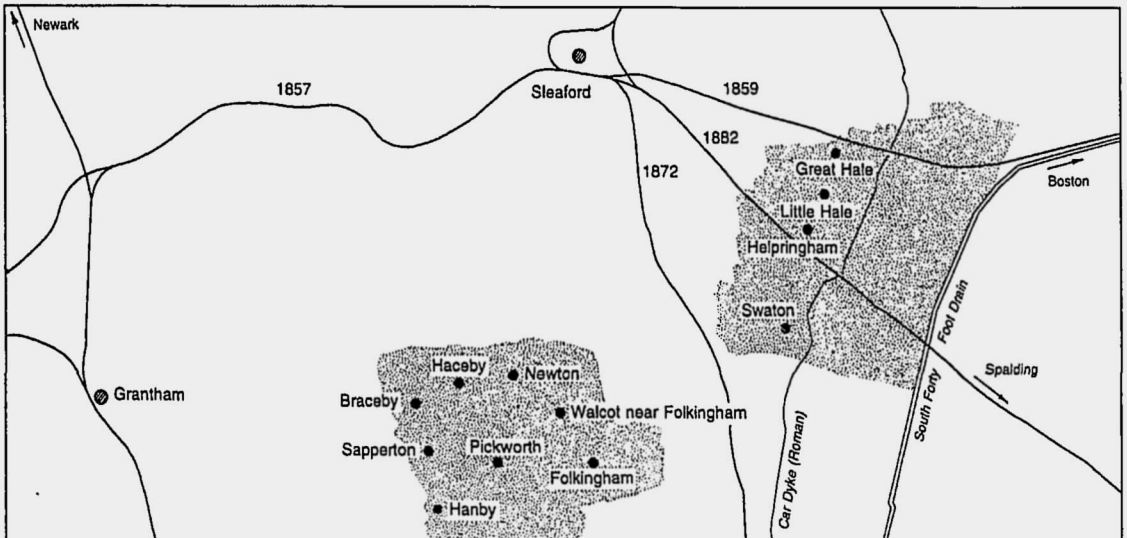


FIGURE 1
The survey areas, showing features discussed in the text.

in the fenland parishes.[3] Traditionally, such drainage as there had been was effected by the Roman Car Dyke, which runs along the western edge of the fen, near the villages. Although it took some of the downwash from the higher land, its effect on the fen proper was negligible. The first major improvement came in the late-eighteenth century, when the South Forty Foot drain (which marks the eastern boundary of the parishes) was created. Although this was a considerable advance, the improvement was not sustained, and there were annual floods between 1795 and 1801. The installation of windmills to lift water from the parish drains into the South Forty Foot made the land more secure, but it was not until the late 1840s, when the South Forty Foot was itself deepened, and a steam pumping engine installed, that the system reached its full effectiveness.[4] Although the western group of parishes was higher, drainage of a different kind – underdrainage – was required in order to render the highly water-retentive clays suitable for tillage: although commenced before 1851, it had not progressed very far by that date.[5] In neither of the survey areas, therefore, was the maximum area of arable land available until the middle of the nineteenth century.

A second factor which affected the econ-

[3] D B Grigg, *The Agricultural Revolution in South Lincolnshire*, 1966, p 33; A Young, *General View of the Agriculture of the County of Lincoln*, 1799, pp 54, 57.

[4] Clarke, 'Lincolnshire', pp 298–302, 306–7; J A Clarke, 'On the Great Level of the Fens, including the Fens of South Lincolnshire', *JRASE*, VIII, 1847, pp 122–3; Grigg, *Agricultural Revolution*, pp 28–9; J Thirsk, *English Peasant Farming: the agrarian history of Lincolnshire from Tudor to recent times*, 1957, p 210.

[5] Clarke, 'Lincolnshire', pp 379–80.

omic potential of the region was the development of new modes of transport. The Car Dyke had once been navigable, and one source records it as being so in Great Hale and Helpringham as late as 1855. The South Forty Foot was certainly navigable during the entire nineteenth century, and in 1851 it was reported that a steam packet was to commence operation along its full length. These facilities meant that the eastern block of parishes had relatively easy access to markets served by the river Witham – westward to Lincoln and eastward to Boston and the coast.[6]

The situation was greatly improved by the advent of railways during the second half of the nineteenth century (Figure 1). The railways were probably even more important for the western area, since they provided the first easy means by which produce could be moved out of the region. The significance of this development for Lincolnshire as a whole was clearly seen at the time, James Caird, writing in 1852, being explicit about the impact of railways on agricultural practice, and land agents in the 1860s considering that rents could be increased in proportion to proximity to railway stations.[7]

A further factor which could affect both profitability and the nature of agricultural exploitation was that of land ownership; this is also directly related to buildings, since estates did not always invest in them at the same time or in the same way. For this reason, one of the criteria for the selection of the survey area was that it should include parts of a number of estates. In the western group of parishes, Newton, Haceby and Sapperton were largely owned by the Welby estate, while Walcot, Folkingham and Lenton (apart from the hamlet of Hanby) were dominated by the holdings of the Heathcote family, and Pickworth by those of the duke of St Albans; smaller areas of land were held by a number of other families of varying status and importance. In the fenland area, the pattern of ownership was different: in Swaton all the land belonged to the Warners of Walsingham Abbey, but elsewhere the land was owned by a number of individuals and estates, including quite a large number of small freeholders. Partly, but not entirely, on account of the presence of the latter, the average farm size in the fen area was 140–160 acres, around half that in the clayland parishes to the west.[8]

II

These general background features are directly relevant to the nature of the agriculture which was practised in the survey area from the late-eighteenth to the early-twentieth century – the period from which the extant buildings survive. At the beginning of the nineteenth century, grassland predominated: one contemporary, speaking of a wider area of south Lincolnshire, appears to have seen this as being at least partly a response to poor transport links, since it was easier to move livestock than grain along bad roads to market. The main agricultural emphasis was on locally-bred sheep, and the finishing of cattle which were imported from as far afield as Scotland and Wales. In most of the western parishes, the largest arable crop in 1801 was wheat, but the acreages were generally small; the arable acreage was rather larger in the fenland area, with oats being the main crop except in Swaton.[9]

Between 1801 and 1866, the area under

[6] Kelly, *Post Office Directory of Lincolnshire*, 1855, pp 110, 116–17 states that the Car Dyke was navigable in Great Hale and Helpringham, though the 25″ OS maps of the 1880s show that it had ceased to be by the time of their production. On the South Forty Foot, see Clarke, 'Lincolnshire', note on p 303.

[7] J Caird, *English Agriculture in 1850–1851*, 1852, p 186; T W Beastall, *Agricultural Revolution in South Lincolnshire*, Lincoln, 1978, p 200.

[8] Since the tithe records are so patchy, the figures are based on the records of the 1910 National Property Valuation for the relevant Income-Tax Parishes, held in PRO, IR58; for the wider context, see Grigg, *Agricultural Revolution*, pp 91, 108.

[9] Grigg, *Agricultural Revolution*, pp 67–9, 105–6; Thirsk, *Peasant Farming*, pp 299–300; the 1801 Home Office Crop Returns for the relevant parishes are in PRO, HO 67/15.

cultivation expanded, as did the proportion of arable, particularly that used for wheat. The more striking change was in the fen-edge parishes, where wheat replaced oats as the dominant crop. In 1851, J A Clarke noted that quite a high proportion of the western area was still under grass (an impression strengthened by the tithe records), and that underdrainage had not progressed very far: in general, he thought the area to be backward and mean, particularly in relation to the feeding of cattle. Despite this, the main trend of the first three-quarters of the nineteenth century was the rise of mixed farming. It is difficult to date the change accurately but, in view of Clarke's comments, it may be that it took place at the same time as, or shortly after, underdraining. Before then, production and, therefore, income, could be maintained by means of expanding the area used for agriculture, whereas thereafter the only scope for improvement lay in the intensification of exploitation, by the adoption of more balanced mixed farming. It is more difficult to determine the timing of change in the fen parishes, since Clarke did not comment upon them, and tithe coverage is poor: the change may have begun earlier, but is likely to have been given fresh impetus by the improvements to drainage made in the 1840s[10] (see above).

The claylands generally were amongst the most severely affected by the late nineteenth-century depression. Analysis of a sample of the crop returns suggests that between the 1870s and 1900s the amount of arable remained roughly stable, but with some shift away from wheat, particularly in the fen. The major change was a large increase in the number of cattle, with sheep remaining a significant part of the regional economy. These trends may be confirmed by an increase in the number of farmers described as graziers, butchers and cattle dealers in successive editions of *White's Directory* – though this could partly be a result of the inclusion of slightly greater detail in the later editions.[11]

III

Turning to the extant buildings, the first question which may arise is their potential as evidence for the agricultural system which produced them. One of the problems with using buildings in this way concerns the difficulty of assigning accurate dates to them. By using a combination of the physical evidence, the tithe maps (where they exist) and the successive editions of the twenty-five inch Ordnance Survey plans (sometimes – though not in the particular areas discussed here – supplemented by estate and parish maps), it is usually possible to narrow the range to twenty-five years, and often to ten years: this means that any patterns which emerge will only be indicative of broad trends.

Despite the clear documentary evidence for the importance of both cattle and sheep in the late-eighteenth and early-nineteenth century, the earliest buildings to survive from both survey areas are almost entirely those associated with arable farming – barns, stables and granaries (often above the stables). Accommodation for cattle is hardly represented until the second quarter of the nineteenth century, and for sheep not at all. That this is not a result of the later reconstruction of livestock housing may be demonstrated by cartographic evidence. At Old Manor Farm, Braceby (Figure 2), for example, the tithe map shows that the only agricultural buildings on the site in 1839 were the dovecote (dated 1701), the barn, and the stable range:

[10] On the western area, see Grigg, *Agricultural Revolution*, pp 155–6; Thirsk, *Peasant Farming*, pp 299–300; Clarke, 'Lincolnshire', pp 268, 378–80. For the Kesteven Fens, see Thirsk, *Peasant Farming*, p 225. See also the 1801 Home Office Crop Returns for the relevant parishes (in PRO, HO 67/15), and the 1866 Parish Crop Returns (PRO, MAF 68/41, MAF 68/42).

[11] Thirsk, *Peasant Farming*, pp 320–1; the annual Parish Crop Returns from 1866 onwards (in PRO, MAF 68); W White, *History, Gazetteer and Directory of Lincolnshire*, Sheffield, editions of 1842, 1856, 1872.

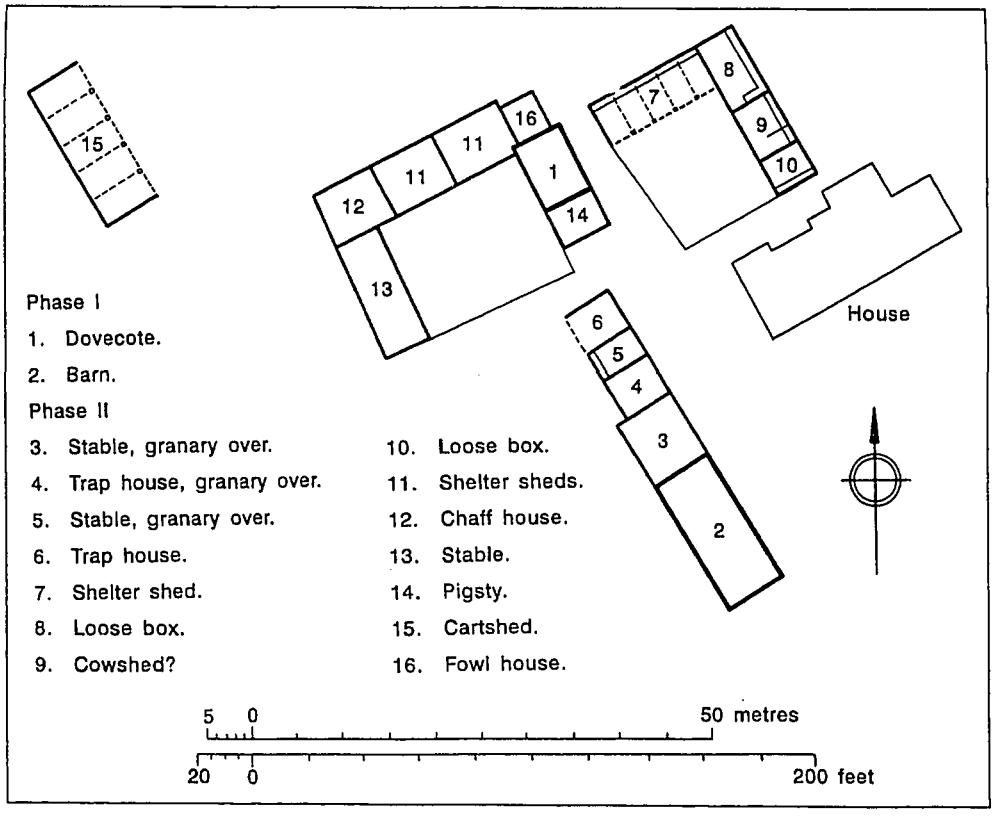


FIGURE 2
Old Manor Farm, Braceby (Braceby and Sapperton parish).

all the livestock accommodation is, therefore, a new creation of the period after 1840. This pattern is so common in the survey area that it is possible to suggest that it was also true of the majority of sites where the tithe map shows only one or two buildings which were later demolished in a complete reconstruction of the farmstead. It would seem that, in the early-nineteenth century the buildings reflect less the agricultural system, than the fact that before the mid-nineteenth century cattle were generally not housed – a point which may be confirmed by P Pusey's observation in 1843 that, in Lincolnshire as a whole, a lack of shelter for cattle was not uncommon.[12] In the same way, no special buildings were provided – either at this date or later – for sheep.

Although new barns and more particularly stables were built during and after the mid-nineteenth century, the bulk of new construction was related to the provision of accommodation for cattle and their fodder. The second and, more especially, the third quarter of the nineteenth century saw the provision of open-sided shelter sheds along the sides of formerly completely open cattle yards, and the construction of chaff and root houses, and a smaller number of spaces for other kinds of fodder preparation. These features are found on those farms (the majority) which developed piecemeal, and on those which were built in a single phase.

This is what would be expected given

[12] P Pusey, 'On the agricultural improvements of Lincolnshire', *JRASE*, IV, 1843, p 305.

the large amount of attention paid to the issue of cattle housing by nineteenth-century commentators. What the physical examples may do, though, is to indicate the time at which local estates and farmers began to seek to increase their profit by intensifying their activities rather than by expanding the area of arable. As noted earlier, the temporal distribution of documentary sources which illuminate this point is not even, resulting in some uncertainty in the chronology. While the buildings cannot provide the whole answer, they can go some way to filling the gap. For example, the fact that only nine shelter sheds appear to have been built in the second quarter of the nineteenth century, while three times that number may with some confidence be dated to the third quarter, may be significant. Given that cattle shelters and cow houses were being advocated as early as the late-eighteenth century, the provision of such buildings in the mid-nineteenth century is unlikely to be a reflection of advances in contemporary thinking about the best way to house the livestock.[13] It may, however, be related both to affordability – the 1850s and 1860s being, in general, a period of agricultural prosperity – and the perception of need in the region – which may be allied to the necessity to maintain and even increase income by means other than expansion.

IV

It is in the sphere of the local manifestations of national trends that the buildings may have their greatest importance, but in relation to a slightly different aspect. The development of thinking concerning the ways in which farmsteads of various kinds were most efficiently laid out is well known from the extensive nineteenth-century literature. The purpose of that literature, however, was to set out models – ideal building types and farmstead plans – and it almost always assumes that a completely new farmstead is being designed.

In reality, of course, relatively few farmsteads were completely reconstructed at one time, most receiving piecemeal additions and alterations. The pace at which this occurred varied considerably from one region – and, in some areas, from one estate – to another. In addition, the authors of the literature, although sometimes extensively travelled, often (perhaps inevitably) designed farms with particular regard to the regions with whose agriculture they were most familiar, and their solutions were not always readily applicable in all parts of the country. The only way in which to assess the impact on the majority of farmers of new ideas, of technological advance, and of changes in the wider economic context of farming (whether national or local) is often likely to be through the physical evidence, which can indicate the time at which the perception of need coincided with the financial means to implement change. Sometimes estate documentation, such as account books or farming diaries, or other written material, such as directories, may provide an insight into local conditions, but the number of such documents is relatively small.

One of the clearest examples of this in the survey area relates to the introduction of mechanization to the processing of grain crops. It is well recognized that the impact of any kind of mechanization on the way in which labour was deployed was immense, and its introduction marks an important point in social history. The timing and form of this development may therefore be of some significance. Neither of the survey areas was particularly advanced in this respect, and there is no positive evidence for the use of mechanical power before the 1850s.

[13] For cattle accommodation in the late-eighteenth century, see N Harvey, *A History of Farm Buildings in England and Wales*, 2nd edn, Newton Abbot, 1984, pp 75–6.

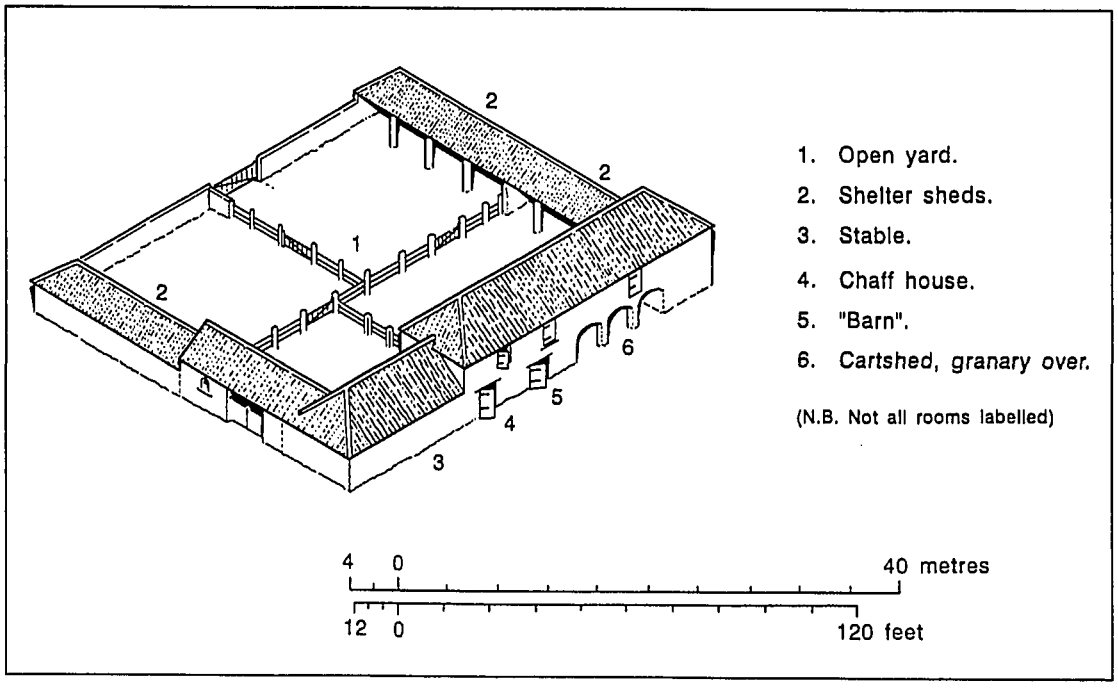


FIGURE 3
Unnamed farmstead on Helpringham Fen, Helpringham.

Until then, barns, however small, were built in traditional form, with large opposed threshing doorways. In the new farmsteads of the 1850s, however, barns are almost non-existent, being little more than compartments within larger buildings, as at an unnamed farm on Helpringham Fen, which is dated 1858 (Figure 3). Probably at much the same date an even smaller 'barn' – here more properly considered as a processing room – was built at Poplar Farm, Helpringham (Figure 4). These two farms, which appear to have been owned by different small landowners, are significant in that their design makes no provision for threshing – whether by hand or by machine – within the buildings: this strongly suggests that mobile steam power was envisaged. What the buildings indicate is not the date at which such engines became available (which the literature shows to have been in the 1840s), nor even the date at which they were introduced into the area, but

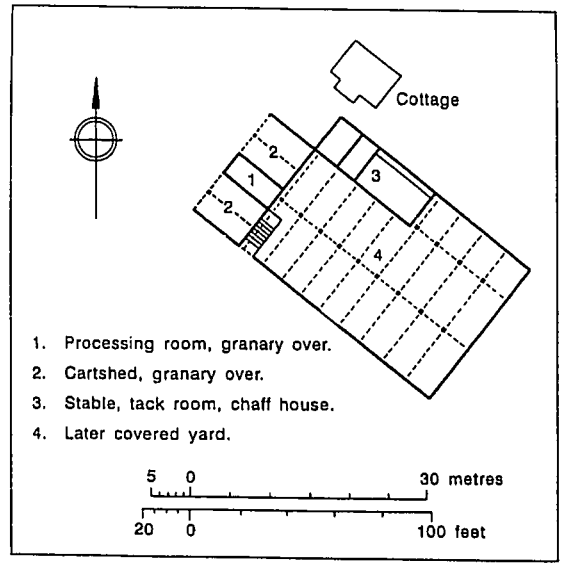


FIGURE 4
Poplar Farm, Helpringham Fen, Helpringham.

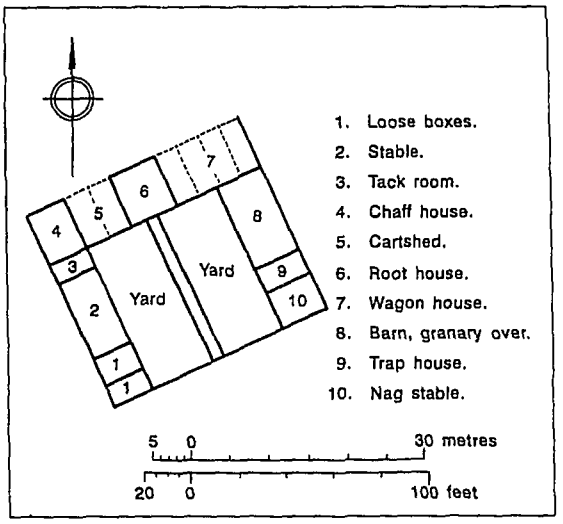


FIGURE 5
Hanby Lodge Farm, Hanby (Lenton, Keisby and Osgodby parish).

the date at which some landowners were so confident of its future that they were prepared to invest in buildings which could not operate in a traditional way.[14]

Not all landowners, of course, built new farmsteads or barns at the moment at which portable steam power became widely available, so that many farmers continued to use old buildings. In the eyes of contemporary commentators, traditional barns were inefficient, but the saving in labour costs cannot have been thought great enough to merit the investment required to replace structurally-sound traditional barns. What is even more interesting is that not all new farms built during the second half of the nineteenth century had new types of barn. At some, such as the planned farmstead of the earls of Dysart at Hanby Lodge Farm (Lenton, Keisby and Osgodby parish), the logic of portable power sources was taken further (Figure 5): as power was applied to the processes involved in preparing fodder for both cattle and horses, it was possible to place the chaff and root houses next to the stable and cattle yards, and to move the engine(s) between them. The barn on this farm was a fully-floored two-storey structure, the first floor of which was really a granary; the function of the ground floor is less certain, but it may have been a cake store, and also have housed hand or mechanically powered machines for breaking cake as well as grinding and bruising grain. On other farmsteads, built at the same time, however, the form of the barn (though not the way in which it was used) was almost entirely traditional. An example of this is the planned farmstead built by the marquis of Bristol at Grange Farm, Little Hale, probably with money borrowed from the General Land Drainage Company in 1880–1.[15] There, the barn communicates directly with the cattle yard, and may have housed some aspects of fodder preparation. However, although the building is a full two storeys in height, it was unfloored, suggesting that it was primarily used for the storage of straw – which many commentators thought could be done as effectively outside.

A similar point can be made with regard to the introduction of more sophisticated methods of keeping cattle during the second half of the nineteenth century. As indicated earlier, the most basic type of improved accommodation consisted of open-sided shelter sheds at the sides of the formerly open yards, and the majority of buildings of this kind were erected in the mid-nineteenth century. By then, however, other kinds of cattle housing system were being advocated, though they were not adopted on many farms for a considerable time. As early as the late-eighteenth century, stall feeding had been recommended, but no agreement was reached, and there was still considerable debate in the years around 1850 concerning

[14] For portable steam engines in general, see N Harvey, *The Industrial Archaeology of Farming in England and Wales*, 1980, pp 102–3.

[15] PRO, MAF 66/2.

the advantages of housing cattle in stalls or boxes.[16]

It has been suggested that, while stalls became common in south Lincolnshire as a whole, this was not the case in south-east Kesteven, in which the survey areas lie.[17] This is borne out by the physical evidence: boxes were indeed built during the second half of the nineteenth century, but on most farms they did not provide accommodation for a significant proportion of the livestock – they were probably used for young stock and pregnant or ill cows. Once again, the pattern was not uniform, even in the small number of parishes in the survey area. The Dysart's model farmstead at Hanby Lodge Farm (Figure 5) adopted the covered yard (see below) in preference to a large number of boxes, but two farms in Walcot, which were effectively completely redesigned in 1883–4, retained open yards but had a greater number of loose boxes; and a small number of sites included enclosed cow houses for a larger number of animals.[18]

Similar variation occurs in relation to the adoption of covered yards, which were advocated from the 1850s onwards as a means of enhancing the growth rate of cattle and of improving the quality of manure. Some commentators recognized that farmers in parts of eastern England were more hesitant about covered yards than those elsewhere; the main reason adduced for this was that the low rainfall in the area did not cause sufficient damage to the manure for investment in covered yards to have been worthwhile, or to offset the negative effects of a reduction of sunlight on the health of young cattle.[19]

The physical evidence not only confirms a general absence of covered yards before the 1880s, but quite clearly indicates that the debate had not been concluded. On the newly-planned farmstead of the early 1880s at Grange Farm, Little Hale (Figure 6), for example, cattle were kept in an open yard with a shelter shed along the north side. At the Dysart's planned farmstead at Hanby Lodge Farm (Figure 5), designed and built in a single phase dated 1883 by a datestone, fully covered yards were provided. On another, rather smaller, farmstead on the Dysart estate (Grange Farm, Hanby), known from a datestone to have been erected only two years after Hanby Lodge, the yards were open: if one estate did not have a clear policy on newly-planned farmsteads of the 1880s, any trends drawn from the literature are unlikely to reveal the considerable local variation in development.

What is perhaps even more interesting is that what may be the earliest covered yard (perhaps of the late 1860s or the 1870s) in the survey area – at Poplar Farm, Great Hale – was built on a farm which did not belong to one of the large estates. Taken in conjunction with the fact that the earliest farms built specifically for portable steam power also appear to have belonged to independent landowners, this may suggest – though very tentatively – that at least some men of this kind may have invested at different periods from some of the owners of large estates.

This point may be pursued further by reference to the dates at which completely new farmsteads were built, the only two which are reasonably certainly known to have been erected by freeholders were built in the 1850s – that is, at a time of prosperity.

[16] For the debates concerning box feeding, see, for example, Caird, *English Agriculture*, pp 385–6; J Ewart, 'On the construction of farm-buildings', *JRASE*, XI, 1850, pp 241–2; T Tancred, 'Essay on the construction of farm buildings', *JRASE*, XI, 1850, p 194; J B Denton, *The Farm Homesteads of England*, 2nd edn, 1865, p 168; More generally, see D B Grigg, *English Agriculture: An Historical Perspective*, 1989, p 71.

[17] Grigg, *Agricultural Revolution*, p 146.

[18] The loose boxes are at Manor Farm, and Red House Farm, Walcot (near Folkingham); details, including the date, are confirmed by architect's plans – Lincolnshire Archives Office, 3 Anc 5/82 and 5/83.

[19] For the advantages of covered yards, see W J Moscrop, 'Covered cattle yards', *JRASE*, 2nd ser I, 1865, pp 88–99, and Denton, *Farm Homesteads*, pp 129–30, where their absence in Lincolnshire attracts comment. For the fodder used in the area, see Caird, *English Agriculture*, p 180, and Clarke, 'Lincolnshire', p 380. The link between fodder and covered yards is discussed in Harvey, *Farm Buildings*, pp 131–2.

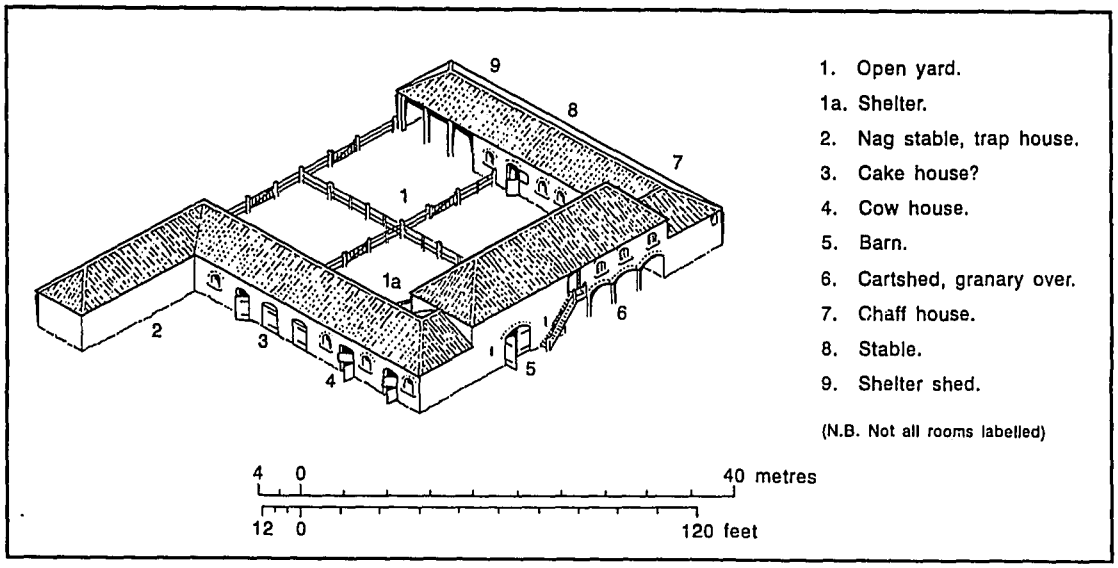


FIGURE 6
Grange Farm, Little Hale.

By contrast, the Ancaster, Bristol and Dysart estates all invested in new tenant farmsteads during the 1880s (and the Welby estate, in one instance, even later) – in other words, during the depression. Combined with what seems to have been significant investment by the Welby estate *c* 1800, and certainly was by the Warner estate in the 1820s, it may be possible to suggest that whereas small landowners may only have been able to afford major investment in periods of prosperity, larger estates (which may have had more diverse sources of income) may have been less concerned to invest when rents were high, but, by contrast, could afford to try to maintain incomes by investment in lean times. The volume of evidence from the survey area is not large enough to demonstrate this conclusively, but it may be a hypothesis worth testing in other parts of the country.

The new types of building adopted, and the speed at which they were introduced to an area are clearly subjects of considerable interest to historians of farm buildings, but is this material more widely relevant? The question cannot be fully answered here, since detailed work on economic history has not been undertaken. It may be suggested, though, that analysis of the timing of the actual introduction of new kinds of building on different kinds of farm provides information concerning the nature and type of investment in farmsteads, which may, when analysed on a regional scale, have implications for the local economy.[20] While a certain amount of evidence concerning investment can be obtained from documentary sources, they are usually estate-based, and the distribution of suitable sources is considerably more uneven than that of farmsteads with intelligible historic fabric. As was shown earlier, in the case of the farms in the Hanby area, the type of investment was not uniform even on a single estate; to draw regional conclusions from patchy estate documentation alone would be unwise – particularly in an area like the

[20] For a similar suggestion, see A D M Phillips, 'Landlord investment in farm buildings in the English Midlands in the mid-nineteenth century', in B A Holderness and M Turner, eds, *Land, Labour and Agriculture, 1700–1920: Essays for Gordon Mingay*, 1991, p 210.

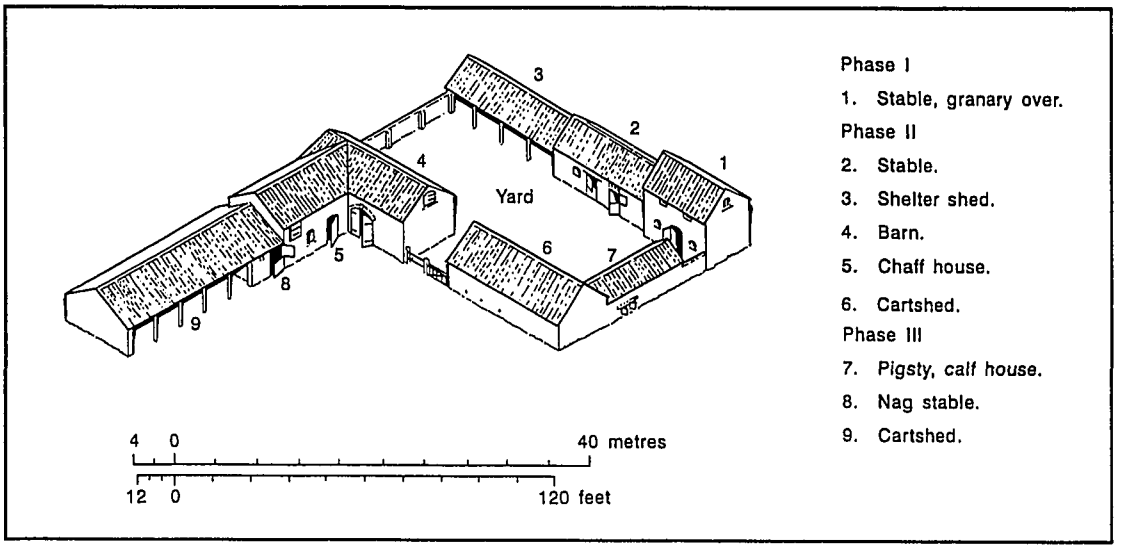


FIGURE 7
Village Farm (now Darwood House), Swaton.

fens, where there was a high proportion of undocumented freeholders.

V

A further aspect of rural life to which extant farm buildings have particular relevance is the way in which the farmsteads were worked. This can only be understood where a high proportion of the historic layout survives or can be reconstructed – often only in the final or penultimate historic phase (which typically, in the survey area, is the late-nineteenth century). One example will suffice – a small farmstead of several phases dating from the late-eighteenth to the early-twentieth century.

Village Farm in Swaton (Figure 7) is a small farmstead which has many features typical of the region. The first phase, which probably dates from the late-eighteenth or early-nineteenth century is a stable with granary above. It is not known whether other buildings of the same or earlier date were once associated with it, and nothing can be deduced of the way in which the farmstead as a whole was arranged at that date. The major phase of construction of the surviving buildings was the second quarter of the nineteenth century and, with its completion, it becomes possible to understand the farmstead quite fully. The stabling was expanded, a shelter shed was provided for cattle, a cartshed (or possible another shelter shed) was constructed, and a barn and chaff house were built. The layout was not convenient, since the grain was still stored above the earlier stable which lay at the opposite corner of the yard from the barn where it was processed (probably originally by hand): the threshed grain therefore had to be carried from the barn across the yard and up through the stable to the granary (there being no first-floor doorway to the granary). The chaff was transferred from the barn to the adjacent chaff house, but, once processed into fodder, also had to be taken across the yard (after first passing round or through the barn), to the horses in the stable and the cattle in the yards. The stables had to be cleaned out regularly, and the cattle yard mucked out less frequently, the manure being taken either to a midden or direct to the fields. In addition, the horses had to be groomed and otherwise cared for on a

daily basis, so that the ill-lit and poorly-ventilated stable was the workplace of a number of men for part of the day.

The third phase, probably of 1850–1870 (and certainly complete by 1887), saw the addition of a cart and implement shed, the conversion of the probable former cartshed (opposite the stable) to a shelter shed for cattle or horses, and the building of a combined pigsty and calf house, which may also have included provision for poultry. The last was very small, indicating that pigs and fowl were probably primarily kept for domestic purposes; it was situated near to the house, and hatches were provided in the outer wall of the building to reduce the distance which the fodder had to be carried from the back kitchen where it was prepared. The final stage in the evolution of the buildings (not on plan) consisted of the construction, in the early-twentieth century, of a shelter shed to the west of the barn, and the roofing over of the southern half of the yard (since removed). While this may have improved profitability and conditions for the animals, it did little if anything to ease the lot of the workers.

The amount of labour involved, even on a relatively small farm such as this, is easily forgotten in our automated age, as is its heavy nature. Even when threshing and other forms of processing were mechanized, the distribution of crops and fodder around the farmstead was still extremely labour-intensive, as analysis of the plan of the model farmstead at Hanby Lodge Farm (Figure 5) will demonstrate. What the buildings show is something of the ways in which farms were worked, and the conditions in which a large mass of the population lived: by doing this, they provide oral history with a corporeal dimension. This aspect of the interpretation of farmsteads is becoming increasingly important as the last of the farmers who remember traditional ways are coming to the end of their lives.

VI

Students of social and economic history, on the one hand, and of farm buildings, on the other, have tended to work in isolation. What has been suggested above is that the work of historians may be given an added dimension by taking physical evidence into account: the study of buildings enables some of the local realities behind more general trends to be perceived in ways in which that of documents rarely does. The importance of this may be debated, but the local variability of agricultural development means that understanding of the broader national picture is likely to be deepened by appreciation of the local conditions of which it is the sum. For the buildings to be useful in this way, however, they have to be analyzed on a regional basis, and in context. Most existing studies of farm buildings concentrate on individual types of structure rather than on farmsteads as a whole, and even regional studies tend to concentrate on the best surviving examples (of either complete farmsteads or single buildings). This is understandable, since buildings in a poor state of preservation, and those which were always of poor quality, do not in themselves make exciting objects of study. Viewed in context, however, they may provide important evidence for regional prosperity, and for the conditions in which the majority of the farming population worked.

The Agricultural Research Association, the Development Fund, and the Origins of the Rowett Research Institute

By DAVID SMITH

Abstract
The Aberdeen Agricultural Association, later renamed the Agricultural Research Association, was established in 1875. Relying upon donations from landowners, the Association set up an experimental station and laboratory, and for a few years ran an experimental farm. From the beginning, the organization challenged the views of agricultural scientists in England. Thomas Jamieson, the Association's chemist, demonstrated that insoluble phosphate was a more useful fertiliser than had been supposed, and later claimed to have shown that green plants could fix atmospheric nitrogen. This lead to a bruising conflict with the director of Rothamsted Experimental Station. In the 1910s the Association's work ceased after it failed to secure a grant from the newly-formed Development Commission. In contrast, a joint committee of the North of Scotland College of Agriculture and Aberdeen University obtained Development Commission funds for an animal nutrition laboratory, and in 1914 appointed John Boyd Orr, a Glasgow medical graduate, as research worker. Orr proved much more effective than Jamieson, both in building and using alliances with members of the agricultural science establishment in England, and in obtaining private funds, leading to the official opening of the Rowett Research Institute, of which Orr was designated director, in 1922.

THE Development Fund, established under the Development and Road Improvement Act, 1909, is one of the measures associated with David Lloyd George's 'People's Budget'. The act sought to encourage economic development by various means, including the support of agricultural education and research, and may be regarded as part of the Edwardian movement to promote 'public science' and enhance 'national efficiency'.[1] The fund was disbursed by the Treasury on the recommendations of eight commissioners and during 1910 two applications for grants were received from Aberdeen: one, from the Agricultural Research Association (ARA), was unsuccessful, contributing to the final demise of this organization; the other, from the Aberdeen and North of Scotland College of Agriculture, lead to the commencement of a modest programme of research before the war, and to the formation of the Rowett Research Institute in the early inter-war period. Directed by John Boyd Orr, by the 1930s the Rowett had become world-famous for research in both animal and human nutrition.

We will see that the final stages of the existence of the ARA were characterized by acrimonious controversy between the agricultural research establishment and the ARA's idiosyncratic director, Thomas Jamieson, over the latter's claims to have shown that green plants can fix atmospheric nitrogen. Nevertheless, the continuous activity of the ARA and its predecessor organization over the period 1875–1913 was, in itself, something of an achievement in Scotland. Russell's *History of Agricultural Science* gives the impression that, while England saw the development of research at Wye College, Cambridge University,

[1] B K Murray, *The People's Budget 1909/10: Lloyd George and Liberal Politics*, 1980; R Olby, 'Social imperialism and state support for agricultural research in Edwardian Britain', *Annals of Science*, 48, 1991, pp 509–26; F M Turner, 'Public science in Britain, 1880–1918', *ISIS*, 71, 1980, pp 589–608; G R Searle, *The Quest for National Efficiency: A Study of British Politics and Political Thought, 1899–1914*, 1971.

Long Ashton, Cockle Park and elsewhere during this period, the main role of Scotland was to produce researchers rather than research. Scotsmen, such as William Somerville, T H Middleton, D A Gilchrist and F H A Marshall, pursued their careers at the new institutions south of the border. In Scotland, even the Highland and Agricultural Society failed to sustain the experimental stations run by its chemist beyond the period 1877–89.[2] Paul Brassely regards 1890 as a turning point in the fortunes of agricultural research in Britain prior to the First World War, yet not one of the institutional developments that he mentions took place in Scotland.[3]

This paper is not intended to be a scientific assessment of the research done by the Agricultural Research Association and the Rowett Research Institute. It rather forms a local case study of the transformation in the organization of agricultural science during the early twentieth century, which accompanied the advent of large-scale public funding. The story brings into focus the challenges faced by those in Scotland who sought to extract a share of centrally-administered research funds, as well as the special circumstances which influenced developments in Aberdeen.

I

The initial aim of the Aberdeen Agricultural Association, established in August 1875, was to conduct experiments 'principally for the purpose of guiding and informing Farmers in regard to the application of Manures'.[4] The 'Acting Committee' of twelve consisted of landowners, farmers and factors, two manufacturers of manures and a seedsman, with the Marquis of Huntly as president. The formation of the Association was largely the initiative of James W Barclay, MP for Forfarshire since 1872.[5] Barclay was initially a Liberal and later a Unionist. Local self-made chemist Thomas Jamieson, lecturer in chemistry at the Mechanics Institution in Aberdeen, was employed to direct the Association's experiments. In about 1878 Jamieson became city analyst for Aberdeen[6] and from 1879 vigorously applied himself to the development of agricultural education at Aberdeen University as Fordyce Lecturer in agricultural science.[7]

The income of the Association was £350–£380 per annum, provided mostly by landowners. In 1880, for example, £360 was raised from 40 subscribers, but seven of them, including the inhabitants of Aboyne Castle, Cluny Castle, Gordon Castle, and Haddo House gave a total of £250. One large donation was given by W Cunliffe Brooks, Conservative MP for Cheshire East, who owned property in Aboyne. About one-fifth of the remaining subscribers were manure manufacturers and other agricultural suppliers.[8]

Four field stations were established on land belonging to the Association's supporters, for research on the use of phosphates for growing turnips. Such a project was ideally suited to the needs of the farmers of the North-East, which had, by this time, become famous for its fat cattle, and in order to produce sufficient winter feed, much effort was put into achieving good turnip crops. And according to I A Symon the dissemination of results of experiments such as these helped farmers

[2] E J Russell, *A History of Agricultural Science in Great Britain*, 1966, pp 183–252; J D G Davidson, *The Royal Highland and Agricultural Society of Scotland. A Short History 1784–1984*, Ingliston, 1984, pp 23–4.

[3] P Brassley, 'Agricultural research in Britain, 1850–1914: failure, success and development', *Annals of Science*, 52, 1995, pp 465–80.

[4] 'Extract from minute of the first meeting of the subscribers, August 1875', in *Proceedings of the Aberdeen Agricultural Association 1875–82*, Library of the School of Agriculture, Aberdeen [hereafter LSAA], xPer 630Abe [hereafter *Proceedings 1875–82*].

[5] 'Obituary', *The Times*, 2 March 1907, p 8e; 'In memorium' in T Jamieson, *Utilisation of Nitrogen in Air by Plants III*, Aberdeen, 1907–8 (*Aberdeen Research Association Report*, 1907–8), pp 3–5.

[6] According to *Mr Thomas Jamieson, Chev Fr, FIC, Sketch of his Life and Work*, Aberdeen, 1899, by 1899 Jamieson had held the post of public analyst for 21 years.

[7] J Hendrick, *The Progress of Agricultural Education in Scotland*, Aberdeen, 1912.

[8] 'List of subscribers for the fifth season', 1880, in *Proceedings 1875–82*.

in Scotland to reduce fertiliser costs during the economic difficulties of the late nineteenth century.[9]

At each of the field stations, 36 plots were laid out, each sufficient for 200 turnips,[10] and Jamieson soon concluded, from experiments with the mineral coprolite, finely ground, that 'soluble phosphate is not superior to insoluble phosphate to the extent that is supposed'.[11] It was claimed that farmers had been wasting money using 'superphosphate', manufactured by treating insoluble phosphates with sulphuric acid.[12] The method for the production of superphosphate had been patented in 1842 by J B Lawes, FRS, the owner and founder of Rothamsted Experimental Station. Lawes's wealth, and Rothamsted, owed much to the view that insoluble phosphates were unavailable to plants.

In 1880, Jamieson's claims were challenged by J C A Voelcker, FRS, consulting chemist to the Royal Agricultural Society. Contrary to previous statements Voelcker now accepted that insoluble phosphates had 'fertilising properties', but suggested 'treatment with acid is the most economical and best plan of utilising mineral phosphates'. Jamieson replied to Voelcker in *The Mark Lane Express*, resulting in an exchange with Bernard Dyer, Voelcker's former assistant. Dyer criticized the small scale of the Aberdeen experiments and pointed out the variability in Jamieson's results. But while Dyer thought Jamieson's experiments could not give 'definite or precise information' he also stated: 'That ground coprolites may increase the turnip crop, there is no doubt in my mind ...'. Jamieson included these articles, and his replies, and an exchange with Lawes in *North British Agriculturalist*, in his report to the Association for 1880, and concluded, 'the "battle of the phosphates" is now nearly over'.[13] In his report for the following year Jamieson triumphantly proclaimed victory and noted that the view that fossil phosphates should be regarded as assimilable by plants had been endorsed by an 'International Congress of Directors of Agricultural Experimental Stations' held in Paris.[14]

Ground insoluble phosphates were certainly more valuable as fertilisers than many other scientists had supposed before Jamieson's work but Russell explained Jamieson's success with ground coprolites as resulting from their application to acidic soils, in which conditions insoluble phosphates are more readily available to crops.[15] That insoluble phosphates are only useful in acidic soils is now the standard textbook view,[16] but some degree of uncertainty remains: one recent author who made a special study of insoluble phosphates argued that it is the concentration of calcium ions in the soil rather than acidity which is most important.[17]

II

After the first two seasons, Jamieson began to study other problems, such as the valuation of manures, the use of manures in the production of hay, grain and straw, and the cause of 'finger-and-toe disease' in turnips.[18] Jamieson's initial approach to 'finger and toe disease' was to question 200 farmers about their experiences of the problem and, following trails, he later concluded that the disease was associated with the use of superphosphate.[19] Jamieson regarded this as one of the most important findings of the Association and later

[9] I A Symon, *Scottish Farming Past and Present*, 1959, pp 196, 205.
[10] T Jamieson, 'Report', March 1877, in *Proceedings 1875–82*, p 6.
[11] T Jamieson, 'Report', 1877, in *ibid*, p 32.
[12] T Jamieson, 'Report', March 1879, in *ibid*, p 10.
[13] T Jamieson, 'Report', Season 1880, in *ibid*, pp 36–40, 44–8, 50.
[14] T Jamieson, 'Report', Season 1881, in *ibid*, pp 5–6.
[15] Russell, *Agricultural Science*, pp 185–6.
[16] George W Cooke, *Fertilizing for Maximum Yield*, 1982, p 145.
[17] G R Davies, *Comparison of Insoluble Phosphate Fertilisers*, Welsh Soils Discussion Group: Special Report No 1, 1984, p 67.
[18] T Jamieson, 'Report', March 1879, and 'Report', March 1882, in *Proceedings 1875–82*, pp 17–19, 11–16.
[19] T Jamieson, 'Report to the Committee', March 1879, and 'Report to the Committee', March 1882, in *ibid*, pp 17–19, 11–16.

remarked that this was 'one of the few findings of the Association that have been accepted without opposition'.[20] This is probably because Jamieson's views were in line with established knowledge and practice: he accepted the recent findings of the Russian scientist M Woronin that a fungus was the immediate cause of finger-and-toe, and liming had long been used to control the problem.[21] It was a small step to the conclusion that superphosphate, which was regarded as an acidic manure, aggravated the problem. Even Jamieson's rival, A D Hall, expressed this position.[22] Later writers, however, while accepting the association between finger-and-toe and acidity, no longer regard superphosphate as increasing soil acidity.[23]

Jamieson's report for 1881 advocated establishing an experimental station and farm, and in order to pursue this objective the Aberdeen Agricultural Association was transformed, in 1883, into the Agricultural Research Association (ARA), which, it was hoped, would be able to sustain the more ambitious programme more effectively.[24] A group of about fifteen, of similar social composition to those giving the largest sums to the original organization, provided donations of £50–500, and an additional 41 people provided subscriptions of up to £25.[25] Land was leased at Glasterberry, near Peterculter, close to Aberdeen, and used for a research station, laboratory, and an experimental arable farm.

Twelve lines of ten one-thousandth of an acre plots were laid out. Just as Jamieson had been criticized for using small plots for the original field experiments, he was now criticized for using even smaller experimental plots. He explained that such plots allowed for strict control of every condition such as drainage, subsoil, soil and cultivation, but this never satisfied the critics however.[26] Further experiments directed by Jamieson were carried out in England under the auspices Sussex Association for the Improvement of Agriculture, an organization which was formed at Jamieson's suggestion along the lines of the ARA, after he was contacted by a landowner from the county. The work in Sussex was directed by Jamieson for twelve years, until he gave it up because of health problems in the early 1890s.[27]

The ARA's farm was only worked for five years and was given up by 1889, after which investigations were confined to the research station and laboratory with some larger-scale trials on the farms of supporters. The failure of the farm was ascribed mainly to bad seasons and a sharp fall in prices. Nevertheless, based on his five-year's experience, Jamieson was soon boldly stating that the results of 'disregarding rotation and of severe cropping ... so long as there is suitable and sufficient manure given, need not be feared'.[28] The farm had also involved a social experiment. Farm servants often lodged with farmers but in Jamieson's view, 'Such close communication ... leads to insubordination ... and to peculiar notions of work and duties'.[29] He therefore converted a byre to provide rooms for four men and a housekeeper. And instead of being bound to work for six months, Jamieson's farm servants were engaged by the week.

[20] T Jamieson, *History of the Progress of Agricultural Science in Great Britain*, Edinburgh, 1911, pp 83–4.
[21] R N Campbell and A S Greathead, 'Control of clubroot of crucifiers by liming', in A W Englehard, ed, *Soilborne Plant Pathogens: Management of Diseases with Macro- and Microelements*, Minnesota, 1989, pp 90–101.
[22] A Daniel Hall, *Fertilisers and Manures*, 1912, p 151.
[23] A Beaumont, *Diseases of Farm Crops*, 1959, p 85; K Parsley, *Fertilisers and Manures* 1959, p 71.
[24] T Jamieson, 'Report', March 1882, in *Proceedings 1875–82*, p 33.
[25] T Jamieson, 'Circular', No 7, January 1888, in *Proceedings Agricultural Research Association 1885–90*, LSAA, xPer 630Agr [hereafter *Proceedings 1885–90*], pp 16–17.
[26] 'Organisation, object and work of the Aberdeenshire Agricultural Research Association', in *Proceedings of the Agricultural Research Association 1891–99*, LSAA, xPer 630 Agr [hereafter *Proceedings 1891–99*], p vi.
[27] *Annual Reports of the Proceedings of the Sussex Association for the Improvement of Agriculture, 1881–89*, LSAA, xPer 630Sus.
[28] T Jamieson, 'Report' Season 1890, in *Proceedings 1885–90*, p 9.
[29] *Ibid*, p 4.

Despite the initial generosity of landowners, the ARA was continuously short of funds, but from the late 1880s a share was received of the first sums made available by the government for agricultural research. In 1888 the Agricultural Department of the Privy Council gave the ARA £150.[30] Jamieson commented that the value of the grant lay not in the amount but in the recognition of the work of the ARA. In his view 'the slow and delicate separation of facts from mistaken ideas with which the untrained familiarity of generation has surrounded almost every Agricultural subject' implied the need for

> ... conditions attainable only by peaceful continuity, as well as a position independent of popularity, of incompetent criticism, and of personal or class interests. Perhaps only the State, looking to the subject from a national point of view, can provide such conditions.[31]

Jamieson was, however, to be bitterly disappointed. The Board of Agriculture, established in 1889, took over the Privy Council grant but reduced it to £100 from 1893–4, and withdrew it altogether in 1907. The income of the ARA was briefly enhanced in 1904 and 1905 by £200 per annum from the Aberdeen County Council, and from 1909 to 1912, £100 per annum was received from the Scotch Education Department via the Aberdeen and North of Scotland College of Agriculture. After this, all state funding ceased.

In 1891 the ARA was reorganized, an executive committee of thirteen was established, and new subscribers were recruited, including H M The Queen, increasing the total to about 80. But financial problems continued. After the reorganization the highest level of annual subscription was just over £190, in 1896. Subscription income steadily declined to about £63 in 1913, the last year for which a financial statement is available.[32]

III

The reports of the ARA, which give results of many varied investigations, are testimony to Jamieson's industry and enthusiasm, and suggest significant local influence. But a detailed account of the investigations, and an evaluation of the results and influence, cannot be attempted in this paper, where we must concentrate upon those investigations which were most important in connection with the development and fate of the organization.

Besides the work on insoluble phosphate and on finger-and-toe disease, there were seven other findings which Jamieson regarded as the ARA's most important contributions to agricultural science. These included the physical features of soil regulating fertility, the potential for improving yields by crossing different varieties of cereals and grasses, and the ability of rye grass to change its form. Jamieson also claimed that his microscopic studies showed the existence of an aperture in root hairs, and nitrogen-fixing hairs in plants.[33]

After the 'battle of the phosphates' it appears that the ARA's work did not arouse much interest among scientists elsewhere. Their attitude may be illustrated by the review in *Nature* of Jamieson's *Farmer's Handbook* (1905). Readers were told that Jamieson had been carrying on 'a series of agricultural experiments, or rather demonstrations' on a small scale, but in 'a very careful and neat fashion'. The book gathered the results and offered a 'brightly written résumé of the elementary facts connected with manures'. The reviewer continued:

[30] See 'Deputation to the Lord President of the Privy Council from the Sussex Association for the Improvement of Agriculture, 23 February, 1888', in *Annual Reports of the Proceedings of the Sussex Association for the Improvement of Agriculture, 1881–89*.

[31] 'Proceedings', Season 1889, in *Proceedings 1885–90*, pp 13–14.

[32] 'Organisation, object and work of the Aberdeenshire Agricultural Research Association; Committee Report', 1891, in *Proceedings 1891–99*, pp 4–8; *Proceeding of the Agricultural Research Association for 1913*, 1914.

[33] Jamieson, *Progress of Agricultural Science*, pp 74–5.

When ... we read that this or that fundamental fact has been discovered or proved ... much as though Mr Jamieson should tell us that he has discovered water is composed of eight parts of oxygen and one of hydrogen, we can only admire the innocence in which Mr Jamieson has managed to preserve his mind. Not for him the knowledge of good or evil that comes of reading other men's work ...[34]

Jamieson appears to have been considered more as a joke than a threat. However, his later work on nitrogen fixation was not just mocked, but was also attacked. Jamieson made a greater effort to publicize this work, which he regarded as his greatest achievement. Four reports of the ARA appeared between 1905 and 1911, entitled *Utilisation of Nitrogen in Air by Plants.*

In the pre-amble to the first report, Jamieson rejected classic experiments by Lawes and by J B Boussingault, because the plants employed had been small and weak. He also rejected the view that root nodules of leguminous plants contained nitrogen-fixing bacteria, counterpoising the views of botanists who, he claimed, regarded the nodules as the product of fungal attack. Jamieson argued it was difficult to understand the productivity of prairies, and of pine forests on shallow soil, unless plants could fix nitrogen, and set about identifying the part of plants responsible for the process.

Jamieson claimed that staining techniques showed that protein formed at the ends of leaf hairs and travelled along the hair to the plant's vascular system. He found such 'albumen generators' on some part of all plants at some stage of development. He claimed that all green plants could fix nitrogen, but accepted that cereals needed nitrogen from the soil for maximum production.[35]

Under the heading 'A mare's nest' (an 'illusory discovery') the report was reviewed in *Nature* by 'A D H', who commented that had Jamieson an 'elementary acquaintance with the manipulation of bacteria' he could easily demonstrate their existence in root nodules. He ridiculed the list of authorities who supposedly rejected the bacteria theory as 'equally amazing as regard either its inclusions, its omissions, or its spellings of proper names', and described the conclusions of the microscope studies as 'even more amazing'. The reviewer remarked that Jamieson's 'discovery'

... would be amusing were it not so dangerous and discreditable to the cause of scientific research. Mr Jamieson has a following ... there is a body of solid farmers and landowners who sit under him and take advice on practical matters which they suppose to represent the last word on science. Accustomed to the amenisites of theological disputation, these men like their agricultural science in the same style; not the dry light of reason, but a strenuous assertion of a monopoly of the truth, rhetoric and passion, and a vigorous denunciation of the other side-all these they get from Mr Jamieson. But it is a windy diet, and sooner or later disagrees with the subject, whereupon science gets the blame.[36]

A D H quoted trials by Lawes and J B Gilbert, Lawes's successor as director of Rothamsted, but Jamieson replied with an alternative interpretation of this work and remarked that 'to show that plants fix free nitrogen is to undermine the work with which Rothamsted is chiefly identified'. He suggested that readers could assess the critique if they were aware that A D H was A D Hall, director of Rothamsted since 1902.[37] Hall replied

Mr Jamieson appears to suggest that Lawes and Gilbert ran the Rothamsted experiments as a sort of conspiracy to disguise the truth in favour of a prepossession of their own, and that after their death the body of scientific men who constitute the committee of management engaged the present director to continue the traditional fraud; this is a 'theory' which, like others of Mr Jamieson's, must

[34] 'Recent publications in agricultural science', *Nature*, 72, 1905, pp 324–5.
[35] T Jamieson, *Utilisation of Nitrogen in Air by Plants*, Aberdeen, 1905 (*Aberdeen Research Association Report*, 1905).
[36] A D H, 'A mare's nest', *Nature*, 73, 1906, pp 531–2.
[37] T Jamieson, 'Utilisation of nitrogen in air by plants', *Nature*, 73, 1906, pp 607–8.

require a robust confidence in the credulity of his disciples.[38]

In August 1906 Jamieson read a paper on the utilization of nitrogen to the British Association, but claimed that the chair cut him off before he had time to present the 'weight evidence' called for by his critics. He then faced a 'little army of carpers', to whom he did not have time to reply.[39]

'Weight evidence' was presented in Jamieson's second report on the utilization of nitrogen. Details were given of experiments in which plants gained nitrogen that, according to Jamieson, could only have come from the air. Jamieson claimed his findings had been well-received in America, Ireland, and on the continent. His first report had been republished in *Annales de la Science Agronomique*. Jamieson's third report included additional results of his own, and further evidence of the seriousness with which his discovery was treated abroad.[40]

The third report also included an account of Jamieson's attempts to obtain redress from the Board of Agriculture following the withdrawal of the Board's grant. When pressed, the Board had specified disapproval of the ARA's opinions on bacteria in nitrogen fixation. Regarding such a judgement as outwith the Board's competence, Jamieson appealed to every member of the Cabinet. The Prime Minister stated he was unable to interfere in a 'purely departmental matter'. Subsequently, Jamieson travelled to London to meet the President of the Board of Agriculture, Lord Carrington, who apparently withdrew the disapproval, but explained that the grant had been discontinued on the recommendation of an unidentified 'expert'. Since Carrington seemed unable to specify the reason for the withdrawal of the grant more precisely, Jamieson claimed that this outcome 'may be held to meet all such unworthy attacks'.[41] This conclusion proved premature. Although Jamieson's fourth report on nitrogen fixation was able to cite corroboration of his weight data by Professors Pollacci and Mameli of Italy,[42] the 'unworthy attacks' continued.

IV

Jamieson's scientific positions not only led to his estrangement from the developing agricultural science establishment in England, but he also became estranged from the local centre of agricultural education despite his pioneering efforts in this field. From the 1880s, Jamieson fought a series of battles over the methods and orientation of agricultural education. His own policy was to avoid lecturing on agricultural practice to farmers, but to teach them the principles of chemistry, and the results of experiments.[43] He opposed the introduction of one-off practical 'extension' lectures, and a degree course in agriculture. These strongly held and expressed views led to Jamieson's loss of the Fordyce Lectureship when the Aberdeen University agricultural department was re-organized in the mid-1890s. Apparently, Jamieson's fate was due to pressure from the county councils and Board of Agriculture which funded the re-organization.[44] Nevertheless, the Aberdeen County Council provided the ARA with a grant in 1903 which was used to subsidize the *Farmer's Handbook*.[45]

In 1904, with further finance from the

[38] A D H, 'Comment on utilisation of nitrogen in air by plants', *Nature*, 73, 1906, p 608.

[39] T Jamieson, *Utilisation of Nitrogen in Air by Plants II*, Aberdeen, 1906 (*Aberdeen Research Association Report*, 1906), p 34.

[40] Jamieson, *Utilisation of Nitrogen in Air by Plants III*.

[41] *Ibid*, p 56.

[42] T Jamieson, *Utilisation of Nitrogen in Air by Plants IV*, Aberdeen, 1911 (*Agricultural Research Association Report*, 1911), pp 32–4.

[43] See T Jamieson, *The Relation of Chemistry to Agriculture. A Lecture*, Aberdeen, 1878; *idem*, *Present Position of Agricultural Education in Scotland*, Aberdeen, 1891.

[44] *Mr Thomas Jamieson*; Jamieson, *Utilisation of Nitrogen in Air by Plants III*.

[45] J W Barclay, 'Report by the Committee, December 1904', in *Proceedings of the Agricultural Research Association 1900–04*, LSAA, xPer 630 Agr, p 12.

county councils, the University department was transformed into the Aberdeen and North of Scotland College of Agriculture. Aberdeen County Council then withdrew its grant to the ARA, but suggested that the ARA might affiliate with the College.[46] In March 1906, however, after a discussion of a memorandum by Jamieson which emphasized that any arrangement would have to guarantee his scientific independence, the College governors declined to share their funds with an 'institution over which they have no control'.[47]

Further contact between the College and the ARA was initiated in 1908. After the Board of Agriculture grant was withdrawn, Jamieson approached the Scotch Education Department as a possible alternative source of funding.[48] The Department suggested that he ask the College for a grant, and Jamieson enjoyed sufficient support for an application to succeed: the governors voted by fifteen to seven to give the ARA £100 for 1909, from the funds that they received from the Scotch Education Department. Despite opposition, this was renewed each year from 1910 to 1912.[49]

When the Board of Agriculture withdrew its grant, Jamieson responded with persistent lobbying, and the matter was raised by his allies in the House of Lords in May 1909. But Carrington was unmoved, and quoted four authorities who rejected Jamieson's claims about nitrogen: the professors of botany at Edinburgh and Aberdeen, T H Middleton, former professor of agriculture at Cambridge, who had recently joined the staff of the Board, and A D Hall.[50]

By this time, the establishment of the Development Fund had been mooted, and the ARA applied for £500 from this source in July 1910.[51] Jamieson was pessimistic when the application was referred to the Board of Agriculture,[52] and he was right to be wary. The Board advised the Development Commissioners that the reason for the withdrawal of the Board's grant, 'that the conclusions arrived at by Mr Jamieson as the result of his researches into the absorption of atmospheric nitrogen ... were ... regarded as erroneous by all scientific authorities ... applies equally to the present application'.[53] The commissioners hardly needed informing of this because they included Hall, who played a major role in the formulation of Development Commission policy.[54]

Jamieson was told in August 1911 that the commissioners were not prepared to make any grant to the ARA except in connection with a scheme submitted by the College.[55] However, such collaboration was never proposed by the ARA. At the end of 1911 the ARA's application to the College for its usual £100 grant involved a particularly bruising conflict. When objections were raised by Sir John Fleming, a governor appointed by the University,[56] Jamieson's attacks upon the College, Board of Agriculture, and Development Commission became steadily more vociferous. One memorandum to the governors headed 'Slander and Vindication of the Nitrogen Discovery' reprinted five

[46] J W Barclay, 'Report by the Committee, December 1905', in *Agricultural Research Association Report*, 1905.

[47] North of Scotland College of Agriculture Minutes and Proceedings, LSAA, xPer 630Nor [hereafter NSCA Minutes], Meeting, 16 March 1906.

[48] Scottish Record Office [hereafter SRO], AF 43/13 T Jamieson to J Struthers, 27 Feb, 11, 17 April, 6 July 1908; Agricultural Research Association [hereafter ARA] to Board of Agriculture [hereafter BA], 24 March 1908; T Jamieson, 'Confirmation of nitrogen fixation by plants. Attempt to stifle the discovery. Dishonourable conduct by a government board', 5 July 1908.

[49] SRO, AF43/13, J Struthers to T Jamieson, 15 April 1908; NSCA Minutes, Meetings, 30 Oct 1908, 19 Nov 1909, 25 Nov 1910, 21 March 1912. See also SRO, AF 43/22, Correspondence between the Scotch Education Department [hereafter SED], Jamieson and the College.

[50] *Parliamentary Debates, Lords*, 1909, I, col 1122–33.

[51] PRO, D2/1, ARA to Treasury, 27 July 1910.

[52] SRO, AF43/22, Treasury to ARA, 9 Aug 1910, T Jamieson to Lord Pentland, 10 Aug 1910, and manuscript notes summarizing the correspondence concerning the ARA application.

[53] PRO, D2/1, BA to Development Commission [hereafter DC], 29 May 1911.

[54] H E Dale, *A D Hall, Pioneer of Scientific Agriculture*, 1956.

[55] SRO, AF43/22, Treasury to T Jamieson, 11 Aug 1911.

[56] SRO, AF43/22, T Jamieson to the governors of the North of Scotland College of Agriculture [hereafter NSCA], 7 Dec 1911, 31 Dec 1911; NSCA Minutes, Meeting, 18 Jan 1912.

unanswered letters from Jamieson to Fleming.[57] In another memorandum prepared for MPs Jamieson complained that when his discovery had been announced 'no less than three Lecturers of the College – simultaneously as if under order – publicly denounced or disparaged it'.[58]

While the application for 1912 was reluctantly accepted, the ARA withdrew from further attempts to obtain government funding. In his final report on the utilization of nitrogen, Jamieson blamed the ARA's difficulties on

> ... two, or three, men in the south of England whose dislike has been aroused by our work, who are in constant touch with one another, and in influential touch with the central authorities ... 'aided and abetted' by two or three local men.[59]

The Development Commission, he asserted, had relegated the distribution of money for agricultural research to 'bodies of men who, in some cases, have no real sympathy with or knowledge of research, and who are too often guided by other feelings'. However, he asserted

> It is not known that any material discovery has ever been made on this *collective plan*, or as a result of work to order; it has probably always been the result of individual work and devotion.[60]

After claiming that Rothamsted's results were 'useless and misleading' and the ARA's 'relative position as to results is highest in the kingdom', he asked:

> Is it for an Association, with such a record, to put itself in a position of pleading with public bodies ... or, recognising them to be undiscerning and biased, to expose and censure them; and, being unable to compel, to leave them to their devices, and to silent contempt?[61]

Jamieson concluded that it was time for the ARA to 'preserve its dignity' by 'holding aloof' from the 'money patronage' of public bodies.

Jamieson's report for 1913 was the last published. He included an account of experiments on the sterilization of soil, which he intended continuing, but how much longer the ARA remained functional is unclear. In *Nature's Serious Tale*, published in 1926, two years after his death, Jamieson explained that the war 'put the voluntary support of the research work into abeyance'. The book was an attempt to report his final findings. Among other conclusions that he had arrived at were the views that 'The basis of vital action is not protoplasm but miniature embryos in albumen', and '"Sex" action is due to different states of oxidation'. He had returned to a religious faith, and was comforted by the thought that his ousting from the University, providing the leisure which made the discovery of nitrogen fixation possible, had been 'arranged by higher powers'.[62]

Jamieson was also comforted by a recent article in the *Proceedings of the Royal Society* which explicitly supported him. Benjamin Moore, FRS, of the National Institute of Medical Research, referred to the 'utmost care' that Jamieson had taken with his experiments and confessed that a 'careful perusal of the wealth of facts' published by Jamieson had convinced him 'in favour of the assimilation of nitrogen from the air by the green cell'.[63] In the long term, of course, there was no shift in consensus in favour of Jamieson's theories.

V

While the failure of its application to the Development Commission contributed to the demise of the ARA, an application by its local rival succeeded and led eventually

[57] SRO, AF43/22, T Jamieson to the governors of NSCA, 31 Dec 1911.
[58] SRO, AF43/22, T Jamieson, Document prepared for leading Members of Parliament, nd.
[59] Jamieson, *Utilisation of Nitrogen in Air by Plants IV*, p 53.
[60] *Ibid*, p 62.
[61] *Ibid*, p 59.
[62] T Jamieson, *Nature's Serious Tale*, Aberdeen, 1926, p xvi.
[63] B Moore and T Arthur Webster, 'Studies of photo-synthesis in fresh-water Algae', *Proceedings of the Royal Society*, Series B, 91, 1920 pp 201–15.

to the establishment of the Rowett Research Institute. But even for the College, extracting funds from the Commission was not straightforward.

The governors of the Aberdeen College, along with those of the other Scottish agricultural colleges, first applied to the Commission in October 1910, for grants to purchase farms for instruction and research.[64] The Aberdeen application included £5000 to cover buildings and equipment for experimental work 'particularly in the Feeding and Breeding of Farm stock'.[65] The applications were rejected on the grounds that the provision of farms was not covered by the act,[66] but this policy was soon revised: by March 1911 it was agreed that farms could be funded as long as half the costs were raised locally.[67] This led to negotiations to purchase Craibstone farm, north-west of Aberdeen, which were not completed until 1914.

The pursuit of Development Fund grants for *research* was taken over by the Scotch Education Department. The Highland and Agricultural Society convened a meeting of representatives of the agricultural and veterinary colleges, which supported a proposal of the Department to appoint an expert committee to advise on Scotland's agricultural research requirements.[68] In April 1911 the Development Commissioners were informed of a 'strong feeling ... that a grant ... for the purpose of aiding research in relation to Scotland should be allocated to Scotland separately'.[69] The commissioners deprecated the proposal to appoint a Scottish advisory committee, and commented that if the Scotch Education Department was concerned with 'scientific research proper (as distinct from the application of known facts to local conditions)' then any scheme should take account of what was being done elsewhere in the UK.[70]

In early 1911 the commissioners had appointed their own advisory committee charged with producing a programme of agricultural research. Hall was the key member of this committee, which entered into negotiations with the Board of Agriculture, whose own advisory committee, chaired by Middleton, had already proposed a scheme.[71] The Board favoured concentrating initially upon providing qualified research workers, and developing strong teaching institutions at which research would be expected. This focus on teaching institutions tended to exclude Scotland from the Board's plans, as the Scotch Education Department had taken over the administration of funds for agricultural education in Scotland in 1896. In contrast to the Board's emphasis on educational institutions, the Commission favoured a more direct route to the development of agricultural research and envisaged the creation of a series of new institutes. A compromise was agreed at a meeting between Middleton and Hall in June 1911. The agreed plan retained the new institutes, but in most cases they were closely associated with teaching institutions.[72] In the proposals regarding the remit and location of the institutes there was only one mention of Scotland: animal nutrition would be covered partly by Cambridge University 'leaving one other institute to be settled later, possibly in Scotland'.[73] Cambridge was confirmed as the site for an Animal Nutrition Institute in August 1911: £14,500 was granted, the

[64] PRO, D2/3, 'Application by the governors of the Aberdeen and North of Scotland College of Agriculture to the Development Fund', 28 Oct 1910.
[65] *Ibid.*
[66] PRO, D2/3, DC to SED, 12 Jan 1911.
[67] NSCA Minutes, DC to SED, 2 March 1911, SED to NSCA, 10 March 1911, in Meeting, 16 March 1911.
[68] NSCA Minutes, Meeting, 16 March 1911.
[69] PRO, D2/3, SED to DC, 24 April 1911.
[70] PRO, D2/3, DC to SED, 5 May 1911.
[71] PRO, MAF 33/63, A13129/1910.
[72] PRO, MAF 33/72/A21599/1914; T H Middleton, Memorandum, 30 Dec 1914; see also T DeJager, 'Pure science and practical interests: the origins of the Agricultural Research Council, 1930–1937', *Minerva*, 31, 1993, p 133, and Olby, 'Social imperialism', p 152.
[73] PRO, D2/1, Memorandum on a meeting, 6 June 1911.

commissioners waiving the standard condition that one-half of the capital was to be raised from local sources, and building began in early 1913. The co-directors of the Cambridge Institute were professor of agriculture T B Wood and biochemist F G Hopkins, but Hopkins lost interest in the venture after he was appointed to a chair of biochemistry.[74]

The Scotch Education Department was disappointed, arguing 'a useful if not indispensable preliminary ... would have been a careful enquiry as to the subjects ... of special value to the agricultural community in Scotland' but commented that the north-east would be suitable for animal nutrition investigations.[75] However, responsibility for agricultural research was about to be transferred to a Board of Agriculture for Scotland, created under the Small Landholders (Scotland) Act (1911). The Development Commissioners then argued that the purpose of the new Agriculture (Scotland) Fund, worth £200,000, was similar to that of the Development Fund, and should be exhausted before Scottish applications could be considered.[76] When it was explained that the Scottish fund was for land resettlement schemes,[77] the commissioners suggested that payments from the Development Fund for Scottish purposes might be considered loans, to be re-paid if the land resettlement programme proved less expensive than anticipated.[78] This arrangement was not finally agreed until February 1912.[79] Since, after Hall, one of the most influential participants in these discussion was Scottish, T H Middleton, whose initial training was at Edinburgh University, it is perhaps surprising that there was not a more sympathetic attitude towards Scottish needs. Presumably, having left Scotland after graduating BSc (Agriculture) in 1889, Middleton's sympathies were now primarily with English institutions such as Cambridge University, where he had served as professor of agriculture, 1902–1906, and the Board of Agriculture.[80]

During 1911 and 1912 the Aberdeen governors were engaged in the purchase of Craibstone farm, the formulation of a constitution, adopted in March 1912 (after which 'Aberdeen' was dropped from the name of the College), and the creation of a chair of agriculture, to which James Hendrick was appointed in May.[81] In August Hendrick told the governors that it was necessary to 'at once push forward' with the research application. He set out a modest scheme involving capital expenditure of £3210 and recurrent expenditure of £420. Hendrick advised that it was unlikely that the commissioners would support research 'on more than one main group of subjects' and suggested that the research should focus on animal nutrition and animal husbandry. However, some of the governors were concerned that other subjects should also be supported. The principal of Aberdeen University suggested 'it would be inimical to the scientific interests of research if it were confined to one department'.[82]

Hendrick's scheme revived the application at a time when a proposal, supported by the Board of Agriculture, had been made that the second animal nutrition institute should be established in Leeds instead of Scotland.[83] In November 1912, the chair of the governors' sub-committee dealing with research, explained that thinking it had been agreed that an animal

[74] See M Weatherall, 'The foundation and early years of the Dunn Nutritional Laboratory', in D F Smith, ed, *Nutrition in Britain: Science, Scientists and Politics in the Twentieth Century*, 1997, pp 29–52.
[75] PRO, D2/3, SED to DC, 12 Aug 1911.
[76] SRO, AF43/1, DC to Board of Agriculture for Scotland [hereafter BAS].
[77] SRO, AF43/1, BAS to DC, 4 June 1912.
[78] SRO, AF43/1, DC to BAS, 1 July 1912.
[79] SRO, AF43/1, BAS to DC, 17 Feb 1913, DC to BAS, 26 Feb 1913.
[80] E J Russell, 'Thomas Hudson Middleton 1863–1943', *Obituary Notices of Fellows of the Royal Society*, 4, 1944, pp 555–69.
[81] NSCA Minutes, Meetings, 21 March and 16 May 1912.
[82] NSCA Minutes, Meeting, 8 August 1912.
[83] PRO, D2/6, BAS to DC, 16 Aug 1912.

nutrition institute would be established in Aberdeen, further action was suspended while negotiations regarding Craibstone were underway. Hearing that 'there was a likelihood of ... loosing this nutrition grant – that it was to be taken to England',[84] an application was hurriedly sent to the Development Commission, via the Board of Agriculture for Scotland. This was more ambitious than Hendrick's proposal, involving capital expenditure of £4–5000 and recurrent expenditure of £1900. The proposed programme included research on the chemistry of food-stuffs, and the nutritive values of food constituents and Scottish farm foods. J Arthur Thomson, professor of zoology, was to study 'the effect of nutrition upon sex and inheritance' while Hendrick was to investigate the use of milk substitutes for feeding young animals. In addition, it was explained that although the governors 'regard research in animal nutrition as the most important part of the work to be undertaken ... there are other branches of research which are of great importance to the district'. These 'minor investigations' were a study of soil drainage losses and manure-making, by Hendrick, and some experiment that the professor of botany wanted to carry out.[85]

At the end of November the commissioners agreed to grant Leeds University £1000 towards animal nutrition research. The Aberdeen application was also before the meeting, but the commissioners were not yet ready to consider it in detail. A report on research in the Scottish universities by two of their members, Hall and Sir William Haldane, crown agent for Scotland was also on the table, and the commissioners simply agreed, in principle, that 'on receipt of suitable applications' £1500 per annum could be granted to each of the Scottish agricultural colleges.[86] At the following meeting at the suggestion of Hall and Haldane, the commissioners decided to advise the North of Scotland College of Agriculture that a joint committee of the College and the Aberdeen University should be formed to supervise the proposed research.[87]

VI

Both the University court and the College governors agreed to appoint four representatives each to a joint committee. At this time only four of the 45 governors represented Aberdeen University, so the arrangement greatly enhanced the role of the University in the agricultural research scheme. The governors appointed their chairman, Mr James Campbell, commissioner to the Countess of Seafield and representative of Banff County Council, Mr R H N Sellar, implement maker, and Robert Wilson, MD, both representatives of Aberdeen County Secondary Education Committee, and William Bruce, MD, retired medical officer of health for Dingwall, a co-opted member of the governors.[88] The University court appointed the principal, Sir George Adam Smith, Matthew Hay, professor of forensic medicine and public health and medical officer of health for Aberdeen, Colonel William Johnston, retired army medical officer and an assessors of the court, and H M MacDonald, FRS, professor of mathematics.[89]

Before the committee met, the Commission advised that £1000 would be made available for research in 1913–14, plus an additional £500 if £500 could be raised from other sources, provided a suit-

[84] 'College of Agriculture The Craibstone Grant,' nd, Press cuttings file 1913–1920, pp 14–15, LSAA. See also NSCA Minutes, Meeting, 21 Nov 1912.

[85] PRO, D2/10, BAS to DC, 21 Oct 1912; Application by the governors of the North of Scotland College of Agriculture', Oct 1912.

[86] PRO, D1/1, DC Meeting, 28 Nov 1912.

[87] PRO, D1/1, DC Meeting, 19 Dec 1912; PRO, D2/10, DC to NSCA, 1 Jan 1913.

[88] NSCA Minutes, Meeting, 27 Feb 1913.

[89] Rowett Research Institute, Minutes book of joint committee on research in animal nutrition, volume I [hereafter RRI Minutes], Extract from Aberdeen University Court Minutes, 11 March 1913.

able scheme of research was submitted. It was also specified that 'it would be best if, for the present, research carried on in Aberdeen were not necessarily confined to one particular subject, but included other investigations of permanent scientific value having their origin in local requirements' and that 'in undertaking ... any research the College should communicate freely with the institute specially concerned with the subject'.[90]

When the committee met in May 1913, Smith was appointed chairman and a scheme prepared by Hendrick and Thomson was presented. This was revised and submitted to the Commission, and proposed that a 'Bio-chemist' should be appointed to work in co-operation with Hendrick, and that five projects would be carried out – on 'Factors determining fertility and sex', 'Soils and drainage', 'Heavy root feeding and dung making', and 'The nitrogenous constituents of turnips'.[91]

The programme was approved apart from the project on fertility and sex which the Commission regarded as 'too extensive and abstract a question to be considered as a subsidiary subject in a Department of which the main present object is work in Animal Nutrition'.[92] Capital of £807 and £905 recurrent expenditure would be available, provided the senior officer appointed met with the approval of the Board of Agriculture for Scotland, and that the scheme was discussed with and approved by those working on animal nutrition in Cambridge and Leeds. A further £95 would be provided if a suitable project 'more based on local requirements' was proposed as an alternative to the one rejected.[93] The committee successfully responded with a proposal to study 'Isle of Wight Bee Disease', which was causing problems for honey producers in Scotland.[94] The named projects were underway by the end of 1913.

The committee advertised for a biochemist in October 1913 and by early November eight applications had been received. However, Hendrick and Smith placed an alternative name before the committee, E P Cathcart, lecturer in physiological chemistry at Glasgow University, and undertook to ascertain what salary Cathcart would require.[95] It is not known how Cathcart's name came to the attention of Hendrick and Smith, but it may be significant that the applications to the Development Commission of October 1910 included a proposal from the West of Scotland College for studies of nitrogen metabolism and the construction of a respiration calorimeter,[96] two of Cathcart's main interests.[97] Smith interviewed Cathcart and spoke to D N Paton, professor of physiology at Glasgow, but it seemed that Cathcart was unwilling to go to Aberdeen for the salary on offer, £450, or to give up his existing work, in view of the possibility of a chair of physiology. But Smith received a suggestion that Cathcart's junior colleague, John Boyd Orr, a Glasgow graduate in medicine and physiology and a research scholar in Paton's department, would be a suitable candidate.[98] Orr and Allen Neville, an agricultural chemist of the School of Agriculture, Cambridge, appeared before the committee in mid-January 1913. Orr was selected and appointed from 1 April 1914.[99]

After Orr arrived in Aberdeen, the construction of an animal nutrition laboratory was begun at Craibstone, while Orr worked at the College of Agriculture and the physiology department of the

[90] RRI Minutes, DC to NSCA, 4 March 1913.
[91] RRI Minutes, JC Meeting, 2 and 16 May 1913.
[92] RRI Minutes, DC to JC, 8 Sept 1913, JC Meeting, 26 Sept 1913.
[93] PRO, D1/1, DC Meeting, 26 June 1913.
[94] PRO, D2/10, Aberdeen University [hereafter AU] to DC, 11 Nov 1913, DC to AU, 31 Oct 1913.
[95] RRI Minutes, JC Meeting, 6 Nov 1913.
[96] PRO, D2/3, Application from the West of Scotland College of Agriculture, 24 Oct 1910.
[97] See R C Garry, *Life in Physiology* (ed D F Smith), Glasgow, 1992.
[98] RRI Minutes, JC Meeting, 20 Nov 1913.
[99] RRI Minutes, JC Meeting, 15 Jan 1914.

University. He continued work begun in Glasgow on the influence of water ingestion on the excretion of the metabolites creatin and creatinin in urine, using human subjects.[100] Before the laboratory was completed however, Orr joined the Royal Army Medical Corps and research on animal nutrition was effectively suspended for the duration of the war. During the war the soils and drainage project was troubled by loss of staff and by technical problems, but the work on Isle of Wight Bee Disease made progress, and was rewarded by additional private and Development Commission funding.[101] The soil research was handed over to the College in 1921,[102] as was the bee disease work a year later.[103]

Orr returned to Aberdeen as a war hero and resumed his duties in February 1919, vigorously setting about the establishment of an animal nutrition research institute, of which he was designated director. The Development Commission agreed to match locally-raised funds, and the committee set about fund raising. John Quiller Rowett, a school friend of R H A Plimmer, a biochemist who was recruited to the staff, first offered £500 towards the construction of experimental animal stalls.[104] Rowett was a London-based businessman who had thrived during the war, and following a meeting with Orr he increased his offer to £10,000. This meant the committee could plan an initial expenditure of up to £20,000. The committee asked Rowett to allow his name to be associated with the institute, and when Rowett agreed, he expressed the hope that the institute would 'give valuable results in the subject of Animal Nutrition and, in due course ... Human Nutrition and public health generally'.[105] Much was made of this point in the *First Report* of the Institute, issued in December 1922. It was claimed that 'probably the greater part ... of the ill-health of human beings is due ... to nutritional disorders' and that much of the research to be carried out would be applicable to humans. Rowett was said to have made the 'enlightened and humane suggestion' when giving his 'munificent donation' that when there were 'indications that work in certain directions might throw light on human nutritional disorders, this work might be allowed to carry on, even though it had no direct bearing on the feeding of farm animals'.[106]

VII

This paper has been prepared as part of a larger project on the history of nutrition science during the twentieth century, a history in which a major role was played by Orr and the Rowett. The story of the rise and fall of the ARA helps both to highlight the challenges that Orr faced, and to elucidate the circumstances of the origins and early development of the Rowett.

Both the ARA and the Rowett were located at the centre of the same large agricultural region far from the decision-making centres in Edinburgh and London. The worlds of both Jamieson and Orr were populated by landowners, farmers, industrialists, politicians, civil servants and scientists. Both faced the problems of raising funds and of relating not only to the distant government bodies, but also to the local educational, scientific, social, and agricultural establishments. While in Orr's era more government funding was available, the success of applications for funds towards

[100] J B Orr, 'The influence of excessive water ingestion on protein metabolism', *Biochemical Journal*, 8, 1914, pp 530–40.
[101] RRI Minutes, JC Meeting, 31 Oct 1918.
[102] RRI Minutes, JC Meeting, 28 Sept 1921. Eventually, in 1930, the Macaulay soil research institute was established in Aberdeen with Development Commission backing: Russell, *Agricultural Science*, pp 452–8.
[103] RRI Minutes, JC Meeting, 5 Oct 1922.
[104] RRI, JC Minutes, 12 Feb 1920.
[105] RRI, Rowett to Smith, 8 March 1920; JC Minutes, 15 March 1920. See also J B Orr, *As I Recall*, 1966, pp 91–2.
[106] Rowett Institute, *First Report*, Aberdeen, 1922, pp 17–18. Two years later Rowett committed suicide, after a serious downturn in his business fortunes: 'Obituary', *Aberdeen University Review*, XII, 1925, p 95.

capital expenditure still depended upon success in raising funds from private sources.

The ARA appears to have been the product of co-operation between one chemist, and a group of aristocratic landowners, agricultural manufacturers and suppliers, and politicians with a range of formal affiliations, with farmers cast largely in the role of consumers of the knowledge that the Association was created to produce.[107] The ARA may be regarded as representative of progressive opinion of the late Victorian period: the organization favoured state support of research, and Jamieson's writings show an impulse to modernize agriculture, to disrupt the established rhythms of the countryside, and to introduce the methods of science and the social organization of the town.

From the beginning Jamieson and the ARA cast themselves as outsiders and challengers to the nascent agricultural science establishment in the south of England, but after the 'battle of the phosphates', and while state funding for agricultural research was relatively modest, it appears to have been largely assumed that these challenges could be safely ignored. But as the scientific challenges became more fundamental, and more vigorously pursued, and when the prospect of much more extravagant expenditure by the state became apparent, Jamieson's claims were taken more seriously: steps were taken to discredit his claims and to remove the respectability that was conferred upon the ARA by an annual government grant. Jamieson's aristocratic allies proved powerless to reverse these setbacks: by this time, the agricultural scientific-administrative establishment was becoming firmly entrenched. However, Jamieson and the ARA retained sufficient indigenous support for a small grant to be obtained, for a while, from funds administered locally.

But the difficulties faced by Jamieson and the ARA and may not be explainable entirely in terms of reaction to their maverick activities. The resistance of the Development Commission to the independent planning of agricultural research in Scotland, the single mention of Scotland in the plan agreed by the Commission and the Board of Agriculture, and the reluctance to allow Scottish applications to the Development Fund for agricultural research, all suggest an attempt by the central agricultural research establishment to retain research funds close to home, and a general suspicion of the periphery.[108]

The prevarication of the Development Commission over the Aberdeen College's application, and the support of the Board of Agriculture and the Commission for the establishment of animal nutrition research at Leeds, may be further examples of the commissioners' attitude towards research in Scotland. However, these features of the story, as well as the particular conditions applied to Aberdeen, the formation of the joint committee and the need to consult Cambridge and Leeds, may have been the result of perceptions specifically concerning the situation in Aberdeen – conditioned by past conflicts of the Board of Agriculture and the Development Commission with Jamieson, and by the support that Jamieson still appeared to retain among some of the governors of the College.

[107] There is much potential for further research into this organization. The investigation of the precise interests of manure manufacturers in the north-east of Scotland in promoting the use of ground mineral phosphates, for example, might further elucidate the nature of the alliance of interests upon which the organization was originally based. The formation and survival of the Association, as well as the financial difficulties that it faced, and the advent of governmental support, owed much to the agricultural depression of the late nineteenth century. But whether, how, and to what effect, the ARA influenced farming practices in the north-east of Scotland and beyond, awaits further research and analysis.

[108] This notion is reinforced by the history of the DC-supported plant breeding institutions: the DC resisted the establishment of a plant breeding institute near Edinburgh, preferring to have a single institute in Cambridge. See P Palladino, 'The political economy of applied research: plant breeding in Great Britain, 1910–1940', *Minerva*, 28, 1990, p 460.

Just as the development and activities of the ARA depended very much upon the initiative of Jamieson, the development of the Rowett depended very much upon the initiative of Orr, but Orr proved much more effective than Jamieson in building and using powerful alliances both at the centre and locally. After the war Orr was still required by the Development Commission to consult T B Wood, who had become the sole director of the Animal Nutrition Research Institute in Cambridge.[109] But Orr enjoyed a good relationship with Wood and therefore this association worked to his advantage. Wood, in turn, was close to Middleton and Hall.

Jamieson sought to create an identity for the ARA by developing unique scientific positions; similarly, Orr attempted to develop a distinct research programme at the Rowett. But while Jamieson's unique positions implied continual challenge to and conflict with the most significant figures in the south, Orr developed a programme which brought him into an alliance with Wood. The Rowett took up a concerted programme of research on the role of minerals in nutrition,[110] challenging the enthusiasm for the newly-discovered accessory food factors or vitamins which had arisen among some scientific, medical and agricultural circles, following the work of F G Hopkins and others. However Orr's sceptical position on vitamins was shared with Wood,[111] and also with his former colleagues in Glasgow.[112]

During the 1920s Orr also formed a valuable alliance within central government with Walter Elliot, MP, one-time researcher at the Institute, who was Under-Secretary of State for Scotland in the Conservative government of 1926–29 and later Minister of Agriculture and Fisheries, Secretary of State for Scotland and Minister of Health. This connection brought the Rowett additional sources of public funding for research in both human and animal nutrition from the Empire Marketing Board.[113]

While the intended function of the joint committee may have been to help ensure the effective deployment of Development Commission funding, it brought together a group of influential men at the periphery who helped to create a greater degree of autonomy from the government decision-making and funding bodies than otherwise would have been the case. Orr enjoyed a good relationship with the joint committee which helped him to pursue his objectives. The support of men such as the principal of Aberdeen University was of great assistance in Orr's money-raising efforts. In addition, when Orr's two most senior members of staff opposed the focus upon minerals and the sceptical position on vitamins, his support by the joint committee was such that the outcome of the ensuing conflicts resulted in the resignation of his most senior member of staff and the termination of the employment of the second most senior.[114]

The work on minerals, which addressed problems of human as well as animal nutrition highlights a dimension to the work of the Rowett which was not available to the ARA. Such work was directed towards the medical profession as well as to agriculture: Orr's world was also popu-

[109] The plans for building of animal nutrition research facilities at Leeds were suspended during the war, and in 1919, the key worker, C Crowther, left Leeds: see PRO, MAF 33, 17/TE1756, 17/A21385/1915, 17/TE1757 and Russell, *Agricultural Science*, p 253. The failure of the Leeds scheme may partly explain why the development of animal nutrition at Aberdeen became more straightforward after the war.

[110] D F Smith, 'The early institutional and scientific development of the Rowett Research Institute' in A Adam, D F Smith and F Watson, eds, *To the Greit Support and Advancement of Helth*, Aberdeen, 1996, pp 45–53.

[111] See Orr, *As I Recall*, p 107; Weatherall, 'Dunn Laboratory', pp 32–3.

[112] See D F Smith and M Nicolson, 'The "Glasgow School" of Paton, Findlay and Cathcart: Conservative thought in chemical physiology, nutrition and public health, *Social Studies in Science*, 19, 1989, pp 195–238.

[113] See Orr, *As I Recall*, pp 90, 109–11.

[114] D F Smith, 'Establishing a position: John Boyd Orr, the Rowett Institute and minerals in nutrition: internal struggles 1920–32', paper given at a conference at Aberdeen University, 1 July 1995. This paper is currently being prepared for publication.

lated by medical scientists, administrators and practitioners. As we have seen, Orr was medically-qualified. The composition of the joint committee also facilitated this dimension of the Rowett's work. Matthew Hay, medical officer of health for Aberdeen was an original member of the joint committee and he was later joined by J A MacWilliam, professor of physiology at the University of Aberdeen.

While, like Orr, Jamieson favoured state funding, Jamieson consistently emphasized the need for independent work by scientists, and expressed the view that scientific advance was most likely to be the product of hard work by solitary scientists. The ARA's applications to the College of Agriculture and the Development Commission were simply for funds to subsidize the organization, rather than to advance particular research programmes. Due to the changed funding situation, Orr was able to plan research on a much larger scale. In assembling a group of researchers committed to the programme of research on minerals in nutrition Orr consistently deployed the ideology of teamwork in science,[115] in line with the ideology which may be found in Development Commission documents,[116] and in writings of men such as Hall.[117] In this emphasis on teamwork, there is a striking contrast with the views of Jamieson. Orr enthusiastically embraced collectivism in science and was willing and able to develop the networks necessary for him to take advantage of the opportunities offered by the increasing state support for science of the twentieth century.

[115] See, for example, the document prepared by Orr proposing the development of an animal nutrition research institute: PRO, D2/26, Memorandum reasons for drafting and submitting scheme, June 1919.

[116] For example, the DC's report for 1920 quoted a memorandum submitted to the Treasury in Aug 1911 which emphasized the value of 'collaboration upon a single question of several men differently equipped': *Tenth Report of the Development Commissioners for the Year ended the 31 March 1920*, 1920, p 19.

[117] See, for example, A D Hall, 'The present position of research in agriculture', *Jnl Roy Soc Arts*, LXIX, 1921, pp 300–12.

Inter-War Land Drainage and Policy in England and Wales[1]

By JOHN BOWERS

Abstract

Economic conditions in the inter-war period made field drainage uneconomic to the farmer and, in consequence, there was no social return on arterial investment designed to facilitate it. Despite this, the Ministry of Agriculture carried through a substantial programme of arterial drainage. To achieve this it was necessary to reform the archaic and chaotic system of drainage administration and to overcome opposition from the farming community to paying for its programme. Administrative reform was consolidated in the Land Drainage Act of 1930. Opposition was overcome in three ways: by promoting land drainage for other purposes such as the relief of unemployment and thus tapping other sources of funding; by widening the definition of beneficiary so as to broaden the fiscal base; and, via loans and grants to drainage authorities, by shifting the burden from rates to general taxation. The programme was complemented by propaganda to promote field drainage. The motivation for the programme appears to have been technical, stemming from the recognition that land drainage would increase agricultural output. This foregone output was presented as a loss to the nation despite the fact that it was not economic to produce it. Parallels are drawn with the post-Second World War Ministry view that the economic incentives facing the farmer should be manipulated so as to achieve production that was technically possible.

THE middle years of the nineteenth century were a period of great activity in agricultural drainage. Between 1847 and 1899 Phillips estimated that £5.5m of public money was lent to landowners in England for the underdraining of agricultural land.[2] This public money was supplemented by private. On the great estates public loans provided about 20 per cent of the total capital suggesting total expenditure for England over the period of £27.5m in the draining of 4.6 million acres of agricultural land.[3] The expenditure peaked in the 1850s and declined rapidly thereafter. With the onset of agricultural depression land drainage expenditure dwindled to almost nothing. According to MacGregor's analysis[4] expenditure on drainage was only £531,000 in the decade 1883–92 and totalled only £90,000 in the next two decades, despite additional legislation encouraging drainage.[5] The reasons for this decline were principally that, at lower agricultural prices, land drainage was unprofitable. Landlords could not recoup their expenditure in higher rents and

> on most of the heavy arable land the expense of cereal production was unprofitable and much land was laid down or permitted to tumble down to grass. Land too wet for arable might do well enough for pasture.[6]

By the onset of the First World War it is clear that drainage had deteriorated considerably from its position thirty years previously. Nor, apart from the war and its immediate aftermath, were agricultural conditions such as to see any improvement from initiatives by landlords or their tenants. Throughout the 1920s and 1930s agricultural land drainage was simply unprofitable. Adkins' judgement is again worth quoting.[7]

[1] I am grateful to my colleague Katrina Honeyman for her helpful comments on this paper. Responsibility for what remains rests of course with me.

[2] A D M Phillips *The Underdraining of Farmland in England during the Nineteenth Century*, 1989, chapter 3.

[3] *Ibid*, p 120.

[4] Unpublished figures by J J MacGregor quoted in C S Orwin and E H Whetham, *History of British Agriculture 1846–1914*, 2nd ed, Newton Abbott, 1971, p 196; see also Phillips, *Underdraining*, pp 122–6.

[5] Thus agricultural tenants were encouraged to drain their land at the expense of their landlords by the Agricultural Holdings Act 1883.

[6] B W Adkins *Land Drainage in Britain*, 1933, pp 228–9.

[7] *Ibid*, p 229.

Since the War the improvement of agricultural land by land drainage or otherwise has become a difficult problem; the cost of labour has increased, probably it has doubled in most cases, the cost of materials has also doubled. Times have become very bad for agriculturists and agricultural land is almost a drug on the market. Agricultural land drainage on the old lines has become practically a dead letter for the cost of draining an acre by those methods is in many cases more than the value of the freehold of the land. The skilled drainers have died out and draining by unskilled labour is a slow and expensive process.

Technical progress had not rendered the traditional methods obsolete. Thus Adkins again:

Mole drainage has been much talked of recently and the coming of the tractor and other appliances has made cheap work possible. A considerable amount of mole draining has been done where the soil and circumstances were suitable but this method of draining land has its limitations and it can be regarded only as a poor substitute for pipe drainage.[8]

Agricultural land drainage embraces two inter-related processes: field drainage, the drainage of individual fields with the objective of lowering the water table and improving the growth conditions for the crops grown; and arterial drainage, improvements in the capacity of the river system to shift water from the land. Arterial improvements facilitate field drainage by providing the system capacity to accommodate field drainage and, by reducing the incidence of flooding, increasing the economic returns on it. Arterial drainage is a collective benefit to the owners and occupiers of the affected lands and as such, from the time of Henry VIII at least, there has been statutory provision for collecting its cost from the benefiting landowners or occupiers. But the benefit from arterial drainage and hence the incentive to contribute to its cost depends on its relationship with field drainage. If economic conditions mean that the investment in field drainage yields insufficient return to the farmer such that he will not invest in it, then arterial drainage – providing the conditions for field drainage – has itself no economic return.

This statement is of course an oversimplification. Improvements to the arterial system reduce flood frequency and hence reduce flood damage. But with livestock systems this damage is typically small and areas prone to frequent flooding are perceived correctly by farmers as unsuitable for arable. Some improvements to the arterial system yield automatic benefits by lowering the water table without the intercession of field drains and by permitting an extension of the grazing season. But even with the prices prevailing in the 1970s automatic benefits from arterial schemes were very small and insufficient to cover the costs of the works.[9]

The land drainage expenditure of the mid-nineteenth century involved both field and arterial drainage with the driving force lying in the profits to be derived from field drainage. In the inter-war period economic conditions were not favourable to field drainage and little was carried out. Indeed the evidence points to substantial disinvestment through the failure to maintain the system. The area of tillage in England and Wales fell by over 3 million acres between the end of the First World War and 1932 and showed no serious signs of recovery until 1940. This loss was not a switch to grass leys since the area under grass less than seven years old remained almost constant. Rather it reflected the abandonment of land maintenance. The area classified as Rough Grazing in Sole Right, land in poor state receiving effectively no maintenance, increased over the period by 600,000 acres; the rest comprised ageing permanent grass with some, presumably declining, agricultural value.[10]

[8] *Ibid.*

[9] J K Bowers, 'Cost benefit analysis of wetland drainage', *Environment and Planning A*, 15, 1983, pp 227–35.

[10] Data from Ministry of Agriculture, Fisheries and Food, *A Century of Agricultural Statistics. Great Britain 1866–1966*, 1968.

Agricultural observers noted and deplored the state of the land. Thus:

> The deplorable state of a large acreage of farming Britain today is enough to make one weep – land under-stocked, weeds flourishing, fences and hedges in dis-repair, ditches and drains neglected, and everywhere a woeful lack of fertility, production and employment.[11]

Despite the lack of activity on the farm which alone would have given a return on it, the Ministry of Agriculture nonetheless was able to sustain a considerable volume of investment in arterial drainage. This paper shows how it was achieved and why. The drive for the programme was technical. Higher crop yields and livestock outputs were available if the land was drained and indeed substantial investment in both arterial and field drainage was necessary if technological possibilities were to be realized. The economic factors that were inhibiting this investment were seen as obstacles to be overcome rather than as signals that the market didn't want the produce.

To achieve its programme the Ministry overturned the traditional views on financing land drainage and established it instead as a public responsibility financed ultimately by the urban taxpayer. Its successes with arterial drainage were not matched at the level of the farm despite an extended campaign.

Agricultural policy directed at realizing the technical possibilities of agricultural production regardless of the economic circumstances characterizes the period following the Second World War[12] and suggests a continuity of policy objectives. The difference between the periods is that in the inter-war period the Ministry could not manipulate prices to realize its vision and therefore could not ultimately deliver the output that was technically possible. In the 1950s this constraint had gone. This picture of a continuity of agricultural policy conflicts with the views of Whetham[13] of passive *laissez-faire* in the inter-war period modified slowly in consequence of the results of the 1930s depression. That view derived from a concentration on the effects of policy on farmers' prosperity rather than what the Ministry was up to.

I

There are no available direct data on arterial land drainage investment in the inter-war period and work was carried out by a large number of drainage bodies. The work was however partially funded with a variety of loans and grants from the Ministry of Agriculture and data on these allow estimates to be made of the work done. The details of these estimates are presented in Table 1 and the resulting series are in Table 2. The expenditure can be interpreted as gross domestic fixed capital formation at, in the terms of Feinstein,[14] original cost. While depreciation cannot be estimated much of this drainage work in the major wetland areas such as the Ouse catchment was new. Figure 1 graphs the results in both current and constant (1930) prices. Constant prices reduce the estimates of expenditure in the early 1920s but otherwise scarcely affect the results. The peaks in 1926 and 1930 result from the pattern of legislation that facilitated funding. From 1935 expenditure was on a sharply rising trend. Uncertainty attaches to the exact timing of the expenditure that was financed; loans and grants were typically provided in advance of the work; and the expenditure was probably smoother than is shown. Over the period 1919–1940 £8.5 m investment at 1930 prices is identified. The scale of the works may be gauged by comparing them with Feinstein's esti-

[11] A G Street, *Farming England*, 1937.

[12] J Bowers, 'British agricultural policy since the Second World War, *AHR*, 33, 1983, pp 60–67.

[13] Edith H Whetham *The Agrarian History of England and Wales. Volume VIII, 1914–39*, 1978.

[14] C H Feinstein *Domestic Capital Formation in the United Kingdom 1920–1938*, 1965.

TABLE 1

Government finance to land drainage

Year	Grants (£'000)					Loans (£'000)							
	Grants under land drainage acts[1]	*Unemployment relief schemes*[2]	*Sub total*	*Wash reclamation*[3]	*Total grants*	*Land Drainage Act 1918*[4]	*Unemployment relief*[5]	*Sub total*	*Expenses of inquiries*[6]	*Total loans*	*Gross expenditure*	*Net identified repayment*[7]	*Net loans*
1919				100.0	100.0	150.0		150.0	10.0	160.0	260.0		160.0
1920				11.2	11.2	79.0		79.0	7.0	86.0	90.2	10.0	76.0
1921		222.1	222.1	2.5	224.6	12.0	96.4	108.4	5.0	113.4	338.0	10.0	103.4
1922		241.9	241.9	1.0	242.9		91.5	91.5	4.0	95.5	338.4	9.9	85.6
1923		189.8	189.8	0.4	190.2		73.7	73.7	4.0	77.7	267.9	7.1	70.6
1924		164.5	164.5	0.4	164.9		63.2	63.2	3.0	66.2	231.1	9.9	56.3
1925		37.6	37.6	0.4	38.0		63.0	63.0	2.5	65.5	103.5	7.9	57.6
1926	170.0		170.0	0.2	170.2				1.0	1.0	171.2	8.9	−7.9
1927	80.0		80.0	0.2	80.2				4.0	4.0	84.2	4.9	−0.9
1928	95.0		95.0	0.5	95.5				0.6	0.6	96.1	4.7	−4.1
1929	115.0		115.0		115.0				0.5	0.5	115.5	1.1	−0.6
1930	120.0	40.0	160.0		160.0				1.3	1.3	161.3	1.5	−0.2
1931	190.0	60.0	250.0		250.0				2.0	2.0	252.0	1.8	0.2
1932	66.0	6.5	72.5		72.5				1.0	1.0	73.5	3.0	−2.0
1933	62.0		62.0		62.0				0.9	0.9	62.9	2.4	−1.5
1934	68.0		68.0		68.0				0.9	0.9	68.9	2.1	−1.2
1935	59.4		59.4		59.4				2.1	2.1	61.5	3.1	−1.0
1936	120.0		120.0		120.0				2.0	2.0	122.0	3.3	−1.3
1937	200.0		200.0		200.0				1.3	1.3	201.3	3.7	−2.4
1938	304.0		304.0		304.0				1.2	1.2	305.2	2.9	−1.7
1939	379.0		379.0		379.0				0.7	0.7	379.7	2.2	−1.5
1940	505.0		505.0		505.0				0.6	0.4	505.4	1.3	−0.9

[1] Grants to drainage authorities, catchment boards and county councils under the Land Drainage Acts 1918, 1926, 1930 and Agriculture Act 1937.

[2] A) Winter schemes for the relief of unemployment 1921–6, land drainage and coastal defence schemes, grants paid to drainage authorities and county agricultural committees.
B) Grants to landowners towards the cost of approved schemes of field drainage, water supply and fen claying for the improvement of agricultural land initially; schemes designed to facilitate the transfer of labour from distressed areas.

[3] Reclamation scheme for northeast corner of the Wash. Funded from the Development Fund. Some revenues in the form of land sales and rentals resulted from the scheme.

[4] Various schemes under Land Drainage Act 1918 including emergency schemes. Some of the work was performed by POWs whose labour is not priced in the scheme cost.

[5] Element of relief of winter unemployment expenditure recoverable from the parties benefiting. Much of its expenditure was never recovered.

[6] Recoverable expenditure related to the administration of the land drainage acts, expenses of inquiries and (under the Land Drainage Act 1930) costs of surveys.

[7] The recoverable expenditure identified from the estimates falls far short of expenditure. Some was identified as written off. Much has simply disappeared from the accounts.

TABLE 2
Estimated expenditure on arterial land drainage and sea defence schemes, 1919–1940

Year	*£'000 at current prices*	*£'000 at 1930 prices*[1]	*Percentage government funds*
1919	510[2]	373	100
1920	259	155	100
1921	333	228	100
1922	334	294	100
1923	277[3]	261	95
1924	281[3]	261	81
1925	154[3]	144	66
1926	486[4]	462	35
1927	229[4]	218	35
1928	271[4]	263	35
1929	329[4]	322	35
1930	464[4,5]	464	34
1931	725[4,5]	732	34
1932	208[4,5]	221	35
1933	177[4]	191	35
1934	194[4]	210	35
1935	170[4]	182	35
1936	300[6]	311	40
1937	500[6]	487	40
1938	760[6]	702	40
1939	946[6]	923	40
1940	1263[6]	1150	40

[1] Other construction work; table 63 in C H Feinstein *Statistical Tables of National Income, Expenditure and Output of the UK, 1855–1965*, 1972.
[2] Includes an estimated £300K for the value of prisoner-of-war labour.
[3] Includes non-grant-aided expenditure by the Ouse D B and Middle Level D C.
[4] Average grant rate of 35 per cent assumed.
[5] 33⅓ per cent grant on Unemployment Relief Schemes.
[6] 40 per cent average grant rate assumed.

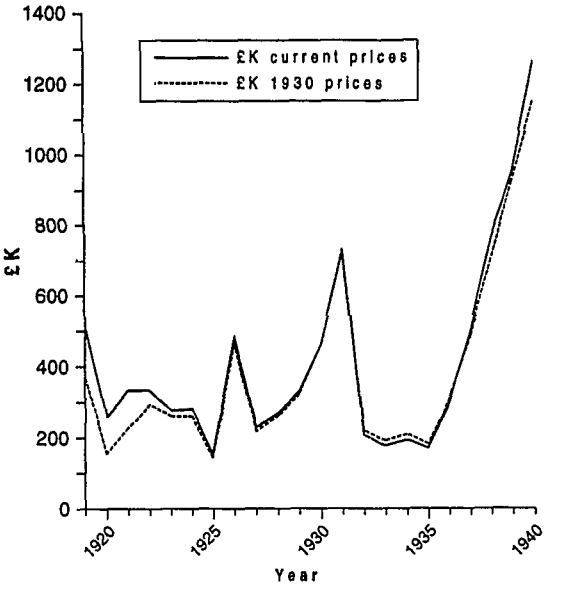


FIGURE 1
Expenditure on land drainage.

mates of gross fixed capital formation in agriculture (Table 3). Arterial drainage investment was over 7 per cent of gross domestic capital formation in agriculture 1920–1938 and amounted to 13 per cent in the depth of the depression in the early 1930s.

II

The problem faced by the Ministry of Agriculture in upgrading the arterial drainage system of the country was two-fold. First the system of land drainage administration was complex, archaic and chaotic. Conflicting responsibilities, lack of effective powers and limited ability to raise revenue was perceived as an obstacle to improvement. Second, because of the lack of perceived benefits by those on whom the costs would fall it faced considerable resistance among the agricultural community to any expenditure on land drainage. We discuss these in turn.

III

At the end of the First World War there remained a bewildering number of bodies with arterial drainage powers and responsibilities. Some attempt at reform had been made under the Land Drainage Act 1861. This had created two kinds of areas and authorities: drainage areas under commissions of sewers and drainage districts under elective drainage boards. The former were crown appointees on recommendation of the Inclosure Commissioners, the latter were constituted by parliamentary order on petition of the owners of at least a tenth of the affected land. The act's intention was that these new bodies would

TABLE 3
Gross domestic fixed capital formation in arterial land drainage and agriculture

Period	*GDFCF/pa Agriculture*[1] *(£m 1930 prices)*	*GDFCF/pa Arterial Drainage (£m 1930 prices)*	*Drainage as a percentage of agriculture*
1920–24	5.7	0.2	4.2
1925–29	3.2	0.3	8.8
1930–34	2.8	0.4	13.0
1935–38	5.2	0.4	8.1
1920–38 (Total)	81.6	6.1	7.4

[1] C H Feinstein, *Statistical Tables of National Income, Expenditure and Output of the UK, 1855–1965*, 1972, table 5.10.

replace existing ones but progress required the consent of the bodies to be discontinued which clearly proved difficult to obtain. Without such consent the powers of both types of bodies to carry out works was severely limited. Furthermore the confirmation of the order setting up a drainage district required the consent of owners of two-thirds of the land. By 1918 there were 51 commissions of sewers and 49 elective drainage boards under the 1861 Act but there remained 219 other drainage bodies under various previous special acts.[15] An Act of 1918 was intended to facilitate the formation of drainage districts by altering the conditions of consent. The provisional order setting up the drainage board would be confirmed unless within a prescribed period owners of one-third of the land objected. This had some effect. In 1927 the elective drainage boards had increased to 114 with 49 commissions of sewers but the number of other drainage bodies had fallen only slightly to 198.[16] In the Great Ouse catchment alone there were 81 separate drainage bodies.

The solution of the Royal Commission on Land Drainage set up in March 1927 with the terms of reference 'to inquire into the present law relating to Land Drainage in England and Wales and its administration to consider and report whether any amendment is needed to secure an efficient system of arterial drainage ...' and reporting nine months later was the creation of a central drainage authority for each major river catchment area with sole authority for the main channel of the river and with supervisory powers over elected internal drainage authorities where these were required, who would be responsible for subsidiary drainage channels. 'Commissions of sewers and obsolete or moribund Drainage Authorities should be abolished'.[17] This reform should be implemented by a consolidating Land Drainage Act and all previous legislation should be abolished or so amended as to conform with the objectives of that act. Overall control of the new catchment boards would be vested with the Minister of Agriculture and Fisheries and the catchment areas should be listed as a schedule to the act. The commission supplied a suggested list of 89 catchment areas together with their areas of administrations and suggestions for priorities in creating catchment boards.

These recommendations were carried through in the Land Drainage Act 1930 and some 46 catchment boards, constituting, with some consolidation, the royal commission's priority areas, were created. Where catchment boards did not exist the act, as recommended by the royal commission, vested drainage powers with county councils.

This system, which survived until further consolidation under the 1972 Water Act,

[15] Adkins, *Land Drainage*, p 194.
[16] Cmd 2993, *Royal Commission on Land Drainage*, 1927, para 7.
[17] *Ibid*, para 143.

provided the conditions for comprehensive catchment drainage plans and it was the implementation of these which gave the rising volume of arterial drainage investment in the 1930s (Table 1). Some illustrations of the work are in order.

The Ouse Drainage Board constituted by ministerial order in 1920 and confirmed after opposition in both Houses of Parliament was *de facto* a catchment board. A commission appointed by the Minister of Agriculture[18] recommended works totalling £2.5m for the main river and its outfall plus £216,000 for the South Level Drainage Internal Drainage District. Much of this work was carried through over the following decade and in addition substantial works by the Middle Level Drainage and Navigation Commissioners totalling £650,000 were completed by 1934.[19]

The Kent Rivers Catchment Board was created by ministerial order in 1937 and involved the amalgamation of four out of five of the Kent catchment boards created under the 1930 Act. It inherited a three-phase plan for the Medway Catchment totalling £900,000 on which work had started in 1934. By 1938 phases 1 and 2 totalling £450,000 had been largely completed.[20]

The Rother and Jury's Gut Catchment Board was faced with a substantial programme of sea defence works at and around Rye Harbour where works carried out in 1924 had been unsuccessful. Work commenced in 1934 and £180,000 had been spent by 1938 with further smaller works still to be done. In addition land drainage works totalling £164,000 had begun in 1935.[21]

IV

If the administrative structure was an impediment to the development of arterial drainage in the inter-war period, the agricultural depression was a greater one since it led to consumer resistance to expenditure. The basic principle of finance for land drainage, and a hallowed one, was that the cost of works should be borne by the owners of the land which benefited. Since the owners saw little or no benefit from arterial drainage they resisted the expenditure.

The best documented example of ratepayers resistance is found in the saga of the Great Ouse Catchment. Under powers conferred by the Land Drainage Act 1918 the Board of Agriculture made a draft order for a single catchment drainage board in 1919. The board's responsibility involved 140 miles of main river and 480,000 acres of rateable land in ten counties, 'nearly a quarter of which has hitherto made no contribution to the cost of keeping the main channel and its banks in order!'[22] Objection was made to the order and a public inquiry called. This by no means silenced the opposition and the Ministry was forced to clarify its motives:

> Certain statements recently published in the press disclose considerable misunderstandings with regard to the object and effect of the Order ...
>
> It has been alleged that if the Order becomes effective the Ouse Drainage Board will embark forthwith on a scheme for putting the river into order at a cost of not less than £3,000,000. Such a statement is, of course, entirely misleading and incorrect. In the first place, the highest estimate yet put forward was not £3,000.000 but £2,000,000. In the second place, even assuming that such a figure represented the probable cost of putting the rivers into order, it is obvious that the work would

[18] Cmd 2572, *Report to the Minister of Agriculture and Fisheries of the Commission appointed by him in connection with the Ouse Drainage District*, 1926.

[19] A T A Dobson, 'State-aided land drainage works in the Middle Level District of the Great Ouse Catchment Basin', *Journal of the Ministry of Agriculture (JMA)*, 36, 1929, pp 620–3; Anon, 'Land drainage works in the Middle Level District of the Great Ouse Catchment Basin', *JMA*, 38, 1931, pp 893–4; Anon, 'New sluice and pumping station at St Germans', *JMA*, 41, 1934, pp 729–32.

[20] Anon, 'Land drainage: an account of works of improvement in the Medway Area of the Kent Rivers Catchment Board', *JMA*, 45, 1938, pp 132–9.

[21] Anon, 'Land drainage improvement works carried out by the Rother and Jury's Gut Catchment Board', *JMA*, 45, 1938, pp 1147–54.

[22] *JMA*, 26, 1919, pp 729–31.

necessarily be extended over a great number of years, and that nothing approaching such a sum would ever be raised at once. The Ouse Drainage Board will be a body elected by the ratepayers of the district, and it is inconceivable that a body of that nature would embark upon any such fantastic career of extravagance as is suggested by the persons who have made the statements referred to above.

Calculations have been published in letters to the Press, of the amount of the rate per acre which may be expected to be imposed on agricultural land in the upper valley of the Ouse by the Ouse Drainage Board. Those calculations were not only made on the false assumptions that the Drainage Board will raise a sum of £3,000,000 by a single loan, but they appear to have been based on the original draft of the Ouse Drainage Order. The rating schedule contained in that draft was revised drastically in favour of the upper parts of the valley before the Order was sealed.[23]

The provisional order was confirmed after debates in both Houses of Parliament. In announcing this, the first positive result of the 1918 Act, the Ministry again felt the need to defend itself:

It is sometimes thought that in endeavouring to establish a drainage board the Ministry is conspiring to force the carrying out of one or other elaborate engineering scheme and that on the establishment of such a board the district will suddenly be burdened with intolerable expense. It must be stated with greatest emphasis that this is not the case.[24]

The protesters were right in their belief that the Ministry was convinced of a need for a comprehensive scheme even if it had no commitment to any particular one. The denials in any case had little effect. The Ouse Drainage Board found itself simply unable to collect its rates and in 1925 the Ministry was forced to suspend the rating of the upland areas of the Ouse Drainage District and to set up a commission to investigate the problem of Ouse drainage and its finance.[25]

The problem of the Ouse catchment was by no means unique. The royal commission noted that problems of rate collection were fairly general and disputes on liability commonplace. In 1918–19 some difficulties were experienced in getting landowners to accept work carried out by prisoners of war apparently because of the element of cost that they would have to meet[26] and opposition equally was met to the schemes for the winter relief of unemployment. Thus, the report of the second season's work noted:

As in the previous period there was a tendency on the part of owners of the land at first to assume that under the conditions of working with unskilled labour, and in spite of the Ministry's grant the work would prove expensive.[27]

The rational basis for such opposition, that arterial improvements would yield no economic benefits to the ratepayers, has been explained.

The Ministry's strategy to overcome this problem had three components: i) land drainage works were promoted instrumentally for other purposes, and as such they could be subsidized; ii) the notion of benefiting area was extended, increasing the rateable value of the drainage authorities and thereby reducing the burden on existing ratepayers; and iii) state support for arterial drainage was shifted from loans to grants so that an increasing part of the cost was borne directly by the taxpayer.

With the first component, the first expedient was the use of the free labour of prisoners of war for drainage works. This commenced under the Defence of the Realm regulations and continued under the Land Drainage Act 1918. Free labour of prisoners of war was provided

to obviate the injustice of compelling a ... occupier or owner to pay for work which benefited other land besides his own.[28]

According to a review in 1920 some 405,500 acres in England and Wales benefited from these schemes. Some 30,000 of these acres were in Norfolk where some

[23] *JMA*, 26, 1920, pp 1172–3.
[24] *JMA*, 27, 1920, pp 767–8.
[25] *JMA*, 33, 1925, pp 102–3.
[26] *JMA*, 26, 1919, pp 729–31.
[27] *JMA*, 30, 1923, p 523.
[28] *JMA*, 26, 1920, p 1089.

1.17 m man-hours of POW labour was committed.[29] If we assume that man-hours per benefiting acre was the same for other schemes[30] and, that an hour of POW labour is equivalent to an hour of a free unskilled agricultural labourer then the total labour cost of the schemes amounted to approximately £726,000. To this must be added expenditure on tools and supervision. Some £90,000 was advanced to county agricultural executive committees for this purpose, giving a total expenditure incurred in 1918 and 1919 of £826,000. This can be treated as a measure of the value of the investment in land drainage and in that spirit a portion of it has been included for 1919 in Table 1. Exchequer cost would, of course, be less than this and opportunity cost of POW labour could reasonably be treated as zero. This was the Ministry's view: the ultimate cost of the work to the state, they argued, amounted only to £70,000 of advances written off as irrecoverable – an average of 2*s* per acre.

The other major instrumental justification for land drainage schemes was the relief of unemployment. A programme of winter works for the relief of unemployment operated from 1921–2 to 1925–6.[31] Funds were made available to drainage authorities, or where none existed, to county agricultural committees (CAC) for approved schemes of land drainage. The Ministry advanced the entire of the money but drainage authorities were expected to repay 25 per cent and CACs 33.3 per cent, the latter under guarantee of the benefiting owners. In exceptional cases repayments of up to 50 per cent of the money were required. At 75 per cent of cost the grants to drainage authorities were the highest rates paid for land drainage in the inter-war period. The justification for these rates lay in the restrictions imposed. Work was to be done by hand labour as far as possible and expenditure for tools and materials was restricted to 20 per cent of the wage bill; where possible 75 per cent of the employed should be ex-servicemen and of the remaining 25 per cent the majority should be married civilians. Skilled men were restricted to one for every ten unskilled. Wage rates were not to exceed the local rates for unskilled agricultural workers.

The intention of the programme was to provide relief for the rural unemployed and it had its counterparts in other public works schemes for the urban unemployed. Nonetheless by 1924–5:

> the altered conditions of agricultural employment have depleted the rural districts of casual labour causing more recruitment from adjacent towns.

Other conditions of the scheme were altered as it progressed. In 1924–5 the restriction on tools and materials was relaxed so as to encourage larger-scale drainage schemes. In the final season, 1925–6, applications were confined to CACs and the volume of expenditure capped at a lower level.

The drainage schemes were of two types, land drainage and sea defence, the latter including some urban coastal protection. There was additionally a small amount of expenditure by CACs for water supply to remote farms. Winter was hardly the proper season for land drainage works and opposition from landowners was experienced for that reason as well as reasons of cost. Furthermore, the winters of 1922–26 were exceptionally wet and a number of schemes were abandoned with the work incomplete. As measured by labour input the scale of the scheme was considerably smaller than the Defence of the Realm operations using POWs, and while figures are incomplete, the maximum number engaged in any week was probably less

[29] Estimated from Anon, 'Drainage operations in Norfolk', *JMA*, 26, 1919, pp 381–7.

[30] A questionable assumption since topography is the main determinant of the area of benefit per unit length of water course. It perhaps suffices for a ball-park figure.

[31] Annual reports of the programme are published in the *JMA* as follows: 29, 1922, pp 488–9; 30, 1923, pp 519–25; 31, 1924, pp 610–7; 32, 1925, pp 588–94; 33, 1926, pp 201–11.

TABLE 4
Employment under relief works (including water supply)

Year	*Total (Mondays) ('000)*	*Max in 1 week*
1921–2	900	8165
1922–3	1019	9879
1923–4	711	na
1924–5	644	na
1925–6	219	na

than 10,000 (Table 4). As a contribution to the unemployment problem, even the problem of agricultural unemployment, it was of little consequence. Maximum expenditure in 1922–3 was less than £300,000. Most of the take-up was by drainage authorities where schemes averaged almost nine times the size of CAC schemes (Table 5). This implies that the project was concentrated in the major wetland areas where most of the drainage authorities were located. The published data include a regional breakdown but since the regional boundaries were changed in each of the first four years of the programme and were drawn in a variety of bizarre ways little information about the geographic spread of drainage under the programme can be gleaned.

Whether measured by number of schemes, total cost or area benefiting, the overwhelming majority of the programme was directed at land drainage rather than sea defence. Sea defence projects were, however, larger than land drainage ones on average and more expensive also in terms of cost per acre (Table 6).

While the notion of area of benefit was a matter of dispute in the 1920s, as discussed below, it is clear from internal evidence that in this case it refers to estimates by those responsible for the works of the area directly benefiting in that the land would experience less frequent flooding or lowered water tables as a direct consequence of the work done. For drainage authority schemes this would not necessarily coincide with rating liability. Excluding sea defence schemes, where some proportion of the benefiting land – probably a small proportion – could be in non-agricultural use, the total area of benefit amounted to just under 2.4 m acres.

From 1926–32 grants towards the costs of field drainage schemes were available to landowners as part of the programmes to facilitate the transfer of labour from distressed areas. The sums involved were small, the maximum identified being £60,000 in 1931 which includes an unknown amount for water supply and fen claying as well as field drainage.

The creation of catchment-wide drainage authorities consolidated in the 1930s Land Drainage Act broke the direct link between benefit and payment for arterial drainage. Henceforth drainage works were financed from rates levied on all ratepayers of the catchment including householders with no connection with agriculture. The change could be expected to reduce

TABLE 5
Land drainage and sea defence

Year	*Drainage Authorities*			*County Agricultural Committees*		
	No of schemes	*Total cost (£K)*	*Cost per scheme (£K)*	*No of schemes*	*Total cost (£K)*	*Cost per scheme (£K)*
1921–2	149	239.2	1.605	176	28.8	0.164
1922–3	182	248.7	1.366	350	38.0	0.109
1923–4	174	179.0	1.029	216	41.6	0.193
1924–5	152	152.7	1.005	234	38.8	0.166
1925–6	—	—	—	194	38.0	0.196

TABLE 6
Land drainage works for the relief of unemployment

Year	No of projects			Area benefiting ('000 acres)			Miles of waterways/ coastline covered		Total cost (£K)			Cost per project (£K)			Cost per acre benefiting (£)
	Land drainage	Sea defence	Total	Land drainage	Sea defence	Total	Land drainage	Sea defence	Land drainage	Sea defence	Total	Land drainage	Sea defence	Total	Land drainage
1921–2	281	44	325	299.5	42.1	341.6	na	na	na	na	318.4	na	na	0.98	na
1922–3	358	47	405	746.7	166.1	912.7	2105	88	228.4	93.7	322.1	0.64	1.99	0.80	0.31
1923–4	353	37	390	658.2	69.1	727.3	na	na	223.8	32.3	256.2	0.63	0.87	0.66	0.34
1924–5	352	34	386	597.1	71.5	668.5	1667	55	174.2	59.1	233.3	0.49	1.74	0.60	0.29
1925–6	188	6	194	95.2	8.5	103.8	na	na	53.6	9.0	62.6	0.29	1.50	0.32	0.56
Total	1532	168	1700	2396.7	357.3	2753.8	na	na	na	na	1192.6	(0.54)	(1.20)	0.70	(0.32)

opposition from potential beneficiaries who calculated that their benefits fell short of the costs but at the possible risk of further opposition from those with no possibility of benefit. The likelihood of this, however, was low following the Local Government Act 1929 which abolished general rates on agricultural properties. Thereafter the only rates payable on agricultural land were for drainage. Opposition from upland ratepayers was central to the troubles in the Ouse catchment and led to their exclusion from its boundaries. In accordance with the recommendation of the royal commission, rating for drainage purposes was henceforth based on annual value of property rather than acreage, thus shifting the incidence from agriculture to urban properties. This was to be accomplished by a precept on the counties and county boroughs to be collected as part of the general rates. This revenue was for three purposes: main river works; administration; and contributions to internal drainage authorities. These latter bodies were to collect revenue for internal drainage, defined as all arterial drainage works within the catchment area other than works on the main channel and its outfall, from rates levied on their respective internal drainage districts. These rates had to be by value except for agricultural land where they could be acreage based (1930 Act clause 23). Catchment boards were empowered to exact contribution from internal drainage bodies for works done on their behalf or for their specific benefit.

The royal commission recommended that a distinction should be drawn between upland and lowland parts of catchment with a lower rate precepted for the former. The division was subject to confirmation by the Minister with a right of appeal by aggrieved parties.

They argued at length that the traditional narrow definition of benefit deriving from 5. 5. 3 of the Bill of Sewers 1531 was the main hindrance to progress in land drainage and was no longer unacceptable. In discharging water to a river the landowner bore some responsibility for its passage to the sea If he altered discharges by field drainage then he should bear some of the costs incurred in the lower reaches of the water course affected.

> Originally the Lowlands were in many cases swamps, receptacles for the upland waters. The ingenuity of the Lowlander has reclaimed them, and from being vast unhealthy washes they have ... been converted into some of the ... most valuable lands in the kingdom ... Modern methods of agriculture have been adopted by both the Uplander and the Lowlander. Field drainage ... has become common to both. The result is that the waters from the Uplands reach the outfall more rapidly than formerly ... This has driven the Lowlander to expend vast additional sums on protective measures ...[32]

These reforms undoubtedly served to relieve the financial constraints under which arterial drainage had hitherto operated. By spreading the burden much more widely, and removing the direct link between drainage and payment, opposition to land drainage was effectively removed. The net effect of the rating reforms of the 1929 Local Government Act and the 1930 Land Drainage Act was probably that the rates burden was reduced for all farm-land even with the higher levels of expenditure on arterial drainage.

A switch from loans to grants was in many ways a logical complement to the rating reforms. With the transference of the burden to the taxpayer all links between direct benefit and liability for payment for land drainage are severed. The winter schemes for the relief on unemployment were partly grant financed. When phased out they were replaced by powers under the 1926 Land Drainage Act with grant aid for approved schemes by a drainage authority 'conferring a wide benefit on agricultural land.'[33] This scheme had no links with unemployment and hence there were

[32] Cmd 2993, paras 38 and 39.
[33] *JMA*, 33, 1926, p 496.

no restrictions on the use of machinery. The only constraint was that all new plant and material must be of British manufacture.

The scheme was originally for five years. It was continued under powers of the 1930 Land Drainage Act and subsequently extended and up-rated by the Agricultural Act 1937. Rates of grant varied between drainage authority but were higher under the 1937 Act than before it. Calculation of average grant rate is rendered difficult not only because of the variations between authorities but also because rates were effectively scheme-specific and were higher for large scale long-term programmes (although they varied between parts of the programmes). An additional complication is that they were typically coupled with a wide variety of soft loans. The calculations in Table 1 assume an average rate of 35 per cent 1926–35 and 40 per cent 1936–40. The rating reforms meant that the drainage authorities had little need for state loans after the introduction of this scheme and gross expenditure on loans was virtually zero, with expenditure net of repayments slightly negative after 1926. As a rough approximation then land drainage investment was financed 60–65 per cent by the ratepayer and 35–40 per cent by the taxpayer. Loan finance was important for land drainage only in the early 1920s. It is clear from the annual appropriation accounts that many of the loans given in the early years were never repaid and were subsequently written off, so that the distinction is more a matter of form than substance.

V

The incentive to the farmer to undertake field drainage depends on a comparison between the costs of installation and the benefits in terms of increased crop yields and the opportunity to shift to more profitable enterprises. Given the state of agricultural markets the costs of field drainage were prohibitive throughout most of the inter-war period. Thus in 1921:

> Manual labour in digging and laying drains on stiff land last winter probably cost about £15 per acre. Expenditure on this scale, coupled with the long period required to complete the work, and the increasing difficulty of obtaining skilled men to carry it out, is doubtless preventing much tile drainage work from being undertaken.[34]

The Ministry's attention therefore focused on the possibility of the use of machinery. A review of available machinery was published in the *Journal of the Ministry of Agriculture* for 1921.[35] This suggested that a petrol engine wheel excavator as used in Canada was suitable for tile drainage and a trial of such a machine was conducted in Cambridgeshire in July 1921.[36] The results were disappointing. The machine was expensive to operate and unreliable:

> As an example of a typical day, August 25th may be quoted. There was a stoppage of 1½ hours for a blacksmith's repair; 1¾ hours in minor adjustments in the field; and a period of 6 hours was actually spent in digging 21½ chains of 2 ft 6 in minors in stiff wet clay, 11½ gallons of benzol, 2¼ gallons of cylinder oil and about ½ lb of grease being consumed.

The cost of digging mains by the machine under controlled conditions was within the range 'estimated by practical farmers who saw the work' of doing the same work by hand. The machine offered some small cost advantage for dry soils.

Machinery in fact made no significant impact on the cost of field drainage throughout the inter-war period. Nicholson's view as late as 1940 is worth quoting:

> The land most in need of draining today is, unfortunately, least able to bear costs of any kind. ... Tile draining is laborious and costly – £10–20 per acre

[34] H V Garner. 'The "Buckeye" Ditcher for land drainage: trial in Cambridgeshire', *JMA*, 28, 1921, pp 306–20.
[35] Major J G Merrison, 'Farm drainage machinery', *JMA*, 45, 1920, pp 1080–88.
[36] Garner, 'The "Buckeye" Ditcher'.

before the beginning of the war. For most heavy land, the costs of such work are prohibitive.[37]

Faced with this difficulty the Ministry devoted considerable effort to the promotion of the cheaper alternative of mole draining.[38] Mole drainage is a technique for pasture improvement, not, in normal circumstances, suitable for arable. Successful moleing requires clay subsoil and some 'fall' to the land since the mole will be a constant distance below the surface.[39] It does not work with crumbly soils nor on flat lands. The opinion of the Ministry's expert was that 'since most of the land needing under-draining is land with a clay soil there are few cases where this method is not effective.'[40] Much of the land in the major wetlands which the Ministry was draining with arterial schemes was however likely to be flat. Mole draining with horse and by double steam traction was deemed to be too expensive, but drawing moleing machines by tractor or single steam traction was feasible with a cost far lower than tile draining.[41] The Ministry undertook a programme of mole ploughing demonstrations to publicize the technique to the farming community. In the period 1924–1932 53 demonstrations in 34 counties were carried out. An analysis of the results suggested a less than rosy picture. Some were judged to have been failures and many more only partially effective. While in some cases an effective life of ten years was possible, from the data given, the norm would seem to have been less than five.[42] The programme was successful in revealing the limitations and problems with mole drainage[43] and in stimulating the market in equipment.[44] There are no data on the spread of mole ploughing from which the broader success of the programme in disseminating technique can be judged. Indirect evidence however suggests that it was not widely adopted. Thus in 1940 Nicholson could say that:

> There is reliable evidence that 25 per cent of the heavy land of the country is in need of field drainage, and in many parts of the eastern counties considerable areas are derelict for this reason. This condition can be largely rectified by means of the mole plough.[45]

VI

During the early 1920s the Ministry undertook an extensive inquiry into the need for land drainage. For the 1925 survey of agricultural output[46] the crop reporters were asked to estimate the area which might be improved by small scale drainage schemes. They identified some 650,000 acres although over 50 per cent was in the northern counties,

> accounted for in the main by rough grazings where open 'sheep drains' are required or old drains of this type require cleaning out.

To this 650,000 acres had to be added the areas which could only be dealt with by large drainage schemes 'and the aggregate of these areas is very considerable'. In total the Ministry estimated that

> over a million acres of agricultural land in England and Wales are urgently in need of drainage and another half-million acres are capable of improve-

[37] H H Nicholson, 'The importance of mole draining in present circumstances', *JMA*, 46, 1940, pp 671–6.

[38] Anon, 'Mole drainage demonstrations', *JMA*, 33, 1926, pp 587–91.

[39] 'With some types of mole plough it is, at least theoretically, possible to vary the depth of the cartridge as the mole plough travels along ... but the operation requires considerable skill, and ... has not proved satisfactory': Thompson Close 'Mole draining by direct haulage', *JMA*, 32, 1925, pp 303–6.

[40] *Ibid.*

[41] Mole draining of 87 acres in 1925 with a single steam engine took four days at a total cost of £1 6*s* 8*d* per acre: A D Imper, T Lewis and V Liversage, 'A note on the cost of mole draining' *JRASE*, 86, 1925, pp 43–8; Adkins suggests £3–£5 per acre as being more typical: *Land Drainage*, p 289.

[42] J H Blackaby, 'Mole drainage demonstrations, 1924–32', *JMA*, 42, 1935, pp 1244–55.

[43] Including the problems created by (real) moles. The little gentlemen in black velvet seem to have taken the name of the process literally and assumed that the demonstrations were for their benefit.

[44] 'At the first demonstrations in 1924, direct haulage was represented by one tractor and one make of mole plough, whereas in 1932, it was demonstrated by no fewer than 8 tractors ... and 9 mole ploughs': Blackaby, 'Mole drainage', pp 1244–55.

[45] Nicholson, 'Mole draining', p 671.

[46] Cmd 2815, Ministry of Agriculture and Fisheries, *The Agricultural Output of England and Wales 1925*, 1927, p 7.

ment by drainage, and these estimates are exclusive of land where field drainage alone is required.[47]

These figures were subsequently refined by evidence gathered from other sources including returns from drainage authorities and the works undertaken for the relief of unemployment. A paper in 1927 gave surprisingly precise figures of 1,279,350 acres in urgent need of drainage and 475,850 acres capable of improvement through drainage, a grand total of 1,755,200 acres.[48] This estimate of need was repeated on several occasions including by the Royal Commission on Land Drainage[49] and clearly provided a driving force and justification for Ministry policy. But what was the nature of this need?

In the opinion of the royal commission the need was a strategic one for self sufficiency in food production to which the state of land drainage was an impediment.

> As the period of the War lengthened and the necessity became apparent of raising from the land of this country as much as possible of the food required for the population, the problem of land drainage emerged as one of great urgency (para 53).

However,

> the desirability of providing for the proper drainage of the agricultural land of this country was fully appreciated long before 1914; the emergency measures necessitated by the War merely focused attention upon it.

The commission was quite clear that this strategic need necessitated public subsidy. The situation was worsening:

> ... the depression in agriculture which existed during the last 20 years of the Nineteenth Century made it increasingly difficult for owners of agricultural land to maintain at their own cost an efficient system of land drainage over large tracts of the country. These difficulties have been aggravated in some parts of the country by the scarcity during the War, and its increased cost since. With the splitting up of estates during the last few years, the serious waterlogging of land may be expected to become even more prevalent, unless adequate steps are taken to ensure that drainage operations, in many cases of an extensive character, are carried out efficiently and economically (para 55).

These were the views of the landed interest from which the royal commission membership was drawn. The Ministry of Agriculture and Fisheries could scarcely openly endorse its protectionist stance. Instead it offered two justifications. First, the damage done from drainage was irreversible.

> ... a vast amount of work requires to be done if valuable land in large tracts is in many cases to be saved from sooner or later becoming derelict. That such is the case requires no expert eye, but merely the casual observation of any ordinary traveller from one end of England to the other.[50]

The appeal to casual observation was necessary since the claim does not stand up to scrutiny. The land whose drainage had deteriorated had been drained before with private finance when the economic conditions made it profitable to do so and there was no reason why it should not be improved again if the market conditions were suitable. Furthermore the large arterial schemes that the Ministry was promoting was making it possible to bring into production land that had not previously been drained, because it was not economic to do so, during the high drainage period of the nineteenth century. This was the case in the major wetlands, for example of the Ouse catchment and the Kent Marshes. Thus the work conducted by the Rye-Rother catchment allowed a major switch from sheep to arable on Romney Marsh in the 1950s.[51] Finally, to reiterate, the state of the land and the economic return on the arterial schemes depend on field drainage which will not take place unless it is profitable. The note concludes, lamely:

[47] *Ibid*, p 8.
[48] Anon, 'The need for land drainage', *JMA*, 33, 1927, pp 1010–14.
[49] Cmd 2993, para 57.
[50] Anon, 'The need for land drainage', p 1013.
[51] John Sheail and J Owen Mountford 'Changes in the perception and impact of agricultural land-improvement: the post-war trends in the Romney Marsh', *JRASE*, 145, 1984, pp 43–55.

the Ministry is not unmindful of the difficult times through which agriculture is now passing, but ... there can be no question that the expenditure involved is not only essential, but will ultimately prove profitable.

The second argument concerned the economic loss from undrained land:

> Out of 27 million acres under crops and grass, at least 1,200,000 are in areas which are waterlogged and another 500,000 acres are capable of being improved by drainage operations. These latter areas include some of the richest land in the Kingdom ... The loss to the nation in food alone has been estimated at £18 million annually, in addition to the loss to the country through the smaller employment of labour.[52]

There are several obvious criticisms of this statement. First the lost gross output from the land is too high. The loss of gross output per acre implied by this figure is £10.59. From the 1925 Agricultural Census,[53] total gross output for England and Wales was £225,330,000 from an agricultural area (excluding rough grazings) of 25,755,000 acres implying a gross output of £8.75 per acre. This global figure includes elements such as glasshouses, soft fruit and orchards which should be excluded. Gross output of livestock products per acre of grass from the census is £8.77; gross output per acre of farm crops and vegetables is £7.29; gross output per acre of crops and livestock is £8.31. This latter would seem a more sensible figure to use. It would reduce the 'loss to the nation in food alone' to a little over £14 m.

But this assumes that all the 1,700,000 acres are currently producing nothing. It is clear that the 500,000 acres described as capable of improvement were not in that situation. If we assume that the land was yielding half of average gross output, the loss is further reduced to £12 m. The Ministry's figure of £18 m would require that the land if drained would produce a gross output 33 per cent above the national average.[54] Over such a large area of land, even with field drainage, which was not forthcoming, this was an unrealistic expectation to say the least. The Ministry must have known that its estimate of output losses was a gross exaggeration.

But of course the production of food requires resources, and the 'loss to the nation' from poor drainage is not measured by gross output but by net output. The distinction would have been perfectly understood within the Ministry since the 1925 Agricultural Census was carried out in connection with the Census of Production Act 1906. That having been said, the measurement of net output is not straightforward because of the difficulty of measuring on farm consumption of crops. Using the conversion factors suggested by Ojala,[55] the ratio of net to gross output for 1924–9 is 0.563. Thus the Ministry's 'loss to the nation' gross output of £10.59 per acre equates to a net output loss of £5.96 or, in aggregate £10.13 m. Our corrected estimates of £12–14 m equate to losses of £6.76 m–£7.88 m.

The average gross outputs revealed in the 1925 census of £8.77 per acre for livestock products and £7.29 per acre for crops equate to net outputs of £4.47 per acre and £5.10 per acre respectively.[56] These figures reveal the dilemma faced by the Ministry in promoting field drainage. Deduction of labour costs from these figures would give gross margins of something like £1–£2 per acre. With a cost of tile drainage of £15 per acre the internal rate of return on the investment for land currently producing nothing will be 3–5 per cent against a cost of borrowing of 7–10 per cent.

[52] Anon, 'Government assistance to land drainage', *JMA*, 33, 1926, pp 280–1.
[53] Cmd 2815.
[54] This calculation assumes that the 1,200,000 acres in need of drainage produced nothing but were included in the census acreage, an unlikely contingency since such land would in all probability either appear as rough grazing or escape enumeration.
[55] E M Ojala, *Agriculture and Economic Progress*, 1952.
[56] Using net/gross output ratios calculated from Ojala, *Agriculture and Economic Progress*, of 0.51 for livestock and 0.70 for crops.

VII

The return on arterial drainage of agricultural land depends on parallel investment in field drainage by the farming community. Throughout the inter-war period the economic condition of agriculture was not conducive to field drainage investment and little was carried out.[57] Despite this obstacle the Ministry of Agriculture promoted an extensive programme of arterial drainage works. It did this through a series of administrative returns which broke the traditional link between payment and benefit and transferred the cost of the programme to taxpayers and urban ratepayers. But relieving farmers of the cost of arterial drainage works was not sufficient to induce them to drain their land and expand output with the consequence that the tax- and ratepayers saw no return on their investment until the changed conditions of the Second World War or in some cases until the post-war period.

The motivation for the drainage programme lay in the Ministry's preoccupation with technical efficiency as defined by agricultural science which showed that it was technically possible to increase the agricultural product, to improve crop yields, if the land were properly drained. From an economic viewpoint of course this missing output was not a waste since the opportunity cost of realizing it was too high.

The Ministry could only have achieved its ambition of having the land efficiently farmed had it been able to subsidize the investment in field drainage and, since at the agricultural prices then prevailing field drainage would not have been worthwhile at virtually any cost, also to raise the return received by the farmer from the resulting product. In the political conditions of the inter-war period it was able to do neither. In the different conditions after the Second World War it could and did do both. The result was that tile drainage became the norm in the English and Welsh lowlands with well documented consequences for landscape and wildlife.[58] The arterial drainage of the inter-war period facilitated this. But while subsidy and price support could alter the economics of field drainage from the viewpoint of the farmer, it could not alter the social return from arterial drainage since the real return on agricultural expansion is not changed by subsidy. Arterial drainage in the post-war period remained uneconomic.[59] But, as in the previous period, that did not prevent it from taking place.

[57] The absence of public loans or grants for field drainage in the inter-war period means that there is no hard evidence to support this contention. One possible source of evidence is the administration of field drainage grants after 1939 where MAFF drainage advisors were required to note the presence of old drains. These data were analysed by F W H Green, 'Field under-drainage before and after 1940', *AHR*, 28, 1980, pp 120–23, who treats them as evidence of nineteenth-century drainage since 'it is known that little was done between 1880 and 1939'. A later analysis by M Robinson, 'The extent of farm underdrainage in England and Wales, prior to 1939', *AHR*, 34, 1986, pp 79–85, concurs except that 'some short lived twentieth-century drainage schemes might have been counted in error'.

[58] For a summary see J Bowers and P Cheshire *Agriculture, the Countryside and Land Use: An Economic Critique*, 1983.

[59] J Bowers 'Cost-benefit analysis in theory and practice: the case of land drainage', in R K Turner, *ed*, *Sustainable Environmental Management Principles and Practice*, 1988, pp 265–89.

Measuring Regional Variation in Farm Support: Wales and the UK, 1947–72*

By GILLIAN BRISTOW

Abstract

This article uses the Producer Subsidy Equivalent (PSE) method of measuring farm support as a basis for quantifying the subsidies provided in the UK as a whole and the region of Wales between 1947 and 1972. The results demonstrate that when expressed as a percentage of the value of production, the PSE was on average higher in Wales than the UK as a whole. This was partly a product of the spatial dimension to UK farm policy provided in the form of hill farm subsidies. However, market price support dominated farm policy expenditure which, along with headage payments and improvement grants, tied the benefits of support to the scale of production. This penalized Wales where farm size was smaller on average than in the UK as a whole. Indeed, when the PSE results are expressed per hectare and per farm they show that hill farm subsidies were not sufficient to compensate for the disadvantage Welsh agriculture experienced from its smaller average farm size.

THE spatial dimension of agricultural policy is gaining increasing prominence in current debate. The issue is particularly exigent in the EU where enlargement, subsidiarity and future CAP reform are focusing attention on the question of how support can be more effectively targeted to particular regions and farms. A major product of this is increased pressure for a shift of policy competence back from EU institutions to national ones. Support for such a change is growing strongly in the UK owing to the high net cost of the CAP to the country and the continuing strains in the UK governments relationship with the EU.[1]

The assertion that national governments are more likely to cultivate regionally variable measures of farm support would appear, *prima facie*, to be supported by historical experience, and the commitment to hill farm support consolidated after the Second World War. Indeed, the UK government was determined to defend these subsidies upon entry to the European Community in 1973, citing their critical importance to the economic fortunes of hill farmers in regions such as Wales.[2] As yet, however, the precise scale of importance of these subsidies has not been measured because of a lack of quantification of the total amount of support received at the sub-national level.

In the light of this, the aim of this article is to measure both the regional dimension to pre-CAP UK farm policy (ie objectives and instruments) and the outcome of this in terms of the geographical distribution of support. More specifically, the article will measure the amount of farm support provided between 1947 and 1972 in the UK as a whole and in the region of Wales where hill subsidies were deemed to be particularly important. The purpose of this analysis is twofold: firstly, it will provide answers to questions about the significance of regionally variable subsidies in the UK in the period of national autonomy over farm support; and secondly, it will highlight the potential role for the sub-national

*I am indebted to staff at both the Welsh Office Agriculture Department and the Ministry of Agriculture, Fisheries and Food for their help in collecting the data for this paper. I am also grateful for the comments and suggestions of two anonymous referees.

[1] R. Kjeldahl and M Tracy, eds, *Renationalisation of the Common Agricultural Policy?*, Copenhagen, 1994; P Minford, 'Deal of understanding after the Beef War', *European Jnl*, 1996, p 10.

[2] Cmnd 4289, *Britain and the European Communities: An Economic Assessment*, HMSO, 1970, p 17.

quantification of farm support in both historical and contemporary policy analyses.

I

The 1947 Agriculture Act consolidated and extended state support for UK agriculture and therefore provides a useful starting point for this analysis. Building upon 1930s policy developments and embracing the lessons of wartime experience, the act affirmed the purpose of and mechanisms for farm support in the UK. Deficiency payments were the favoured tools of support. Under this scheme, farmers were guaranteed a certain market price while consumers paid the price freely determined by supply and demand. If the price consumers paid fell short of the guaranteed price, the difference was made up in the form of subsidies from the government.

This scheme was favoured because it allowed both low food prices and easy import access to a country only 65 per cent self-sufficient in food. Over 80 per cent of agricultural output was initially covered by the scheme which aimed to encourage a 20 per cent increase in production by 1952 and stabilize and support the level of farm income. Price guarantees were set on the basis of average industry costs.[3] This inevitably penalized smaller than average farms and those farm types with higher than average costs. This implied that the performance of UK aggregate income was emphasized over that of particular regions or types of farms.

Price guarantees were accompanied by input subsidies and improvement grants which increased in number and type over the 1950s and 1960s. These were specifically designed to lower farm costs, encourage the use of modern technology and so contribute to production expansion.[4]

The payment of direct subsidies on hill livestock represented the only deliberate attempt to channel extra support to clearly defined geographical areas. These began in wartime and were continued by the Hill Farming Act of 1946 and the Livestock Rearing Act of 1951. These subsidies were primarily designed to ensure that hill farms provided sufficient stocks for lowland breeding purposes in line with the government's livestock production objectives.[5]

These subsidies were destined to be of particular importance in Wales where with 80 per cent of farmland subject to severe crop-growing limitations, hill cattle and sheep farms accounted for over 60 per cent of farm holdings. Indeed, the Welsh agricultural sector has traditionally appeared distinctive in its UK context. In terms of structural characteristics, output per hectare of farmland (or land productivity) in the region was some 30 per cent below the UK national average in 1947, while mean farm size was some 50 per cent below the UK figure. Agriculture has also traditionally occupied a relatively more important socio-economic role in Wales than in the UK as a whole. In 1947, farming accounted for 9.3 per cent of Welsh GDP and 6.3 per cent of UK GDP. By 1995, the figures were 2.1 per cent and 1.5 per cent respectively. Agricultural activity remains of critical importance to the Welsh rural economy, the management of the environment and the preservation of the minority Welsh language.[6]

II

An appropriate measure of the amount of support made available in the UK and Wales from 1947 must, therefore, be one which measures both price support and the subsidies made available as improvement

[3] Cmd 8239, *Fixing of Farm Prices 1951*, HMSO, 1951, p 4.
[4] *Ibid*, p 3.
[5] Cmd 8556, *Annual Review and Determination of Guarantees 1952* [hereafter *Guarantees*], HMSO, 1952, p 4.
[6] M Haines *et al*, *Agriculture and Rural Wales*, Report of a working party to the Campaign for the Protection of Rural Wales, Welshpool, 1991.

grants and hill farm support. OECD practice is to use the Producer Subsidy Equivalent (PSE) method, as developed by Professor Tim Josling.[7] The PSE is a measure, for each commodity, of the total value of transfers from consumers and taxpayers to producers resulting from a given set of agricultural policies at a particular point in time. It has the advantage of combining the measurement of market price support with the amount of subsidies provided as direct payments (which do not raise consumer prices), and indirect or other support such as capital grants and input subsidies.[8]

The OECD has calculated and published PSEs for its member countries since 1979. However, for the EU countries the calculations pertain only to the EU as a whole.[9] As yet, no attempts have been made to produce PSE estimates for individual EU countries and their regions. Nevertheless, the OECD has recognized that more disaggregated PSEs may have an important role to play in analysing the effectiveness of past, present and future agricultural policies.[10] By applying the OECD's methodology, disaggregate PSE estimates have been produced in this study for Wales and the UK from 1947 (the year of the Agriculture Act) to 1972 (the year before entry to the EC). This is therefore a pioneering study which will not only shed important light on the potential uses of disaggregate PSEs, but will also yield new insights into farm support in this particular historical context.

Since Wales is part of the UK, it could be argued that this analysis involves double-counting. A comprehensive breakdown of UK support between all four constituent countries of the UK would indeed be informative and is a potentially fruitful area for future research. Nevertheless, as a starting point for an analysis of the regional variation in UK farm support in this period, the Wales-UK dichotomy offers a useful standard for comparison.

Estimates have been made for eight commodities accounting for over 95 per cent of the total value of UK agricultural output (see Appendix, Table A1). For each commodity, the gross (or net) PSE is calculated as:

$$\text{Gross(Net) PSE} = \text{MPS} + \text{DP} + \text{OS}(-\text{FA}) \quad (1)$$

where MPS = market price support, or the amount spent on supporting the prices farmers receive; DP = direct payments, which refer to all subsidies paid directly to farmers which do not raise product prices; OS = all other support, which includes all production and improvement grants designed to modernise farms and encourage increased productivity; FA = Feed Adjustment, the extent to which feed costs are inflated by market price support on cereals. More detailed information on the methodology used to calculate PSEs for Wales and the UK is contained in the Appendix.

For individual commodities the rate of farm support can be expressed per unit of output (PSEu):

$$\text{PSEu} = \text{PSE}/\text{Q} \quad (2)$$

Since it is inappropriate to aggregate different commodities in tonnes, the rate of farm support for all commodities together is expressed as a percentage of the adjusted value of production (AVP) where:

$$\text{PSE Equivalent (\%)} = \frac{\text{PSE} * 100}{\text{AVP}} \quad (3)$$

where

$$\text{AVP} = (\text{Q} * \text{P}) + \text{DP} \quad (4)$$

III

Table 1 presents a summary of the calculations of the gross (or net) and percentage

[7] FAO, *Agricultural Protection: Domestic Policy and International Trade*, C/73/LIM/9, Rome, 1973.
[8] G H Peters, 'The interpretation and use of Producer Subsidy Equivalents', *Oxford Agrarian Studies*, 13, 1988, pp 1–13.
[9] OECD, *Agricultural Policies, Markets and Trade: Monitoring and Outlook*, Paris, annual.
[10] OECD, 'Modelling the effects of agricultural policies', *OECD Econ Stud*, 13, 1989–90, p 37.

TABLE 1

Producer Subsidy Equivalents (PSEs) for Wales and the UK 1947–72

		1947	*1948*	*1949*	*1950*	*1951*	*1952*	*1953*
Gross PSE (£m)	Wales	14.4	18.6	22.4	20.8	22.8	25.8	25.9
	UK	115.5	174.0	222.3	198.1	239.3	268.4	289.2
PSE %	Wales	45.5	45.6	50.3	43.3	45.5	47.2	44.1
	UK	25.8	31.1	36.1	29.5	33.8	33.6	31.7
		1954	*1955*	*1956*	*1957*	*1958*	*1959*	*1960*
Gross PSE (£m)	Wales	26.3	25.2	26.9	22.9	21.6	29.8	32.7
	UK	302.5	332.0	320.5	383.3	445.1	378.0	400.9
PSE %	Wales	44.9	42.6	42.6	42.0	42.2	45.4	49.8
	UK	31.8	33.8	32.2	38.5	41.7	36.3	38.1
		1961	*1962*	*1963*	*1964*	*1965*	*1966*	
Gross PSE (£m)	Wales	41.6	34.0	27.8	32.3	30.3	31.8	
	UK	454.4	439.9	426.0	363.3	290.8	331.5	
PSE %	Wales	58.1	48.8	42.3	44.5	42.2	40.8	
	UK	40.6	42.4	41.1	32.4	22.4	27.2	
		1967	*1968*	*1969*	*1970*	*1971*	*1972*	
Net PSE (£m)	Wales	36.3	40.4	36.6	37.3	40.5	40.5	
	UK	416.0	340.9	354.9	355.4	451.4	308.2	
PSE %	Wales	44.2	46.3	41.4	39.7	40.1	35.8	
	UK	29.9	23.6	23.9	22.0	25.0	15.6	

Source: PSE calculations; see Tables A2 and A3 in Appendix.

PSE for Wales and the UK from 1947 to 1972. The Appendix presents the results in greater detail.

The results demonstrate that Wales consistently received a higher percentage rate of agricultural support than the UK average. The gap between the percentage PSE in Wales and the UK as a whole averaged 12.9 percentage points over the entire period. Some 8.6 percentage points of this were accounted for by the higher rate of market price support (MPS) received in Wales, 2.4 percentage points by the higher rate of direct payments (DP), and 1.9 percentage points by the higher rate of other support (OS) received in the region. Welsh agriculture therefore enjoyed a higher than average margin of protection on the value of its output, suggesting that the spatial dimension to UK agricultural support was indeed successful at targeting extra support to Welsh farmers.

IV

The higher percentage rate of market price support in Wales was not a product of higher regional producer prices. Closer analysis of the individual commodity PSEs expressed per unit of output reveals that differences in support levels between Wales and the UK were caused almost entirely by different (generally higher) unit levels of direct payments and other support in Wales. For example, over the 1947–72 period on average, the unit PSE for beef/veal was some £55.10 per tonne higher in Wales than the UK. Some £33.90 of this could be accounted for by higher direct payments per unit of beef output in Wales, and the rest by the higher unit rate of other support on beef in the region.

The only exception to this was milk where there was a small difference in regional prices as a result of the pricing policy of the Milk Marketing Boards

established in 1933. On average over the 1947–72 period milk prices in Wales were 2.5 per cent higher than in the UK as a whole. These higher prices were designed to cover the extra transport costs of collecting milk from remote hill farms in the region.[11] For all other commodities the UK government set support prices and adopted a uniform pricing policy for the whole country. The government was not prepared to sacrifice the administrative simplicity of its price support policy which set prices on the basis of the costs of an average-sized farm.

This uniform pricing policy discriminated against Wales. This was because support was allocated per unit of production, so that the more farmers produced the more subsidy they received. Smaller than average farms, which predominated in Wales, therefore received less than average support. This prompted one Welsh MP to call for the introduction of regional prices in 1968, claiming that 'unless such a system is created to take account and acknowledge the...different circumstances which exist between Welsh agriculture and the general agriculture of the UK, there will never be a satisfactory system of price determination for Welsh agriculture'.[12] The government rejected this proposal on the grounds that it would be impracticable and costly to implement.

Neither was the union lobby predisposed to fight for flexible pricing. The position of power held by the National Farmers Union (NFU) in the policy-making process was built on its claim to represent the interests of UK agriculture as a whole.[13] It was therefore continuously forced to balance the needs of both cereal and livestock producers, and smaller and larger farmers. The perceived failure of the NFU to represent the interests of Welsh livestock farmers ultimately led to the formation of the Farmers Union of Wales (FUW) in 1955. However, the NFU's exclusive position in the policy-making process at that time meant that FUW proposals for differential prices could not penetrate policy discussions.[14]

The higher percentage PSE in Wales is instead explained by the variation which existed in levels of price support between different commodities and therefore farm types. In other words, the geographical variation in production gave rise to an inevitable degree of variation in the level of market price support (Table 2).

The higher percentage rate of market price support in Wales was caused by the fact that price support was highest on milk, the commodity which dominated Welsh agricultural production (Table 3).

Table 3 shows that milk consistently enjoyed the highest rate of support. This was a result of its consumer importance and a tradition of protection dating back to the establishment of the Milk Marketing Board in 1933. When a surplus developed, a 'Standard Quantity' or limit on the output of milk subject to guarantee was introduced in 1954.[15] However, this resulted in only a marginal reduction in the rate of price support. Moreover, the rate of production expansion actually increased from 1.8 per cent a year between 1950 and 1960, to 1.9 per cent between 1960 and 1970. Other livestock products were less heavily protected than milk and, as with crops, saw their rates of support change directly in accordance with the government's production objectives. Price support on pigmeat rose until the mid-1950s when a surplus developed, culminating in the introduction of a Standard Quantity in 1961.[16] Prices were increased again after

[11] Milk Marketing Board, *Dairy Facts and Figures*, Thames Ditton, Surrey, annual.
[12] House of Commons, *Official Report of the Welsh Grand Committee – Agriculture*, 1968, first sitting 3 April 1968, col 19.
[13] J Smith, *The Politics of Agricultural Support in Britain: The Development of the Agricultural Policy Community*, Aldershot, 1990.
[14] FUW, *A Statement of Policy for the Farmers Union of Wales*, Aberystwyth, 1958.
[15] Cmd 9104, *Guarantees 1954*, 1954, p 3.
[16] Cmnd 1311, *Guarantees 1961*, 1961, p 8.

TABLE 2
Average rates of market price support in the UK (expressed as a percentage of the value of output)

Period	*Wheat*	*Barley*	*Sugar*	*Potatoes*	*Beef/veal*	*Sheepmeat*	*Pigmeat*	*Milk*
1947–50	8.2	37.8	17.2	3.8	1.3	36.6	5	47.5
1951–54	−8.5	18.3	33.1	13.3	−14.4	12.9	23.1	53
1955–58	16.2	23.3	28.7	28.6	2.1	3.8	21.2	51.3
1959–62	20.6	37.5	25.8	14.8	11.2	18.3	18.5	49.9
1963–66	14.4	26	20	5	−17.5	5.8	5.9	46.9
1967–70	15.9	7.9	2.4	1.6	−3.1	6.8	2.3	41.4
1971–72	21.1	17.7	−7.1	−34.2	−33.6	16.1	11.1	39.4
1947–72	12.6	24.1	17.2	4.7	−7.7	14.3	12.4	47.1

Source: PSE calculations.

TABLE 3
Average commodity shares (percentage) of total value of production* 1947–72

Commodity	*Wales*	*UK*
Wheat	0.7	6.8
Barley	1.1	7.1
Sugar	0.1	2.8
Potatoes	4.6	7.8
Beef/veal	8.9	11.6
Sheepmeat	10.7	5.3
Pigmeat	6.0	14.3
Milk	67.9	44.3

* Of commodities included in PSE calculations.
Source: PSE calculations.

1968 as part of the production expansion programme which characterized entry preparations for the European Community.[17] Sheepmeat support followed a similar pattern to pigmeat.

The emphasis placed upon expanding agricultural production in preparation for membership of the European Community deserves some explanation. European agricultural policy (based on high consumer prices and import protection) was ill-suited to the needs of UK agriculture since with its much smaller agricultural population (3.5 per cent compared with 16 per cent in the Community of Six in 1967), it would not benefit as much as other member states from high prices. At the same time the costs of importing from higher-price Community sources would be proportionately more burdensome given heavy UK import requirements. The need to both reduce the import bill and maximize the benefits of high market prices required that production be expanded as quickly as possible.

From 1966, the government emphasized the expansion of beef production as part of the new import-saving role identified for agriculture by the 1965 National Plan.[18] However, although the domestic producer price rose by 9 per cent a year on average between 1964 and 1972, market price support actually fell and was negative for most of this period. This was because world prices rose by 11 per cent a year on average due to international beef shortages.[19]

The import-saving policy had considerable implications for cereals support. From 1964 target prices for wheat and barley were set in relation to imports and standard quantities introduced.[20] These were relaxed from 1966 when the emphasis on expanded meat production necessitated increased domestic production of feedstuffs. From 1967 attempts were made to redress the cereals market imbalance by encouraging a switch from barley to wheat production. As a result the standard quantity on wheat was abolished in 1968 and

[17] Cmnd 3558, *Guarantees 1968*, 1968, p 14.

[18] Cmnd 2764, *The National Plan*, HMSO, 1965.
[19] Cmnd 5254, *Guarantees 1973*, 1973, p 8.
[20] Cmnd 2315, *Guarantees 1964*, 1964, p 9.

the differential between wheat and barley price guarantees increased by 50 per cent. The standard quantity on barley was abolished in 1969 when poor harvests threatened production targets.[21]

V

As mentioned earlier, over the 1947–72 period on average Wales experienced a higher percentage rate of direct payments than the UK national average. Between 1947 and 1972, the subsidies classified as direct payments to the UK agricultural sector consisted of the Hill Sheep, Cattle and Cow Subsidies (which had a deliberate spatial bias), and the Calf and Beef Cow Subsidies (which did not). The accumulated expenditure on these schemes in the UK amounted to £520.9 million, of which £90.9 million (17.4 per cent) was received in Wales. It is worth noting that on average over the 1947–72 period, Wales accounted for 10.4 per cent of the UK's farm holdings.

In terms of the total expenditure, Wales received more than any other UK region from the schemes of hill farm support, simply because it had the largest number of farms eligible for these subsidies.[22] For example, 60 per cent of the region's hill cows were eligible for the Hill Cow Subsidy. This was introduced in 1953 and was paid annually on cows in regular breeding herds on land suitable only for the production of store cattle and sheep (Table 4).

The Hill Sheep Subsidy (introduced in 1952) was paid on ewes of specified hill breeds and was designed to maintain a reservoir of breeding ewes and store sheep for lowland producers. Prior to 1967, the subsidy was paid retrospectively according to the previous year's hill farm income and was not paid in 1954, 1958 and 1959 when sheep farming was relatively profitable. A flat rate basis for payment was adopted in 1967 and the subsidy extended to include flocks maintained in areas eligible for hill cow subsidy.[23] As Table 5 shows, this significantly increased the scope of the scheme in Wales.

As the volume of hill farm support increased in Wales, so did the Welsh hill farmer's dependence upon this support. On average between 1952 and 1957, hill subsidies accounted for 18 per cent of net agricultural product in Wales (where net product is equal to gross output less gross input less depreciation). By 1967–72, this ratio had risen to 58 per cent.

Despite the large quantities of hill support received in Wales, the region's farmers could have earned even more had their rate of subsidized herd expansion (up 352 per cent by 1975) matched that of their English counterparts.[24] Moreover, the PSE analysis enables us to place the value of hill farm support to Wales in its context. The £50.2 million spent on hill subsidies in the region up to 1972 was relatively insignificant compared to the £459.3 million received as price support.

The other direct payments to farmers introduced after 1947 had no explicit spatial objectives but were also geared towards livestock production. Over £35 million (10 per cent of the UK total) was received under the Calf Subsidy in Wales up to 1972. However, the north-west and south-west regions of England captured the greatest shares of this subsidy since they benefited from greater opportunities for switching from milk to beef production.[25] The Beef Subsidy (introduced in 1967) was even less significant in Wales, providing a total of just over £2 million of assistance (7.5 per cent of the UK total) up to 1972.

[21] Cmnd 3558, *Guarantees 1968*, p 14; Cmnd 3965, *Guarantees 1969*, 1969, p 15.
[22] I Bowler, 'Regional specialization in the agricultural industry', *Jnl Agric Econ*, 32, 1981, pp 43–54.
[23] Cmnd 3554, *Wales 1967*, HMSO, 1967, p 47.
[24] I Bowler, *Government and Agriculture: A Spatial Perspective*, 1979, p 53.
[25] *Ibid*, p 54.

TABLE 4
The Hill Cow Subsidy in Wales 1953–72

Year	*Number of cows subsidized in Wales*	*Total payments in Wales (a)* £*m*	*Total payments in UK (b)* £*m*	*(a) as percentage of (b)*
1953	3894	0.036	0.310	11.6
1954	53635	0.492	2.320	21.2
1955	43505	0.429	2.419	17.7
1956	49806	0.498	2.675	18.6
1957	36746	0.367	2.850	12.9
1958	73635	0.736	3.050	24.1
1959	59348	0.683	3.850	17.7
1960	67312	0.807	4.475	18.0
1961	68423	0.809	4.900	16.5
1962	78237	0.936	5.300	17.7
1963	80403	0.961	5.550	17.3
1964	77241	0.921	5.675	16.2
1965	87517	1.607	6.450	24.9
1966	108782	1.958	7.300	26.8
1967	105811	2.037	8.400	24.2
1968	110306	2.344	9.900	23.7
1969	122720	2.729	11.425	23.9
1970	129053	3.063	13.375	22.9
1971	134740	3.201	13.500	22.1
1972	139355	3.413	15.300	22.3
		Total 28.027	Total 130.024	Mean 20.0

Sources: MAFF, *Agricultural Statistics of the UK*, annual; MAFF Welsh Department, *The Digest of Welsh Agricultural Statistics*, annual.

VII

Table 6 shows the many and various schemes classified as other support in the UK between 1947 and 1972. The accumulated expenditure on these improvement grants and input subsidies amounted to £1463.83 million in the UK, of which £114.63 million (7.8 per cent) was received in Wales.

Most of these subsidies were designed to help farmers in all parts of the country to become more productive, and were not therefore tailored to different regional needs and circumstances. For example, as part of the production expansion programme, the 1947 Agriculture Act established subsidies on fertiliser and lime. A total of 6.6 million tonnes of fertiliser were delivered to Welsh farms up to 1972 under the aegis of the Fertiliser Scheme, at a cost in subsidy of £28.6 million. Lime was more appropriate for improving fertility on upland farms and although 7.8 million tonnes were supplied to Wales by 1972 at a cost of £12.8 million, the rate of application of subsidized lime in the region remained only half that in England. The blanket nature of the scheme failed to account for the higher unit cost of lime spreading in upland areas where heavy rainfall continually leached the soil.[26]

Even those schemes of support which were specifically designed to encourage hill farm improvements were criticized for not being sufficiently tailored to the conditions of Welsh agriculture. Under the Hill Farming Act of 1946 and Livestock Rearing Act of 1951, grants were provided to cover 50 per cent of the cost of improving the socio-economic fabric of hill farms. The Hill Farming Act of 1956 extended the

[26] Cmnd 7820, *Wales and Monmouthshire: Report of Government Action for the Year Ended 30 June 1949* [hereafter *Wales Government Action*], HMSO, 1949, p 22.

TABLE 5
The Hill Sheep Subsidy in Wales 1952–72

Year	*Number of sheep subsidized in Wales (million)*	*Total payments in Wales (a) £m*	*Total payments in UK (b) £m*	*(a) as percentage of (b)*
1952	1.422	0.215	1.003	21.4
1953	0.026	0.003	0.015	20.0
1954	0	0	0	0
1955	1.105	0.260	1.125	23.1
1956	1.083	0.255	1.100	23.2
1957	1.564	0.036	0.175	20.6
1958	0	0	0	0
1959	0	0	0	0
1960	0.987	0.142	0.525	27.0
1961	1.301	0.206	0.775	26.6
1962	1.302	0.339	1.250	27.1
1963	1.518	0.665	2.150	30.9
1964	1.319	1.477	5.100	29.0
1965	1.247	1.267	4.800	26.4
1966	1.595	1.703	7.100	24.0
1967	1.517	1.759	6.425	27.4
1968	2.172	2.311	6.875	33.6
1969	2.246	2.386	7.200	33.1
1970	2.361	2.543	8.550	29.7
1971	2.226	3.412	9.600	35.5
1972	2.364	3.413	9.275	36.8
		Total 22.392	Total 73.043	Mean 29.0

Source: as for Table 4.

period for submitting improvement schemes by a further seven years and made an extra £5 million available. While over 3000 schemes were approved in Wales by 1962, completion rates in the region (13 per cent) were lower than the UK average (22 per cent) as progress was hindered by poor access roads and difficulties in obtaining contract labour.[27]

The main problem, however, was that Welsh hill farmers faced relatively greater difficulties in meeting their share of the costs of improvements, which were high relative to farm size even with a 50 per cent grant.[28] As early as 1953, Welsh MPs proposed that higher rates of grant aid and low interest-rate loans be paid to Welsh farmers.[29] However, this proposal was rejected since 'the government could not agree that it would be right to give farmers in one part of the UK a rate of subsidy higher than that available to other farmers on similar land elsewhere'.[30] Instead, from the late 1950s onwards schemes of 'other support' were increasingly geared towards encouraging the creation of viable farm units by amalgamation.

However, owing to limited spatial flexibility in the design of these schemes, Welsh farmers still encountered difficulties in maximizing their benefits. For example, low financial incentives and stringent eligibility conditions limited the uptake of support under the Farm Amalgamation and

[27] Cmnd 8959, *Wales Government Action 1953*, 1953, p 25.
[28] House of Commons, *Official Report of the Welsh Grand Committee – Agriculture*, 1962, 30 May 1962, col 110.
[29] Cmnd 8844, *Report of the Rural Development Panel of the Council for Wales and Monmouthshire*, HMSO, 1953, p 7.
[30] Cmnd 9014, *Rural Wales*, HMSO, 1953, p 6.

TABLE 6
Schemes of other support in the UK 1947–72

Scheme	*Total expenditure 1947–72 £m (current prices)*	
	UK	*Wales*
Farm water	9.82	1.24
Field drainage	42.75	1.51
Hill farming improvement	17.82	10.93
Ploughing grant	108.95	13.13
Marginal production	12.01	1.65
Silo subsidy	6.80	1.29
Farm improvement	122.92	14.49
Horticultural improvement	16.35	0.29
Farm capital grant	134.27	3.44
Investment	27.00	1.06
Hill land	2.10	1.81
Lime subsidy	130.40	12.80
Fertiliser subsidy	509.15	28.60
TB attested herd	64.55	6.42
Small farmer	34.60	7.16
Small farm business management	2.60	1.02
Farm structure	4.07	0.27
All other*	217.64	7.52

* Many minor schemes such as bracken eradication, scrub clearance, grassland renovation.
Source: as for Table 4.

Farm Structure (Payments to Outgoers) Schemes of 1967. By 1972, rates of successful application under the Outgoers Scheme stood at 3.1 per cent in the UK and only 1.7 per cent in Wales. Similarly, the rate of adoption by eligible farmers under the 1957 Farm Improvement Scheme remained consistently lower in Wales (less than 60 per cent) than in England (over 90 per cent) due to lower average farm size.[31] This also resulted in the mean value of aid per farmer being 40 per cent lower in the region.

The Small Farmer Scheme of 1959 was the most obvious attempt to encourage small farms to achieve a minimum acceptable economic size. This scheme defined this minimum size as a labour requirement of 275 Standard Man Days.[32] This was supplemented in 1965 by the Small Farm (Business Management) Scheme.

Uptake of these schemes was fastest amongst the dairy farms of north-east Wales seeking to improve grassland quality.[33] Indeed, Wales received a larger share than any other region (23.6 per cent or £8.18 million) of the support made available under these schemes by 1972. However, the conditions of eligibility excluded 3000 part-time farmers in Wales and all farmers in receipt of hill farm improvement grants.[34] Moreover, while the scheme contained 'permissive provision ... to meet the needs of the various part of the UK ... no provision [was] made even for the possibility of a separate scheme for Wales ... ignoring the clear fact of special Welsh conditions'.[35]

Despite the substantial amount of support made available in Wales, the continuing concern was that revenue from farm

[31] R C Hine, 'Structural policies and British agriculture', *Jnl Agric Econ*, 24, 1973, pp 321–29.
[32] Cmnd 583, *Assistance for Small Farmers*, HMSO, 1958, p 5.
[33] Bowler, *Government and Agriculture*, p 61.
[34] House of Commons, *Official Report Standing Committee A – Agriculture (Small Farmers) Bill*, 1958, 25 November 1958, col 73.
[35] *Ibid*, col 119.

TABLE 7
Mean PSE per farm and per hectare (ha), UK and Wales 1947–72

Years	*Mean PSE per ha (£)*		*(a)–(b)*	*Mean PSE per farm (£)*		*(a)–(b)*
	UK (a)	*Wales (b)*		*UK (a)*	*Wales (b)*	
1947–51	9.5	11.1	−1.6	357.6	360.4	−2.8
1952–56	15.6	14.3	1.3	576.9	473.9	102.9
1957–61	20.9	16.9	4	850.1	571.4	278.7
1962–66	18.8	18.2	0.7	828.5	632.5	196
1967–72	23.1	22.8	0.3	1063.8	1017.6	46.1
1947–72			0.9			124.2

Sources: PSE calculations; MAFF, *Agricultural Statistics of the UK*, annual.

production in the region was incapable of meeting labour and capital costs.[36] However, at the same time the response to this, the amalgamation of small farms, was contributing to the onerous problem of rural depopulation, such that Wales was the victim of 'policy schizophrenia'.[37] Between 1950 and 1960, Welsh agricultural employment fell by 29 per cent.

So far the analysis has focused on explaining why Wales had a higher percentage PSE than the UK national average. However, on its own the PSE percentage is not an adequate measure of the extent of regional variation in farm support. This is because the effect of a higher margin of protection may be nullified where a region has lower productivity and/or smaller average farm size. A proper evaluation of the extent of regional variation in support therefore demands that the PSE figures also be expressed per farm and per hectare (Table 7).

While the percentage PSE figures in Table 1 suggested that there was a degree of regional variation in support in this period to favour Wales, Table 7 reveals a different picture. On average over the whole period there was very little difference between mean PSE per hectare in Wales and the UK, while mean PSE per farm was some £124 higher in the UK than in Wales. This suggests that the effect of the higher percentage PSE in the region was more than cancelled out by the effect of the region's lower land productivity and smaller average farm size. This implies that the regional variation in support was not sufficient to compensate for Wales' relative physical and economic handicaps and Welsh farmers therefore remained relatively disadvantaged.

VIII

Using the OECD's PSE methodology, this article has measured the amount of farm support provided in the UK and the region of Wales from 1947 to 1972. First and foremost, this has provided a means of measuring the spatial dimension to UK farm policy during this period. The PSE calculations show that when expressed as a percentage of the adjusted value of production, Wales received a higher rate of support than the UK national average. The greatest share of farm support in the region was provided by market price support and, moreover, Wales received a higher percentage rate of price support than the UK national average. However, this geographical variation in support did not reflect a policy of regional pricing but was rather the inevitable product of varying levels of commodity protection.

[36] House of Commons, *Official Report of the Welsh Grand Committee – Agriculture*, 1965, third sitting, 23 June 1965, col 132.
[37] R W Slee, 'Agricultural policy in remote rural areas', *Jnl Agric Econ*, 32, 1981, pp 113–21.

The spatial dimension to UK farm support was provided by hill farm subsidies with Welsh agriculture receiving a greater share of this support than any other region of the UK. However, Welsh farmers could have earned even more from these schemes had they been able to increase average herd sizes more quickly. Smaller average farm size also thwarted the ability of Welsh farmers to benefit from the increasing array of production and improvement grants provided over this period. Although the burden of the costs of these schemes was proportionately higher in Wales, the policy-making structure could not accommodate demands for flexible subsidy arrangements. The policy was instead directed towards raising the number of farms above defined thresholds of viability, which created concern that the depopulation of rural Wales might be accelerated.

Indeed, when the PSE results are expressed per hectare and per farm, they suggest that Welsh agriculture remained relatively disadvantaged in its UK context. Price support, headage payments and improvements grants tied the benefits of support to the scale of production. The more farmers could produce, the more subsidy they could earn. This inevitably benefited larger farms in the more fertile agricultural regions of the country. The spatial dimension to policy, provided principally by hill farm support, was not sufficient to outweigh the disadvantage Welsh agriculture experienced from its smaller average farm size. Further research is required to determine whether the Common Agricultural Policy has been any more effective in this respect.

It would appear, therefore, that national and sub-national PSE calculations have a useful role to play in agricultural policy analyses at the regional level. They can be used to estimate the quantitative importance of spatially variable farm policies and can generate important insights into how effective policies are at compensating for regional disadvantages. This paper indicates that deliberately spatial farm policies are of limited use where they are insufficiently tailored to a region's needs, and where they remain dominated and overshadowed by blanket support mechanisms.

APPENDIX

Methodology for PSE Calculations for Wales and the UK

For each commodity the Gross PSE is calculated as:

$$\text{Gross PSE} = \text{MPS} + \text{DP} + \text{OS} \qquad (1)$$

where MPS = market price support; DP = direct payments; OS = all other support.

MPS is calculated as the difference between the supported producer price (P) and some reference or 'world' price in national currency (Pwnc), multiplied by the volume of production (Q):

$$\text{MPS} = Q^*(P - \text{Pwnc}) \qquad (2)$$

The PSE therefore assumes the small-country case with no account taken of the effect of any country's policies on the actual world price. The PSE calculations are particularly sensitive to the values of reference prices and therefore the choice of these prices is an important one. The OECD guideline is that the reference price should not necessarily be the cheapest source of a particular commodity, but should be that which is most representative of where the particular country, region or trading bloc can obtain supplies of the commodity of a comparable quality and suitability for its requirements.[38]

Since 1979, the OECD has made strenuous efforts to improve the choice of reference prices used in the EU PSE calculations. It has done this by adopting prices which are representative of EU trading patterns as a whole and which could therefore be used in national and sub-national PSE analyses for EU member countries.[39]

As far as possible, this convention has been adopted for this analysis with reference prices being chosen on the basis of how representative they are of European import prices for this period. This provides an important standard for the analysis. It

[38] OECD, *Agricultural Policies*, annual.
[39] *Ibid.*

TABLE A1
Commodity definitions and reference prices used 1947–72

Commodity	*Type*	*Reference price*
Wheat	Common wheat	US export price
Barley	Common barley	Canadian import price
Potatoes	Maincrop/ware	Netherlands producer price
Sugar	Sugar beet	Danish producer price
Beef/veal	Bovine meat, dressed carcase weight	Argentinian imported deadweight
Sheepmeat	Dressed carcase weight	UK wholesale price deadweight
Pigmeat	Whole and half carcasses	Danish producer price deadweight
Milk		Implicit external milk price derived from milk equivalent of traded dairy products (butter, skim milk powder; Netherlands & Denmark)

Sources: FAO, *Production Yearbooks*, Rome, annual; World Bank, *Commodity Trade and Price Trends*, Rome, annual.

may be desirable in the future to produce PSE estimates using these prices for other European countries and regions for this period, to analyse both the volume and spatial variability of the support they provided at this time. Table A1 shows the reference prices chosen for this analysis and indicates the data sources used. All prices have been converted using the current £:$ exchange rate.

Estimating UK and Welsh PSE's for the 1947–72 period is aided by the wealth of statistics available on prices, production and subsidies. The main UK sources are the White Papers published annually as part of the Review of the UK agricultural industry which determined the level of price guarantees up to 1973;[40] and the annual census returns for UK agriculture published by the Ministry of Agriculture Fisheries and Food. The main Welsh sources are the agricultural census returns for Welsh agriculture published by MAFF Welsh Department, MAFF, *Agricultural Statistics of England and Wales*, annual, and Department for Home Affairs, *The Digest of Welsh Statistics*, annual.

Quantity data relate to production from the relevant national farm as recorded in the census returns. Quantities of meat output in Wales have been estimated as the number of slaughtered Welsh livestock multiplied by the UK ratio of meat equivalent. Domestic producer prices are annual averages at the farm-gate, including guarantees, and have been obtained from the Annual Review White Papers. Where UK prices are unavailable, prices used are the average for England and Wales.[41] Where expenditure on subsidies relates to financial years (April to March), it has been calendarized using the ratio 0.25:0.75.

For livestock commodities, a deduction is made to the gross PSE to account for the effect of guaranteed cereal prices on purchased feed costs. Thus:

$$\text{Net PSE} = \text{Gross PSE} - \text{FA} \qquad (3)$$

where FA = feed adjustment, calculated as the difference between expenditure on feed at protected and world prices by livestock category.

It is difficult to make the feed adjustment to UK and Welsh PSEs because of the lack of reliable data on feed prices and quantities by livestock category and region. This problem has been overcome by using farm level data on concentrate expenditure.[42] No feed adjustment estimates have been made before 1967 because up until this time price support on feed grains took the exclusive form of a deficiency payment which did not raise its free market price.

For each livestock enterprise, the total feed adjustment (FA) estimate has been calculated as:

$$\frac{\{[(a * P_{fw}) + (b * P_{fb})] * 100\}}{C} - \frac{\{[(a * PW_{fw}) + (b * PW_{fb})] * 100\}}{C} \qquad (4)$$

where Pfw and Pfb are the protected prices of feed wheat and barley respectively; PWfw and PWfb are their respective world prices; C is total expenditure on purchased concentrates, and a and b are weights based on the proportions of the volume of concentrates accounted for by wheat and barley, the main price supported cereals fed to livestock.

These weights have been estimated using MAFF six-monthly surveys into livestock rations, which typically cover between 40 and 50 per cent of all

[40] For example, Cmnd 3558, *Guarantees 1968*.
[41] MAFF, *Agricultural Statistics of England and Wales*, annual.
[42] Farm Management Survey, *Statistical Results for Wales*, University of Wales, Aberystwyth, annual.

TABLE A2
UK PSEs 1947–72: aggregate of all commodities

	Unit	*1947*	*1948*	*1949*	*1950*	*1951*	*1952*	*1953*	*1954*	*1955*	*1956*
Adjusted value production	£M	448.428	560.33	615.21	671.971	708.631	798.65	912.53	952.44	982.93	993.71
A. Market price support	£M	114.595	172.736	221.03	196.841	234.669	241.129	255.202	262.432	279.979	262.194
B. Levies	£M	0	0	0	0	0	0	0	0	0	0
C. Direct payments:	£M	0	0	0	0	0	0	0	0	11.4	15.2
Area & Headage Payments	£M	0	0	0	0	0	0	0	0	11.4	15.2
D. Reduction of input costs/general services:	£M	0.939	1.312	1.228	1.308	2.208	16.449	20.483	24.287	27.307	41.376
Capital Grants	£M	0	0.029	0.039	0.202	0.917	7.445	8.896	11.223	11.643	10.732
Structural/Infrastructural	£M	0	0	0	0	0	0	0	0	0	0
Fuel/Fertiliser	£M	0	0	0	0	0.917	7.57	10.176	11.434	14.146	22.655
General Services	£M	0.939	1.283	1.189	1.106	0.374	1.434	1.411	1.63	1.518	7.989
E. other	£M	0	0	0	0	2.453	10.829	13.509	15.786	13.347	1.695
Total other support	£M	0.939	1.312	1.228	1.308	4.661	27.278	33.992	40.073	40.654	43.071
Gross total PSE	£M	115.534	174.048	222.258	198.149	239.33	268.407	289.194	302.505	332.033	320.465
PSE percentage		25.7642	31.0617	36.1272	33.7736	33.6076	31.6915	31.7611	33.7799	32.2493	

	Unit	*1957*	*1958*	*1959*	*1960*	*1961*	*1962*	*1963*	*1964*	*1965*	*1966*
Adjusted value production	£M	994.78	1066.84	1040.01	1050.98	1119.27	1038.34	1037.15	1120.02	1299.15	1220.1
A. Market price support	£M	321.317	379.518	302.011	316.218	364.513	352.203	336.821	272.439	202.282	237.713
B. Levies	£M	0	0	0	0	0	0	0	0	0	0
C. Direct payments:	£M	15.8	17.4	20.6	22.9	23.6	24.5	27.4	34.599	37.199	46.414
Area & Headage Payments	£M	15.8	17.4	20.6	22.9	23.6	24.5	27.4	34.599	37.199	46.414
D. Reduction of input costs/general services:	£M	43.802	45.752	53.066	58.495	66.231	61.633	59.787	54.633	51.366	47.427
Capital Grants	£M	12.084	12.55	16.209	18.553	22.481	21.807	21.102	18.793	17.957	16.238
Structural/Infrastructural	£M	0	0	0	3.261	5.31	1.503	3.397	3.716	2.74	1.881
Fuel/Fertiliser	£M	25.121	26.724	30.032	30.049	32.466	33.872	32.331	30.693	28.185	26.817
General Services	£M	6.597	6.478	6.825	6.632	5.974	4.451	2.957	1.431	2.484	2.483
E. other	£M	2.42	2.456	2.326	3.26	0.028	1.601	1.978	1.653	0	0
Total other support	£M	46.222	48.208	55.392	61.755	66.259	63.234	61.765	56.286	51.366	47.427
Gross total PSE	£M	383.339	445.126	378.003	400.873	454.372	439.937	425.986	363.324	290.847	331.554
PSE percentage		38.5351	41.7238	36.3461	38.1428	40.5954	42.3693	41.0727	32.4391	22.3875	27.1743

TABLE A2
(*Continued*)

	Unit	*1967*	*1968*	*1969*	*1970*	*1971*	*1972*
Adjusted value production	£M	1389	1446.9	1484.72	1616	1803.02	1979.1
A. Market price support	£M	327.498	241.607	255.058	234.529	325.099	182.833
B. Levies	£M	0	0	0	0	0	0
C. Direct payments	£M	44.596	52.899	56.599	62.9	67.3001	69.9
Area & Headage Payments	£M	44.596	52.899	56.599	62.9	67.3001	69.9
D. Reduction of input costs/general services:	£M	49.427	51.204	55.597	66.887	74.222	79.316
Capital Grants	£M	18.102	21.634	24.85	27.322	40.098	48.69
Structural/Infrastructural	£M	1.376	1.373	1.741	1.143	0.769	0.658
Fuel/Fertiliser	£M	27.304	25.575	25.543	30.576	24.717	24.523
General Services	£M	2.645	2.622	3.463	7.846	8.638	5.445
E. other	£M	0	0	0	0	0	0
Total other support	£M	49.427	51.204	55.597	66.887	74.222	79.316
Gross total PSE	£M	421.521	345.71	367.254	364.316	466.621	332.049
Feed adjustment	£M	−5.482	−4.816	−12.395	−8.955	−15.246	−23.838
Net total PSE	£M	416.039	340.894	354.859	355.361	451.375	308.211
PSE percentage		29.9524	23.5603	23.9007	21.9902	25.0344	15.5733

TABLE A3
Wales PSEs 1947–72: aggregate of all commodities

	Unit	*1947*	*1948*	*1949*	*1950*	*1951*	*1952*	*1953*	*1954*	*1955*	*1956*
Adjusted value production	£M	31.729	40.837	44.433	48.112	50.179	54.76	58.758	58.524	59.24	63.025
A. Market price support	£M	14.353	18.475	22.236	20.711	21.447	22.497	21.507	21.491	20.246	21.011
B. Levies	£M	0	0	0	0	0	0	0	0	0	0
C. Direct payments:	£M	0	0	0	0	0	0.478	1.018	1.358	1.463	1.767
Area & Headage Payments	£M	0	0	0	0	0	0.478	1.018	1.358	1.463	1.767
D. Reduction of input costs/general services:	£M	0.098	0.136	0.127	0.136	0.679	1.721	2.047	2.071	2.357	3.109
Capital Grants	£M	0	0.003	0.004	0.021	0.282	0.779	0.889	0.957	1.005	1.411
Structural/Infrastructural	£M	0	0	0	0	0	0	0	0	0	0
Fuel/Fertiliser	£M	0	0	0	0	0.282	0.792	1.017	0.975	1.221	1.522
General Services	£M	0.098	0.133	0.123	0.115	0.115	0.15	0.141	0.139	0.131	0.176
E. other	£M	0	0	0	0	0.714	1.133	1.35	1.346	1.152	0.982
Total other support	£M	0.098	0.136	0.127	0.136	1.393	2.854	3.397	3.417	3.509	4.091
Gross total PSE	£M	14.451	18.611	22.363	20.847	22.84	25.829	25.922	26.266	25.218	26.869
PSE percentage		45.5451	45.5739	50.3297	43.3301	45.517	47.1676	44.1165	44.8807	42.5692	42.6323
	Unit	*1957*	*1958*	*1959*	*1960*	*1961*	*1962*	*1963*	*1964*	*1965*	*1966*
Adjusted value production	£M	54.634	51.109	65.649	65.567	71.66	69.694	65.665	72.462	71.954	78.023
A. Market price support	£M	16.492	14.193	22.818	24.506	33.324	25.384	19.548	21.417	19.409	21.824
B. Levies	£M	0	0	0	0	0	0	0	0	0	0
C. Direct payments:	£M	1.626	2.266	2.306	2.733	2.67	2.87	3.468	4.34	3.926	6.2
Area & Headage Payments	£M	1.626	2.266	2.306	2.733	2.67	2.87	3.468	4.34	3.926	6.2
D. Reduction of input costs/general services:	£M	4.143	4.603	4.232	5.075	5.389	5.566	4.713	6.516	7.018	3.829
Capital Grants	£M	2.148	2.589	1.882	1.978	2.005	2.059	1.6	3.442	4.299	1.459
Structural/Infrastructural	£M	0	0.067	0.196	0.895	1.144	1.149	1.015	0.93	0.651	0.497
Fuel/Fertiliser	£M	1.835	1.786	2.014	1.987	2.013	2.132	1.926	1.917	1.853	1.67
General Services	£M	0.16	0.161	0.14	0.215	0.227	0.226	0.172	0.227	0.215	0.193
E. other	£M	0.689	0.525	0.46	0.368	0.264	0.166	0.066	0.0041	0	0
Total other support	£M	4.832	5.128	4.692	5.443	5.653	5.732	4.779	6.52	7.018	3.829
Gross total PSE	£M	22.95	21.587	29.816	32.682	41.647	33.986	27.795	32.277	30.353	31.853
PSE percentage		42.0068	42.2372	45.4173	49.8452	58.1175	48.7646	42.3285	44.5433	42.1839	40.8251

TABLE A3
(*Continued*)

	Unit	*1967*	*1968*	*1969*	*1970*	*1971*	*1972*
Adjusted value production	£M	82.088	87.257	88.467	93.993	101.124	113.254
A. Market price support	£M	27.6515	25.751	25.6214	24.7484	26.8654	25.497
B. Levies	£M	0	0	0	0	0	0
C. Direct payments	£M	6.171	7.724	8.237	8.766	10.047	10.612
Area & Headage Payments	£M	6.171	7.724	8.237	8.766	10.047	10.612
D. Reduction of input costs/general services:	£M	2.839	7.365	3.346	4.24	4.416	5.913
Capital Grants	£M	0.703	5.104	1.033	1.993	3.114	3.918
Structural/Infrastructural	£M	0.359	0.334	0.424	0.36	0.258	0.33
Fuel/Fertiliser	£M	0.59	0.749	1.656	0.561	0.772	1.517
General Services	£M	0.187	0.178	0.233	0.326	0.272	0.148
E. other	£M	0	0	0	0	0	0
Total other support	£M	2.839	7.365	3.346	4.24	4.416	5.913
Gross total PSE	£M	36.6615	40.84	37.2044	37.7544	41.3284	42.022
Feed adjustment	£M	−0.399	−0.409	−0.609	−0.44	−0.8	−1.469
Net total PSE	£M	36.2625	40.431	36.5954	37.3144	40.5284	40.553
PSE percentage		44.1752	46.3355	41.3662	39.6991	40.0779	35.8071

compound feed production in the country.[43] Feed wheat and barley prices have been obtained from MAFF, while world feed prices have been estimated based on the margin between domestic and world producer cereal prices.[44]

The percentage of total concentrate costs at given prices accounted for by the major cereals has been applied to concentrate costs per £100 of enterprise output (derived from the farm level data) to give an estimate of concentrate cost per unit of output at protected prices. The difference between this estimate and that at world prices is the implicit tax on feed costs to be deducted from the gross PSE.

[43] MAFF, *Surveys into the Composition of the Main Livestock Rations in Great Britain*, annual.
[44] MAFF, *Agricultural Statistics of the UK*, annual.

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Conference Report: 'Crime in the Countryside' Winter Conference 1997

By JOHN R WALTON

THE winter conference took place on Saturday 6 December at the Institute of Historical Research, University of London. An audience numbering about 50 heard four papers which explored different facets of English rural crime from the fifteenth to the nineteenth centuries. In the first paper, Dr Isobel Harvey (Cambridge) considered 'Hunting, poaching and rural society in fifteenth-century England'. Hunting was a medieval passion which verged on a mania, and by the fifteenth century the deer, which had a high commercial value, was the animal of choice. Poaching had five underlying causes. Some poachers were hungry, while others poached for commercial gain. Peasants attempting to rid their land of destructive vermin represented a third category. Poaching was also an important feature of feuding between rival magnates. After the murder of the duke of Suffolk in 1450, the parks of his widow were repeatedly raided by followers of the duke of Norfolk. Last, the fifteenth century marked the beginning of the long history of poaching as a politically-motivated crime, a form of sedition articulated as an attack on a resource perceived as 'fair game'. Legislation designed to exclude a widening circle of the population from the right to hunt was an important source of grievance. But poaching and protest became closely identified in a more general sense. For example, the self-styled 'servants of the queen of the fairies' who in October 1450 attacked the deer in the duke of Buckingham's park at Penshurst, Kent included known insurgents.

Malcolm Gaskill (Anglia) then presented his paper 'Coining in the seventeenth century – a social crime?'. So far as its practitioners were concerned, coining was a victimless crime bringing returns far better than any legitimately gained by the drudgery of a normal working life: 'a better trade than selling potatoes' one enthusiast remarked, 'a better trade than hedging' according to another. With £25 per day possible for two counterfeiters working together, some coiners became social climbers, and others, like the Yorkshire coiner Thomas Lightowler, acquired a far-flung reputation as folk heroes. Appropriately, the state found that financial inducements were the most effective means of persuading the populace to give evidence against coiners. Coining's two sub-disciplines, counterfeiting and clipping, differed in their demands. Those of plebian status found it difficult to acquire the privacy, space, and capital needed to run a successful counterfeiting operation, although in the northern counties they pooled their resources in gangs organized to circumvent these difficulties. By contrast, clipping, which required only unclipped coin and a pair of scissors, was widely practised. Life's most essential need, the preservation and reproduction of the domestic economy of the household, was achieved by fair means if possible, by foul if not. In response to a questioner, Dr Gaskill said that he considered the numerous Yorkshire examples quoted in his paper owed more to the survival of the northern circuit assize depositions than to anything else. By the 1690s, coining was a problem throughout the entire country.

In the first session after lunch, Peter King (Nene) spoke on 'Crime and the life-cycle experiences of the poor in eighteenth-century England'. As at present, crime had marked life-cycle associations, although historians have hitherto paid little attention to them. Each crime had a distinct age structure. The curve for burglars peaked at age range 18 to 19, and highway robbers in the early 20s. Those aged 60 and upwards scarcely appeared in the indictment rolls except as receivers. Overall, late adolescents and young adults made more court appearances than anyone else. There was a general reluctance on moral grounds to try child and young adolescent offenders, even after they had reached the age of criminal responsibility. Older offenders often escaped indictment where there was a strong possibility that their dependents would become a public charge if they were convicted. Given the pressures of their circumstances, adults with children probably offended more than the frequency of indictments against them suggests. Young adults enjoyed no similar immunities and were everyone's favoured targets. Thefts from masters by servants and apprentices, especially to enhance diet or social life, figured among the indictments with remarkable

frequency. During war periods, enlistment was an alternative to indictment, explaining the disappearance during those years of the normal young-adult peak in property offenders. Migration or flight was another alternative, with the runaway often committing additional crimes while on the run. In eighteenth-century Wiltshire, nearly half of all depositions were against itinerants or those more than five miles from home. Surviving vagrancy examinations relate to a skewed sample of the mobile poor, since the young were either moved on or put in the army without further ado. The speaker concluded with a plea that the history of property crime be more youth focused.

John Archer (Edgehill) then presented his paper, '"A reckless spirit of enterprise": poaching gangs and violence in nineteenth-century Lancashire'. The poaching war in Lancashire was more brutal than its counterpart in the southern counties. The county society of industrial Lancashire was still dominated by its rural élites, whose game estates were an easy target for nocturnal forays by poachers resident in the towns and cities. In general, Lancastrian farmers, constantly troubled by trespass and the theft of crops and stock, welcomed the game laws, which brought a measure of surveillance by keepers. Poaching may have been a social crime, but most of Lancashire's poachers were not social criminals. Many had strings of convictions for other offences. They were motivated not by the pressing needs of subsistence but by the cash available for poached game in the towns. In the 1840s, a St Helens glassblower could double his weekly wage by selling seven pheasants. Before 1862, the game laws were only lightly enforced by a county constabulary anxious not to increase its unpopularity. However in 1842–3, the police were forced to resort to infiltration and plain-clothes detection to break a poaching gang known as the Long Company whose suspected crimes included murder. Some 28 of the gang of 40 have been traced by Dr Archer. Many were tied by blood or marriage. Fourteen were resident in Liverpool, others in industrialized villages. As Lord Sefton remarked, 'the burglars herd within the borough but commit their depredations without'.

The conference concluded by conveying its thanks to John Broad for his efforts in organizing another successful and enjoyable meeting.

Book Reviews

E A WRIGLEY, R S DAVIES, J E OEPPEN and R S SCHOFIELD, eds, *English Population History from Family Reconstitution, 1580–1837* CUP, 1997. xxii + 657 pp. £60.

Of all the funded research projects into economic and social history during recent decades that of the Cambridge Group for the History of Population and Social Structure has surely been the most fruitful. When work began in the 1960s the study of historical demography was in its infancy, its basis marked by uncertainty and its methodology primitive. The publication of E A Wrigley and R S Schofield, *The Population History of England, 1541–1871: a reconstruction* in 1981 marked the completion of a new era of rigorous enquiry and firm answers to basic questions. Meanwhile, numerous books and articles and the creation of a flourishing society and a journal had placed historical demography at the forefront of research into British economic and social history. The publication of the present book reinforces the sense of massive advance in the subject. It uses the technique of family reconstitution to obtain accurate and detailed information about fertility, mortality and nuptiality in the period before civil registration, when Anglican parish registers were the prime source available.

The Population History of England was based on the aggregative analysis of 404 parish registers. If that seems a small proportion of the 10,000 or so ancient parishes, then the sample of 26 parishes for this companion volume will seem tiny indeed. They are scattered widely but do not cover the Welsh border counties and only three are from northern England. Agrarian historians who are accustomed to regional variety will naturally question this distribution, but the problem is one that is discussed at some length in Part I and the authors reasonably argue that their results are consistent not only across the sample but with the findings of their previous work. They take the view that their parishes are 'broadly representative of the country as a whole'.

Part II, which forms the core of the book, deals in turn with the detailed findings concerning nuptiality, mortality and fertility. The evidence confirms the previous conclusion that average ages at marriage were fairly high in the seventeenth and early eighteenth centuries but fell sharply in the middle decades of the eighteenth century. The extent of the fall was about three years from peak to trough. This resulted in a marked increase in overall fertility. A steep rise in illegitimate fertility and a surge in general fertility occurred at the same time. The importance of nuptiality change in influencing population trends is clear. It appears to have been remarkably uniform both geographically and according to social and economic grouping. The authors claim that 'the timing and extent of the fall in marriage age was not greatly different between, say, agricultural parishes and small market towns, nor between different regions'. There is a hint that the fall in the age of marriage was greater in parishes with a growing rural handicraft industry than elsewhere, 'but uniformity rather than variety of experience is the predominant impression'. Their sample of 26 parishes does not, however, include any of the industrial towns which grew so quickly from the end of the seventeenth century. This growth was not entirely due to immigration; the age at marriage in places such as Sheffield, Birmingham, Nottingham and Manchester may have fallen a generation or two before the country at large. The sample used in the present work relates only to rural parishes and small market towns.

The prime role of nuptiality change in determining population trends seems certain. Another earlier finding that has been confirmed is that early-modern England 'was largely free from devastating brief mortality shocks of the kind that occurred in some countries until a much later date'. The 1550s, 1680s and late 1720s were the worst decades. The broad picture, however, masks the fact that infectious diseases were likely to strike particular places at any time. Death rates do not appear to have altered much, except in brief periods of crisis, until they began to fall steadily in the 1740s. The contribution of this fall to the general rise in population was not as great as that of lower ages at marriage.

The family reconstitution approach that is employed here does far more than confirm previous findings. For example, it is particularly useful in charting the relative changes in infant and child mortality. In the early seventeenth century first month mortality was substantially higher than mortality between the third month and the end of the second year, but by the early nineteenth century it was less than half as high. Such patterns were invisible when aggregative analysis was used. The present volume therefore provides new insights and (in the Conclusion) suggests further avenues of research. The foundations of the subject have been firmly laid, but much interesting work remains to be done.

The section on fertility demonstrates how 'apparently small changes in the mean age of marriage could result in substantial swings in fertility', especially as many marriages were cut short by early deaths. The authors again stress 'the remarkable homogeneity of the patterns to be observed in the

data for individual parishes'. The insignificant differences between regions and economic and social groups can be explained as random variation. This leads to the interesting conclusion that as fertility was heavily influenced by social conventions local cultural differences were more muted in England than on the continent. This thought clearly poses challenges to agrarian historians. The whole tenor of the work of the CAMPOP group has been to stress broad similarities throughout the country and to play down local and regional differences. How can local societies be so different in some ways – work, speech, religious allegiance – and yet be so similar in others? The unique role of London and the integrated nature of the national economy are part of the explanation of England's relative homogeneity, but the question is a perplexing one that probably has many answers, all hedged with qualifications. Wrigley *et al* are adamant that the marked differences in fertility patterns on the continent are not observable when comparing say Yorkshire and Devon. Their findings are so consistent and so rigorously tested that they must command respect.

DAVID HEY

BRUCE A BAILEY, ed, *Northamptonshire in the Early Eighteenth Century: The Drawings of Peter Tillemans and Others*, Northamptonshire Record Society, 1996. 221 pp. Illus. £17 + £4 p and p.

Northamptonshire is a fine county and is doubly fortunate to have had a historian, John Bridges, and an artist, Peter Tillemans, to describe and illustrate it in the early eighteenth century. Though Bridges's *History and Antiquities of Northamptonshire* was not published until 1791, the drawings, of which few were engraved, have only now been brought together in this handsome volume by the Northamptonshire Record Society.

There is a wealth of material here for the historian and the antiquary. Although the focus of Tillemans and others was on the buildings and their contents, the countryside played an important part in Tillemans's prospects. He shows us landscapes of enclosed fields (eg Rothwell) with, here and there, survivals of ridge and furrow (Boughton House and Clifford Hill). However, the figure in the landscape is not his concern and the seasonal tasks of the farming and gardening year are not portrayed. True, we see the shepherd with his flock before Oundle and the local hunts outside Aynho and Northampton, but these vignettes are only foreground fillers.

The tree planting and the avenues around the country houses help us to focus on their Dutch-style gardens of terraces, topiary and vases – a style well known to Tillemans, a citizen of Antwerp. He allows us to enjoy the past glories of Barton Seagrave, Drayton House, Horton, Lamport and Easton Neston. Apart from this formality, the garden historian will view with interest the more ragged way that fruit trees and shrubs were encouraged to cling to the very houses themselves. Steane and Stoke Bruerne provide good examples. Inside Easton Neston and in the gardens the artist provides us with a superb record of the Arundel Marbles which then adorned the place and now grace the Ashmolean Museum.

The fine prospects of Northamptonshire's towns – Higham Ferrers, Rothwell, Oundle, Kettering, Northampton and Peterborough – give a wealth of topographical information, since lost or stranded in urban sprawl. Windmills are especially notable. The townscape of Peterborough is accompanied with excellent drawings of the exterior and interior of the cathedral. How much more texture and intimacy is achieved in pencil and wash! Finally, there are the delights of the county's lovely parish churches, with their fittings, monuments, heraldry and stained glass – a joy to every ecclesiologist.

All the drawings have an illuminating commentary by Bruce Bailey, a native of the county. Occasionally he could be clearer in describing what has been lost and what survives. The introduction is also useful in tracing the development of Bridge's *History* and the eventual passage of Tillemans's illustrations to the British Library. An appreciation of Tillemans in an art historical context would have been welcome. He was among the last in a line of visiting topographical artists, from Hoefnagel and Hollar to Siberechts, Knyff and Kip. He and they strongly influenced the Buck brothers and the subsequent English landscape artists.

The book is a credit to the Northamptonshire Record Society and a worthy tribute to the late Sir Gyles Isham who initially inspired it.

TREVOR BRIGHTON

TOM BARRY and DOUGLAS HALL, *Spottiswoode: Life and Labour on a Berwickshire Estate 1753–1793*, Tuckwell Press, East Lothian, 1997. xxiii + 180 pp. 21 plates. £14.99.

This informative local study is centred on the John Spottiswoode who lived from 1711 to 1793, the owner of the Berwickshire estate of the same name, standing on the southern edge of Lammermuir. The book falls into two equal parts, and the first part by Douglas Hall traces the history and background of the Spottiswoode family down to the break-up of the estate in the inter-war years. The mansion itself, built in 1834 but incorporating an older house, was demolished in 1938. The John Spottiswoode who is the main subject of the book was trained in the law, exhibited scholarly tastes,

and showed a strong interest in the architectural and agricultural improvement of his estate.

For agricultural historians the second part of the book, by Tom Barry, may hold the greater interest. It consists of an extended commentary on a surviving diary-cum-ledger which covers the years 1753 to 1793 and which, Mr Barry argues, justifies giving Spottiswoode a place among the leading Scottish improvers of his time.

The commentary traces the work which was carried out for the laird by a number of craftsmen and farmworkers who were employed for varying periods of years. Their terms of employment included payment partly in cash and partly in kind, including such benefits as a house, grassing for a cow or some sheep, meal, and even a pair of shoes – evidently an item of importance – or cash in lieu. Some were described as masons and executed various types of stone work and building, as well as other tasks. The cash payments were often made infrequently, and fairly substantial sums might be accumulated by the time the employee left the estate or died.

One of the most interesting features of the record is the numerous transactions entered into between the laird and his men. Evidently he purchased items in bulk which he retailed to them, such as herrings, barley for meal, nails, wool, and even snuff. But some transactions moved in the opposite direction with the laird purchasing goods which his people had produced on their holdings or in their workshops. There is much incidental information on such matters as the coins and weights and measures in use, as well as on farm implements and equipment.

Spottiswoode was clearing waste land or stones and bringing it into cultivation, but although James Small was developing his new light plough in the 1760s at Blackadder Mount, not far away, there is no mention of its early adoption by Spottiswoode. Indeed, from the surviving evidence produced here it is difficult to assess Spottiswoode's status as a progressive landlord and farmer. Mr Barry emphasizes the backwardness of the Scottish economy and farming environment at this time but we need to have some details of other comparable estates to come to a firm conclusion. At the least, however, we have here a very interesting and worthwhile study which throws much light on the conditions in the district in the later eighteenth century.

G E MINGAY

A F J BROWN, *Prosperity and Poverty: Rural Essex, 1700–1815*, Essex Record Office, Chelmsford, 1996. vii + 203 pp. £9.95.

A F J Brown's name is synonymous, of course, with the history of modern Essex, and with this volume he adds further to his accomplishments in this field. His new book is wide-ranging and informed by formidable local knowledge based on a wide variety of sources. While not lacking in the essential background of economic circumstances and population growth, his main features include discussions of the social structure and variety of occupations in Essex villages. Major changes resulted from the decline of the county's cloth industry and the expansion of farming from the middle eighteenth century. The depression of the 1730s was relieved in Essex by its proximity to the London market, which extended its influence to the processing of agricultural produce, as evidenced by the spread of large-scale milling and malting.

Successful farmers had interests in these trades together with others, and the farming prosperity of the later eighteenth century influenced a variety of crafts and trades as well as the growth of shopkeeping. Farms got larger and small farms declined as the biggest men came to occupy groups of separate large holdings; correspondingly, the numbers of farmworkers grew as farming became more large-scale and more intensive. Farm servants were in decline by the later part of the century, at the same time as labourers' incomes came under pressure, with consequences for food riots and resort to the poor law. The picture is a well-rounded one, with material on housing, clothing, fairs and sport, as well as many other aspects of the period.

The Essex gentry are shown to be fluid in composition, and in their entering and leaving the county. Among the many families brought to our notice is one of those who sprang from local origins, the Strutts of Terling (later to be leading exploiters of the London dairy market and eminent cattle breeders). Many, however, came from outside the county, from London and elsewhere, like the redoubtable Bamber Gascoyne, described in his obituary as 'plain, rough, and impetuous', while another was the Revd. Henry Bate Dudley, an improving landlord and active magistrate, who claimed to have once killed a fox on the roof of Creaksea church.

The book is rounded off by very interesting accounts of the Church, tithes, and nonconformity, the work of parish officials, and the variety of ways in which Essex was affected by the French Wars. The Church was not very active in promoting schools, and the majority of the county's children were catered for in Sunday schools the briefly fashionable schools of industry, and more largely numerous private schools which in 1810 had some 7000 pupils). The affluence of the larger farmers in the late eighteenth century was reflected in their patronising relatively expensive boarding schools. Although the Wars exerted their well-known effects

on prices, harvests, and labour supply, the military precautions, particularly evident in the coastal districts of the county, seem to have had relatively little impact on rural life.

To sum up, Mr Brown's new book is more than a general history of his county's countryside: all those interested in the period will find much that is enlightening and will appreciate the insights, the detail and the numerous examples and quotations as revealing the enormous variety of country life and its people.

G E MINGAY

RAFAEL DOMÍNGUEZ MARTÍN, *El campesino adaptivo: campesinos y mercados en el norte de España, 1750–1880*, Universidad de Cantabria/Asamblea Regional de Cantabria, Santander, 1996. 333 pp. no price given.

IÑAKI IRIARTE GOÑI, *Bienes comunales y capitalismo agrario en Navarra, 1855–1935*, Ministerio de Agricultura, Pesca y Alimentación, Madrid, 1997. 495 pp. no price given.

Spain is truly a fertile land when it comes to the publication of detailed and original monographs on just about every aspect of that country's rural past. Thanks in no small part to the generosity of the Ministry of Agriculture, the seventeen regional governments and the universities, a remarkable amount of high quality research keeps finding its way to scholar's bookshelves. Much of this new material first saw the light of day as a doctoral thesis in Spain's burgeoning university system. And, not surprisingly, given Spanish academia's latterday penchant for local studies in agricultural history, in common with other disciplines such as geography and social anthropology, a sizeable portion of recent publications have gone to fill many a gap in our defective knowledge about a particular region of the Iberian Peninsula. In addition, the growing tendency among Spanish doctoral candidates to survey the literature far and wide in search of the most useful theoretical approach usually leads to a full frontal assault on any lazy preconceptions we might have about such old chestnuts as Spain's much trumpeted rural 'stagnation' or the perennial ignorance and inertia of peasants south of the Pyrenees in the face of constantly changing market conditions. In the case of the two books in front of me, the two young researchers in question also set out to challenge any tired old beliefs I might have on the atypicality of agricultural life in various parts of northern Spain by comparison with generally accepted national trends.

Rafael Domínguez Martín's account of peasants and the market in Cantabria covers the period from the final years of the *ancien régime* down to the agricultural crisis at the end of the nineteenth. In a well researched and genuinely interdisciplinary study, he shows how peasant proprietors in Galicia, Asturias, Santander and the maritime provinces of the Basque Region – a region largely characterized by its plethora of tiny uneconomic plots of land – were nevertheless far from blinkered their outlook and responded surprisingly well to increasing market opportunities for their products. Rejecting traditional views of rural self-sufficiency, which portray peasant farmers as eking out the most miserable of existences based on meagre yields of maize, potatoes and vegetables supplemented by a few scraggy pigs or cattle, Domínguez Martín confirms the rise of both dairy farming and stock rearing for domestic consumption and international trade. Perhaps his most significant contribution to the debate on the extent of rural change south of the Pyrenees at this crucial moment in the evolution of capitalist agriculture is to place Cantabrian peasants in the vanguard of integration into the evolving market for agricultural products.

In similar vein, the insertion into the growing market for landed property of the communal forests of Navarre is the subject of Iñaki Iriarte's exhaustive study. This tidily constructed work extends from the famous Madoz Act of 1855, which allowed for the disentailing of common lands, down to the Spanish Civil War. Ultra-catholic Navarre – a prime focus of opposition to the new Liberal order in nineteenth-century Spain – is often considered by legal historians and many geographers as a case apart. Yet, thanks to extensive archival research, Iriarte is able to demonstrate a much more complex relationship between public and private property than has been hitherto suspected. In essence, he argues, the varied agents of the centralising Spanish state showed a surprisingly flexibility in their approach to land sales. Many recent synthetic approaches to the economic history of modern Spain have tended to heap blame on the agricultural sector for its supposed abject failure in almost all of the modernizing tasks assigned to it by conventional economic theory. Yet these two detailed and innovative studies do much to reject some of the more 'heroic' assumptions about immobilism and stagnation in the Spanish countryside – even in those regions where we might least expect it.

JOSEPH HARRISON

A D M PHILLIPS, ed, *The Staffordshire Reports of Andrew Thompson to the Inclosure Commissioners, 1858–68: Landlord Investment in Staffordshire Agriculture in the Mid-Nineteenth Century*, Staffordshire Record Society, 1996. viii + 158 pp. £15.

The Inclosure Commissioners of the latter half of the nineteenth century, though initially set up to

pronounce upon the acceptability of proposals to enclose land, gradually acquired other responsibilities as time went on, and this book by Tony Phillips arises from one of these. When government loans were made available to landowners to underdrain land or rebuild farms, responsibility for ensuring that schemes were properly devised, and the money properly used, fell upon the Commissioners, who employed local agents to investigate. Andrew Thompson was one such agent, and his reports on schemes in Staffordshire take up approximately half of this volume.

These reports give a significant insight into the agricultural state of the county in the second half of the nineteenth century. Thompson appears to have been a careful observer and, unlike some agricultural writers of the time, a cautious and hard-headed judge of both the value of the land and the potential benefits to be gained by 'improvements'.

Tony Phillips is described as the editor of the work, but this seems unduly modest, for a good half of it consists of his own commentary and context, which for the general reader is the most interesting part of the book. He uses the reports as a basis for comparison with other sources, and provides a liberally-illustrated discussion of the agriculture of Staffordshire before and during the period when Thompson was operating. By using the tithe material, the Ministry of Agriculture's Annual Returns, and a range of other sources, he integrates the material contained in the reports into a more general picture, showing the overall trends, and the need for the improvements upon which Thompson was making his judgements. Phillips concludes that Staffordshire agriculture was in a markedly less healthy situation in the period 1850–70 than other commentators would suggest, and had made less progress in adapting to the economic situation of the second half of the nineteenth century. As a consequence, the improvements were much needed. He demonstrates that smaller estates, in particular, provided little of their own capital for these improvements, and that even substantial landowners may have done relatively little over the earlier part of the century.

As with any source, however, one must ask questions. Phillips himself points out that Thompson emerges from the reports as a man with very clear views on what constituted a proper scheme of drainage, or what formed the best plan for a farm-house and its buildings. It is also clear that he was quite prepared to use his position as, effectively, the judge of whether the loan should or should not be made to impose his views on the applicants, who had little choice but to comply. One wonders whether his judgement was always so good, and what some of the recipients of his 'advice' thought of him.

The series of which this forms part is described as 'Collections for a History of Staffordshire', but this study of the source and its use may stimulate researchers to make use of it in other counties, and to look for survivals of similar material elsewhere. Thompson's reports appear to have been preserved by accident, as copies amongst his personal papers, but his work alone stretched far beyond the county to include much of the Midlands, with occasional forays as far afield as Durham and Essex. There must be a good deal to be gained from Thompson's papers for other areas. If similar papers survive from other reporters they could be of significant value elsewhere. A full picture of how these men influenced the types of schemes which were accepted, and hence what was and was not done in the way of drainage and farmhouse building would be a most interesting one. Tony Phillips has provided a useful service in drawing attention to the survival and utility of this material.

JOHN CHAPMAN

EWEN A CAMERON, *Land for the People? The British Government and the Scottish Highlands, c 1880–1925*, Tuckwell Press, Phantassie, East Lothian, 1996. x+221 pp. £25.00.

This volume is the second in a series sponsored by the Scottish Historical Review Trust which aims to publish works of scholarly research covering all aspects of Scottish history. Ewen Cameron's study has already gained the distinction of being joint winner of the Hume Brown Senior Prize in Scottish History in 1995. It focuses on a period noted for important policies and legislation on landholdings and settlement in the Highlands.

The introduction emphasizes that previous studies have tended to be highly emotional accounts and have concentrated on events associated with the Crofters' Act of 1886. The period between the mid-1880s and the inter-war years have largely been neglected. Considerable weight is also given to criticism of the limited range of sources that have been consulted and so it is not surprising that the introduction includes a detailed critique of sources. This section and the comprehensive and well-organized bibliography will leave the reader in no doubt about Cameron's commitment to producing a monograph based on a thorough investigation of the widest range of source material available.

The eight chapters are concerned with the policies of the various governments of the period – Liberal, Conservative and Coalition, the views of Highland landed society, the aspirations as well as the agitation for land from among the tenantry (crofters and cotters) and the achievements of bodies

such as the Congested Districts Board (CDB) which were set up to create larger holdings in those areas where population pressure was particularly acute. The chapters examine the impact of four major pieces of legislation: The Crofters' Holdings Act (1886), The Congested Districts Act (1897), The Small Landholders Bill (1911) and The Land Settlement Act (1919).

The simplistic view that this legislation was the outcome of a consistent strategy aimed at tackling fundamental problems of Highland agriculture is roundly dismissed. While the 1886 Act was intended to provide a solution to over-crowding, it and subsequent statutes each seems to have created political tensions rather than facilitated a collective will among the different parties to constructively debate and seek solutions to common problems. Consequently, while the objective of land redistribution remained central to policy making, the administrative structures, the methods of achieving this goal and the priority of Highland land in the national political agenda changed at fairly frequent intervals.

Chapter 1 deals with the background of the personalities and events surrounding the Napier Commission and the 1886 Act, a piece of legislation which attempted to satisfy the majority of crofters and persuade moderate landowners to make voluntary concessions particularly, the provision of more land for small tenants. The difficulties encountered by the Crofters' Commission is the focus for chapter 2. Its early years were spent grappling with a heavy workload and it was under pressure to visit as many estates as possible to review rent levels. Yet once this backlog was cleared, it became apparent that it lacked a clear-cut role and by the 1890s much of its work was consultative and in the first decade of the twentieth century it was investigating social conditions in Lewis and Uist.

The different policies of the Liberal and Conservative administrations of the 1880s and 1890s are highlighted in chapter 3. Between 1888 and 1892, the Conservative strategy for Highland development embraced the fishing industry and transport improvements at a time when crofter agitation for further land reform had died down. The author notes how little was achieved by these non-agrarian initiatives, however the record of the Liberal administration that followed was equally disappointing. Better economic conditions meant that pressure from amongst the crofting community remained at a low level, but more telling was the failure of the Scottish Secretary to prioritize Scottish issues and the distraction of the Irish Home Rule issue pushed the Highlands down the political agenda. In chapter 4, Cameron notes that the Conservative election campaigns in 1895 and 1900 embodied strong criticism of the Liberals neglect of the Highlands. The creation of the CDB in 1897 to purchase landed estates for sub-division among crofters and cotters can be seen as one attempt to redress the situation. Unfortunately, the Board lacked powers of compulsory purchase while notions of aiding crofters to migrate from the most overcrowded districts foundered on the attachment of the people to the land and the belief that migration was too similar to the clearances experienced at the beginning of the century. Chapter 5 continues the review of the Board's work, this time under a Liberal government (1906–1911). It focuses on efforts to persuade the crofters of the Kilmuir estate in Skye, acquired in 1904, to purchase their lands and the consequences of a land raid for potato ground by crofters from Barra on the small neighbouring island of Vatersay. Both episodes demonstrate the difficulties faced by the CDB while operating under a different administration. Kilmuir highlighted the unpopularity of the concept of land purchase among the crofters, and landed disapproval for liberal policy persuaded the owner of Vatersay to sell the island and its problems to the CDB.

In chapter 6, the House of Lords opposition to the Small Landholders Bills in 1906 and 1908 are contrasted with the passing of a private member's bill in 1911. This act abolished the Crofters Commission and the CDB whose rules were taken over by the Board of Agriculture for Scotland (BoAS) and the Scottish Land Court. The following chapter deals with mechanisms by which small holding schemes could come into operation and it goes on to explain that the low success of the scheme can be attributed to a lack of suitable farms, wartime staff shortages and the all too familiar lukewarm political support for the BoAS.

The 1919 Act (chapter 8) is notable for having cross-party backing. The new act also embraced elements of previous legislation notably the creation of new holdings and the opportunity for crofters to become the owners of their holdings. The author notes more activity coupled with more demand articulated by local activists to put pressure on the authorities. Although the 1920s are shown to have been something of a golden age in terms of achievement, more land would have been re-distributed but for the Treasury's disquiet over expenditure. The board displayed considerable skill in emphasizing the potentially volatile situation that existed in the Highlands if the aspirations of crofters were frustrated.

The story of land in the Scottish Highlands and Islands is certainly a complex one. Ewen Cameron's account is lucid, meticulously researched and robustly argued. He strikes a balance between the national political debate and what was happening

on individual estates and in particular islands. The parts played by the different actors: national political figures and Highland MPs, propagandists, administrators, landed proprietors, crofters, land raiders and policemen are skilfully addressed. His conclusions are an admirable assessment of the contribution made by each phase of legislation and what was achieved in a temporal and spatial context. Finally, the bibliography, like the text, is comprehensive and clearly structured. Ewen Cameron's study has set a very high standard indeed and deserves to be widely read. It is to be hoped that further authoritative volumes on the Scottish countryside will be published in the Scottish Historical Review Monograph Series.

DOUGLAS GRANT LOCKHART

HUGH CLOUT, *After The Ruins: Restoring the Countryside of Northern France after the Great War*, University of Exeter Press, 1996. 300 pp. Illus. £35.

The modern visitor to north-eastern France, whether bent on visiting battlefield sites or not, may sometimes wonder at the contrast between the smooth landscapes seen through car or train window, and the jagged hell excavated by men and high explosives which is preserved in memory and film. How was the latter trans-mogrified into the former? This is Hugh Clout's concern, and the result is a fascinating exercise in historical research.

The dimensions of the task at the Armistice were enormous. The ten invaded and battle-torn *Departments* constituted 12 per cent of the total land area of France, and, according to the *Ministere des Regions Liberees*, 3.4 million hectares were devastated. To be sure, a large part of this (some 1.7 mn ha) needed only simple clearance of shells and military installations to be more or less usable as farmland, but this in itself would be an enormous task; by 1922, 20.8 *million* tonnes of munitions had been destroyed (at the cost of many lives).

The reconstruction which Clout has unearthed did not have a grand plan at its centre. Although the state had early (in 1914) assumed the unprecedent responsibility for compensating those suffering wartime loss, it was never intended that the state or official labour should play a long-term role in the process of reconstruction. Accordingly, the process divides into two: state involvement in clearing and levelling land, restoring drainage, and providing temporary accommodation for the worst cases, which phase was largely over by 1922; and subsequently leaving the task to private initiative, either by individual *sinistres* (those who had suffered loss), or by reconstruction cooperatives who provided a more coordinated and probably more efficient effort.

The first phase had its critics; much of the labour employed seems to have been inefficient, and sometimes lawless; the *sinistres* were plagued by an excess of paperwork, occasionally falling prey to freelance advisers, who, for a fee, would negotiate with the state on their behalf; much of the temporary accommodation erected was of very inferior quality (roofing made from tarred cardboard was used to excess); and in the winter of 1919–20, many farmers were living in cellars or in makeshift shelters dug into the ground. But state help included such things as setting up light railway lines for the clearance of war material and the shipping of building materials, the use of some 2000 motor tractors, and the restoration of some of the livestock and implements stolen by the invaders. Above all, much of the land clearance had already been achieved; by the start of 1921, some 2.5 mn ha (three-quarters of the final figure, in 1931) had been cleared of shells. Apart from state aid direct, much had been achieved by the amazing energy and ingenuity of individual farmers, so that some 1.0 mn ha of devastated land was reported to be ready for cultivation at the start of 1921.

From the early 1920s until 1931 (when reconstruction was adjudged complete), the field was left to private and local community initiative. In this phase, unfinished business from the emergency period was concluded, and the long-term task of rebuilding houses and farmsteads tackled. Much was done by cooperatives of *sinistres*. Some of their rebuilding stories were very impressive (eg, at Ancerviller, near Luneville, p 219), although progress was uneven in the devastated regions as a whole.

Two notable features of the rebuilding were the persistent pressure on local government to minimize the total of land declared beyond reclamation, and the success of the *sinistres* in ensuring that the rebuilding restored the environment to its former state, as near as possible. There was little desire to take the opportunity to modernize, in the sense of evolving some town-planned form of commune, although a few *cites-jardins* made their appearance, and the rebuilt farmsteads were more hygienic, since they separated humans from animals. It was also notable that the opportunity to consolidate the scattered French farm holdings was resisted: *morcellement* continued, and *remembrement* was rarely tried. The reasons for this are not clear; fear of losing out in land exchanges and impatience to restart cultivation seem to have been the most powerful forces.

The story told by Clout is full of detail, yet never loses sight of the main themes. It is the product of considerable research in national and *departemental* archives, and fills a notable hole in the history of rural France. It should be added that the

quality of both print and illustrations, is excellent, and the University of Exeter Press are to be congratulated on producing a high-quality book at a reasonable price.

PETER DEWEY

PETER DEWEY, *War and Progress: Britain 1914–1945*, Longman, 1997. xvii + 377 pp. 4 maps. £17.99.

This book is the second to appear in an intended seven-volume general economic and social history of Great Britain. As it is a general study, the space given to agriculture reflects its importance within the economy and society. In 1911 only a very small proportion of the labour force were employed in the sector – as is clearly shown on the first map (pp 2–3) – and after twenty years of peace-time depression and eleven of war-time disruption accompanied by the processes of economic development and structural change, it was even less important by 1945. As a result it is mainly the important landmarks, many of them institutional or legislative, that are noted, such as the sale of agricultural estates after 1918, the Agriculture Act of 1920, its repeal the following year, the difficulties of the 1920s and 1930s, the Agricultural Marketing Acts of the 1930s, and the increased role of British agriculture's contribution to food supply in both world wars. The reasons for these changes are made clear so that the reader can see how these events were driven by forces at work in the wider economy. The most important were the repercussions of changes in world prices for primary products upon British farming, and the emergence of tariff protection after 1930. However, it would be misleading to suggest that only economic factors were operating, as Dewey also mentions the manner in which links between rural society and the land were reduced with increased mechanization on the farm. Other factors were the rise of the tourist industry in some areas, and the increasing use of the countryside as a dormitory area for town workers. As it is a general study, the amount of space given to agriculture is about right, and therefore it is only fair to review this book as a general study, in spite of Peter Dewey being best known to many readers of this journal for his specialist work on British farming in the First World War.

From well before 1914 the daily lives of most were largely affected by developments within the international economy and their impact on the great export industries, as well as changes in the service economy. The coverage of these is good, as it is for the other important topics, such as the enhanced role of government, shifts in social policy, changes in income distribution and the advance of urban society. There are seventeen chapters, beginning with a survey from 1900 to 1914, one chapter on the First World War, eleven on the interwar years, two on the Second World War and a concluding chapter that takes the form of a national balance sheet for the years 1900 to 1945. The conclusion is that in spite of structural decline of some industries and a worsening Britain's international position, most people experienced an improvement in living standards. This is a thesis that is hardly revolutionary, and it is supported by the preceding chapters.

The 1914–1945 period is not an easy time span to handle as the main part of the book is focused on two decades of peace sandwiched between two major conflicts that proved to be watersheds. Wars are the major discontinuities of the twentieth century, immensely important because of their sudden transformation of the British economy and society, partly accelerating the pace of previous change but also introducing fresh elements into the process. In his treatment of these conflicts Dewey certainly stresses the links between wartime and peacetime conditions and the dual effects of the war on relationships within Britain, and also upon its role and position within the international economy are explored. However, the war economy itself could have benefited from more detailed discussion. Under this heading are the forces behind the development of the inflationary gap in wartime. Inflation is of course mentioned in the context of both wars, as is the rise of government spending and the decline in civilian consumption, but the nature and extent of the unsatisfied demand created by wartime conditions is never fully developed. It is this phenomenon – the shift to the left in the supply curve and the shift to the right in the demand curve – which brought together all the aspects of a wartime economy and made necessary the multiplicity of controls that had to be imposed on civilian consumption and social life and which figure prominently in Dewey's accounts of both wars. Elements of the inflationary process are dealt with in isolation such as 'the large gap between [government] revenue and expenditure' (p 30), but mention of this by itself is likely to cause students to incorrectly identify the budget deficit as the inflationary gap rather than a contributor to it. In the Second World War planners were better informed on such processes, and in March 1941 the cabinet's economic section estimated the likely increase in incomes in the coming financial year at £100 million and the probable reduction in consumer goods and services at £400 million, thus creating an inflationary gap of £500 million. Again, the more efficient control of inflation in the Second World War is described; a process that was presumably helped by the lessons learnt from the First World War. Here it would have helped had the parallels and divergence of economic policy in both wars been contrasted more

strongly, although there is an attempt in the final chapter (pp 330–1) to compare the financial impact of the two wars, largely in terms of government spending.

The whole format of the book, with sub-headings every 1000 to 1500 words or so and punctuated with frequent tables, gives it the appearance of having been written to a design tailored for modular courses. This is a structure that is likely to make it a popular book for students with essays to write, and for those engaged on such enterprises there are enough references to follow up topics in greater detail. With this end in view the bibliography is also helpful as it is divided into over thirty sections, but the quite reasonable decision to have no duplicate entries means that the one on crime contains only three items and E Smithies's study of crime in wartime is to be found in the section on the Second World War. The balance between social and economic topics is equal, although the frequent sub-headings might invite some to conclude there is no need to make any formal link between economic and social history. This would be a pity because the coverage of both is good, and there has certainly been no attempt to neglect the economic factors that underpinned the social changes. Although there are a number of other texts that cover the whole or part of this period of British history, Dewey has produced a text book that has enough substance to capture a good share of this market.

RICHARD PERREN

PETER MANDLER, *The Fall and Rise of the Stately Home*, Yale University Press, 1997. 531 pp. £19.95.

The heritage industry, like it or loathe it, is now an established part of our national life. Every year we individually and collectively visit hundreds of houses, museums and other 'sites' which enjoy protected status of one form or another from the state. Country houses are a particular attraction, many of them lovingly conserved by the (aptly named) National Trust. But why? How has it come to be that these houses, great and small alike, built for and by private owners, are now happily accepted as part of the national heritage? In turn this raises a further question of why and how the English aristocracy – quintessentially rural and agricultural to the core – has so successfully persuaded a dominantly urban and industrial state to take over and finance the upkeep of many of its otherwise redundant houses.

Mandler enters this debate at two levels. The core of the book is simply the story of country house visiting since the early nineteenth century. From his reading in the periodical press, together with archival material drawn from a range of sources, Mandler constructs a compelling argument which shows that country house visiting has gone through several phases rather than enjoying an exponential rise. The first period of mass interest was in the middle decades of the nineteenth century. Houses and gardens were opened to an increasingly wide audience, but this phase did not last and by the late nineteenth century interest in the stately home was in rapid decline. Through the interwar years visitors dwindled to a trickle with only a couple of dozen houses regularly open to the public. The revival began only in the 1950s and 1960s, and then from about 1974 turned into a veritable renaissance which has in turn spawned a minor media industry pioneered by *Brideshead Revisited* and symbolized by BBC Television's *Antiques Roadshow*.

Mandler tells his story well, but he has a wider agenda which is to make a contribution to the modern debate opened up by Robert Hewison a decade ago on 'the heritage industry'. Mandler argues that the fall and rise of the stately home reflects movements and trends in English history more generally. Thus the initial rise in country house visiting reflected an opening up of the market for cultural products, and a particular romantic interest – fuelled by Sir Walter Scott – in houses from earlier times such as Haddon and Hardwick in Derbyshire, Knole and Penshurst in Kent. The decline in interest towards the end of the nineteenth century he attributes to a mixture of political radicalism, anti-aristocratic sentiment expressed particularly through the back to the land movement, and a shift of interest towards seaside resorts and rambling with the growth of the excursion and the holiday. The absence of interest during the interwar period is difficult to explain, while the modern resurgence of visiting and the growth of the National Trust offers Mandler a challenge to which he does not fully respond. Throughout the book he is handicapped by knowing very little about numbers of visitors, and about their motives, but in the recent past this is surely less so, hence the surprise when he relies on nebulous ideas about anti-urbanism rather than correlating the increase in visits with private car ownership. Mandler's long discourse on government policy and taxation may tell us why the country house has enjoyed a renaissance but it tells us little about the visitors – why, one longs to know, have so many people joined the National Trust since 1970?

It would be churlish to end this review on a negative note. In general this is a splendid book, it tells a fascinating story in a lively and interesting way, and it asks pertinent questions about why such houses – many of them built in European styles of

one sort or another, and filled with artifacts plundered on numerous grand tours and similar journeys – are now being protected as part of the 'national heritage'. Along the way, Mandler raises other interesting questions about the aristocracy generally. In the 1890s W T Stead imagined that they would soon be handing over their houses to successful businessmen and financiers. He was wrong: although many have gone, the majority of those who have survived with their houses intact are a tribute to a group which has successfully struck out against the tide of English history, even if only a few have done so without financial help from the government. Perhaps the last word on this book should be the illustration on the back cover, an 1858 watercolour by E Adveno Brooke of Alton Towers, one of the earliest houses to be opened regularly to the public. In the mid-nineteenth century visitors came to enjoy the landscape features, the fountains and the conservatories: today they come in their thousands to a place every modern child wants to visit, but few of whom associate with a stately home and an English aristocracy!

J V BECKETT

GORDON E CHERRY and ALAN ROGERS, *Rural Change and Planning: England and Wales in the Twentieth Century*, E & F N Spon, 1996. 206 pp. £39.50.

This book is the latest in a long line of distinguished contributions in the *Studies in History, Planning and the Environment* series, jointly edited by Gordon Cherry and Anthony Sutcliffe; it is all the more sad to record Gordon Cherry's death since the completion of this volume. What they have in common, as this amply demonstrates, is a lively historical sense, with which to present and illustrate the work of geographers and planners. This book thus sets in historical context the evolution of planning as it has affected the countryside in the present century.

The story starts with setting the rural context in the early years of this century. At this time, the future fate of the countryside seemed to be predictable; it would be one of continuing decline, in economic importance, in population, and in political influence. 'Ill fares the land' well describes what many felt about things rural. On the other hand, there was an immensely romantic yearning for what were seen as the simplicities and eternal verities of rural life; *Merrie England*, by Robert Blatchford (1894), had sold over a million copies.

Between the wars, the growing concern of government, at all levels, was with urban planning only, with a view to the effective and hygienic layout of planned urban development; the Housing and Town Planning Act of 1919 was the result, and it did little to influence rural conditions. But outside the towns controversy was growing in a variety of ways, as the modern age obtruded on what many (usually in the towns) felt should approximate to Arcadia; the spread of housing in the urban hinterlands; 'ribbon development'; unregulated housing and industrial or tourist enterprises in beauty spots and seaside areas; the march of electricity pylons; the continuing conflict over walking and access (the Ramblers' Association being formed in 1935).

After 1945, government intervened decisively to influence rural development. The main presupposition of policy was that farming should be protected as it went about its business, since it provided the best means of securing the countryside from unwanted development. Thus the Agriculture Act of 1947, which assured farmers of financial support, was complemented by the Town and Country Planning Act of the same year.

While the first couple of decades thereafter saw this policy largely accepted, there came a time around the 1970s when the political climate changed, and farming was increasingly seen as having a deleterious effect on Arcadia, through the use of pesticides, the removal of hedgerows, the erection of unsightly buildings, and the pollution of watercourses. However, the basic planning structure still remains intact, and agriculture is still largely immune from the attentions of the planners. The new concerns have been met by the creation of a raft of special bodies and mechanisms for the 'designation' of areas in which development (agricultural or other) may be challenged. Mechanisms have been adopted to compensate farmers financially for lost potential profits. The policy of designating certain areas for certain purposes has grown up piecemeal, and along with it many different institutions – Green Belts, National Parks, Areas of Outstanding Natural Beauty, Environmentally Sensitive Areas, Nature Reserves, and Sites of Special Scientific Interest. But even these do not provide a cast-iron protection against development if an alternative case can be made sufficiently strongly.

In sum, the record is one of continuous policy adaptation, with a strong democratic element (the planning authorities are elected bodies), and a fair measure of success. At present, the greatest question is whether the planning system will move further in the direction of intervention in the business of how farmers farm their land. The authors are to be congratulated on presenting the history and the issues in such a clear and cogent form.

PETER DEWEY

Shorter Notices

MAURO AMBROSOLI, *The Wild and the Sown: Botany and Agriculture in Western Europe, 1350–1850*, CUP, 1997. xxiv + 460 pp. 27 plates. £50.00.

This short note is to welcome the English edition of Mauro Ambrosoli's richly textured study of the diffusion of forage-crops in early modern Europe which was first published in Italian in 1992 and reviewed in this journal by S R Epstein two years later (volume 44, part I, 1994, pp 91–2). The author's central concern is with the convoluted history of lucerne. Known and revered in classical times, it disappeared from Italy to be reintroduced in the sixteenth century from Spain; but it never gained much of a following in Britain despite growing publicity. Why this should have been the case is not fully explained. Nevertheless, Ambrosoli reveals in enormous detail the process – both literary and by personal contact – by which botannical knowledge was transmitted from area to area within Europe. For British historians the message is clear: native botanists and agricultural writers owed a great deal to their classical forefathers and to their contemporaries on the Continent; until the eighteenth century the British were followers rather than leaders.

DONALD WOODWARD

F MOUNTFORD, *Heartbreak Farm: A Farmer and His Farm in Wartime*, Sutton Publishing, Stroud, 1997. viii + 144 pp. Illus. £17.99.

This is essentially the story of Frederick 'Ray' Raybould, born into a tenant farming family from the Warwickshire-Worcestershire border in 1899, though his wife Isabel actually takes an equal share of attention for much of the book. The various farms he lived on were classic family holdings of around the hundred acre mark, and all were close to towns. He stands out as an individual only in that during the Second World War he was evicted by the local War Agricultural Executive Committee on fairly specious grounds, losing his place on the farming ladder and never regaining it. Lavishly illustrated with drawings and displaying a strong sense of 'rural heritage', this is not in any sense an academic history, but it is not overly romantic and there are many points of interest, particularly in putting a human face onto agricultural history. It is a good corrective to any tendency to portray Edwardian farmers as a relatively homogeneous group of capitalist employers, for personal and family labour, ruthlessly exploited, was the basis of survival. Raybould was poorly educated even by contemporary standards, and earned a poor living in terms of disposable income despite the social standing he had as a farmer. His father relentlessly drove himself and his family, so that Raybould described the period after he left school as 'fifteen years of slave labour', without even a wage to show for it. Similarly, the personal difficulties of a farmer's wife, and especially one not born to farming, are well brought out. Similarly, while it is not typical, the eviction shows a side of the war that would be difficult to reconstruct from documents: the human cost of the massive increase in the intensity of agriculture and the dangers of unfettered executive power that such a crisis tends to bring. Altogether, it is worth perusing for anyone with interests in the locality, or in farmers as a class, or the impact of war in agriculture.

STEPHEN CAUNCE

JOHN CANNON, ed, *The Oxford Companion to British History*, OUP, 1997. xii + 1044 pp. £30.00; JACK SIMMONS and GORDON BIDDLE, eds, *The Oxford Companion to British Railway History*, OUP, 1997. xv + 591 pp. Maps. £45.00.

These two substantial reference works are welcome additions to the widening range of *Oxford Companions*. Over 100 scholars have contributed more than 4000 entries to the volume on British history and 88 scholars have co-operated in writing the 600+ entries on the railways. Each volume is arranged on an A–Z basis, which makes for quick consultation and encourages the reader to browse. The information ranges from the well-known to the esoteric. Did you know that the first circus train was that used in 1872 by Barnum & Bailey in the USA, closely followed by Ringling Bros, or that the first monorail was patented by H R Palmer in 1821? 'Be honest in your answer', as Sellars and Yeatman said.

The volume on the railways naturally has more scope for long entries than the volume which attempts to cover the whole of British history. There are pieces on the various companies, important engineers and chairmen, navvies and railwaymen, places (with maps of each region), the ways in which the system worked, and the social and economic consequences of the railways. The *Companion to British History* is a first point of reference from Roman times to the present day. It contains an enormous range of brief biographies and accounts of events of national importance, but it is by no means restricted to political and constitutional matters, aiming rather to be as comprehensive as space allows. One always wants more, of

course, but these are ambitious volumes that serve their purpose well.

DAVID HEY

THELMA MUNCKTON, *Chancellors Farm Accounts, 1766–1767*, Harry Galloway Publishing, Weston-Super-Mare, 1994. 42 pp. £4.75.

This farm in the Mendip Hills is used by the Somerset Trust for Nature Conservation to train volunteers in conservation. The first year of the accounts (which continue until 1769) have been transcribed, together with a land description of 1754, a map and schedule of *c* 1829 and the MAF survey of 1941–43.

JAMES S. TALLETT, *Farm Diary: A Daily Record of Work on a Buckinghamshire Farm, 1879–1883*, privately printed, 1996. 93 pp. Maps. Available from the author, 64 Weyland Road, Headington, Oxford, OX3 8PD; no price given.

A day-to-day account of farm work by Thomas Dover of South End, Haddenham, Buckinghamshire at the time of the agricultural depression. The diary ends when Dover retired at the age of 65.

BRENDA J BUCHANAN, ed, *Bath History, VI*, Millstream Books, Bath, 1996. 76pp. Illus. £7.99.

Eight essays, including one by J H Bettey on sixteenth-century litigation, and others on the Twerton cloth industry and the Avon Navigation which contain material of interest to agrarian historians.

Notes

DATABASE OF PRIVATE BILL WITNESSES

A new database of major importance to agricultural historians is now available at the House of Lords Record Office. It contains the names, occupations, places of residence or work and other information relating to about 200,000 witnesses who gave evidence to committees of the Commons or Lords considering opposed private bills between 1771 and 1917, together with names of petitioners and bill titles.

The database enables easy access for the first time to about five million pages of predominantly manuscript evidence, largely in the House of Lords Record Office but including some held elsewhere. It is possible to search for all database entries relating to a particular person, place, occupation or company – for example all witnesses dealing in artifical manure, or from Ransome's of Ipswich. Evidence was taken most often on bills for the construction of railways, but there were also large numbers of bills concerning enclosure, canals, docks, harbours, roads, tramways, civic improvements, gas works and water and electricity supply systems. It relates to the entire United Kingdom, including the whole of Ireland; in addition, many witnesses drew on their international experience.

The database is available on-line at the House of Lords Record Office. The Record Office is able to make quick searches for researchers who write to the Clerk of the Records, House of Lords, London, SW1A 0PW. A guide to the database, entitled 'Witnesses before Parliament' is available from the same address, price £3 including postage. The database has been funded by the Transport History Research Trust, with a major contribution from the House of Lords Record Office.

MEDIEVAL AND MODERN PLANT MATERIALS, SOIL FERTILITY AND DIET

Dr F B Stitt, former archivist at Staffordshire Record Office, has sent the following comment in the light of the paper by E I Newman and P D A Harvey, 'Did soil fertility decline in medieval English farms? Evidence from Cuxham, Oxfordshire, 1320–1340', which appeared in volume 45, 1997, of the *Review*.

'In recent years two new and important fields of study, using scientific data, have been opened by students of medieval life. One, the impact of corn growing on soil fertility, the other the nutritional values of medieval diet, in which, particularly for the poorer in society, bread and ale were important constituents. In both cases findings have been based on meticulous research and sophisticated statistics, but in both the scientific input has drawn heavily on modern plant materials, whether seed corn, malt (for ale), or flour. Does this present potential difficulties? Would the use of medieval material, had it been available, have modified results?

'I am not a scientist, but I know one who some ten years ago carried out an experiment which suggests caution may be necessary. Various factors have contributed to the vastly greater yields of present-day corn in the west compared with medieval conditions. Some of the more important are extrinsic: use of large amounts of more advanced fertilisers, of fungicides and pesticides, for example. But one important factor is the increased yields and other improvements of the seed corn itself, arising from generations of crop breeding. Has this brought about "collateral" changes in the chemistry of the growing seed and its derivatives, flour and malt? In the experiment in question, the control system of seed potatoes was manipulated so as to vary the amount of starch made in the tubers. Where this was largely suppressed, although the grown plant outwardly was a fine cluster of new potatoes, in fact they contained little starch and would be more a substitute for sugarbeet. Put another way, the quantity of one chemical produced in a plant affected the quantity produced of another.

'In comparison with its medieval ancestor, does modern seed corn demand not just different quantity of nutrients from the soil, but because of its greatly increased yield also require them in different proportions? In respect of malt and flour, the sources of ale and bread, has centuries of effort to improve the yield of corn altered the chemistry of flour and malt? In particular have the levels of protein or of trace elements, some of which play an important part in their nutritional values, been affected? Has their presence in some cases been diminished, even eliminated; or has, in some, been increased?

'Unfortunately, I am given to understand that most medieval corn which has survived has been contaminated by its surroundings (middens or ovens). Banks of relatively primitive corn from the Middle East and elsewhere have been accumulated, but here of course the relevance of its characteristics to those of western medieval corn has to be shown. Nevertheless, the problems I have outlined could well exist.'

Notes on Contributors

P S BARNWELL works for the Royal Commission on the Historical Monuments of England, at York, and is a committee member of the Historic Farm Buildings Group. In addition to participating in the Commission's recent project on farmsteads, he has worked on medieval houses in Kent and on Northamptonshire's medieval churches. His main interests, however, lie in early medieval history, and he has published a number of books and articles on both British and European subjects.

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GILLIAN BRISTOW is Research Fellow at the Cardiff Business School. She is currently conducting post-doctoral research into the measurement and impact of agricultural support policies on the regions.

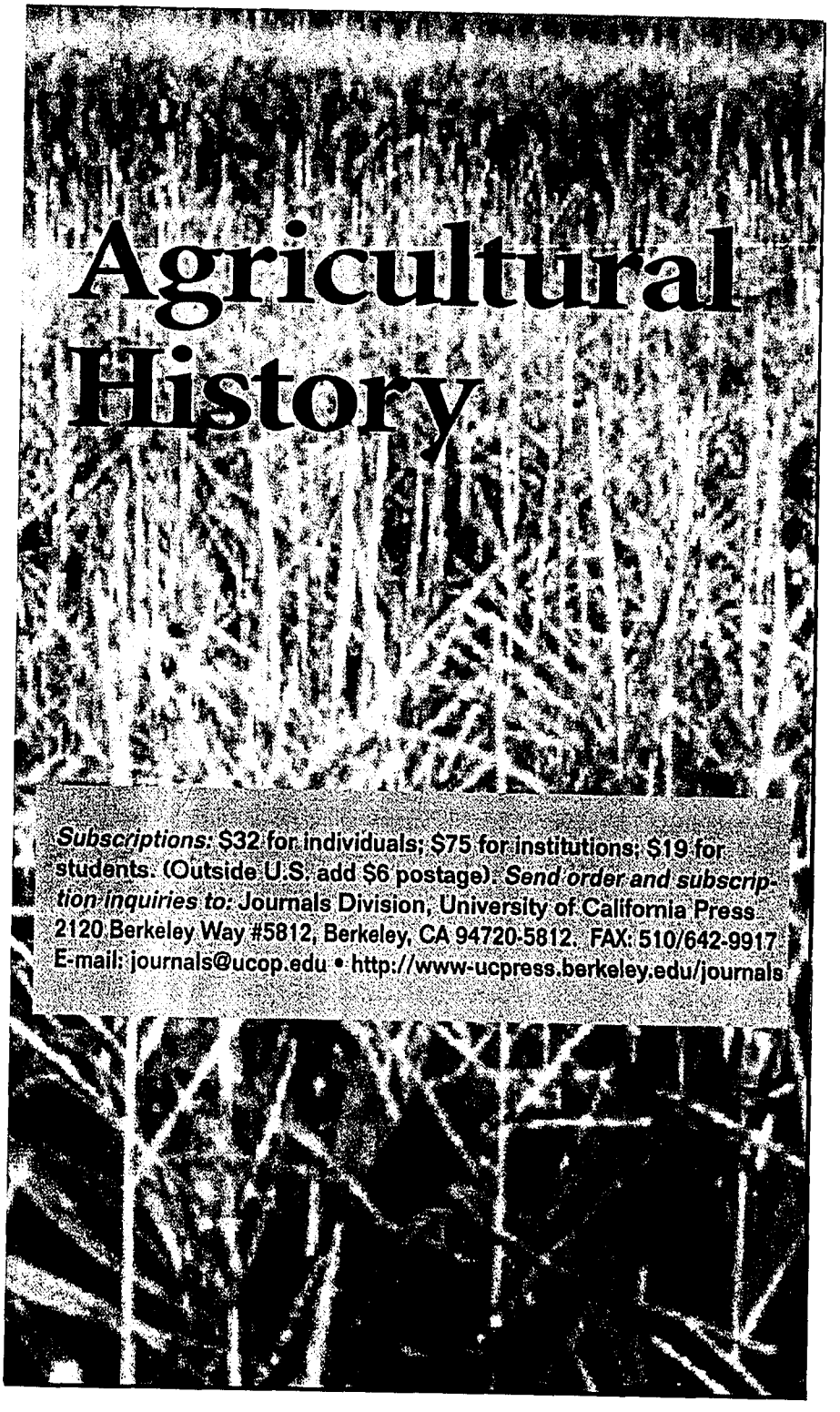
CHRISTOPHER DUNCAN originally took BSc and PhD degrees in zoology from London University. He has been Professor of Zoology, Liverpool University, since 1970. His interests include control systems in cell physiology, epidemiology, and population biology.

STEPHEN DUNCAN graduated in physics from Cambridge University and took MSc and PhD degrees in control systems engineering from Imperial College, London. Currently he is Lecturer in Control Systems, University of Manchester Institute of Science and Technology. He is interested in modelling non-linear systems and the application of neural networks.

ELIZABETH GRIFFITHS spent three years farming in New Zealand, before taking a degree at the University of East Anglia and completing a PhD on the management of the Blickling and Felbrigg estates in the seventeenth century. With Prof A Hassell Smith, she also wrote a *History of the Norwich Freemen and the Town Close Estate* (1987). After nine years teaching, she is working on various aspects of her work for publication, including an article on 'Sharefarming in Norfolk in the 1670s and 1680s', and the preparation of *William Windham's Green Book 1673–1689* for the Norfolk Record Society.

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THE AGRICULTURAL HISTORY REVIEW

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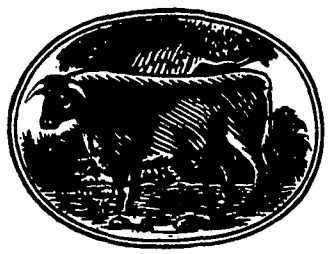
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THE AGRICULTURAL HISTORY REVIEW

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The Development of the Lease and its Role in Agricultural Improvement in East Anglia, 1660–1870

By SUSANNA WADE MARTINS and TOM WILLIAMSON

Abstract

Historians have long debated the role of the lease in agricultural change during the eighteenth and nineteenth centuries. This paper examines the development of the lease in East Anglia, and argues that it was probably not a crucial factor in the improvement of farming in the 'agricultural revolution' period. Husbandry prescriptions did not have a major role in encouraging the adoption of improved methods, and terms and conditions tell us as much about the changing relationship between landlord and tenant as they do about the development of farming practice.

THE ROLE of the lease in stimulating and directing agricultural change in the eighteenth and nineteenth centuries has long excited comment. The discussions between modern historians have been very much along the lines of those among land agents and improvers two centuries ago. How much control over and effect upon farming methods could really be exercised by the lease? Did legal contracts really give tenants more security than less formal arrangements? How important was the lease in promoting new methods? Following on from these questions: how important was the landlord in influencing the pattern, and pace, of agricultural change; and how reliable are the terms of lease agreements as a guide to contemporary farming practices? Recent research in East Anglia has involved the systematic study of a wide variety of leases from the seventeenth century onwards, across a broad spectrum of estates. This paper attempts to throw light on some of these questions using this material.

Leases could be used to promote 'improved' farming in three principal ways. Firstly, they could – unlike yearly tenancies at will – provide the farmer with a measure of long- or medium-term security, and thus give him an incentive to invest in improvements the benefits of which might only be fully realized in the medium or long term. Secondly, they could be used to frame co-operative ventures of land reclamation and improvement. The eighteenth century saw a substantial expansion of arable land in East Anglia – the conversion of heaths on the lighter land, and of ancient pastures and wood-pastures on the clays, to arable. Lease agreements provided a way in which the capital and effort of landlord and tenant could be combined in the arduous work of drainage, clearance, or marling that such schemes involved. As William Kent put it in 1796, 'Without leases no marling to any extent would have been undertaken, nor so much ground brought into cultivation by one-third as there now is'.[1] Thirdly, leases could formally stipulate practices which were beneficial to the farm, by – for example – laying down a particular course of husbandry which the tenant was to follow. It is this latter aspect of the lease which has perhaps received most attention from modern historians, especially those investigating the improving activities of great East Anglian estates like Raynham or Holkham.

[1] W Kent, *General View of the Agriculture of the County of Norfolk*, 1796, p 123.

The significance of leases in the development of 'improved' agriculture was emphasized by Arthur Young in 1771, when he included the long lease in his list of factors which made up the 'Norfolk system' of farming. In 1804 he went so far as to assert that the 'great improvements in Norfolk husbandry were the result of the 21 year lease'.[2] Kent was equally enthusiastic: 'Leases are the first, the greatest and most rational encouragement that can be given to agriculture admits not of a doubt ... In this county it is rather the fashion to grant leases, which in great measure accounts for the improvements that have taken place in it'.[3] Among modern historians, however, there has been rather less unanimity on the importance of the lease. While Habbakuk in 1953 listed the lease and its covenants as one of the main ways in which landlords could influence farming on their estates, albeit within certain limits,[4] others have been more sceptical, suggesting that leases were merely a 'loose framework' within which the landlord and tenant could work, and that even where long leases were not usual, there was in practice effective security of tenure.[5] Most landlords disliked frequent changes of tenants and would do all they could to prevent 'removals'. In a system in which landlords required good tenants just as farmers required good landlords, annual tenancies could be just as secure.[6] In the case of eighteenth-century Nottinghamshire it has been suggested that leasehold tenants were not characterized by any greater propensity to improve than those with annual tenancies.[7]

Nevertheless, those who have studied the early development of leases on the two almost legendary estates of Raynham and Holkham, on the light soils of north-west Norfolk, have suggested an important role for them. James Rosenheim, in his analysis of the leases issued by Lord Charles 'Turnip' Townshend of Raynham, saw 'lease-based control over tenant practices' as 'an essential element of Townshend's successful managerial regime [which] begins to explain his reputation as an innovative agriculturalist'.[8] Townshend's 'reliance on leases to bring tenants to his view of husbandry was indeed a far-sighted innovative and effective strategy'.[9] Parker, similarly, writing of the activities of Thomas Coke at Holkham, emphasized the precocity of lease agreements on that estate in the early decades of the eighteenth century. Here detailed husbandry clauses appear from the 1730s (one for Massingham in 1732, and another for Longlands Farm in Holkham for the following year, stipulating the use of turnips in the rotation).[10] In Parker's words, 'The terms of leases are of great importance. They provide evidence of the standards of cultivation the landlord was setting for his tenants. The progress and technical changes in the clauses dictating how the land was to be used are evidence for the progress of farming'.[11]

I

One problem with these kinds of assertion is that they are made in the absence of comparative studies of other East Anglian estates, especially those of the local gentry. In fact, although relatively few early leases have survived, such evidence as there is suggests that neither Holkham nor Raynham were especially innovative in

[2] A Young, *The Farmer's Tour Through the East of England* 2, 1771, p 150, *idem*, *General View of the Agriculture of the County of Norfolk*, 1804, p 47.
[3] Kent, *General View*, p 123.
[4] H J Habbakuk, 'Economic functions of English landowners in the seventeenth and eighteenth centuries', *Explor Entrepren Hist*, 6, 1953, pp 92–102.
[5] C Clay, 'Landlords and estate management in England', in J Thirsk, ed, *The Agrarian History of England and Wales*, V, part 2, 1985, p 228.
[6] J V Beckett, 'Landownership and estate management', in G E Mingay, ed, *The Agrarian History of England and Wales* VI, 1989, p 615.
[7] *Ibid*, p 614.
[8] J M Rosenheim, *The Townshends of Raynham*, 1989, p 151.
[9] *Ibid*, p 154.
[10] Holkham Hall Archives, Massingham 236, bundle 10; Holkham deeds, 1072, bundle 23.
[11] R A C Parker, *Coke of Norfolk*, 1975, p 54.

their use of the lease; and that both, in fact, were more or less in line with general practice on the better-run East Anglian estates.

Leases were already favoured by many landowners by the late seventeenth century. As early as 1694 the agent for an estate at Horsford in the heathlands to the north of Norwich informed the absentee landlord that he intended letting all the estate by lease, 'for as long as they are tenants at will there will be no care taken to improve the estate'.[12] Some examples of leases survive from as early as the sixteenth century, such as the six-year lease for the demesne of Sapiston Grange in the Suffolk Breckland, granted in 1567, which stated that the farmer promised to leave the land in question fallow every third year.[13] Such rather vague husbandry prescriptions were typical of the period before the later seventeenth century: indeed, many leases made no husbandry prescriptions at all. One of 1628 from the parish of Nacton on the edge of the Suffolk Sandlings, for example, simply required the tenant to maintain hedges and keep buildings in repair;[14] another from the same estate, granted 30 years later, merely required the tenant not to plough up pasture or sell manure.[15] Similarly, two leases from the 1690s for farms in Carlton and in Great and Little Thurlow (Suffolk), only contain the stipulation that the land should not be third cropped, but should lie fallow after two crops.[16] A three-year lease granted in 1684 for a farm in the parish of Barrow, on the Ickworth estate in the Suffolk Breckland, and a similar one for 1694 for another farm in this parish, similarly restricted the farmer to growing two cereal crops in succession, to be followed by fallow, and includes no other prescriptions.[17] Roughly contemporary leases from the Le Strange estate on the light soils of north west Norfolk – 19 in all, spanning the years from 1680 to 1699 – are just as general, although mostly granted for rather longer periods than those just discussed – two were for terms of no less than 21 years.[18]

On many estates vague or limited prescriptions continued to appear in leases well into the eighteenth century. One of 1727, for a farm in Thorndon in the north Suffolk claylands, for example, simply stated that the tenant 'will in every third year summertill the same according to the course of good husbandry in that country'; and similarly in Little Thurlow in 1703 there was to be no third cropping (even as late as 1759 a lease here simply stated 'not more than two crops without summerlay').[19] It is possible that in many of these cases – particularly those relating to farms in Breckland and north-west Norfolk – husbandry details *had* to be vague, because of the particular character of the open-field systems which were still in operation in these regions. Although these were less rigidly organized than most Midland field systems, they were still subject to a degree of communal regulation, and detailed cropping prescriptions would often have been difficult or impossible to follow.

This may explain why, by the end of the seventeenth century, leases from other areas of East Anglia, where communal organization even of unenclosed arable had always been weak or non-existent, had begun to make more detailed provisions. Many such agreements come from the heathlands of north-east Norfolk, an area of innovative farming even in the Middle Ages[20] and the district which William Marshall saw as the cradle of improved husbandry. Thus the single surviving seven-

[12] Essex Record Office [ERO], D/DL/C4/1.
[13] East Suffolk Record Office [ESRO], HD535/907/1.
[14] ESRO HA93/3/43.
[15] ESRO HA93/3/42.
[16] ESRO HA540/2/47 and 49.
[17] ESRO HA507/3/583 and 584.
[18] Norfolk Record Office [NRO], Le Strange KA 12.
[19] ESRO HA540/2/47, 49.
[20] B M S Campbell, 'Agricultural progress in medieval England: some evidence from eastern Norfolk', *Econ Hist Rev*, sec ser, 36, 1983, pp 26–46.

teenth-century lease from the Blickling estate – dating from 1666 and concerning a seven-year tenancy of Abbey Farm, a property scattered across the open fields of Horsham St Faith – stipulates that at the end of the term the farm was to be left with 20 acres 'lying conveniently together' under turnips, tilled and sown in 'a husbandlike manner at seasonable times in the year, that is to say about midsummer time'. Fifteen acres was also to be 'summertilled in the fourthe earth' (ie, left as fallow that had been ploughed four times).[21] Other equally early leases from this region contain similar prescriptions, most notably the fine series from Thorpe Market, drawn up by the Rant estate (later absorbed into the Harbord's Gunton estate).[22] All except one of the 12 leases granted before 1700 are for terms of five or seven years; the exception is for 17 years. The earliest, granted in 1662, contains no detailed husbandry clauses. But one of 1665 includes a description of how the farm should be left at the end of the final (fifth) year: 10 acres were to be under pea, buck or vetch stubble, next to be sown with winter corn; and 10 acres were to be pasture of two years lying. The fact that these areas were to be 'lying as continually together as may be' reveals, clearly enough, that these husbandry clauses were being enforced in an open-field context. The lease states that all the fodder produced was to be fed to stock on the farm and that the resulting muck was to be spread and not sold, thus ensuring the maintenance of soil fertility. All the muck that was produced in the last year of the lease was to be put on the land destined for winter corn.

There are six Thorpe Market leases from the 1680s, all of which include broadly similar husbandry prescriptions. Turnips are first mentioned in a lease of 1690. Two acres were to be sown in the final year of the tenancy (compared with the 10 to be left in pea stubble and 10 in pasture lays of one and two year's growth). In a seven year lease granted in 1709, 10 acres were to be left sown with turnips in the last year, 18 with clover seed, 10 were to be under 'olland' (pasture ley) of two years' lying, 10 under pea stubble to be sown with winter corn, 26 in pasture of three years' lying, 6 in wheat stubble sown on a new break, and 7 in barley stubble sown after wheat. Thereafter turnips figure regularly in husbandry clauses in leases issued by the estate, in gradually increasing quantities.

The Thorpe Market series is a rare survival, but other scattered evidence shows that leases for fairly long terms of years, and containing fairly detailed husbandry clauses, were by no means unusual in the early years of the eighteenth century. An insistence on turnip cultivation was also a common feature. Thus a lease of 1711, for a farm in Garboldisham on the edge of the Norfolk Breckland, lays down that not more than two crops were to be grown in succession before 'summerlanding or growing turnips in a husbandlike manner'.[23] Interestingly, a note in a lease for a farm at Felbrigg, in the heathlands of north Norfolk, drawn up in 1723, states that 'whereas tis said in the old lease that not above 3 crops of corn shall be sown before the land is lay'd down with clover or nonsuch and that he may sow turnip seed between any of the three crops of corn, now the meaning is that he may have liberty to sow one crop of turnips besides three crops of corn before it is laid down as aforesaid'.[24] The earliest surviving lease from the Heydon estate, from 1724, similarly instructed the tenant of Beer House Farm in Cawston 'not to sow more than three crops whereof one is turnips, before laying down to three years olland'.[25]

[21] NRO, Mss 16.023.
[22] NRO, uncatalogued collection.
[23] NRO, MC 421/4.
[24] NRO, WKC 5/95/3.
[25] NRO, BUL 1/310 617X4.

This is the first in a book of leases from the Heydon estate, in the northern heathlands of Norfolk. Whilst all (nine from the 1720s, 23 from the 1730s, and 22 from the 1740s) have much in common, there are individual variations which suggest that some at least were negotiated individually with tenants. Throughout the 30 years from 1720 to 1750, leases for terms of 21 years were a minority, although by no means rare: there are three for the 1720s, two in the 1730s and one in the 1740s. In the 1720s, in fact, the length of the tenancy was rarely stipulated, which presumably means that the lease ran from year to year. By the 1730s seven years was by far the most usual term, generally increasing to 14 years by the 1740s. Like the Thorpe Market leases, those from Heydon include quite detailed prescriptions regarding the management and maintenance of the farm. Typical is a seven-year agreement for a holding in Cawston granted in 1747. At the end of the lease the tenant was to leave '15 acres of olland of two years' lying, 15 acres of olland of one years' lying having been sown with 8lb of clover and a bushell of nonsuch per acre, 10 acres mucked and summertilled on the third earth and sown with turnips at a rate of $1\frac{1}{2}$ pints per acre, and once howed, 10 acres of summerley on olland of 2 years' lying tilled on the third earth, mucked and made ready to sow with wintercorn'. He was not to sow 'above two crops whereof turnips was one' before laying the land down to grass for two years.

Holkham and Raynham did not, therefore, pioneer long leases with detailed husbandry clauses. They were a fairly common tool of estate management in the first half of the eighteenth century, especially in north-east Norfolk, and Rosenheim's statement regarding a particularly detailed Raynham lease of 1717, that 'the lease terms outstrip in precision any known Norfolk leases of this date and show Townshend as already unmistakably in the vanguard of agricultural improvement', is at best an exaggeration.[26]

II

All this, however, brings us to a more fundamental question: were leases anyway of much importance in moulding the activities of farmers? While some modern historians have, as we have seen, emphasized their role in promoting innovation, or at least 'best practice', in agriculture, others have been more sceptical. Even Habbakuk acknowledged that in practice their influence could be very limited: leases 'prohibited objectionable behaviour rather than enjoined behaviour thought to be beneficial'. This rather cautious approach has been echoed by Christopher Clay, who sees leases as largely enforcing local conventions. The East Anglian evidence studied here offers considerable support for such a cautious view. In particular, it clearly demonstrates that where leases fail to mention 'improved' practices, this is absolutely no indication that they had not already been adopted by farmers in the vicinity.

There is at present some debate about the chronology of the adoption of the 'new rotations' in East Anglia. Mark Overton has suggested, as the result of his detailed study of probate inventories, that in the period from 1660 to 1739 only *c* 3 per cent of the cropped acreage of Norfolk was devoted to clover, and only *c* 8 per cent to turnips.[27] Moreover, even when present in the fields in the period before *c* 1750, the new crops were not being combined in the ways most beneficial to fertility: 'In the early eighteenth century few farmers seem to have been employing anything resembling a fully-fledged Norfolk four-course'. This is not the place

[26] Rosenheim, *Townshends of Raynham*, p 152.

[27] M Overton, 'The determinants of crop yields in early modern England', in B M S Campbell and M Overton, eds, *Land, Labour and Livestock: Historical Studies in European Agricultural Productivity*, Manchester, 1991, p 312.

to discuss this issue in detail: suffice to say that an analysis of tithe accounts, estate accounts and correspondence strongly suggests that these *average* figures obscure a good deal of local variation, and that in many areas of Norfolk and Suffolk turnips and clover were well established, normal features of agricultural practice long before 1750. It is true that these crops were often combined in ways rather different from those of the conventional four-course, as some of the lease terms presented above indicate: but many of these 'irregular' improved rotations were probably well-adapted to the particular needs of local farmers, involving for example the taking of two successive grain crops on heavy or fertile land. What is important in the present context, however, is the extent to which the adoption of new practices was directed, to any significant extent, by landlords.

Shotesham, in the claylands of south Norfolk, provides a good case study. The parish has a fine series of early and mid-eighteenth-century leases for the Fellowes estate; and also detailed tithe accounts for the 1720s, 1730s and 1740s, which detail the crops grown in every piece of land in the parish.[28] At the start of the latter series the proportion of turnips being grown in the parish varied from farm to farm, but the average was already fairly high, at around 12 per cent of the total cropped acreage. Nonsuch and clover accounted for over 18 per cent of the cropped area. Bare fallows were already rare: only *c* 8 per cent of the acreage was under year-long fallow at any one time. During the 1730s and 1740s there was a steady reduction in the proportion of year-long fallows or 'summerleys': by the late 1740s these accounted for no more than *c* 4 per cent of the arable acreage. At the same time there was a significant rise in the acreage under turnips, from *c* 12 per cent to *c* 16 per cent of the cropped area. Clover declined slightly from *c* 18 to 15 per cent of total cropped area. It is true that even at this stage many Shotesham farmers were still employing rather irregular rotations. Nevertheless, by the late 1740s a more or less standard version of one of the 'improved' rotations could be found in around half the fields of the parish.[29]

We would get a very different impression of local farming if we relied solely on the evidence of leases. Those granted for farms in the parish in the 1730s and 1740s simply stipulate that not more than two crops of grain were to be grown before summerleying, and the cultivation of turnips is nowhere explicitly stipulated. It was not, in fact, until the late 1740s that the Shotesham leases begin to insist on the inclusion of turnips in the course of cropping, when two leases, one of 1747 and one of 1749, required that 12 and 20 acres of the crop should be left at the end of the tenancy on the respective farms.[30]

Some particular examples perhaps serve to amplify the point. Henry Moor of Shotesham Hall Farm was given a 14-year lease in 1733. This stipulated that no more than two cereal crops were to be grown in succession, after which the land was to be fallowed.[31] The tithe books, however, show that turnips were a major crop on the farm; that bare fallows were gradually eradicated during the course of the tenancy; and that by the end of the lease most of the arable land of the farm was cultivated under the improved five-shift system. Similarly, Whitwood Farm was bought by William Fellows, owner of the Shotesham estate, in 1733 and a nine-year lease was granted to R Pooley.[32] The tithe books show that he was already the tenant here. The lease stated that not more than two cereal crops should be grown in succession

[28] NRO, FEL 382–430; FEL 480 553X.

[29] NRO, FEL 480.
[30] NRO, FEL 406, 408.
[31] NRO, FEL 394.
[32] NRO, FEL 400.

and that a summerley should follow the barley course. In fact, Pooley simply continued what had been his practice over the previous years: following erratic 'improved' rotations which seldom included fallows, but frequently featured turnips. The terms of the lease, in other words, simply made no difference to his farming.

Husbandry prescriptions thus provide a poor guide to the development of farming methods: and landlords did not necessarily set the pace of agrarian change by insisting on innovative practices in their leases. But leases can mislead in another way. Even where landlords were trying to improve the character of their tenants' husbandry, their prescriptions might simply be ignored, either because the farmers had a more practical knowledge of local conditions, or because they were attempting to wrest more out of the ground at the expense of longer-term soil fertility. As the Raynbirds emphasized in 1849, on the Suffolk clays in the 1840s few farmed 'strictly according to covenants, except by not sowing two white corn crops following; in fact it is impossible. Seasons will not always admit of ploughing a certain number of times at certain intervals'.[33] On the Earsham estate on the claylands of south Norfolk a field book showing the crops grown on the Earsham and Denton farms between 1773 and 1778[34] can be compared with the terms of a lease for Hill Farm, Earsham granted in 1773.[35] The latter stated that not more than one crop of grain should be grown without laying to clover, and that the clover should remain for at least 18 months. However, the field book shows that two and in some cases three consecutive grain crops were grown, and that clover frequently remained in the fields for only one year. Presumably these deviations from the tenancy agreement were made with the knowledge of the landlord, who perhaps cared less than modern historians about the precise course of husbandry adopted. Indeed, some contraventions to prescriptions might be to his advantage: the Earsham home farm accounts for the 1780s and 1790s show the owner buying fields of turnips from his tenants, in spite of the fact that the selling of fodder crops off the farm was expressly forbidden in the estate leases.[36]

Landlords certainly made sporadic attempts to monitor the adherence of tenants to the terms of their leases. On the Saumarez estate in east Suffolk a cropping book for the parish of Henley was begun in 1769 specifically 'to know if your tenants use the land according to the covenants in their leases and take no more than 2 crops before they summerlay the same or sow with clover or turnips which is not esteemed a crop'.[37] But how common such attempts were, and how successful, is unclear. It is evident that even tenants of the exemplary Holkham estate did not always keep to the terms of their leases. The journal kept by John Leeds of Billingford, in the claylands of central Norfolk, in the 1820s shows that contrary to the terms of his lease two crops of grain were often grown in succession in the fields of his farm.[38] There is no indication that the Holkham agent ever checked what was being grown and it appears that, perhaps because Billingford was so far from the estate centre, Leeds felt safe to do more or less what he liked.[39]

The evidence from East Anglia is thus fairly unequivocal regarding the significance of the lease as a tool for propagating new forms of cropping. Firstly, the granting of leases with detailed husbandry clauses, and for a moderate number of years, was by no means unique to the famous

[33] W and H Raynbird, *The Agriculture of Suffolk*, 1849, p 127.
[34] NRO, MEA 3/537.
[35] NRO, MEA 3/518.
[36] NRO, MEA 3/13.
[37] ESRO, HA93/3/53.
[38] NRO, Adcock Accn 27.6.74; Holkham Hall Archives, Holkham Ms MM96727/1, letter book 1816.
[39] NRO, MS 34018.

Holkham and Raynham estates in the first half of the eighteenth century. Instead it appears to have been common practice and the pioneering role of these estates must, in this respect at least, be discounted. Secondly, where 'improved' practices were demanded in leases there is no guarantee that they were being followed by the tenants: and, more importantly, where they were *not* demanded this does not mean that they were not being practised anyway by local farmers. The lease, in other words, was not primarily a tool by which 'improved' practices were imposed by enlightened aristocrats on an unwilling peasantry.

III

Leases could also be used to promote practices, such as regular marling, which served to improve the quality of the soil. Yet here, too, it is clear that they can be a poor guide to the actual development of farming practice. It is important in this context to distinguish between two kinds of marling: the routine application of an alkaline subsoil to neutralize acidity and thus improve yields on existing arable land, on the one hand; and the application of such a subsoil to land being reclaimed from acid heathland, on the other. Marling of both kinds had been known for centuries in areas of light acid land, especially in north-west Norfolk, Breckland and the north Norfolk heathlands. A grant of 1276, for example, refers to a 'Marlepit' at Saxthorpe in north Norfolk; marling is mentioned in a number of fourteenth-century documents relating to the Breckland; and marl pits are referred to on a number of occasions in thirteenth and fourteenth-century documents in the Holkham cartulary.[40] The impression given by medieval and early post-medieval references, however, is that marling was then a sporadic and occasional practice. It is only in the late seventeenth and early eighteenth centuries that very large applications begin to appear in estate leases and accounts. Some of the most striking evidence come from north-west Norfolk, and especially from the Holkham estate. In the period 1710–15 John Carr, fulfilling the terms of his tenancy, marled 240 acres of his farm in Massingham: he was allowed 8*s* an acre in return by the estate, thus receiving a total of £96.[41] William Kent of Weasenham was allowed £70 in 1748 for carrying 5856 loads of marl; and in the same year John Elliott, of Branthill Farm in Holkham, was allowed £30 for 2000 loads.[42] Raynham estate accounts and leases tell a similar story. In 1714 alone, in East and West Rudham, 3700 loads of marl were spread. In 1717 John Money leased Grange Farm in West Rudham for 21 years: a farm of 460 acres, of which 90 acres were arable outfields or 'breaks'. Of the latter, 30 acres were designated for annual cultivation. Money was to marl 20 acres of these at his own expense with 60 loads per acre, and receive rent reductions for marling the other 10.[43]

There is no evidence, however, that these famous estates on the light soils of north-west Norfolk were *really* taking the lead in this practice. Equally early, or even earlier, references to marling on this scale come from the heathlands of north Norfolk. Thorpe Market leases refer to marl as early as 1682, when John Noble was allowed to take 'as much as he think fit' from pits on the estate. Another Thorpe Market lease, of 1690, stipulated the application of 50 loads of marl on every acre, 'the landlord paying or allowing for the said digging, loading and spreading of the said marl'. In 1701 W Challis was allowed 30*s* for every 100 loads of marl put on the

[40] H Prince, 'The origin of pits and depressions in Norfolk', *Geog* 49, 1964, pp 15–32; W Hassal and J Beauroy, *Lordship and Landscape in Norfolk 1250–1350*, 1993, pp 186, 210, 534, 541, 564–5, 582.

[41] Holkham Hall Archives, A/B, 1711–1748.

[42] Holkham Hall Archives, A/B, 1727, 1748.

[43] Rosenheim, *Townshends of Raynham*, pp 151–2.

land. Marl continued to feature in leases of 1705 (for a farm in Southrepps where 200 cart loads were to be spread on an unknown acreage) and 1709 (Thorpe Market, Roughton, and Gunton; the tenant to be allowed 30*s* per 100 loads for 600 loads used on the premises).[44] Yet it is important to emphasize that marling is not *normally* referred to in early and mid-eighteenth-century leases. Indeed, only a small minority make any allusion to the practice. Moreover, where marling *is* mentioned, it is almost invariably in the context of the breaking in of new land – the reclamation of acid sheepwalks and heaths, which could not be successfully cultivated with massive does of lime – and it generally involved the landlord paying, or subsidizing, the tenant for his efforts. Marling as a regular or *routine* treatment of existing arable land does not usually figure as a stipulation in leases in this period. Once again, however, this does not mean that the practice was not being widely employed. To judge from the available evidence, marling grew steadily in importance in the middle decades of the eighteenth century. An anonymous correspondent to the *Gentleman's Magazine* in 1752, for example, argued that while marling *per se* was a centuries-old practice in East Anglia, it had recently increased greatly in scale. Formerly (he asserted) it had been customary to apply marl to only 2 or 3 acres at a time. The more extensive applications about which he was writing were a development, in essence, of the previous few decades.[45] Nineteenth-century commentators similarly believed that large-scale marling was widespread by the middle decades of the eighteenth century. Richard Bacon, for example, described the transformation in yields which had been effected on a Watton farm, on the edge of the Norfolk Breckland, in the 1730s and 1740s through assiduous applications to existing arable land (6378 loads between 1732 and 1742).[46] Cartographic evidence certainly suggests that the incidence of 'routine' marling increased markedly in the eighteenth century. On Lodge Farm, Castle Acre, for example, a map of 1715 shows only one marl pit, 'No Mans Pit', situated among the open field strips of West Field. A map surveyed *c*1840 shows no less than seven 'old pits' and 16 'new pits' within what was now enclosed land.[47]

On most East Anglian estates, however, the status of marling appears to have changed significantly in the years around 1800. Routine marling of arable land ceased to be a matter left to the discretion of the tenant: instead it often became an obligation, a condition of a tenancy. The surviving leases for the Heydon estate, in the heathlands of north Norfolk, show this transformation well.[48] Marling is referred to as early as 1724, in a lease for a farm at Thurning, by which the tenant undertook to marl 30 acres of land at the rate of 40 loads an acre. The work was carried out at the landlord's rather than the tenant's cost – he agreed to pay 15*s* per 100 loads. This, and the small acreage involved, suggests a limited land-improvement scheme. The same is true of the next reference, in a lease of 1729, by the terms of which J Dewing agreed to lay 600 loads of marl on two closes; and the next, in 1748, when marling was stipulated in a lease for a farm in Heydon parish, but only as a condition for the breaking up of outfield 'breaks' and heaths. A lease for a Cawston farm drawn up in the same year has an identical clause, while another, also of 1748, for a farm in Oulton, stipulated that the tenant was to marl that part of the enclosed and break-lands 'as has not already been marled', laying 40 loads on every acre: terms

[44] NRO, uncatalogued collection.
[45] *Gentleman's Magazine*, XII, 1752, p 502.
[46] R N Bacon, The Agriculture of Norfolk, 1844, pp 267–76.
[47] Prince, 'Origins', p 22; Bacon, *Agriculture of Norfolk*, pp 267–8.
[48] NRO, BUL 11/310.

repeated in another Oulton lease issued 10 years later. In both cases, the implication is that the land was in the process of being reclaimed. Once again, however, we need to emphasize that the close association between marling and reclamation does not mean that marling as a more routine activity was not part of local farming practice. Thus another 1758 lease, for two farms in Cawston, contains a clause allowing the tenant to take marl from estate pits in Heydon and Cawston *for his own use.*

Unfortunately, after 1761 there is a gap in the sequence of surviving Heydon leases, until 1789: after this there are leases for 1802, 1803, and 1804. The first of these, for a farm in Corpusty, stipulated that the tenant should marl every field on the farm in the first 12 years of the lease, at 25 loads an acre. The 1803 lease (for Cawston) required that 35 acres were to be treated every year, with 20 cartloads per acre; while the 1804 lease (again for Cawston) stipulated 40 acres were to be marled each year, with 10 loads per acre. What had once been general practice – but left to the tenant's discretion – was now being demanded as part of the terms of a tenancy agreement.

This significant shift in emphasis is apparent elsewhere. Thus on the Kings Lynn Borough's Snettisham estate, on the light lands of north-west Norfolk, two eighteenth-century leases for Red Barn Farm (one undated, one of 1786) make no reference to marling. By 1803, however, an estate survey noted of the property: 'at the rent Bunn engaged the farm he ought to have covenanted to have carried at least 40 loads of marl and clay which are on the premises per acre on the whole land'. Accordingly, when a new lease was issued by the corporation in 1807 it stipulated that 250 acres were to be 'clayed' within seven years with at least 50 cartloads per acre.[49]

[49] NRO, Af 234; 220; 206.

The story of that other key form of soil improvement in East Anglia's 'agricultural revolution' – the underdrainage of heavy land – is in some ways similar. Leases seldom mention the practice in the eighteenth century, and when they do so it is usually when pasture land was being broken up for arable. (In these circumstances, as when newly reclaimed heathland was being marled, the landlord agreed to carry at least some of the cost.) Other sources, however, such as farming journals, show that the use of bush drains to improve existing arable land spread slowly but steadily on the East Anglian claylands in the second half of the eighteenth century,[50] and Glyde in 1856 estimated that wheat yields had risen from 24 to 32 bushels per acres between 1770 and 1850 on the Suffolk clays because of the widespread adoption of the practice.[51] To begin with, such drainage of existing arable was carried out at the cost and instigation of the tenant. But – in a way that parallels the story of marling – leases began to demand the practice, albeit sporadically, during the buoyant years of the Napoleonic Wars. In 1811, for example, Thomas Carter agreed, as a condition of a lease signed for a farm near Stowmarket, to 'underdrain not less than seven or ten acres of land in each year the draining to be paid for by him the said Thomas Carter'.[52] Where long runs of leases survive, the chronology of this change of emphasis is clear. In the case of the Fellowes estate leases, for example, a generalized draining clause first appears in a lease for a Shotesham farm of 1804, by which the tenant agreed to put in 300 rods of underdraining each year for the first 10 years of the tenancy.[53] Yet there is one significant difference between marling and draining: the latter was an improvement which usu-

[50] S Wade Martins and T Williamson, eds, *The Farming Journal of Randall Burroughes*, Norwich, 1995, pp 26–29.
[51] J Glyde, *Suffolk in the Nineteenth Century*, 1856, p 339.
[52] J Thirsk and J Imray, eds, *Suffolk Farming in the Nineteenth Century*, Ipswich, 1958, p 40.
[53] NRO, FEL 417.

ally lasted only for the duration of the lease (most bush drains would be effective for only 10 to 15 years). As Caird reported in the 1850s, 'At the beginning of a new lease the land is gone over again ... Draining is looked upon as a matter of regular occurrence once every 14 or 15 years'.[54] Landlords therefore had less interest in this improvement, and even in the Napoleonic War period only a relatively small proportion of clayland leases make any mention of this crucial improvement.

In the decades either side of 1800 leases thus began to make prescriptions regarding aspects of husbandry about which they had earlier remained silent. In this context, it is noteworthy that around the same time there were changes in the character of cropping prescriptions. On estates where 'improved' rotations had not formerly been stipulated, they were now almost universally demanded; and it was the four-course, rather than other kinds of turnip-based rotation, which was usually insisted upon. Husbandry prescriptions thus became increasingly standardized, and simplified: and even where the *terms* did not significantly change, their *expression* generally did. On the Earsham estate in the south Norfolk claylands, for example, the leases for the 1760s and 1770s were often very detailed:[55] typical is an example of 1760 which stated that the tenant was to 'lay down to summerlay in a husbandlike manner with clover upon the first crop after a good summertilth and turnips well-mucked and continue the same laid down by the space of 18 months at least before the breaking up the same again ... it is declared and agreed that peas set on clover stubble sown next after a good summertilth and turnips well mucked shall not be deemed a crop as to hinder the taking of one crop of corn in succession after the same'.[56] From 1788, however, such leases were replaced by ones which stipulated a similar four-course shift, but in much simpler terms. A quarter of the arable was to be in clover, and a quarter in summertilth followed by turnips. Only one crop of cereals was to be grown before a break crop, and the clover was to stand for a year to 18 months before being ploughed (peas and beans – especially suited to such heavy land – were not to be counted as a corn crop in the rotation). From 1811, Earsham leases simply stated that the arable was either to be worked in four shifts (corn or pulses; turnips; summer corn; and clover lay); or else the tenant was to take two crops of corn or pulse and then fallow (again a reflection of the particularly tenacious soils found on parts of this estate).[57]

The trend towards greater standardization, and greater simplicity, while not universal, is evident on most of the larger estates and was epitomized by the 'model' leases produced by William Marshall and Nathaniel Kent. In 1787 William Marshall published what he claimed to be 'a pretty faithful outline of the modern Norfolk lease',[58] presumably based on his direct experience as agent of the Gunton estate, whilst also drawing on information from elsewhere. As well as keeping the hedges, gates and buildings in repair, refraining from breaking up meadows and lopping timber, the tenant was not to take more than two crops of corn without a whole year's fallow, a crop of turnips twice hoed or a two-year lay. All the straw, hay, etc, was to be consumed on the farm and the dung was to be spread on the fields. The number of acres of turnips, and of 'olland' of one and two years, to be left at the end of the lease was also stipulated. Nathaniel Kent's lease – which his firm, Kent, Claridge and Co had provided for Thomas William Coke and no doubt other clients – was quoted by him in 1796. A six-course shift was laid down 'of which one shift

[54] J Caird, *English Agriculture in 1851*, 1852, pp 152–3.
[55] NRO, MEA 3/515–527, 668 X 7.
[56] NRO, MEA 3/515.
[57] NRO, MEA 3/538.
[58] W Marshall, *The Rural Economy of Norfolk*, 2, 1787, pp 71–80.

shall be turnips or vetches fed off with sheep, two other shifts in grass seeds (which shall not be broken up till the same have lain two years) one other shift in wheat and the remaining two shifts in lent grain'.[59] These trends were taken further by the Holkham agent, Francis Blaikie, after 1816 with the development of the famous 'Holkham lease'. Several different, but nevertheless standardized, shifts were devised to suit the variety of soils on the estate. These included a four, five or six course shift, longer periods of lay being required on poorer soils.[60]

The range of alternatives proposed by Blaikie was unusual, however. By the early nineteenth century husbandry covenants in leases generally laid down a simple four-course rotation. On many estates a printed form was devised. Typical was that used on the Langley estate in the 1820s which stipulated a rigid clayland version of the standard Norfolk four-course. A quarter of the land was to be 'well-wrought summer tilth on which shall be taken no other crop but turnips, beet, cabbages, parsnips or carrots'; a quarter was to be under barley or oats after summertilth; a quarter sown with clover; and a quarter with wheat after layer.[61]

There were thus a number of significant changes in the form of East Anglian leases in the late eighteenth and early nineteenth centuries, but we should be wary of interpreting them as a direct reflection of developments in farming practice. Routine drainage and marling were both widely practised in East Anglia by the early nineteenth century, and the increased attention paid to such matters in leases in the years around 1800 cannot simply reflect landowners' efforts to foster 'improvements' on apathetic tenants. Nor can an increased insistence on simple and standardized forms of cropping be easily explained in such terms: rotations featuring regular courses of clover and turnips had been employed in most parts of the region for many decades. In part, no doubt, these developments were part and parcel of a more general tendency towards bureaucratization in British society, a symptom of the development of an increasingly professional group of land agents. More importantly, however, they must be seen as a consequence of the changing balance of power between the two principal groups within agriculture. In the early and middle decades of the century East Anglian landlords had found it relatively difficult to attract tenants of ability and capital, especially to farms on the less fertile soils. In such a situation the prescriptions contained in leases were bound to be limited in scope and often variable in character, the result of individual negotiations or compliance with local custom. As agricultural prices rose towards the end of the century, however, this situation was gradually reversed. Landowners were now in the commanding position: able to insist on practices thought beneficial to the long-term fertility of the farm, especially the four-course rotation (with its equal balance of cereals and 'restorative' crops) and regular applications of marl.

V

Leases continued to be seen as a valuable instrument of estate management throughout the first decades of the nineteenth century, and the tithe files of the late 1830s remark on a number of occasions on the profound effect they could have on the practice of farming. In Burlingham St Andrew, on the edge of the Norfolk Broads, a parish where ownership was divided between two middle-ranking landlords, farming was based on a four-course system 'to which they are obliged to adhere

[59] Kent, *General View*, pp 223–5.
[60] Parker, *Coke of Norfolk*, p 54.
[61] NRO, MF/RO 117/9.

by the covenants of the eight-year leases'.[62] However, in Mattishall in the claylands of central Norfolk, where ownership was shared between several small landlords, the standard of farming was said to have declined 'arising from the decline of leasing the farms for 14 years and the introduction of a system of tenancy from year to year'.[63] Questions 164 to 175 of R N Bacon's 1844 questionnaire, sent to Norfolk farmers, dealt with leases. Most of the 77 farmers who replied were happy with a system of long (14–21 years) leases, and with the standardized restrictions which they generally contained. Individual answers concerning husbandry clauses ranged from 'absolutely necessary' to 'they are of little consequence where men are disposed to act honourably'.[64] In summarizing his replies, Bacon wrote that farms were 'almost entirely held on lease', mostly for 8, 12 or 21 years, on terms which generally bound the farmer to the four-course system.[65]

Nevertheless, leases were being abandoned in some parts of East Anglia by the 1830s, particularly in those areas where estates were small and where owners were absentees: most notably, in the heavy but fertile claylands of the region. Tenancies-at-will, verbal undertakings which committed a farm for a year but which could be terminated by either party at six months' notice, were increasingly favoured. Indeed, on the Ashburnham estate leases had already been abandoned as early as 1830.[66] By 1841 the majority of tenants on the Branford estate in Suffolk were holding by yearly tenancies.[67] The experience of the post-Napoleonic War slump had engendered a degree of caution on the part of many farmers, and there was considerable uncertainty subsequently over the possible effects of the repeal of the Corn Laws. The Raynbirds in 1849 thought that on the heavier Suffolk soils 'few farmers have leases ... some landlords will not give leases and many farmers will not hire on leases, from the fluctuation of prices and danger of free trade'.[68]

With the development of 'high farming' in the middle decades of the century, moreover, there was increasing opposition to standardized husbandry prescriptions. In particular, the increasing use of oil cake and artificial fertilisers allowed the sacrosanct principles of the four course rotation to be broken, and as early as 1844 one of Bacon's respondents said that he saw no objection to two successive straw crops being taken if the tenants 'were prepared to go to the expense necessary'. The high rates of investment now demanded of farmers, coupled with a certain lack of confidence in the future of farming, began to redress the balance of power between tenants and landlords, and as the former became increasingly assertive in the middle decades of the century opposition also focused on the issue of the tenant's right to compensation for unexhausted improvements. The Select Committee on Agricultural Customs looked into the question of tenant right across England in 1847–8, and included two East Anglian agents amongst its witnesses. Mr R B Harvey, land agent and tenant of the Flixton estate, stated that allowances for unexhausted improvements had been part of the agreements between landlord and tenant there since 1840, and that these were more important to improvement than leases. The agent to the Tollemache's Helmingham estate, in the claylands of central Suffolk, took very much the same view.[69] Covenants which provided for the outgoing tenant to be compensated by the incoming for unexhausted improvements

[62] PRO, IR 18581 5.
[63] PRO, IR 18608 4.
[64] NRO, MF/RO 10.
[65] Bacon, *Agriculture of Norfolk*, p 35.
[66] ESRO HA1, HB4/2.
[67] ESRO HA61/436/896.
[68] Raynbirds, *Agriculture of Suffolk*, p 127.
[69] BPP, 1847–48, VII, *Select Committee on Agriculture Customs*, p 68.

were initially attached to lease agreements, but in the middle decades of the century were increasingly applied to yearly tenancies without leases. With their investment in improvements thus guaranteed, tenants had even less incentive to tie themselves to a farm at a fixed rent for a long period of years.

By 1851, Caird was finding that leases were disliked amongst the tenantry, although he believed that the system of yearly tenure was 'inferior to that of leases with liberal covenants when fairly and judiciously tried'.[70] Nevertheless, in an article of 1868 surveying farming customs and covenants across Britain, Clement Cadle wrote that most Norfolk and Suffolk farms were still held by lease, and he pointed out, interestingly, that 'Farmers prefer leases in proportion as they are capitalists, ie the more capital a farmer has to invest, the more anxious he is to have security'. He noted, moreover, that most East Anglian leases still contained detailed husbandry provisions: most, indeed, normally stipulated a four-course rotation. This was a practice he considered quite unnecessary, given the recent developments in farming practice: limiting the number of grain crops which could be taken during any five year period would have been sufficient protection of the landlord's interest.[71] Few of the larger East Anglian landowners would probably have agreed. True, on the Holkham estate tenants were being given permission to depart from the terms of their leases and grow more grain, using artificial manures, as early as 1860.[72] But more typical was the view of the agent at Little and Earl Stonham (Suffolk) in 1851: 'I think no deviation from the four-course should be allowed, but under special circumstances of high farming and then only by permission and to a small extent'.[73]

Indeed, the larger estates generally fought a rearguard action, attempting to preserve the established form and content of the lease, well into the 'high farming' period. Charles Lenny's 1864 report on the Earsham estate noted that the 'courses of cropping' followed by the tenants were 'very unequal'; for the proper management of the estate he thought that 'leases with judicious covenants under proper restrictions' were necessary, and he laid down a standard rotation to be followed on all the farms.[74] The continuing enthusiasm for established forms was explained by the Holkham agent, William Keary, in his 1861 report to the dukes of Norfolk on their south Norfolk estate. 'Under a lease (good tenants having been carefully selected) with fair and liberal covenants, the land is generally improved in value by the combined skill and capital of such men, and at its termination a legitimate opportunity, not considered grievous by the tenant, arises for the landlord to re-let under a fresh lease at an increased rent due to the improved condition of the farm'.[75]

Nevertheless, leases seem to have declined in popularity during the 1850s and 1860s, and even where they continued to be used husbandry clauses gradually became less restrictive. Indeed, in the early 1870s they were abandoned altogether even by the Holkham estate, and tenants were allowed to farm as they wished until the final years of the term, when the land had to be returned to a standard rotation (although if the agent ever thought that a farm was in a bad state, he had the power to reimpose a strict cropping pattern). As the agricultural depression deepened in the 1880s landlords everywhere found it impossible to enforce the terms of leases and many even had to take back responsi-

[70] Caird, *Agriculture*, p 509.
[71] C Cadle, 'Farming customs and covenants of England', *JRASE*, 6, sec ser, 1868, pp 144–175.
[72] S Wade Martins, *A Great Estate at Work*, 1980, p 121.
[73] ESRO, HA93/3/676.
[74] NRO, MEA 3/59.
[75] NRO, Smiths Gore 21/10/78.22.1.

bility for building repairs. In a time of falling prices tenants were not prepared to commit themselves to a set rent over many years, and by the end of the century annual tenancies were normal on most estates.

VI

On balance, it would seem that the lease was probably not a crucial factor in the East Anglian 'agricultural revolution'. Long leases may have encouraged greater investment on the part of tenants. But husbandry prescriptions did not have a major role in encouraging the adoption of improved methods of farming. Indeed, terms and conditions tell us as much about the changing balance of power between landlord and tenant as they do about the development of farming practice. In the early and middle decades of the eighteenth century, when farms were relatively difficult to let, husbandry clauses generally reflected, at most, 'best practise' in the locality. They did not usually stipulate new techniques, and seem to have accepted the diversity of local husbandry regimes, 'improved' or otherwise, adapted to the specific environmental conditions of the district in question. They might thus, for example, accept the sensible principle of taking two corn crops in succession on the stronger soils. Soil improvement measures – especially marling – were only mentioned in the context of land improvement schemes, usually subsidized in part by the landlord. In the last decades of the century, however, as competition for farms increased, more standardized husbandry clauses began to appear. Landlords and agents displayed a single-minded obsession with maintaining soil fertility, and the 'non-exhaustive' four course was generally insisted upon, even in contexts to which it was probably not well suited. An over-riding interest in soil fertility is also reflected in an increasing insistence on the regular application of marl to existing arable land, and – to a lesser extent – the implementation of underdrainage schemes. Yet even in this period, leases were not always adhered to, and may provide a poor guide to the actual practice of farming.

The rigidity of the standard lease, particularly as regards courses of cropping, came under increasing attack in the middle decades of the nineteenth century and leases went into decline in many areas. As prices fell from the late 1870s, with the onset of agricultural depression, farmers everywhere ceased to commit themselves to a set rent for a long period. It was once again a tenant's market, and husbandry clauses and long leases had been abandoned on most East Anglian estates by the end of the century.

Counting Sheep: Waking up to New Estimates of Livestock Numbers in England *c* 1800*

By MICHAEL TURNER

Abstract

Before the appearance of official basic agricultural statistics in the 1860s agricultural historians have had relatively few estimates of the extent of farm crops and the number of farm animals on which to rely. This article is concerned with farm animals. It is based on a series of government inquiries which were conducted from 1796–1803, which together covered about 25 per cent of the land area of England. Estimates of the size of the national herds of cattle, pigs, horses, and sheep have been constructed on the basis of these inquiries. From this base, the article proceeds to concentrate on the sheep estimate, which turns out to be much smaller than the one which historians have used in the past. A case is made for suggesting that the recycling of old estimates, on the basis of guesswork rather than scientific methods, has perpetuated a myth about the size of the sheep population in *c* 1800.

A MEASUREMENT or estimate of the composition of the cultivated area of England is a prerequisite for subsequent calculations of the arable output of the country, but it is not the only prerequisite for an estimate of agricultural output as a whole; equivalent data on the number and types of animals are also required. These prerequisites are made the more difficult for periods when no censuses are available. In 1801, however, an arable census of sorts was conducted, popularly known as the 1801 crop return.[1] But there has been no attempt to venture new estimates of the size of the livestock sector. Volume VI of the *Agrarian History of England and Wales* covering the period 1750–1850 merely reiterated the dated, casual, well-known references which are paraded on such occasions.[2] This is not surprising, however, since there is not a comparable 1801 national survey for the livestock sector, nor anything remotely similar for that date or for a further fifty-three years when tolerably good estimates can be derived from the sample counties employed in the 1854 experiment at collecting national agricultural statistics.[3] However, there may yet be sufficient fragmentary observations and related data available to make at least an initial estimate of the size of the national herd for the early nineteenth century, which is a prerequisite to making a sensible estimate of agricultural output.

In parts I and II the data are described and a method of estimating the national herd of cattle, sheep, pigs and horses is suggested. This employs a sample of data which cover about 25 per cent of the land area of England. In part III these new estimates for horses, cattle and pigs are placed alongside those which are currently

* My thanks to Bethanie Afton, John Beckett, David Richardson and Donald Woodward for sharing with me some of their thoughts about reconstructing the national livestock herd. My thanks also to the multitude of archivists who answered my inquiries and furnished me with documents. Finally my thanks to the useful comments of referees who must bear collective responsibility for the flights of fancy conjectured in the concluding paragraphs.

[1] M Turner, 'Arable in England and Wales: estimates from the 1801 crop return', *Jnl Hist Geog*, 7, 1981, pp 291–302; M Turner, ed, *Home Office Acreage Returns (HO 67)*, List and Index Society, vols 189, 190, 195, 196, 1982–3.

[2] G E Mingay, ed, *The Agrarian History of England and Wales*, VI, 1989, in particular the chapters by H C Prince and B A Holderness, though see *passim* under the named animals and their numbers.

[3] Mingay, *Agrarian History*, pp 1042–44. See also Phillip Dodd, 'The agricultural statistics for 1854: an assessment of their value', *AHR*, 35, 1987, pp 159–70.

in use, and their plausibility is examined. In part IV the focus of attention is very much on the new sheep estimates in which it is suggested that for too long historians have relied upon a source which seems grossly to exaggerate the size of the national sheep herd. If this allegation is true then it should have serious implications for any estimates of the contribution of sheep to agricultural output, and also implications for our understanding of the growth of the domestic woollen industry over the course of the eighteenth and nineteenth centuries.

I

During the French Wars of the 1790s, and again when the Peace of Amiens broke down after 1802 there was a real fear in Britain that a French invasion was not only possible, but imminent. These fears were founded on facts, with French landings between 1796–8 in Bantry and Killala Bays in Ireland, a landing in west Wales, the observable build up of an invasion flotilla in the French Channel ports, as well a general spirit of republicanism and revolution which spilled over from both France and Ireland into Britain in the 1790s.[4] In the event there was no invasion, but while the threat remained the British state undertook some precautionary measures. These included the mobilization of the local militia under the Posse Comitatus, the supplementation of that militia, and also the call to arms and service of volunteers. These measures were usually conducted at the local county level under the direction of the lords lieutenant and their deputies, and usually what information survives about the local preparations for invasion are found in the county lieutenancy and militia records. Occasionally they are found in the private papers of the descendants of a particular lord lieutenant (the case with Cornwall, and also with the equivalent officer, the governor, for county Down in Northern Ireland, for example), and also in quarter sessions records (Hampshire for example). A number of these records have been researched and local county studies have been written up.[5]

Under the authority of the 1798 Defence of the Realm Act (38 Geo III, c 27, 5 April 1798) and repeated in the reconstituted 1803 Defence of the Realm Act (43 Geo III, c 55, 11 June 1803), the lieutenancy were given specific instructions for preparing for the invasion. This included a live and dead stock census.[6] The idea was to construct an inventory of the amount of moveable livestock (cattle, sheep, etc), and deadstock (grain and other stored crops), and also of the number of vehicles such as barges, carts, carriages and wagons which were available and could be requisitioned, along with the number of people who could act as pioneers and wagon drivers if the emergency ever came about. These people would be mobilized to transport the farm animals and deadstock to positions of relative safety inland, from which the defending armies and civilian population could be provisioned while at the same time denying the invader a ready means of supply. In the last resort there were details about the implementation of a scorched earth

[4] See in general, R Glover, *Britain at Bay: Defence against Bonaparte, 1804–14*, 1973. In detail see PRO(Kew), HO/42/39 ff 231–3, letter 31 December 1796, from George Dunber, major of Liverpool informing the Secretary of State for Home Affairs. the duke of Portland, of the French fleet which had entered Bantry Bay, county Cork; see also the series of articles published in the 1970s by P M Kerrigan, 'The defence of Ireland 1793–1815', *An Cosantoir*, various; PRO(Kew), HO/42/40 ff 88–91, correspondence of February 1797 about the French landing in Cardigan Bay. And on the revolutionary spirit see R Wells, *Insurrection: the British Experience 1795–1803*, Gloucester, 1983.

[5] For example G H Kenyon, 'The civil defence and livestock returns for Sussex in 1801', *Sussex Arch Coll*, 89, 1950, pp 57–84; J Cranmer-Byng, 'Essex prepares for invasion 1796–1805', *Essex Review*, 60, 1951, pp 127–34, 185–93, and 61, 1952, pp 43–7, 57–74; W E Minchinton, 'Agriculture in Dorset during the Napoleonic Wars', *Proc Dorset Nat Hist and Arch Soc*, 77, 1955 pp 162–73; M Y Ashcroft, *To Escape the Monster's Clutches*, North Yorkshire County Record Office Publications 15, Northallerton, 1977; M Turner, 'Livestock in the agrarian economy of counties Down and Antrim from 1803 to the Famine', *Irish Econ and Soc Hist*, 11, 1984 pp 19–43.

[6] The Defence Acts were of course public documents, but thereafter the secrecy with which the invasion preparations were subsequently carried out is open to considerable doubt in view of the public notices printed in local newspapers, such as *The Stamford Mercury*, 2 March 1804. My thanks to Shirley Brook for this reference.

policy. Thus when the earl of Carlisle, the lord lieutenant of the East Riding of Yorkshire, was instructed by the Home Office on 31 October 1803 on the removal of live and dead stock to places of safety inland, he was told that those horses and draft cattle which were not required by the army or for transport services, and which otherwise would be in danger of falling into enemy hands, were to be 'shot or hamstrung and the Axle trees or Wheels of all Carriages in the same Predicament should be broken to pieces, or damaged as much as possible'.[7] Not all of this kind of correspondence or the ensuing detail has survived, and even where it has it is often only a fragment of what was originally said or collected. This article, however, is concerned with the details of the livestock only.

The blueprint for the scheme which was actually implemented was the initiative of the lord lieutenant of Dorset who responded to instructions and requests from the Secretary of State for Home Affairs in 1796 in a more thoughtful and detailed way than his counterparts elsewhere. In August of that year the Home Office prepared some 'General Sketch(es)' for driving the country. They were essentially descriptions of the transportation arrangements which might be implemented in the event of invasion, and the identification of places of refuge, collection, and distribution of produce, and also of places for depasturing animals. These sketches were prepared for the coastal counties of southern England from Somerset round to Norfolk. In consequence the lord lieutenant of Dorset conducted a survey of the moveable live and dead stock available within about 6–8 miles of the coastline of his county.[8] In general this scheme became known as 'Driving the Country'. The Dorset plan was widely publicized and thereby set in train what should have been a nationwide survey.[9] The Defence Act of 1798 was therefore founded 'upon the proceedings taken under the Common Law in the County of Dorset'.[10] Probably in reality, and certainly if the survival rate of the returns is anything to go by, the nationwide survey was either never undertaken in 1798 (nor in 1801 or 1803 when similar surveys were requested), or *not* undertaken seriously. The coastal counties were in the front line and the inquiry therefore only needed to be partial; and even where details survive they are sometimes only fragments. This arises because the lords lieutenant devolved the responsibility for collecting the data from the county down to the individual militia divisions within the county, and thence down to the parish or other local community division for final collection at the individual farm level. Therefore fragments relating to farms, parishes or other local communities, divisions or groups of divisions, or whole county summaries may survive. Yet when they do survive in the manner which was originally intended they constitute, amongst other things, a livestock census, containing details of cattle (which can include a breakdown of the information in terms of young and mature beasts, cows and oxen), horses (both draft and riding), sheep (and sometimes goats separately) and pigs. Table 1 summarizes the survival rate of this census, as far as it has been ascertained for England and Wales.

[7] Humberside Record Office [HRO] LT/4/1, letter of 31 October 1803 from Mr Secretary Yorke to the earl of Carlisle.

[8] PRO (Kew), HO/42/39, August 1796, and Dorset document in October 1796. In general HO/42/39–43, 46, contains a wealth of information about the invasion plans of the period 1796–98 including a letter of 26 April 1797 (HO/42/40/ff 22) from the duke of Northumberland as lord lieutenant of Northumberland in which he refers to the request of the previous November for an account of live and dead stock within 10–12 miles of the sea and in which he states that he appends the completed returns. However, the return is not with the letter.

[9] For example, those parts of the Dorset plan which embodied a 'State of the Civil Power of the County of Dorset' can be found in the surviving lieutenancy papers in East Yorkshire, HRO, LT 9/52, for which see M Turner, 'Dorset prepares for invasion', *Somerset and Dorset Notes and Queries*, 31. no 319, 1984, pp 347–50.

[10] Toulmin Smith, *National Defence in Practice with the Opinions of William Pitt, Charles James Fox, etc, etc, on the Arming of the People*, 1859, p 9.

TABLE 1
The livestock inquiries of 1796–1804

County	*Date*	*Coverage (percentage)**		*Nature of survival*
Berkshire	1798(?)	100	CRO	
Cambridge	1803/4	0	CRO	[a]
Cheshire		0		
Cornwall	1803	88	CRO	[b]
Cumberland		0	CRO	
Devon		0		
Dorset	1796	36	PRO	parishes within 6–8 miles of the sea
Dorset	1803/4	100	CRO	
Durham	1796	6	CRO	[c]
Essex	1798	100	CRO	and in Cranmer Byng
Gloucester	1803/4	0	CRO	[d]
Hampshire	1798	18	CRO	
Kent		0		
Lancashire	1803	?		[e]
Lincolnshire	1798	100	CRO	
Norfolk	1803	100		In R F Mason
Northumb	1803	100		In S MacDonald
Nottingham	1798	neg	CRO	[f]
Somerset	1803/4	4	CRO	[g]
Suffolk	1798(?)	neg	CRO	[h]
Sussex	1801	100		In G H Kenyon
Westmorland		0		
Yorkshire E		0		
Yorkshire N	1801	8	CRO	[i]
Wales		0		[j]
Antrim	1803	25		In W S Mason [k]
Down	1803	89	PRONI	and in Turner [l]

* Coverage is the percentage of the land area in the county covered by the surviving parish or 'district' returns.

[a] There are surviving returns of horses, conveyances (waggons) and drivers for the Isle of Ely. The surviving 'Minutes of subdivision meetings of Deputy Lieutenants', 1803–4 indicate that parish returns were submitted but their final resting place is unknown.

[b] Covering the whole of Cornwall except the hundred of Penwith which is the most westerly hundred in the county including Camborne, Redruth, St Ives, and Penzance.

[c] For a closely grouped set of parishes in the east division of Chester Ward.

[d] Returns of horses and waggons only for parishes in Whitestone hundred.

[e] There is a reference to the 1803 inquiry for Lancashire including a quotation for sheep numbers in J Luccock, *An Essay on Wool*, 1809, p 317. It is far from certain that this quotation is for the whole county.

[f] One parish only (ex information Professor J V Beckett).

[g] For a closely grouped set of parishes in and around Bath.

[h] Livestock returns for three parishes only, but there are also 47 parish returns for the hundred of Blything which give horse numbers alone, and related information with regard to waggons and carts.

[i] For a closely grouped set of parishes in Langbaurgh East wapentake.

[j] There are no surviving returns for Wales, nor indeed any ever compiled according to Thomas.

[k] For the parishes in the three north Antrim baronies of Cary, Upper and Lower Dunluce.

[l] Covering all of the parishes in the baronies of Dufferin, Newry Lordship, and Mourne, 99 per cent by area of Upper Iveagh, 93 per cent of Lower Iveagh, 90 per cent of Ards, 84 per cent of Kinelarty, 76 per cent of Castlereagh Lower and Upper, and 68 per cent of Lecale barony.

Sources: Berkshire CRO, D/ERA 07; Cambridgeshire CRO, 283/0116, 0120, 0122; Cornwall CRO, Enys Papers, EN1820/1 and 2, Abstract of Returns; PRO(Kew), HO/42/39, October 1796 (see also W E Minchinton, 'Agriculture in Dorset during the Napoleonic Wars', *Proc Dorset Nat Hist and Arch Soc*, 77, 1955, pp 166–72); Dorset CRO, M6, Plan of the County of Dorset; Durham CRO, Q/D/LM/27–51; J Cranmer-Byng, 'Essex prepares for invasion 1796–1805', *Essex Review*, 61, 1952, p 63; Gloucester CRO, D149 X29; Hampshire CRO, Quarter Sessions Records, Q22/1/2/5/1–83; Lincolnshire CRO, LAO K/QS/Militia-Military, Lincolnshire 1798; J Luccock, *An Essay on Wool*, 1809, p 317; R H Mason, *The History of Norfolk*, 1884, p 463 (my thanks to the late B A Holderness for this reference); S Macdonald, 'Agricultural response to the changing market during the Napoleonic Wars', *Econ Hist Rev*, sec ser, 32, 1980, pp 70–1; Nottingham CRO (ex-information Professor J V Beckett); Somerset CRO, DD/RG/69–72; E Suffolk CRO, FB 220/A7/3; W Suffolk CRO, Ref. 613/19/1; Acc no 786; G H Kenyon, 'The civil defence and livestock returns for Sussex in 1801', *Sussex Arch Coll*, 89, 1950, p 62; M Y Ashcroft, *To Escape the Monster's Clutches*, North Yorkshire County Record Office Publications, 15, Northallerton, 1977, pp 112–51; D Thomas, *Agriculture in Wales during the Napoleonic Wars*, Cardiff, 1963, p 18; W S Mason, *A Statistical Account, or Parochial Survey of Ireland*, 1, Dublin, 1814, pp 172–3; also John Dubourdieu, *Statistical Survey of the County of Antrim*, Dublin, 1812, pp 446–7; PRO(Northern Ireland), D/654/A2; M Turner, 'Livestock in the agrarian economy of counties Down and Antrim from 1803 to the Famine', *Irish Econ and Soc Hist*, 11, 1984, pp 37–41.

In addition, as indicated, individual parish returns are available for 89 per cent of the land area of county Down in Northern Ireland and for about 25 per cent of county Antrim.[11] The coastal counties dominate, as expected, but where only part-county details survive they are not necessarily for coastal parishes or places. For example, most of the surviving Hampshire returns cover the old county hundred divisions centred on Basingstoke and Odiham in the north, and the surviving returns for Berkshire, a land locked county, have nothing directly to do with the coast.

We cannot be certain that the information arising from the invasion inquiries was collected meticulously or with great accuracy. There may have been local concerns regarding taxation assessments, a not unfamiliar problem encountered by the assessors of the 1801 crop returns, and this concern may have been reflected in underenumeration.[12] However, there is reason to have more confidence in the accuracy of the livestock enquiries, especially the later ones, because the government of the day included instructions to the lords lieutenant to advise farmers and others that there would be indemnification should their livestock be requisitioned for military purposes or if the livestock and other possessions became victims of any scorched earth policy which had to be implemented.[13] Therefore it was in the best interests of farmers and other owners of live and dead stock to agree to the inventory and to list their possessions fully.

The survival of returns covers four separate attempts at acquiring the information, the 'dummy' run of 1796, and the inquiries of 1798, 1801, and 1803, and even though the various instructions which were issued through the office of the Secretary of State for Home Affairs were sent out on specific dates, we know that the resulting information often dribbled in over a considerable time within each inquiry. Unlike the harvest inquiries of the 1790s which were specifically about the state of completed harvests, the invasion scare inquiries were an exercise in taking an inventory at the point and moment of assessment, the timing of which could be important according to the state of the annual cycle of birth, slaughter, and other disposal of the animals. For example, it is important for the historian whether the stock taking was before or after the lambing season. On this point we cannot always be sure. As one observer in county Down commented in November 1803, 'It is obvious, that just now, an almost total change will take place, as to cattle and of course, to dead and livestock, in the slaughtering season'.[14] The Down returns were ordered in September/October 1803, but their subsequent transmission and collation date from these months until at least January 1804 with the possibility that some of the undated ones are even later, and the Antrim returns are said to date from January 1804. The 1804 Dorset inquiry is dated 24 May 1804, but this is almost certainly the collation rather than collection date. G H Kenyon, in collating the three separate censuses which were made for Sussex in 1798, 1801 and 1803, says they were made in the summers of those years 'at much the same season as the 4th June returns...today'. This may be the case for Sussex but not for all other counties. For example the individual Hampshire parish and tything returns all date from the third week in April 1798 and in this particular county this calls into question whether the annual lambing cycle

[11] Turner, 'Livestock in Down and Antrim'.

[12] For example, see PRO(Kew), HO/42/40 ff 209–10, letter of 19 February 1797 from the duke of Richmond, the lord lieutenant of Sussex, in which he questions the reliability and fullness of the returns arising from the original inquiry of 1796 because of suspicions that the returns might be used for taxation purposes.

[13] HRO, LT/4/1.

[14] Public Record Office of Northern Ireland, D654/A2/2, general correspondence, 4 November 1803.

was complete and therefore accounted for.[15]

II

Can these livestock figures reasonably be used to impute the size of the national herd? For seven counties – Berkshire, Dorset, Essex, Lincoln, Norfolk, Northumberland and Sussex – the animal census is available on a 100 per cent county basis; for an eighth county, Cornwall, there is a survival rate which covers 88 per cent of the county by area. For a ninth, Hampshire, there is coverage of 18 per cent of the county which is the largest surviving fragment of all the other English counties. For Northumberland the number of horses has not been reported.[16] If for livestock purposes the aggregate of these counties (less Hampshire) was a representative sample of England we could indeed make an estimate of English livestock numbers. However, the sample is mostly located in the coastal counties, and, apart from a large proportion of Northumberland and much of Cornwall, it is confined to lowland counties. Yet while this is only the whole or major parts of eight counties from a total of forty, nevertheless together they comprised a land area of either 6.606 or 7.898 million acres (the smaller coverage excluding Northumberland for horses only), which is 25.1 per cent of the land area of England (or 21.2 per cent when Northumberland is excluded for the horse sample only). This is not a trivial sample. All but two of the counties, Berkshire and Dorset, are larger than the English average, and at over 1 million acres each, Lincolnshire, Norfolk, and Northumberland are three of the five largest English counties.

The representativeness of these counties for estimating English livestock production for *c* 1800 cannot be guaranteed, not in geographical or agricultural history terms, nor in terms of consistency of year of collection, or of time of year of collection. Nevertheless they do constitute a large, if self-selected sample, and open up the possibility of proceeding for the first time ever to a tentative national estimate of the livestock herd. A number of weighting factors can be suggested for scaling up from the sample to the national estimate. Table 2 presents the raw data for all the counties mentioned so far except Hampshire, and Table 3 presents the estimates which arise from three different methods of weighting and scaling up.[17] The first weighting factor is simply to take the total land area of the whole of seven and the substantial part of the eighth county (Cornwall) as a proportion of the land area of England, and to apply that proportion to the aggregate of animals for the same counties. This results in the first English estimates in Table 3. Yet is the total area of land the correct method of weighting? Perhaps a more appropriate areal measure would be one which was based on the availability of the main feedstuff required by the animals, which in the case of the cattle and sheep was the available pasture land, though heavily supplemented in a number of counties mainly with root crops. In the case of horses the feedstuff would have been pasture and hay, supplemented with oats. B J Capper writing in 1801 produced

[15] Dorset CRO, M6, plan of the county of Dorset, 1804; Turner, 'Livestock in Down and Antrim', pp 23–4, 41; Kenyon, 'Civil defence', p 65; Hampshire CRO, quarter sessions records, Q22/1/2/51–83. Seasonality was a very important factor in many aspects of economic life in seventeenth and eighteenth-century England, as shown in the pattern of weddings by A Kussmaul, 'The pattern of work as the eighteenth century began', in R Floud and D McCloskey, eds, *The Economic History of Britain since 1700, 1, 1700–1860*, 1994, p 5.

[16] S Macdonald, 'Agricultural response to the changing market during the Napoleonic wars', *Econ Hist Rev*, sec ser, 32, 1980, pp 70–1. In addition, there were eleven parish returns unaccounted for in Sussex. When Kenyon wrote up this episode in Sussex history he substituted eight parish returns from the 1803 survey, and for the remaining three parishes which were missing from both the 1801 and 1803 returns he estimated the animal numbers on the basis of the stocking rates per acre of the adjoining and similar parishes: Kenyon, 'Civil defence', pp 62–3.

[17] We cannot sub-divide the animals for all of the counties into different age or sex groups.

TABLE 2
Record of the livestock numbers in *c* 1800

County	*Percentage cover*	*Date*	*Cattle*	*Sheep*	*Pigs*	*Horses*
Berkshire	100	1798	16974	81369	20502	11876
Cornwall	88	1803	83049	265928	48002	18373
Dorset	100	1804	72795	393670	35562	15491
Essex	100	1798	53009	306797	89594	37013
Lincolnshire	100	1798	124036	784435	39836	32812
Norfolk	100	1803	132538	433915	126218	44608
Northumb	100	1803	75840	451547	27987	
Sussex	100	1801	62047	346589	63094	22620
Sub-totals of England	25.1		620288	3064250	450795	182793

TABLE 3
Estimates of English livestock numbers *c* 1800

	Cattle	*Sheep*	*Pigs*	*Horses*
	First estimate			
Weights	25.1	25.1	25.1	21.2
Estimate (millions)	2.471	12.208	1.796	0.862
	Second estimate			
Weights	27.9	27.9	—	23.3
Estimate (millions)	2.223	10.983	—	0.785
	Third estimate			
Weights	20.7	28.8	24.4	23.7
Estimate (millions)	2.997	10.640	1.848	0.771

estimates of the county-by-county distribution of pasture. These suggest that the extent of pasture in England (excluding Monmouthshire) was 14.072 million acres. The extent of pasture in the seven full counties where the invasion returns have survived and proportionately in 88 per cent of Cornwall was, according to Capper, 3.928 million acres (or 3.278 million acres excluding Northumberland as far as the horses are concerned).[18] This provides a new areal weighting of 27.9 per cent of the extent of English pasture (or 23.3 per cent excluding Northumberland for horses), and the resulting second set of estimates reported in Table 3. Another contemporary commentator, W T Comber, published an alternative estimate of land use in 1808 which suggested that the area of England and Wales over which the cattle were depastured was 17.479 million acres.[19] The equivalent area in Capper (that is, now including Wales) was 16.796 million acres. Comber did not produce a county-by-county estimate. Both Capper and Comber have been regarded as the best of the contemporary observers, though their estimates of land use in general have not always passed without criticism.[20]

[18] B J Capper, *A Statistical Account of the Population and Cultivation, Produce and Consumption of England and Wales*, 1801, pp 66–73. Though the development of rather more complicated animal feeding regimes had already been developed by this period, especially for sheep. See for example the sections on individual animals in R J Moore-Colyer, 'Livestock', in Mingay, *Agrarian History*, pp 326–34.

[19] W T Comber, *An Inquiry into the State of National Subsistence: Appendixes*, 1808, p 52, appendix 25.

[20] H C Prince, 'The changing rural landscape', in Mingay, *Agrarian History*, p 31; H C Prince, 'England *circa* 1800', in H C Darby, ed, *A New Historical Geography of England*, 1973, p 403; R J P Kain, *An Atlas and Index of the Tithe Files of Mid-Nineteenth-Century England and Wales*, 1986, p 459; Turner, 'Arable in England and Wales', pp 299–301.

TABLE 4
Proportion of the national herd found in the sample counties, 1871–91*

Year	*Cattle*	*Sheep*	*Pigs*	*Horses*
	(in percentages of national total)			
1871	20.5	28.8	24.3	24.4
1876	20.6	28.5	24.5	23.8
1881	21.1	30.7	24.8	23.8
1886	20.5	28.3	24.5	23.4
1891	20.7	27.5	23.8	23.2
Mean	20.7	28.8	24.4	23.7

* Based on the total numbers of cattle, sheep, pigs and horses for Berkshire, Dorset, Essex, Lincolnshire, Norfolk, and Sussex, the total numbers of cattle, sheep and pigs for Northumberland, and the total numbers of cattle, sheep, pigs, and horses for Cornwall, but this last county weighted by 0.88 to reflect the equivalent survival of the invasion returns.
Sources: Derived from, Agricultural Returns of Great Britain, BPP, 1871, LXIX, pp 60–5; 1876, LXXVIII, pp 32–41; 1881, XCIII, pp 20–33; 1886, LXX, pp 38–51; 1890–91, XCI, pp 2–15.

Although there were both major and minor adjustments within local agricultural regimes over the eighteenth and nineteenth centuries, nevertheless if the broad pattern of the arable counties, the mixed husbandry counties, and the pasture counties was reasonably well set by about 1800 and did not change substantially as between counties subsequently, a third method of weights might be employed which is based on the relative distributions of livestock from another, better documented period. For example, Table 4 takes the same sample counties and reports the proportion of the national herd resident in those counties in the late nineteenth century as recorded in the annual agricultural returns. The late nineteenth century was a volatile period, picking up the tail end of High Farming, the impact of railway developments on regional specialization, and the full brunt of the late nineteenth-century agricultural depression. Yet in spite of these great moments in British agricultural history, the proportion of the national herd which was resident in those counties was remarkably stable. This is demonstrated collectively for the counties as a group, as in Table 4, but it also applied in large measure to the individual counties. In turn this approach produces a third set of weights which are variable between animals. These weights are applied in the third method of weighting and produce the imputed national herd totals shown in the third estimates in Table 3. One major problem with this procedure is that the intervening period from 1800 to the late nineteenth century saw important changes in regional specialization, especially with the coming of the railways. For example, with sheep there was a tendency towards greater sheep raising eastwards into otherwise traditional arable counties. The sample of counties includes Norfolk, Essex and Lincolnshire, and therefore, perhaps, to employ the late-nineteenth-century distribution of sheep for these counties exaggerates their importance when applied to the early nineteenth century. If this was the case to any significant extent the application of late nineteenth-century weights would have the effect of underestimating the sheep population in *c* 1800.

Therefore, there are problems associated with these methods of weighting. The principal one with the use of pasture as a weighting device is that it supposes the quality of the pasture was uniform across the country and that the animal stocking rates were also uniform. It also cannot take into account differences in animal breeds and the effect such differences might have had on stocking rates. This last set of issues seems to be intractable, though we can demonstrate the problem with stocking rates. In the annual June returns from 1866 onwards there are data on the numbers of animals and the types of land use. If we take the data for sheep – chosen for reasons which will become obvious below – we note that the rate of stocking in England for every acre of permanent pasture for 1871, 1876, 1881, 1886 and 1891 was 1.8 falling to 1.4. The equivalent measure for sheep for the sample counties was 2.7 falling to 2.0. The sample counties could

bear greater sheep densities per unit of what we take to be the major feedstuff for the animals. The trend also picks up the onset of the Great Depression with a modest decline in sheep numbers (the numerator) and a greater than proportionate rise in the extent of permanent pasture (the denominator) as the agricultural economy retreated from grain production. Nevertheless, the stocking rates on the sample counties were always much higher than for the country as a whole. If this was also the case in the early nineteenth century when a sheep stocking rate for the sample counties was 0.77 sheep per acre of permanent pasture (summation of the invasion returns for the sample counties divided by Capper's estimate of the extent of the pasture for the same sample counties), it suggests that even the low estimate of the sheep population which is computed by the second method of weighting, is itself too high. In the light of the later discussion on sheep numbers this seems an unlikely conclusion. Another problem with using the extent of pasture and other land uses as a measure of the feedstuff available for animals is that it neglects the input of imported feedstuffs. This may have been small for cattle in the early nineteenth century and always small for sheep, but as the nineteenth century proceeded the use of imported feedstuffs for raising cattle increased and if there was not a comparable increase in the national cattle herd then it would have had the effect of withdrawing pressure on pasture resources, relieving pressure on stocking rates and allowing sheep stocking rates to rise.

III

The estimates presented in Table 3 are stark: they are derived from an imperfect database and imperfect methods of deduction and estimation, but do they stand up to closer scrutiny? Contemporary witnesses of the size of the national livestock herd are few and far between. F M L Thompson so doubted the ease of estimation of horse numbers for later in the nineteenth century when sources are more abundant, that for earlier in the century he suggested that estimates are bound to be little more than guesses.[21] Nevertheless, he made a 'conservative' estimate of the horse population in 1811 of 1.287 million animals.[22] This is a good deal larger than the three estimates listed in Table 3. The horse tax of 1812 suggested that the number of farm horses alone amounted to 800,000. The invasion inquiries allow slightly more detail in that they distinguished between riding and draft horses. For the counties in the sample (less Northumberland) the ratio of the former to the latter was 1 : 5.4. This varies from high or higher ratios in counties where we assume that a relative dominance of arable production required more draft animals, such as in Essex, Norfolk and Lincolnshire (with ratios of 6.5, 6.1 and 5.2) to low or lower ratios in what we take to be counties with less emphasis on the arable such as Berkshire, Dorset and Sussex (3.8, 4.2 and 4.7),[23] but with a high ratio of 5.8 for Cornwall for what we might normally expect to be a more pastoral county. The horses in the sample can be sub-divided into 28,666 riding horses and 154,127 draft horses.[24] The re-estimated national horse population then amounts to 0.135 million riding horses and 0.727 million draft horses on the basis of the land area weighting, 0.123 million riding and 0.661 million draft horses on the basis of the pasture-related weighting, and 0.121 million riding and 0.65 million draft horses on the basis of the late-nineteenth-century historic weighting. The second figure by all three

[21] F M L Thompson, 'Nineteenth-century horse sense', *Econ Hist Rev*, sec ser, 29, 1976, pp 60–81.

[22] *Ibid*, p 80.

[23] A point also observed by Kenyon with respect to the Sussex and Essex returns in G H Kenyon, 'Livestock in Icklesham, 1798 and comparative livestock figures for Sussex and Essex, 1798 and 1801', *Sussex Notes and Queries*, 14, 1954, p 50.

[24] This involves a little creative accounting to include 369 horses which were recorded simply as horses.

methods of weighting approximates to the horse farm population. Therefore the 0.8 million farm horses in the 1812 tax is at least of a similar order of magnitude even if it is still a significantly different number, though in point of fact it relates to England *and* Wales. In addition, E A Wrigley has suggested reducing Thompson's estimate for farm horses from 0.8 to 0.7 million animals, with the consequence of a rapid convergence on the new estimates derived from the invasion inquiry.[25]

Arthur Young made an estimate of the horse population of England and Wales in 1770 in his *Northern Tour* of 1.171 million, but then in his *Eastern Tour* of 1771 he revised his estimate to 684,491.[26] Finally, in 1779 in his *Political Arithmetic* he re-estimated that the number of 'draught [sic] cattle' in husbandry, that is oxen and horses, at 927,610. J R McCulloch reported this estimate in the 1830s and made an assumption, though on the basis of no visible evidence, that the oxen amounted to 150,000.[27] This therefore assumed that the horse population was about 0.778 million.[28] We have no way of knowing the trend in horse numbers from the 1770s to the end of the eighteenth century except to say that in some parts of the country there was a move away from tillage and towards pasture, with presumably an attendant decrease in demand for horse power, but that in other parts of the country quite the opposite occurred with the extension of tillage which took place during the French Wars. Even if England had become greener[29] it surely had not tumbled to grass in any dramatic fashion in the last quarter of the eighteenth century. Therefore, perhaps with respect to the horse population, Young's England and Wales estimate in *c* 1770 was not so very different thirty years later. This encourages the hope and expectation that the equivalent estimate of horse numbers from the invasion returns might at least be along the right lines, though that expectation is tempered somewhat by J R McCulloch's view that Young's cattle estimates 'can be regarded only as a very rude approximation', an opinion which we might venture below also applies to his other animal estimates.[30]

John Middleton, the author of the two editions of the *General View of the Agriculture of Middlesex*, was never shy to advance estimates on matters which were way beyond his brief. In 1798 he estimated the national horse herd in what he called South Britain. This was evidently England and Wales. The calculation was determined on the basis of one horse to every 15 acres of arable, where the arable included clover, rye grass, one year's ley and fallow, plus one horse for every 100 acres of grass. His arable amounted to 14 million acres (revised in the second edition of 1807 to 15 million acres) giving an arable-derived horse population of 933,333 (revised to 1 million), which added to his estimate of 213,000 grass-derived horses (revised to 200,000) gave a total agricultural horse population of 1.146 million horses (revised to 1.2 million). He indicated that to this sub-total should be added a further 600,000 'other' horses of non-agricultural origin (unchanged in the second edition) to arrive at the total horse population.[31] While we might admire Middleton's apparent precision and methodology, that admiration is almost certainly misplaced since Middleton was not the greatest of contemporary estimators. In both editions of his work he

[25] E A Wrigley, *Continuity, Chance and Change: the Character of the Industrial Revolution in England*, 1988, pp 41–2.

[26] A Young, *A Six Months Tour Through the North of England*, 4, 1770, p 497; A Young, *A Farmer's Tour Through the East of England*, 4, 1771, p 456, though Young always calls them 'draught cattle', so they may include oxen.

[27] We cannot test for this from the surviving returns because too few of them distinguish the draft oxen from the fat cattle.

[28] J R McCulloch, *A Statistical Account of the British Empire*, 1, 1837, p 495.

[29] Prince, 'England *circa* 1800', pp 417–8.

[30] McCulloch, *A Statistical Account*, p 495.

[31] John Middleton, *General View of the Agriculture of the County of Middlesex*, 1st ed, 1798, pp 483–4, and 2nd ed, 1807, p 639.

calculated the total acreage of England and Wales at nearly 47 million acres whereas the actual size was nearer to 36 million acres. We may venture that he also exaggerated the extent of the arable and the pasture, and thereby his calculation of the horse population.

At least horses attracted a tax from which a contemporary base of their likely total number can be constructed. For other animals there are no such bases, but there are some contemporary estimates. These come in the main from the same small group of observers, Young and Middleton principally. In each of his *Northern* and *Eastern Tours* Young estimated the English cattle stock. In the former they amounted to 4.571 million and in the latter to 2.168 million.[32] In 1779 in his *Political Arithmetic* he settled on a third estimate, but this was only the simple average of the two earlier ones. Thus according to Young the number of cattle in England was 3.369 million, including cows, fatting beasts, and young cattle. This is of a similar order of magnitude to the estimate of cattle which is derived from the historic weightings, but the 150,000 oxen which McCulloch says Young included with the horses should be added to the cattle. Even so, the resulting Young estimate of 3.5 million cattle may seem to bear close comparison with the new highest estimate of 2.997 million beasts based on the invasion returns.

There are very few contemporary estimates which can be employed for a plausible comparison with the new pig estimates of between 1.787 and 1.859 million animals. The best known are Young's estimates of 3.345 million and 1.711 million pigs which accompanied the reports of his two tours.[33] The problem with pigs is the way in which their numbers could fluctuate from year to year. They can be slaughtered in greater than usual numbers to meet a crisis of overall food supply, as occurred during the Irish Famine of the 1840s, in the knowledge and observable practice that with large and frequent litters their numbers can be relatively easily replenished.[34] The invasion inquiry of 1798 came two years after the corn crisis of 1795–6, and the inquiry of 1803 followed more comfortably after the crisis of 1799–1800.[35] If there had been a disproportionate slaughter of pigs during these corn crises then, plausibly, by both 1798 and 1803 the pig population would have recovered. In conclusion, a pig population for England of something a little under 2 million animals may not be far from the mark.

IV

When it comes to estimating the sheep population the evidence is just as conjectural as it is for other animals, but if conjecture can be qualified by degrees, it is even *more* conjectural. The dominant position held by the woollen industry in eighteenth-century trade and industry meant that there were any number of contemporaries willing to estimate its size, and therefore often by association, the size of the sheep herd and the wool clip.[36] The most often cited of these estimates and the most detailed were produced by a Leeds woolstapler, John Luccock, in 1805 and revised in 1809.[37] He not only derived a national total but he also produced sheep totals for each of the English counties distinguishing between the distribution of short and long wool sheep.

In other sources it is most often the sheep population to which contemporaries

[32] Young, *Northern Tour*, p 497; Young, *Eastern Tour*, pp 456 and 459, in each case the summation of his estimates of cows, fatting beasts and young cattle.

[33] Young, *Northern Tour*, p 498; Young, *Eastern Tour*, p 456.

[34] On the Irish example see M Turner, *After the Famine: Irish Agriculture 1850–1914*, 1996, pp 48–9, 123.

[35] For which see M Turner, 'Corn crises in Britain in the age of Malthus', in M Turner, ed, *Malthus and his Time*, 1986, pp 112–28.

[36] Estimates of the wool clip tabulated in G E Fussell and C Goodman, 'Eighteenth-century estimates of British sheep and wool production', *Ag Hist*, 4, 1930, pp 132–3.

[37] J Luccock, *The Nature and Properties of Wool*, Leeds, 1805, p 338; J Luccock, *An Essay on Wool*, 1809, pp 338 and 339.

referred in any detail whenever they discussed animal numbers. In the quarto version of the Board of Agriculture *General View* of the county of Sussex in 1793 the Revd Arthur Young estimated the sheep population at 340,000 animals, and his discussion of sheep easily formed the largest single section in his county review. Even taking into account that he underestimated the extent of the county by about 6 per cent his sheep estimate is remarkably close to the estimate from the invasion returns a few years later. For twenty-six of the Hampshire parish invasion returns there is near contemporary enumeration of their sheep numbers by A and W Driver in their quarto view of Hampshire agriculture in 1794. These parishes covered 61,000 acres which was 36 per cent of the surviving invasion returns or nearly 7 per cent of the county. The invasion returns record 21,752 sheep for those parishes, whereas the estimates by the Drivers for the same parishes amounted to 23,850 sheep. At 9 per cent, this difference is almost negligible in comparison with the other county differences which are listed in Table 5 below.[38]

In contrast, John Claridge in his *General View* of Dorset estimated a sheep population of 800,000 which was about twice as large as the invasion return.[39] Yet Dorset is reckoned as the model county in the history of the invasion inquiries. The invasion estimates for Berkshire generally seem on the low side. They derive from the individual totals for the seven militia sub-divisions of the county plus the separate returns for the boroughs of Abingdon and Reading. These two boroughs were small, and if we combine them with the sub-divisions which bear their names we find that the average number of animals in the enlarged seven sub-divisions of the county were 2425 cattle, 11,624 sheep, 2929 pigs and 1697 horses, whereof the contribution made by Reading (borough and sub-division combined) was 902, 3515, 967 and 1490 respectively. Some of these numbers are suspiciously on the low side yet there is every indication from a 'Rough Map of Berkshire' which accompanies the invasion returns that the Reading sub-division was one of the largest, if not the largest in the county. Furthermore, the author of the quarto *General View* of the county in 1794 remarked that the county 'has, and ever must have, from the nature of the soil, a great quantity of sheep upon it', and he made much of the importance of the town of Ilsley as a sheep market, which had 'of late, become a sheep market, of the first importance, not only to Berkshire, but its neighbouring counties. Not less than 20,000 sheep have sometimes been sold in one market day; and it is computed that the annual average is not under 250,000'.[40] It acted as a regional market for sheep from nearby Oxfordshire and Wiltshire as well as counties further afield. The invasion return for Berkshire, for sheep at least, seems on the low side.[41]

The authority which is always paraded on the occasions when a sheep estimate is required is John Luccock. In 1805 he estimated a sheep population of England and Wales of 26.1 million for *c* 1800, later revised to 24.4 million, in both of which estimates Wales accounted for 1.25 million sheep.[42] Therefore at first sight the new sheep estimates derived from the invasion returns look to be way off beam. The

[38] Revd Arthur Young, *General View of the Agriculture of the County of Sussex*, 1793, pp 71 and 74, in which Sussex is divided broadly into two regions, the Downs on which 270,000 sheep resided and the Weald where 70,000 resided; A and W Driver *General View of the Agriculture of the County of Hampshire*, 1794, pp 23–25.

[39] J Claridge, *General View of the Agriculture in the County of Dorset*, 1793, p 7.

[40] W Pearce, *General View of the Agriculture in Berkshire*, 1794, pp 44, 38.

[41] The effect of discarding the Berkshire returns from the analytical results presented in Table 3 is to adjust the numbers but not dramatically, because Berkshire is a relatively small county in the surviving sample of counties. Doing so increases the national cattle estimate to between 2.3 and 3.0 million, the sheep to 11.0 and 12.6 million, the pigs to 1.8 and 1.9 million and horses to between 0.8 and 0.9 million.

[42] Luccock, *The Nature*, p 338; Luccock, *An Essay*, pp 338 and 339. It looks as though the second time round Luccock failed to include the slaughter of lambs.

estimate of 12.208 million sheep based on the first areal weight is the more plausible method of estimation given the nature of sheep production – that is, the extensive use of land on regulated and unregulated pastures, supplemented by folding on root crops. The other two estimates of a little under 11 million sheep based on pasture weights and a little over 10.5 million based on historic weights, however, look implausibly low. Luccock's method was to estimate a sheep population for each county on the basis of the sheep stocking rates applied to 'the number of acres, which are supposed to contribute toward the production of wool'.[43] It is a little uncertain whether Luccock fully appreciated the land area of England. He certainly understood that a certain amount of land would necessarily have to be deducted from each county because he spoke about excluding hedgerows, coppices, buildings, water, public roads and what he termed but did not define as 'absolute wastes'. For these he deducted one-eighth of the land area of each county. But any other reasonable interpretation of what would remain as part of the contribution towards the production of wool would include the available pasture (including some land otherwise categorized as waste), and an allowance for a proportion of the root crops which were used for feeding sheep. The sum total of this land, according to Luccock and excluding Wales, amounted to just over 24 million acres.[44] Considering that England is 32 million acres in extent the residual 8 million hardly seems enough to cater for grains and roots (which together amounted to about 8 million acres by the agreement of most estimates) or other lands which otherwise might be used for non-agricultural purposes, or for feeding other animals, such as the 3.5 million acres which Wrigley has estimated was needed specifically as horse fodder for feeding the farm horse population of England and Wales.[45] In addition, there was a considerable amount of other non-cultivated land which Comber estimated at nearly 11 million acres. A proportion of that would have been available to sheep in the form of the open moors and mountains, but not nearly at the same stocking rates which applied elsewhere. Surely Luccock has grossly miscalculated the land available to sheep production; and to that land which he has included he has surely applied a stocking rate which is not sensitive enough to land quality.

Luccock's estimate compares badly with the new estimates, though it does compare very well with Young's estimate of 29 million (*Northern Tour*) and 22.2 million (*Eastern Tour*), later averaged in 1779 to 25.6 million sheep.[46] Middleton's estimate of 38.4 million completes the set (revised in the second edition of his work to 35 million), a figure which further discredits almost any calculation that Middleton ever made, but it leaves us unsatisfactorily and unhelpfully with an enormous range of estimates. It suggests we will never have much confidence in establishing the true sheep population, but at least the invasion returns offer a dramatically different estimate from the one which has been trotted out, though usually with no great confidence, for nearly 200 years whenever a reference to early nineteenth-century sheep was required. Luccock's authority was assured in 1828 in a Select Committee on the British wool trade. One witness, Mr James Hubbard, a woolstapler from Leeds, simply took Luccock's earlier estimates and merely adjusted the ratio of long to short wool sheep. He expressed no great confidence one way or the other in Luccock's numbers, but simply 'assumed those to be

[43] Luccock, *An Essay*, p 338.
[44] *Ibid*, pp 338–9.
[45] E A Wrigley, 'Energy availability and agricultural productivity', in B M S Campbell and M Overton, eds, *Land, Labour and Livestock: Historical Studies in European Agricultural Productivity*, Manchester, 1991, p 332.
[46] Young, *Northern Tour* p 497; Young, *Eastern Tour* p 456; compromise estimate quoted by Prince, 'England *circa* 1800', p 421.

correct', but he certainly began the trend of picking Luccock from the shelf. A second witness, Mr J L Calcraft, a Lincolnshire farmer, estimated the number of sheep in the county precisely to the last animal to 1,834,782 animals, though further inquiry reveals that this was an uncritical and unattributed steal from Luccock's estimate of long wool sheep.[47] The importance of offering an alternative estimate of the sheep population let alone a perfectly acceptable one lies in two directions: it concentrates the mind on a particularly difficult and important element in any attempts to measure agricultural output; and equally, it may one day feed into any revised estimates of the size and development of the domestic woollen industry.[48]

In summarizing the evidence from Luccock, Deane and Cole concluded that even he was 'consciously conservative' yet 'may still have been coloured by the climate of exaggeration which had prevailed throughout the eighteenth century in writings on the woollen industry'. More generally Richard Wilson refers to the special place of wool 'in the political and economic writings of the period'...[which meant that]...'Every pamphleteer who made mention of the wealth of Britain felt obliged to estimate the wool clip'...[and]... 'the results were often fantastic and contradictory'...'But it was the industry's importance which led to these wild compilations'. In other words there were even larger estimates doing the rounds at the time, with an all-time high of 54 million sheep in 1782. Yet there were also some low estimates – which incidentally are rarely if ever paraded by historians – as low as 10–12 million sheep in one survey published in 1774, and 12 million in separate estimates which appeared in 1712, 1731, 1736 and 1769.[49] These low estimates have generally been forgotten in the musings of subsequent historians, but they stand up rather well against the new estimates in this paper. However, if Luccock was remotely correct then the combined English and Welsh sheep stock declined from 26 million at the beginning of the nineteenth century to a little over 18 million in mid-century[50], at which rough order of magnitude it remained over the period 1866–1914.[51]

An important point to make is that the June returns of the late nineteenth century captured a more stable proportion of the annual stock than the invasion returns might have done since the latter were conducted at various times of the year, in some cases perhaps before the lambing of the new season but perhaps after the main impact of the annual slaughter cycle of the immediately preceding season. Luccock's estimate was an annual stock, and not a point specific inventory flow. In truth his estimate for England alone was a net stock of 17.8 million surviving sheep, a figure which excluded estimates of the annual slaughter, wastage, and carrion, which he estimated at over 7 million animals for England and Wales, or 27 per cent of the

[47] BPP, 1828, VIII, *Report from the Select Committee of the House of Lords appointed to take into consideration the state of the British wool trade.* In chronological order this genuflection includes: McCulloch, *A Statistical Account*, p 501; Fussell and Goodman, 'Eighteenth-century estimates'; P Deane and W A Cole, *British Economic Growth 1688–1959*, 2nd ed, 1962, p 195; Prince 'England *circa* 1800', p 421; Prince, 'Changing rural landscape', p 43; B A Holderness, 'Prices, productivity, and output', in Mingay *Agrarian History*, though Holderness is far more critical than any of the others.

[48] See Holderness, 'Prices', pp 171–4 in which he finds that Luccock's estimates for domestic wool production sit uneasily alongside the accepted trend of wool production for the century after 1741.

[49] Deane and Cole, *British Economic Growth*, p 195; R Wilson, *Gentleman and Merchants: The Merchant Community in Leeds 1700–1830*, p 6. See also, P Deane, 'The output of the British woolen industry in the eighteenth century', *J Econ Hist*, 17, 1957, pp 207–8 for further statements that question the reliability of contemporary estimates (that is, she points to the likely exaggeration in those estimates). The estimation of 54 million sheep, and others quoted in this paragraph, is one of almost thirty contemporary estimates of sheep population listed in Fussell and Goodman, 'Eighteenth-century estimates', pp 132–33, though many of these are clearly not independent estimates but merely repetitions of previous authorities.

[50] Based on the agricultural statistics of 1854 quoted in Mingay, *Agrarian History*, p 1044.

[51] Though fluctuating between 17.9 and 21.6 million animals, estimates based on five year averages in MAFF, *A Century of Agricultural Statistics: Great Britain 1866–1966*, HMSO, 1968, table 66.

gross stock. Thus by twists and turns we have reduced the Luccock estimate from the usually quoted and, as far as the present exercise is concerned, inaccessible figure of 24.3 million animals for England alone, to a little under 18 million. While this is still considerably more than the top estimate we have derived of a little over 12 million animals, at least the new estimate no longer looks quite so outrageous (and Luccock's figure similarly is no longer quite so formidable), though this assessment makes the unwritten assumption that the greatest impact of the annual slaughter and wastage of sheep was pretty well complete by the time the invasion enquiries reported. This may be far wide of the mark given the disparate dates of the returns from late autumn, into winter, and on into the spring, and in time for the March to April market which was an important time of year for disposal.[52]

The main problem with the new estimates is that they imply that sheep numbers had remained little changed from the base estimate at the beginning of the eighteenth century. Gregory King proposed a sheep population of 11 million in the 1690s. Yet, what if King was wrong and the sheep population was less than 11 million, and less than it by some margin? After all, estimates of the early modern sheep population are no more secure than those in the eighteenth century.[53] Or what if we built into the new invasion estimate Luccock's allowance for the annual wastage and slaughter? In either circumstance this might allow for sufficient growth of domestic woollen output to have occurred in the eighteenth century to satisfy the historians of the woollen industry. By so building in Luccock's full allowance for slaughter and carrion of 27 per cent of total stock into the new sheep estimate, the resulting new gross sheep stock population comes to between 14.6 and 16.7 million animals. These may seem relatively small numbers against the background of other contemporary estimates, but they are large enough to point to a substantial growth of domestic wool production in the eighteenth century. They suggest that if Gregory King's estimate is at all close to reality the gross sheep population was between 33 and 52 per cent larger, one hundred years later (that is after building in carrion and waste). Luccock's figures of course imply a much larger growth. In addition, a lower estimate *c* 1800 implies an expansion of the sheep population which is more in line with the growth rate of domestic wool production in the nineteenth century which Deane and Cole preferred to use, and which they based on Board of Trade estimates.[54] The most often quoted estimates of the contemporary domestic wool clip *c* 1800 was somewhere between 90 and 100 million lbs. This was for the UK which we understand included Ireland.[55] There are no end of estimates of average fleece weights from the *General Views* of the agriculture of the counties, the *Annals of Agriculture*, and from Luccock. They varied enormously with the multitude of different breeds which were available, from 7–8 lbs for long wool fleeces to 3–4 lbs for short wool fleeces. The weighted average suggests an average fleece size of 4–4.5 lbs per sheep, which in turn suggests a sheep population of 22–25 million sheep, not a long way from Luccock's estimate but now including the whole of the UK.[56]

In other words, there is sufficient or even considerable doubt over Luccock's

[52] For which see Moore-Colyer, 'Livestock', p 332.

[53] G D Ramsay, *The English Woollen Industry, 1500–1750*, 1982, pp 75–6.

[54] For a gloss on productivity and yields see Holderness, 'Prices', pp 121–4; Deane and Cole, *British Economic Growth*, p 196.

[55] B R Mitchell, *Abstract of British Historical Statistics*, 1962, p. 190; *Committee on Industry and Trade: Survey of Textiles Industries*, HMSO, 1928, p. 275.

[56] Contemporary average fleece weights are listed in Fussell and Goodman, 'Eighteenth-century estimates', pp 138–42, including all three sources listed here. The weighting procedure I have adopted is based on Luccock's county distribution, a case of hunting with the hare and the hounds because in doing so I seem to be accepting the inter-county distribution while at the same time objecting to his aggregate of the counties.

much used estimates to encourage just these kinds of speculations about the size of the national herd and its trend over time. As Holderness put it, 'John Luccock's very detailed calculation of both sheep numbers and wool production in 1805 is speciously precise and *seems* accurate'.[57] This accuracy can be examined, or even tested, for those counties for which an independent estimate of the sheep population is known. This includes the eight counties from the invasion returns along with several other contemporary county estimates which can be collated from the contemporary *General Views*. These comparisons are made in Table 5.

The invasion returns represent the whole extent of seven of the counties, as well as 88 per cent of Cornwall. The differences between the invasion returns and Luccock's estimates are so dramatic that such differences cannot be accounted for simply by the difference between a measure of the annual stock and a point specific inventory flow. At best the Northumberland returns represent just over 80 per cent of Luccock's estimate for this county, and at worst the Sussex return represents less than two-fifths of Luccock's estimates, and Berkshire is just over 25 per cent, though we have sounded a warning already over the adjudged completeness of the Berkshire returns. Apart from what we have already reported from the author of the quarto *General View* of that county about the prominence of sheep marketing in Berkshire, the author of the later octavo *General View*, William Mavor, was content to repeat Luccock's figures without any criticism or other comment at all. Furthermore, in observing that Luccock slightly underestimated the extent of the county Mavor implied that even the Luccock estimate was too low for Berkshire.[58] It is also no solution to take the sample counties in Luccock as a proportion of Luccock's total and apply that proportion to the invasion returns and scale up for England as a whole, because as Table 5 shows this would only be a sensible option if Luccock and the invasion returns differed in a reasonably consistent fashion across counties.

The second half of Table 5 reviews other contemporary opinion of county sheep totals in the light of Luccock's estimate. Vancouver's estimate for Cambridgeshire is based on an average of 1062 sheep per parish for 62 parishes where their numbers are recorded, but in the knowledge that there were 144 parishes where sheep were kept.[59] Vancouver himself made the estimate recorded in Table 5. An alternative way to calculate the Cambridgeshire total is to say that the 68,988 sheep which were actually recorded were found in parishes extending over 227,375 acres, which amounted to 42.4 per cent of the county. This suggests a county sheep total of 162,708. Whichever way the Cambridgeshire county sheep flock is derived produces a relatively rare example of an estimate which exceeds Luccock's total. The same is true for Pitt's estimate for Northamptonshire, and as we have already noted, Claridge's Dorset estimate of 800,000 sheep also greatly exceeds Luccock's total, but in doing so he makes the invasion estimate for the pioneer county in the invasion inquiry seem quite puny.[60] Young's estimate for Suffolk in relation to Luccock for the same county is of the same order of difference as a number of the invasion returns. The interesting thing is that Luccock himself thought that

[57] Holderness, 'Prices', p 171, his emphasis.

[58] William Mavor, *General View of the Agriculture of the County of Berkshire*, 1809, p 381n.

[59] C Vancouver, *General View of the Agriculture of the County of Cambridge*, 1794, p 205.

[60] W Pitt, *General View of the Agriculture of the County of Northampton*, 1809, p 214; Claridge, *General View...Dorset*, p 7. In his commentary on Pitt's report on Northamptonshire William Marshall, ever the critical reviewer, commented that 'It were unkind not to indulge the Reporter, sometimes by attending to his estimates, and calculations, even tho we may consider them as little more than day dreams': W Marshall, *The Review and Abstract of the County Reports to the Board of Agriculture, IV*, York, 1818, p 395.

TABLE 5
John Luccock's sheep estimates compared

(A) Compared with the Invasion Returns

County	*'Invasion' estimate*	*Luccock's short-wool*	*Luccock's long-wool*	*Luccock's total*	*Invasion estimates as a percentage of Luccock's estimates*
Berkshire	81369	306600	—	306600	26.5
Cornwall	302191*	203000	—	203000	148.9
Dorset	393670	632240	—	632240	62.3
Essex	306797	519000	—	519000	59.1
Lincolnshire	784435	123648	1834782	1958430	40.1
Norfolk	433915	683704	38500	722204	60.1
Northumb	451547	538162	—	538162	83.9
Sussex	346589	863800	—	863800	39.6
Total	3100513	3870154	1873282	5743436	54.0

(B) Compared with *General View* estimates

County	*General View estimate*	*Luccock's short-wool*	*Luccock's long-wool*	*Luccock's total*	*General View estimates as a peercentage of Luccock's estimates*
Cambridge	152928	67744	41688	109432	139.7
Hampshire	350000	516600	—	516600	67.8
Huntingdon	141558	108000	87500	195500	72.4
Northants	710000	—	640000	640000	110.9
Rutland	81146	—	114000	114000	71.2
Suffolk	240000	497000	—	497000	48.3
South Wilts	500000	583500	—	583500	85.7
Total	2175632	1772844	883188	2656032	81.9
Combined total	5276145	5642998	2756470	8399468	62.8

* Based on 88 per cent of the county, scaled up.
Sources: This paper; J Luccock, *An Essay on Wool*, 1809, p 338; C Vancouver, *General View of the Agriculture of the County of Cambridge*, 1794, p 205; A and W Driver *General View ... of the County of Hampshire*, 1794, p 25; R Parkinson, *General View of the ... Country of Huntingdon*, 1813, pp 238–43; W Pitt, *General View of the ... County of Northampton*, 1809, p 214; R Parkinson, *General View of the ... County of Rutland*, 1808, pp 715–16; A Young, *General View of the ... County of Suffolk*, 1794, p 75; T Davis, *General View of the ... County of Wiltshire*, 1794, p 19.

on this occasion his own estimate was probably too high, though he says so in the same breath as he takes Young to task for confining himself 'too much to round numbers' and estimating 'the quantity of land in a loose and hasty way'.[61] Luccock's attempts to engage Young in a correspondence over their differences was frustrated when Young failed to answer Luccock's inquiries, leaving Luccock quite uncertain over the true total for that county. Richard Parkinson's estimates for Huntingdonshire and Rutland have a certain consistency about them relative to the Luccock estimates for those counties, and the difference between Luccock and the Drivers' estimate

[61] A Young, *General View of the Agriculture of the County of Suffolk*, 1794, p 75, and repeated by Young in the various octavo editions of 1797–1813, for example 1813, p 216; Luccock, *An Essay on Wool*, p 246.

for Hampshire is of the same order of magnitude.[62]

There is one further estimate which can be added to the growing sample. When Thomas Davis, the steward on the Longleat House estate, reported on the agriculture of Wiltshire he reckoned on 500,000 sheep in south Wiltshire, the area of which part of the whole county was 500,000 acres. Luccock's estimate for the same half of the county (clearly distinguished by both Davis and Luccock in their references to the Downs), is, on this occasion, only modestly higher. Davis, incidentally, also commented that the sheep stock 'has been, for many years, gradually decreasing, and that it is now lower, by many thousands than it was fifty years ago', a rare reference to sheep numbers which went counter to the assumed eighteenth century trend.[63]

What we may finally do is to combine all of the non-Luccock estimates and rework the national sheep herd accordingly. The resulting expanded sample amounts to the whole or substantial parts of fifteen counties, embracing about 36 per cent of the total land area of England, 40 per cent of Capper's English pasturage, and they accounted for 44 per cent of the sheep population of late nineteenth-century England. With these weights they suggest an early nineteenth-century sheep herd of between 14.4 and 11.8 million animals, in which, methodologically, the 14.4 millions equates with the first estimate in Table 3.[64] The estimate is creeping up, indicating a downward bias in the invasion returns on their own, but even so, this final estimate is still far short of the estimate which has been in popular use for nearly 200 years.

[62] R Parkinson, *General View of the Agriculture of the County of Huntingdon*, 1813, pp 238–43; R Parkinson, *General View of the Agriculture of the County of Rutland*, 1808, pp 715–16; Driver and Driver, *General View...Hampshire*, 1794, p 25.

[63] T Davis, *General View of the Agriculture of the County of Wiltshire*, 1794, p 19.

[64] This is not to deny some sensitivity in these calculation involving individual counties. For example, substituting the Claridge total for Dorset will increase the scaled-up national estimate but it will still be a long way short of Luccock's estimate.

TABLE 6
English nineteenth-century livestock numbers (millions)

Period	*Cattle*	*Sheep*	*Pigs*
c 1800 (based on 8 counties)	2.471	12.208	1.796
c 1800 (based on 15 counties)	—	14.445	—
c 1854	2.921	16.223	2.147
1866–70	3.604	18.923	2.008
1881–85	4.325	15.833	2.066
1896–1900	4.701	15.949	2.158

Sources: This paper; adapted from, G E Mingay, ed, *The Agrarian History of England and Wales, VI*, 1989, p 1044; B Afton and M Turner, 'The statistical base of agricultural performance in England and Wales, 1850–1914', in E J T Collins, ed, *The Agrarian History of England and Wales, VII*, forthcoming, section 1, table 4.

V

Shadow boxing of this nature in search of the all-important but illusive facts – both the new startlingly low estimates and the apparently well-established but almost certainly exaggerated higher ones – further exposes the quicksand which faces historians of agricultural output and productivity. Discussions about agricultural revolution are never very far from the thoughts and minds of agricultural historians. The traditional view stressed the processes of change while in more recent times the emphasis on quantification has led to stimulating but still inconclusive views on both the magnitude of overall change and also on the chronological turning points.[65] How do these new estimates measure up to our current understanding of agricultural history?

Table 6 shows the new estimates in the context of the equivalent numbers we can derive from the agricultural census of nine English counties which was conducted in 1854, grossed up in the same way as the 1800 estimates. In addition we include the annual average animal numbers as reported

[65] The latest of which is M Overton, 'Re-establishing the English Agricultural Revolution', *AHR*, 44, 1996, pp 1–21; M Overton, *Agricultural Revolution in England: The Transformation of the Agrarian Economy 1500–1850*, 1996, especially chapter 3. See also R C Allen, 'Agriculture during the industrial revolution', in Floud and McCloskey, *Economic History*, pp 96–122.

in the first three decades of the annual returns. The percentage increase in the three animals in the first half of the nineteenth century was 18, 33 and 20 per cent respectively, and 23, 26 and −6 per cent in the third quarter of the century. This long-run trend is entirely plausible, in a way which interposing the Luccock sheep numbers would not be. Indeed, employing Luccock instead would surely make the casual reader draw breath with astonishment at the decline in the sheep population. The Luccock figures make no real sense in terms of the domestic woollen industry. Even though raw wool imports increased dramatically over this period, as a proportion of the domestic industry they still suggest a growth in indigenous wool supplies. In the first decade of the nineteenth century raw wool imports (into GB) fluctuated between 2.4 and 11.8 million lbs, which was less than 10 per cent of the wool consumed, and by the 1850s this had risen to between 74 and 133 million lbs (this time into the UK), which was between 30 and 50 per cent of the wool consumed.[66] Though on a declining scale, the domestic supply was still paramount, and unless we can suggest a massive increase in the average wool clip, the rise in sheep numbers which the new estimates imply for the period is a more reasonable description of reality than the massive decline in numbers which Luccock's base implies. The modest increase in the sheep numbers in the third quarter of the nineteenth century is wholly consonant with the view that at the time a half of the value of the wool consumed in the industry was imported.[67]

Table 6 can also be used to compare with current views on agricultural growth in the nineteenth century, though we venture along this path with some trepidation. Unfortunately we cannot break down the animals in 1800 into ages and roles (milk cows, stores, fat stock, etc), though we could for 1854. However, we can value those animals as if mature beasts and as if of unchanging carcass weight upon slaughter, and apply a constant price to the estimates for *c* 1800 and *c* 1850. The carcass weights can be taken from Holderness in volume VI of *The Agrarian History* where there is also encouragement to suppose relatively fixed carcass sizes over the first half of the nineteenth century, and the prices can be taken from quotations at the Metropolitan cattle market for inferior and prime live meat.[68] The resulting values, which at fixed prices amount to a measure of the real volume of animal output, indicate that the animal stock increased by about 24 per cent over the first half of the nineteenth century. Thus far the current view, from R C Allen for example, is that the real volume of animal production (which is not really the same thing as we have measured here) increased by 55 per cent, which is supported by M Overton's separate estimate of the growth of real meat output of the order of 52 per cent.[69] At least we cannot be accused of exaggeration. Moreover, substituting Luccock's sheep numbers would see animal production make the unlikely move into free fall.

This paper does not pretend to clarify to any great extent these issues, but in these closing remarks it does suggest that a major, and seemingly insurmountable problem has been the lack of any secure base points from which both to quantify change and describe its main components. For the period before the advent of the annual agricultural returns from the mid-1860s there have been several attempts at constructing some of the necessary quan-

[66] Mitchell, *Abstract*, pp 191–3; Deane and Cole, *British Economic Growth*, p 196.

[67] Deane and Cole, *British Economic Growth*, p 197.

[68] Holderness, 'Prices', pp 152–3, using fixed weights of 730 lbs for cattle, 86 lbs for sheep, and 129 lbs for pigs; B Afton and M Turner, 'The statistical base of agricultural performance in England and Wales, 1850–1914', in E J T Collins, ed, *The Agrarian History of England and Wales*, VII, forthcoming, section 9, tables 9, 17, and 20, using the five year average prices centred on 1854.

[69] Allen, 'Agriculture', p 102; Overton, *Agricultural Revolution*, p 75.

titative and qualitative elements involved in questions of agricultural change or revolution, and briefly these have been reported in the previous paragraph. In all cases there have been reasonable attempts at establishing the arable base – from the inferred evidence of crop yields in probate inventories, to the comparable evidence on crop yields and the extent and distribution of arable land uses in England and Wales during the French Wars, and to the evidence arising from tithe redemption and commutation in the 1830s and 1840s.[70] All of these cross-sectional measurements have attracted criticisms, but at least they have offered a series of bases for analysis where none previously existed. There are no comparable bases for a study of the livestock economy. The estimates constructed in the present paper are offered as an untried starting point in that process.

[70] For which see editors' introduction and chapters by P Glennie and M Overton in Campbell and Overton, *Land, Labour and Livestock*; M E Turner, 'Agricultural productivity in England in the eighteenth century: evidence from crop yields', *Econ Hist Rev*, sec ser, 35, 1982, pp 489–510; Turner, 'Arable in England and Wales'; Kain, *Atlas and Index*, especially pp 457–67.

The Integration and Analysis of Historical and Environmental Data using a Geographical Information System: Landownership and Agricultural Productivity in Pembrokeshire *c* 1850*

By ALASTAIR PEARSON and PETER COLLIER

Abstract

Historical maps and documents, such as census returns, estate plans, tithe maps, rent rolls and court rolls, have traditionally provided fundamental data sources for historians. This paper concentrates on the integration of environmental data with such historical sources and their subsequent analysis using a GIS. It demonstrates that the scale and range of enquiries that are made possible by such a methodology increases with the application of the new tools that GIS provides. Although the study concludes by suggesting that the application of GIS is not itself unproblematic, it argues that the work presented does illustrate the potential value of GIS in offering a new dimension to agricultural history research.

IN THEORY, a geographical information system (GIS) offers a simple and exploitable set of analytical tools that provides archaeologists and historians with the opportunity to advance the study of past societies in relation to their cultural and physical environments.[1] It has the capacity to interrelate and integrate spatially referenced data as map overlays and to facilitate the description, manipulation and analysis of these maps and the creation of new data as new map overlays. This paper aims to explore its potential through the analysis of landownership as a factor in mid-nineteenth century agricultural productivity at Newport, Pembrokeshire. A tithe map lies at the heart of the analysis, and it is the integration of this source with topographical data supplied by the Ordnance Survey that demonstrates the integrative capabilities of GIS software. Analysis of the results is performed using multi-level modelling, a statistical technique that offers enormous potential for future studies of similar nature.

There is no universally accepted definition of GIS. It is most commonly used as a collective term for a suite of individual components or modules that carry out a variety of functions on spatial data. Clearly, definitions depend on the context within which a GIS is operating. Inevitably, one has to qualify the definition of GIS according to the unique hardware and software capabilities available to the study. For the purposes of this study we can view the GIS as an agglomeration of components including a single GIS package (*sensu stricto*) coupled to statistical and cartographic capabilities brought together under the loose heading of GIS (*sensu lato*).

The main software requirements were met by Environmental Systems Research Institute's (ESRI) ARC/INFO as it possesses sufficient data input, digitizing, editing and analysis capabilities for the initial

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[1] S H Savage, 'GIS in archaeological research', in K M S Allen, S W Green, and E B W Zubrow, eds, *Interpreting Space: GIS and Archaeology*, 1990, pp 22–32.

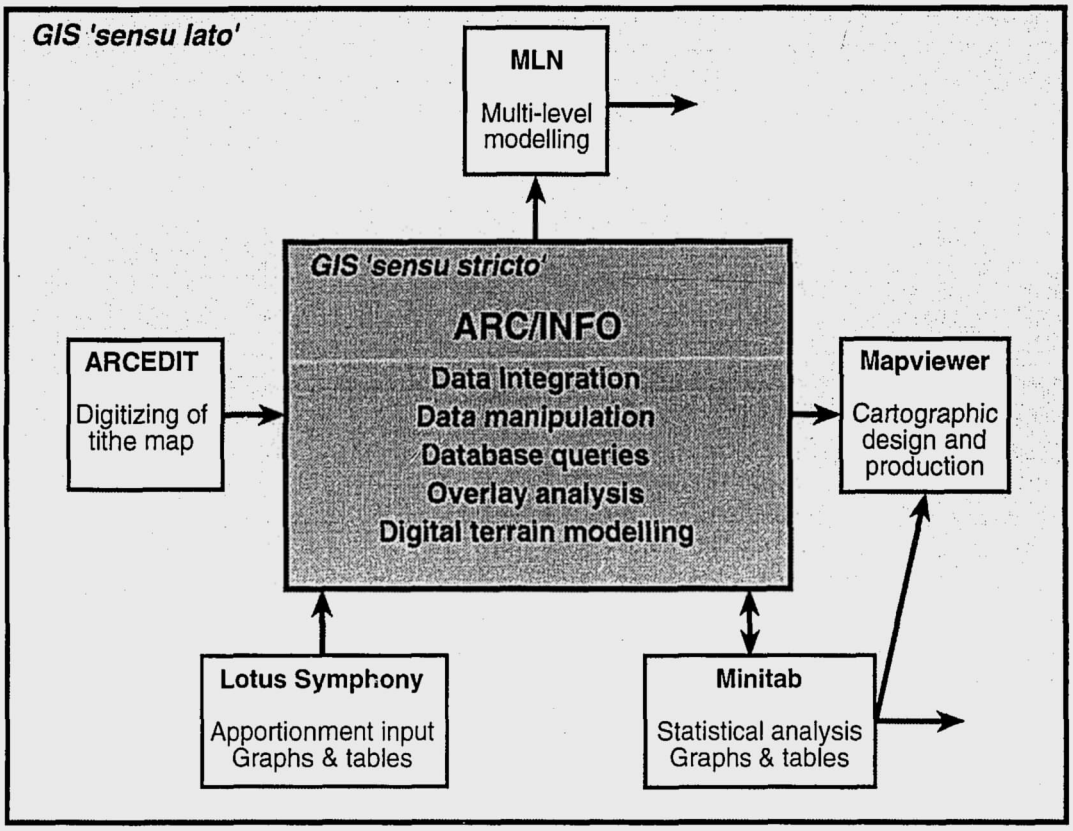


FIGURE 1
Components of the geographical information system, *sensu lato* and *sensu stricto*.

map production and exploratory analysis. ARC/INFO is one of the most widely used systems in the world, being ubiquitous in higher educational establishments, and lay at the heart of most linking components that made up a larger 'system' used for the purposes of this study. The GIS (*sensu lato*) was formed by 'loose coupling' ARC/INFO and the packages used for data capture and processing, statistical analysis, multi-level modelling and cartographic design (Fig 1). The final database consists of a set of layers that includes tithe, soil, topographic and census data (Fig 2).

The parish of Newport represents Pembrokeshire in microcosm. It is a small coastal village with a sandy beach situated midway between Cardigan and Fishguard. Though located in the heart of the Welsh-

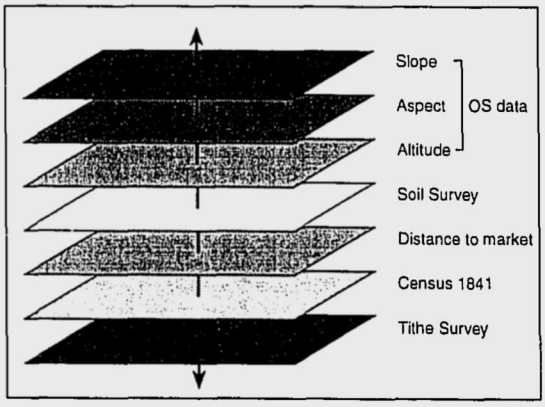


FIGURE 2
Layers within the database. Each layer can be handled separately or combined with other layers.

speaking area of north Pembrokeshire, the village's roots are Norman. Mynydd Carn Ingli, with its formidable hill fort, commands a central position within the parish and indeed appears to have been at the hub of human activity in the area for at least 2500 years.[2] An open field system of farming was established with Mynydd Carn Ingli remaining an important element, providing communal grazing and a source of fuel for a section of the population. Newport thus offers an engaging history and a stimulating location for the researcher keen to study the interaction of society, nature and place from prehistory to the present day.

I

Tithe maps are an important source for the agricultural historian and have claims to be regarded as the most comprehensive record of the agrarian landscape of any period. Several authors provide a comprehensive description and analysis of tithe maps as a data source.[3] Detailed treatment of tithe maps as a data source is therefore not necessary here. However, some consideration of the tithe survey of Newport and its likely accuracy is appropriate.

There is nothing unusual about the tithe survey of Newport. The rent-charge was awarded by the commission and then apportioned field-by-field and a large-scale map and apportionment roll prepared. The maps were made with sufficient accuracy to enable the parties to identify the lands which were subject to rent-charge.[4] The absence of the tithe commissioner's seal identifies the map as a second-class tithe map.[5] It was common practice to compile this class of map from existing sources such as estate plans or parish maps. We must, therefore, be wary of using the tithe map for any other purpose than for reference.

Scrutiny of the tithe file that accompanies the map and apportionment confirms that the implementation of the Tithe Commutation Act followed the guidelines as laid down by the commission. The files provide some reassuring evidence that the survey was carried out by local people who were familiar with the farming practices of the area. Henry Phelps Goode, the tithe surveyor and valuer, was conscious of the variable quality of the land and concerned that this be reflected in the global tithe rent-charge. We can only assume that similar sensitivity is shown in his apportionment of the tithe rent-charge on a field-by-field basis. We must accept, however, that any analysis of the state of cultivation and the productivity of the land as indicated by the tithe rent-charge must ultimately rest on this assumption. The surveyor and valuer were primarily concerned with the survey and allocation of rent-charges within the parish. It is unlikely that they contemplated the information from a geographical point of view. Many of the maps in this paper, derived from the tithe data, are in a form that the surveyor never saw himself. When we consider the pattern of rural settlement as revealed by the tithe surveys, we should be mindful that they were never intended to support such analysis.

II

The tithe map and accompanying apportionment offer a source that is com-

[2] These findings are discussed in detail by A W Pearson, 'Carn Ingli *circa* 1500BC to AD1845: the application of Geographical Information Systems to the study of settlement development at Newport, Pembrokeshire', unpublished University of Portsmouth PhD thesis, 1996.

[3] R J P Kain and H C Prince, *The Tithe Surveys of England and Wales*, 1985; E J Evans, *Tithes: Maps, Apportionments and the 1836 Act*, Chichester, 1993; H C Prince, 'The tithe surveys of the mid-nineteenth century', *AHR*, 7, 1959, pp 14–26; and H M E Holt, 'Assistant commissioners and local agents: their role in tithe commutation', *AHR*, 32, 1984, pp 189–200.

[4] BPP, 1837, VI, *Report from the Select Committee on Survey of Parishes (Tithe Commutation Act) with minutes of evidence.*

[5] An unexpected error appears in the declaration on the tithe map: 'We the undersigned Tithe Commissioners for England and Wales do hereby certify this to be the map or plan referred to in the apportionment... in the Parish of Newport in the County of Radnor' (PRO, IR 30 54/100): right parish, wrong county!

patible with the vector GIS model. As the tithe map consists of field boundaries with unique field numbers that relate to the same field numbers contained within the apportionment, GIS offers the possibility of simply linking the two elements and enabling the display of the apportionment data. Taken further, the tithe map can form the spatial and temporal anchor point to which other data sources, such as the census and topographic data, can be added.

Preliminary investigations of the tithe map and current Ordnance Survey maps showed that the field boundaries had changed little between 1845 and the present day. As a result, the latest Ordnance Survey 1:10,000 scale maps were selected as the most suitable base map to digitize. The relative high accuracy of the positions of field boundaries and the convenience of being able to use the National Grid were advantages that far outweighed any thoughts of digitizing the photocopied reproductions of the tithe map provided by the National Library of Wales. All spatial data could be recorded using the same co-ordinate system for the sake of consistency and compatibility. However, it must be underlined that the digital tithe map is not a 'true' representation of the original document.

Field boundaries on the 1:10,000 Ordnance Survey maps were input using ARC/INFO digitizing module and a pen plot produced on film to the same scale as the tithe map. Editing of the plot to match the tithe map was carried out using simple graphical techniques. The apportionment information on owner, occupant, field name, state of cultivation, acreage and tithe rent-charge were entered into a spreadsheet during the map production phase.

One of the immediate benefits of having the tithe data in a GIS is the ability to display the data. Varying the classification intervals, colour sequences and adjusting scale are no longer time consuming and error prone tasks. Information on the 'state of cultivation', tithe rent-charge and land tenure can be displayed very effectively.

Figure 3 therefore provides a very clear though not necessarily reliable picture of the distribution and pattern of agricultural land use as classified in the 'state of cultivation' column in the apportionment. A summary of statistics is provided in Table 1 for the main cultivation types as contained within the apportionment. Examination of the land use is made difficult by the broad definitions of land use given by the commission to the tithe surveyors and also the subsequent variations in their interpretation of them. What constitutes 'arable' or 'pasture' varied from place to place and differs from modern interpretations. As Kain and Prince warn, 'Although what tithe valuers recorded as arable may not have been what modern surveyors would record as arable, we may be fairly sure that it was what local *contemporaries* would have understood by the term'.[6] According to the commissioners, those lands that were ploughed within the previous three years for crops or fallow were to be classed as arable. Those lands not ploughed were to be classed as grass. Kain and Prince provide substantial evidence of potential pitfalls in interpreting arable land use, particularly in the west of England and Wales. Here, longley pastures are often classed as arable. They indicate 16 different definitions adopted by William Hoskins, an assistant tithe commissioner for Pembrokeshire, used to describe long-leys in Pembrokeshire. As a result significant tracts of land are classed as arable even though they may be ploughed only once in 10 years. What constitutes 'pasture' or 'arable' is therefore not unequivocal. The distinction between permanent grassland and rotation grasses is also not clear-cut. This varied from surveyor to surveyor. These deficiencies must

[6] Kain and Prince, *Tithe Surveys*, p. 140.

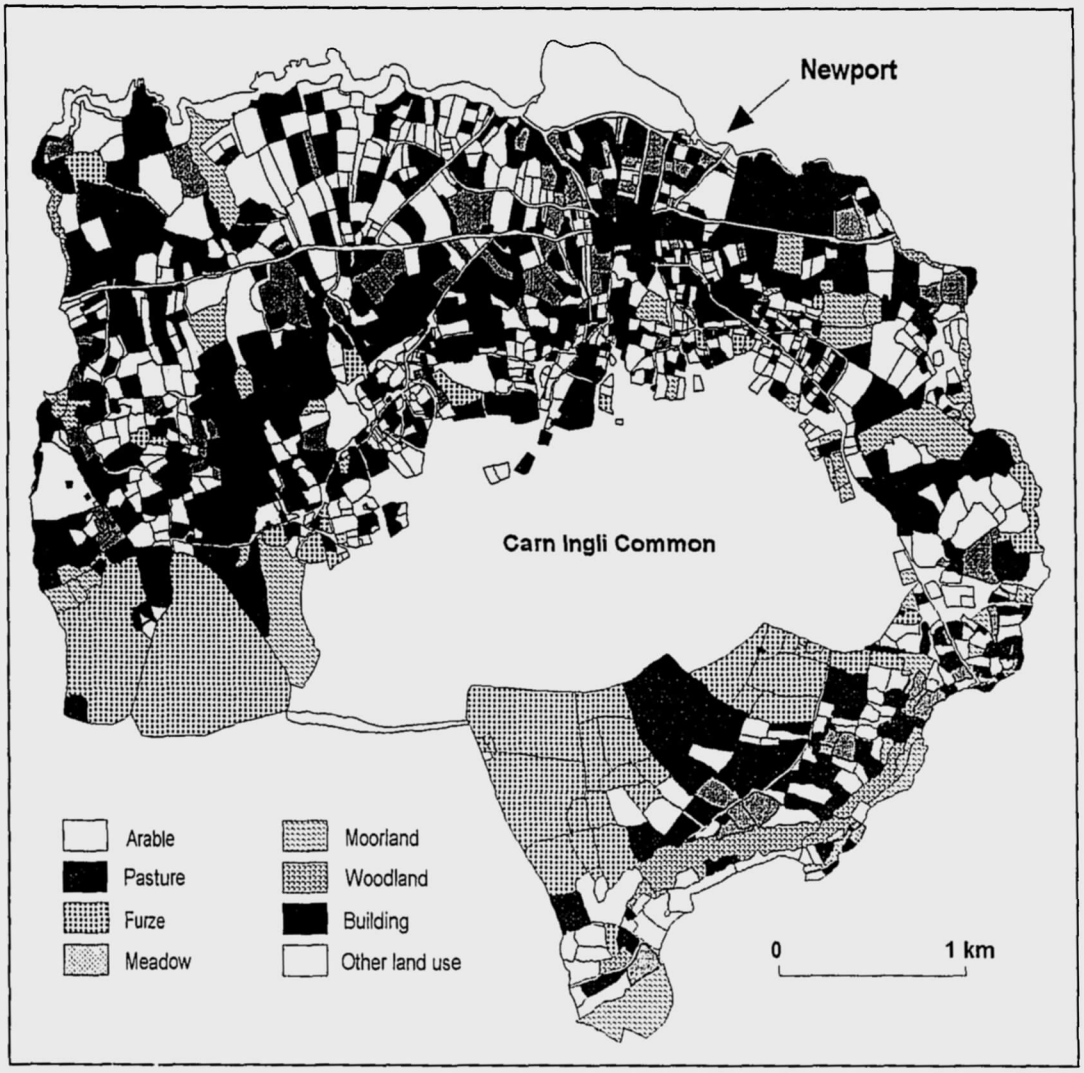


FIGURE 3
State of cultivation as recorded by the tithe survey.

be borne in mind when we consider the land use map.

The most striking feature of the map is the large tract of common land that provided grazing for the commoners of the parish. The vast majority of the common land is contained within the area known as Carn Ingli Common at the centre of the parish. Given its central location and sheer size, the common would have been an important feature of the agricultural practices of the parish.

III

The possibility that the tithe rent-charge might be used as an indicator of agricultural productivity was considered by Chiplen in his study of the rural landscape of Blackmore Vale in Dorset.[7] He suggested that the variations in tithe rent-charges appear to be very closely related to soil fertility and detailed maps on a field-by-

[7] R F J Chiplen, 'The rural landscape of the Blackmore Vale *circa* 1840', unpublished University of Exeter MA thesis, 1969.

TABLE 1
Summary statistics for selected land use types

Land use type	*Fields*	*Acreage*	*Percentage land use*
Arable	496	797.75	17.32
Common	7	1223.74	26.57
Cottage	30	28.69	0.62
Furze	19	45.03	0.98
Garden	21	4.16	0.09
House	109	64.40	1.40
Meadow	89	210.57	4.57
Moory pasture	51	202.20	4.39
Pasture	474	1117.57	24.26
Pasture/furze	23	309.61	6.72
Wood	12	84.36	1.83

field basis showing rent-charge might prove a useful exercise and indicate areal differences. Subsequent research has tended to concentrate on the use of the tithe file data in order to determine the broad pattern of agricultural productivity at the county scale. Gambier assessed the value of using the tithe rent-charge as a measurement of agricultural production using Dorset as her case study area.[8] Tithe data is viewed as particularly significant as there are few other sources for measuring agricultural production before 1866.

The overarching assumption is that the apportionment of the tithe rent-charge varied according to the productivity of the land. As there is no contemporary evidence to corroborate the tithe rent-charge, it is difficult to prove that this was in fact the case. However, there is sufficient anecdotal evidence from the tithe file for Newport and tithe files examined elsewhere by Gambier that productivity was a very important factor in affecting the rent-charge levels. At Newport, the assistant tithe commissioner and several valuers make reference to the varying state of cultivation within the parish, most notably the poor state of cultivation on land recently enclosed from the common. Reference is also made to the poor condition of the roads and that this should be taken into account in the assistant commissioner's calculations of the tithe rent-charge. However, though these variations in the quality of the land were noted during the deliberations on the global tithe rent-charge for the parish, we have to assume that the apportioning of the rent-charge to individual fields was conducted with similar consideration for variations in land quality. Mistakes by apportioners did occur as the apportioners and valuers were working sometimes under extreme pressure.[9]

A map of the tithe rent-charge per acre is provided in Figure 4. The areas recorded in the tithe apportionment have been used for the calculation of the rent-charge per acre. The pattern of rent-charge does confirm at least that the apportionment of rent-charge was not random. The common, where no tithe was levied, is clearly distinguishable at the centre of the parish. In addition, the map clearly shows a marked decay in rent-charge per acre with increasing distance from Newport. The decline is sharpest to the south of the settlement and more gradual from east to west. Pockets of higher rent-charge are evident towards the western edge of the parish and to the south of the common where the small settlements are all isolated from Newport.

Figure 5 shows the rent-charge for arable and pasture land for samples taken every 100 m along a transect from the western edge of the parish to the town of Newport running parallel to the main Newport to Fishguard road. Each sample consists of the average rent-charge for pasture and arable

[8] J R Gambier, 'Tithes, tithe commutation and agricultural improvement: a case study of Dorset *c* 1700–1850', unpublished University of Exeter PhD thesis, 1990; and J R Baker (formerly Gambier), 'Tithe rent-charge and the measurement of agricultural production in mid-nineteenth century England and Wales', *AHR*, 41, 1993, pp 169–75.

[9] Evans, *Tithes: Maps, Apportionments*, p 23.

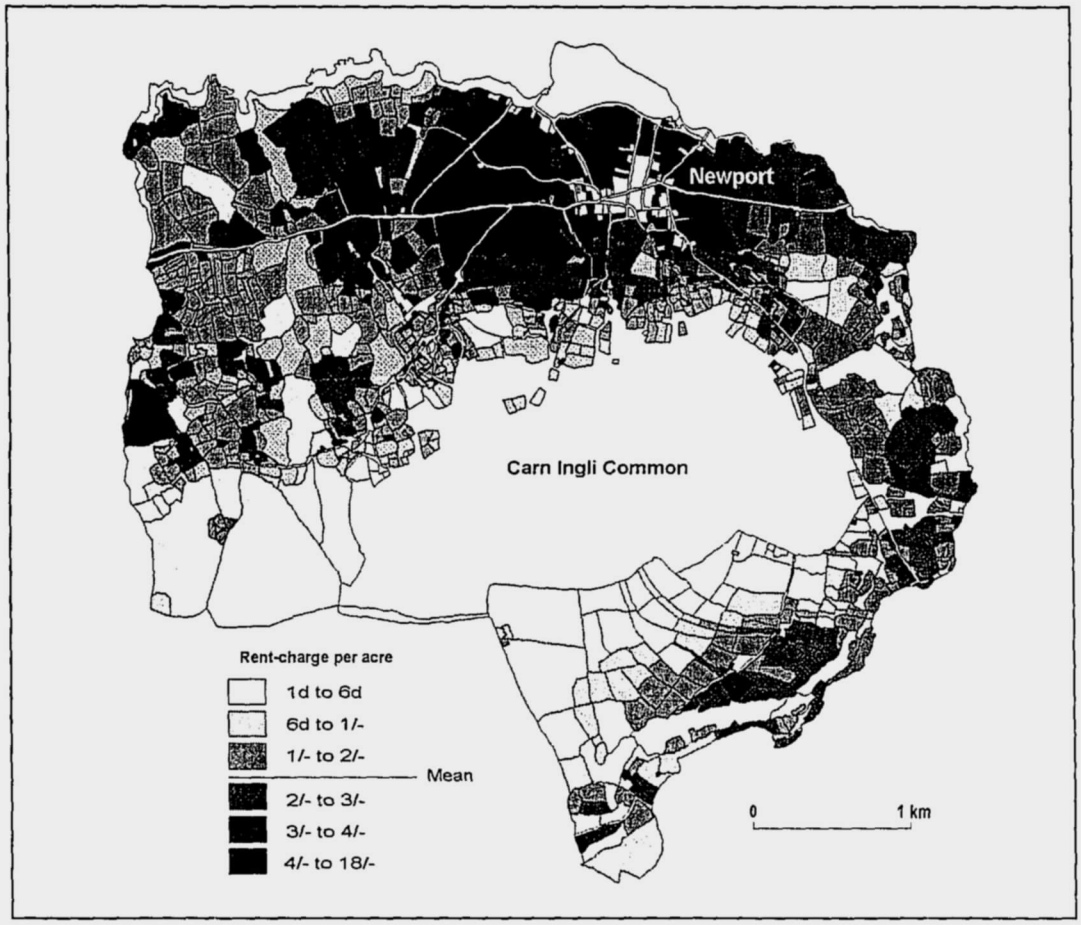


FIGURE 4
Tithe rent-charge per acre.

land use categories for an area 100 by 500 m. It clearly shows that both arable and pastoral land uses at least double in tithe from west to east towards Newport. At this stage it is tempting to suppose that this trend of distance decay is largely determined by the distance of fields from the labour supply and market provided by Newport. However, such an assumption does not take into account environmental and cultural factors.

IV

Landowners typically include a wide range of people from the landed proprietors to yeomen or freeholders with farms to let or farmers occupying their own farms. By the time of the tithe survey of Newport the vast majority of the land was owned by a few individuals (Figs 6, 7a and 7b, and Table 2). The apportionment lists 73 landowners, but the majority of the land (93 per cent) is in the hands of only 13 owners.

We are fortunate that the histories of the two important families in this part of Wales, the Lloyds of Bronwydd and the Bowens of Llwyngwair, are well documented.[10] Both Thomas Lloyd and

[10] P B Morgan, 'Bronwydd and Sir Thomas Lloyd', *Nat Lib Wales Jour*, 23, 1983, pp 377–405; F Jones, 'Bowen of Pentre Ifan and Llwyngwair', *Pembrokeshire Hist*, 6, 1979, pp 25–57.

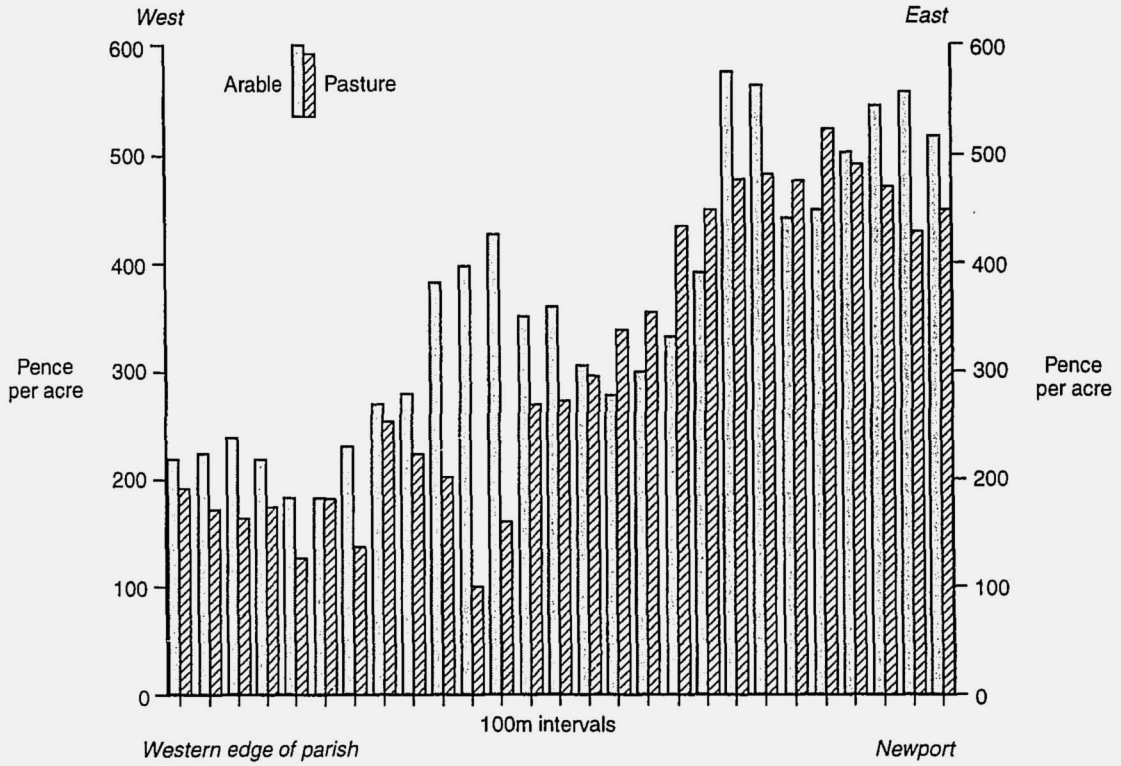


FIGURE 5
Tithe rent-charge per acre along a transect from the western edge of the parish to the edge of the village of Newport.

TABLE 2
Number of fields, total acreage and percentage of land owned by those owning more than 1 per cent

Owner	*Fields*	*Acreage*	*Percentage*
Common (Thomas Lloyd)	8	1223	26.5
George Bowen	445	1259	27.3
Thomas Lloyd	372	335	7.3
Esther Bowen	74	249	5.4
Revd Daniel Davies	29	239	5.1
Lady Mathias	47	185	4.0
Revd Peter Richardson	24	154	3.3
David Hughes	39	151	3.2
Richard Lobant	42	143	3.1
William Harries	65	81	1.8
Benjamin Evans	41	77	1.7
Trustees of Llangloffan Chapel	23	76	1.7
Revd Llew Lloyd Thomas	31	54	1.2
William Morgan	29	53	1.2
Others	331	327	7.1
Total	1569	4606	

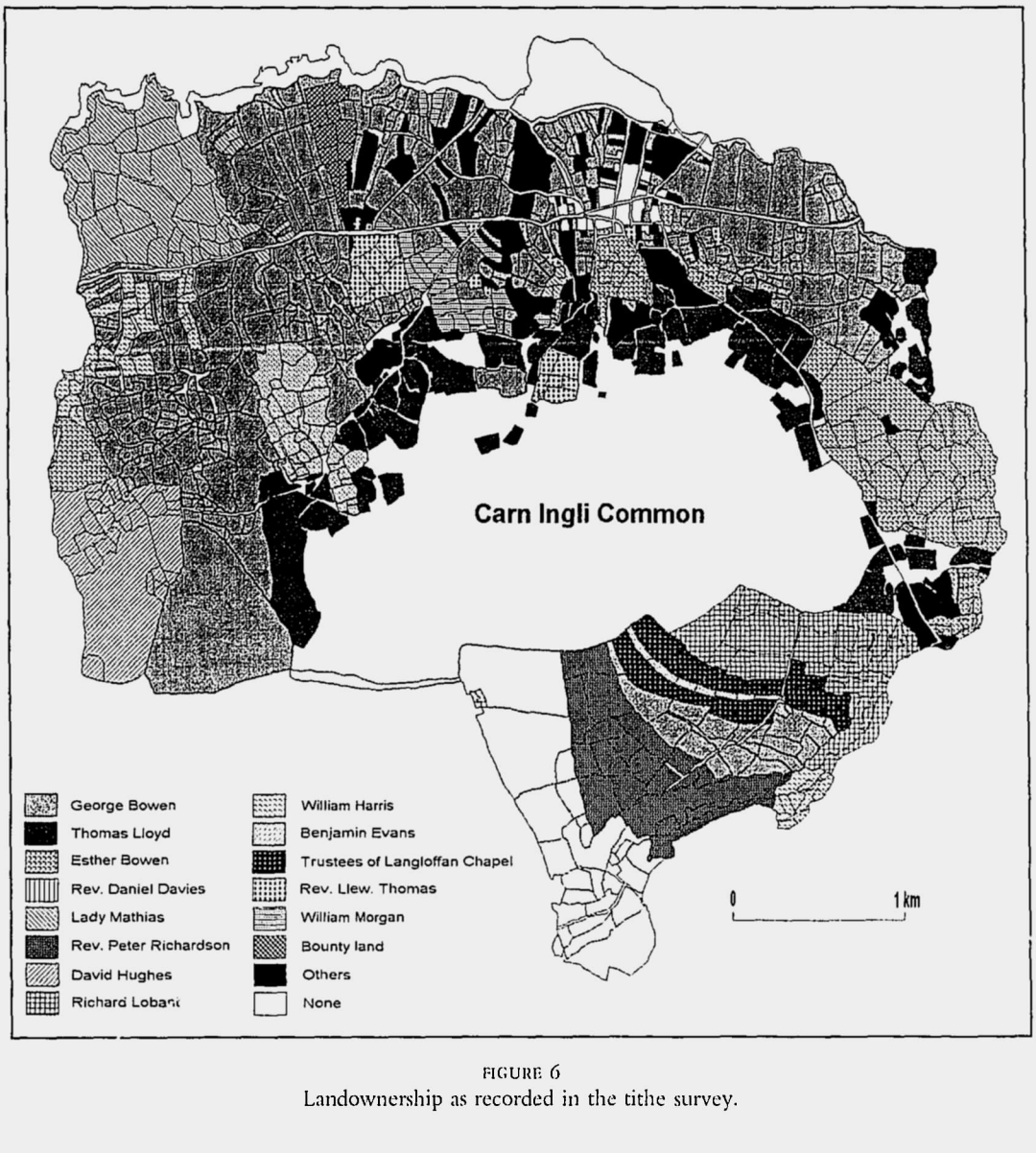


FIGURE 6
Landownership as recorded in the tithe survey.

George Bowen were reputed to be active promoters of new agricultural practices. George Bowen has been described as one of the leading agricultural improvers in the last quarter of the eighteenth century.[11] He was well known as an improving landlord and particularly keen to introduce fertilisers and experiment with the use of seaweed for enriching the soil. He acquired a special machine for grinding bones into powder which he added to seaweed and marl and spread this mixture over the fields 'with most beneficial results'.[12]

Some insight into the mentality of the more typical Pembrokeshire farmer is pro-

[11] D W Howell, 'The economy, 1660–1793', in B E Howells, ed, *Pembrokeshire County History; Volume III: Early Modern Pembrokeshire*, Haverfordwest, 1987, pp 299–332.

[12] Jones, 'Bowen of Pentre Ifan', p 52.

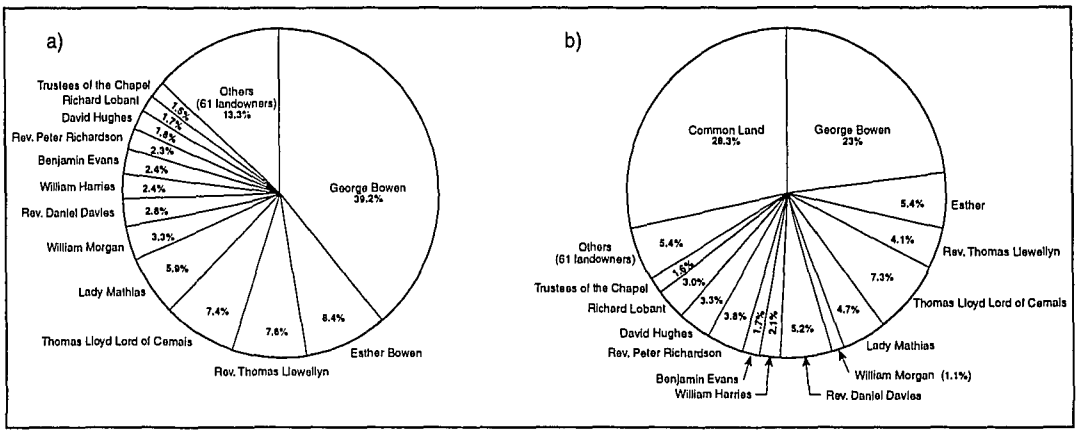


FIGURE 7
A. Percentage of total rent-charge per landowner, B. Percentage of land owned per landowner.

vided by an illuminating description by Sir Charles Hassall in 1794. He writes on the rotation of crops:

> He sows as his own sagacity and caprice dictates, and generally turns his fields out of tillage when he finds by sorrowful experience it will not return him crop enough to pay his expenses. Sometimes he begins with a fallow, then limed and dunged, for
>
> wheat.
> barley.
> oats, or barley.
> barley again, or oates.
> oats
> oats
>
> and ends in weeds and disappointment.[13]

Furthermore, Hassall describes the Welsh plough and is certainly not impressed:

> this is intended to turn the furrow, which it sometimes performs, sometimes not; so that a field ploughed with this machine, looks as if a drove of swine had been moiling in it.[14]

One can sense a certain amount of frustration on the part of Hassall with the prejudice that pervaded the Pembrokeshire farmers against anything new and particularly against adopting English fashions lest their neighbours laugh at them. Though the farmers were aware of new techniques of improving the soil, very few actually implemented them. There are strong grounds perhaps to condemn the conservative nature of the mid-nineteenth century Welsh farmer who was deeply suspicious of innovation. However, the climate and soil conditions generally operated against the growing of heavy root crops in western Wales. Moreover, many small farms were semi-subsistence by nature and the introduction of a basic four-course rotation would reduce by half the amount of arable land devoted to the production of directly consumable food. The high cost of growing turnips and the worry of the crop being destroyed by turnip fly further discouraged its introduction.[15] Some idea of the soil conditions faced by the farmers at Newport is provided by John Johnes, the assistant tithe commissioner, in his letter to the Tithe Commission on 2 February 1844. Enclosures fringing the common were described as:

> very small, that boulders are now to be seen in many instances through the corn, that they grow potatoes, barley-oats generally, that oats are put in as a first crop sometimes, they manure for potatoes or peat and burn, that the cultivation is chiefly

[13] Sir Charles Hassall, *General View of Agriculture in the County of Pembroke with Observations on the Means of its Improvement. Drawn up for the Consideration of the Board of Agriculture and Internal Improvement*, 1794, p 16.
[14] *Ibid*, p 18.
[15] R J Colyer, 'Crop husbandry in Wales before the onset of mechanization', *Folklife*, 21, 1983, pp 49–70.

manual on the common on account of the large stones.[16]

Newport provides a fascinating contrast in terms of its physical characteristics and geographical location to those areas of eastern England noted for agricultural improvements. Theoretically, if there were areas that lagged behind in terms of agricultural improvement then the parish of Newport would be one of them. It is geographically remote from major urban centres and has an average altitude of 97 m (318 ft), with some 41 per cent of the parish above 200 m. It has a mild but wet climate. The soils are predominantly acidic due to the high rainfall and acid parent rock making the seaborne limestone, burned locally, important. The agricultural potential of the land is further restricted by frequently strong salt-laden winds blowing in from Cardigan Bay.

Though the agricultural revolution may not have had the same effect in south-west Wales as it did in England, some of the landlords did attempt to make improvements by land consolidation, promotion of turnpike trusts and enclosing wastes. Employing better farming techniques on the home farm and the support of agricultural societies were attempts to encourage emulation amongst tenants and other neighbouring farmers. If this was the case it is interesting to examine whether we can detect any variation between holdings in terms of their agricultural productivity when all available physical constraints are equal. Theoretically, land of similar potential should not vary significantly in tithe rent-charge from landowner to landowner or occupant to occupant if the same agricultural practices were being carried out. Conversely, if there are variations in rent-charge, can we interpret these variations as due to variations in farming practices? If we compare data for agricultural land within the parish we may gauge the relative influence of owners and occupants by building a multilevel model. Prior to this we need to integrate topographical information within the data set in order to take into account factors such altitude and slope.

V

Ordnance Survey provided the necessary altitude data. This data consisted of a grid of height points at an interval of 50 m for an overall area of 10 × 10 kms. The altitude, slope and aspect values were calculated and then averaged for each field. Clearly, the method of integrating the height data had introduced a variable amount of generalization for each of these variables that depended on the size and topographical characteristics of the field. Nevertheless, given that the tithe data (ie, state of cultivation and tithe rent-charge) were also generalized observations, it was felt that such a smoothing in the data was compatible with the tithe data and the aims of the analysis.

Given the apparent distance decay of the tithe rent-charge from Newport the Euclidean distance from the centre of each field to Newport was calculated using ARC/INFO. Other data sets were added to the database. The final data set includes both the soil survey data for the area and the Census Returns for 1841.[17]

VI

The need to recognize hierarchical data structures where they exist has been the main catalyst in the development of multilevel modelling. In the past it would have been necessary to decide whether to carry out statistical analysis at the level of the owner or at the occupant or field level. In the case of the tithe data, ordinary regression analysis would require that mean

[16] PRO, IR18/14707.

[17] The soil data and census returns, though part of the GIS, were not used in the final statistical analysis in this instance.

values would be calculated for each landowner and environmental factor. Ordinary regression would be carried out to estimate the relationship between mean landowner productivity and mean environmental conditions relating to each landowner's area. Any interpretation of the results cannot take into account the individual occupants and the variations between individual fields. In a field-level analysis an average relationship between tithe rent-charges would normally be estimated using data for all 1568 fields and the variation between landowners would be modelled by using separate terms for each landowner. Such a procedure is inefficient, and inadequate for the purpose of generalization. Conventional multiple regression is viewed as inefficient as it involves estimating many more coefficients than the multilevel procedure and does not recognize that the landowner's fields are a random sample and provides no information about the variation in the underlying population of occupants.

School education can be used as an appropriate example of a population with a multilevel structure. The education system has a typical hierarchical structure with pupils learning in classes, classes being taught within schools and schools being administered by education authorities or school boards. Such a system fits a multilevel structure with pupils assigned to level 1, classes to level 2, schools to level 3 and authorities to level 4. Units within one level are viewed as being nested within units at the next highest level. Each of these levels may be a factor in determining the performance of a child. We would assume that it is at the level of the individual pupil that most of the variation can be explained and that the impact of the other levels will decrease as one goes up the hierarchy. Multilevel analysis would give us an indication of the statistical significance of each level on the performance of the child. Similarly, taking our tithe survey, the level-1 units can be viewed as individual fields that nest into two sets of overlapping level-2 units, that is occupants and owners, forming what is known as cross-classified multilevel structure as demonstrated in the following analysis (Fig 8).[18] If we are to measure agricultural productivity as indicated by the tithe rent-charge per acre we have to examine how this structure affects the measurement of interest. Theoretically, if landownership affects the level of productivity, then tithe rent-charges should vary between landowners. This means that occupants of land owned by the same landowner should be

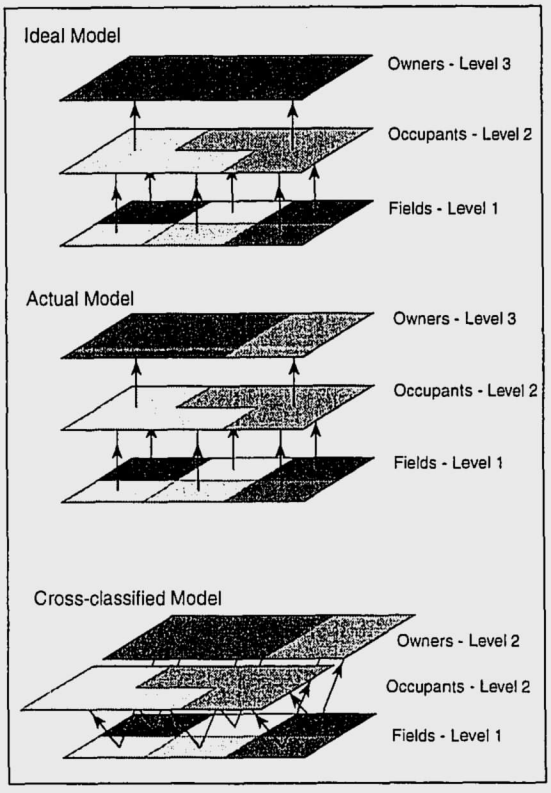


FIGURE 8
Ideal, actual and cross-classified multilevel models. Note that the ideal model differs from the actual model in that occupants are not perfectly nested within owners. Some occupants rent land from more than one landowner thus making the cross-classified model appropriate.

[18] H Goldstein, 'Multilevel cross-classified models', *Sociol Methods and Research*, 22, 1994, pp 364–75; *idem*, *Multilevel Statistical Models*, 1995.

TABLE 3
Results of multilevel analysis

	Model 1 *Estimate* *(standard error)*	*Model 2* *Estimate* *(standard error)*	*Model 3* *Estimate* *(standard error)*
Fixed Terms			
Constant	1.72	1.73	1.75
Logged acres	−0.24(0.01)	−0.26(0.01)	−0.26(0.02)
Height	−0.002(0.000)*	−0.002(0.000)*	−0.002(0.000)*
Slope	−0.007(0.001)	−0.005(0.001)	−0.006(0.001)
Distance	0.00003(0.000)*	0.00004(0.000)*	0.00004(0.000)*
Mixed arable	−0.06(0.03)	−0.06(0.03)	−0.06(0.03)
Buildings	0.11(0.02)	0.10(0.02)	0.11(0.02)
Other land use	−0.10(0.03)	−0.10(0.03)	−0.12(0.03)
Clover	0.02(0.05)	0.02(0.05)	0.02(0.05)
Furze	−0.47(0.04)	−0.48(0.04)	−0.46(0.05)
Meadow	0.18(0.02)	0.18(0.02)	0.17(0.02)
Moor	−0.26(0.03)	−0.24(0.03)	−0.23(0.03)
Pasture	−0.03(0.01)	−0.04(0.01)	−0.05(0.01)
Mixed pasture	−0.24(0.05)	−0.28(0.05)	−0.29(0.05)
Random Terms			
Level 1: Field			
Variance: constant	0.034(0.001)	0.04(0.001)	0.034(0.002)
Level 2: Occupants			
Variance: constant	0.008(0.002)	n/a	0.005(0.002)
Level 2: Owners			
Variance: constant	n/a	0.005(0.002)	0.004(0.002)

* Denotes a standard error estimated to less than three decimal places.

more alike, on average, than occupants of other owners' land. A key aim of this part of the analysis is to determine whether certain landowners are more effective than others in promoting agricultural productivity, taking into account variations in the environmental conditions of the land.

The results of multilevel analyses were estimated using the Ml*n* software package.[19] Table 3 provides summary statistics for the model. Model 1 is a two-level model where fields (level 1) are nested within occupants (level 2), whereas fields are nested within owners (level 2) in Model 2. Both models include a number of predictors (logged acreage, height, slope, distance from Newport and land uses) in an attempt to explain the logged tithe rent-charge as used for exploratory single-level regression models. The constant is allowed to vary at both levels one and two,[20] and thus two variances are estimated for both models: fields and occupants in Model 1, and fields and owners in Model 2. The estimates for all the fixed terms in Models 1 and 2 are statistically significant[21] with the exception of the estimate for the contrast term for field under clover, and stable for both models.

It is the interpretation of the random terms that is important. The variation in tithe-rent charge between occupants is estimated as 0.008 in Model 1 and as 0.005 for owners in Model 2. These level-2 variations are both considerable and statistically significant. It is worth noting that

[19] J Rasbash and G Woodhouse, *Mln Command Reference – Version 1.0*, London, 1995.

[20] K Jones, 'Specifying and estimating multi-level models for geographical research', *Trans IBG*, 16, 1991, pp 148–60.

[21] Using a pseudo-Z test (Jones, 'Specifying and estimating multi-level models').

there is greater variation in rent for occupants (Model 1) than that for owners (Model 2), and accounts for 19 and 11 per cent respectively. However, the majority of the variation (over 80 per cent) is associated with individual fields in both cases.

In an attempt to assess *simultaneously* the contribution of both sets of level-2 units (that is occupants and owners), a cross-classified 2-level multilevel model was also fitted. The fixed terms associated with the level-1 predictors in Model 3 are almost exactly the same as those estimated for Models 1 and 2 and can be interpreted in exactly the same way. It is the estimates associated with the random terms of Model 3 that are interesting. The variation in rent associated with fields (level 1) is estimated as 0.034 and is the same as that estimated for Model 1 and close to that for Model 2, and accounts for 79 per cent of the total variation in the tithe-rent. The estimated variance for occupants (level 2) and owners (also level 2) are close in value (0.005 compared to 0.004), with 12 per cent of the total variation in rent-charge being associated with occupants and 9 per cent being associated with owners. There is a considerable (three-eighths) reduction in the variation in rent-charge between occupants having fitted the cross-classified model (Model 3 compared to Model 1). In conclusion it appears that variations in tithe-rent is greater and more considerable for occupants than owners having allowed for a number of level-1 predictors in the fixed part of models. It seems that the occupant rather than the owner provides a slightly greater source of contextual variation in the tithe rent-charge as one would expect. The occupant does appear to be an influential level suggesting that the holdings varied in their success at coping with environmental conditions.

It is difficult to draw too many conclusions from such statistical analysis given the rather narrow geographical extent of the study area. However, the results are given some credence by Howell's observation that in Pembrokeshire the efforts of the larger landowners were probably largely unsuccessful: 'Furthermore, it may have been that the minor gentry and those large freeholders and tenant farmers below them did most to advance the techniques of agriculture by dint of patient trial and error'.[22] Expansion of the study area to neighbouring parishes would clearly improve the validity of the results and help to identify the varying success of farmers in adapting to the physical conditions of the area.

VII

It is important to appreciate that no single GIS (*sensu stricto*) is necessarily going to provide all requirements. The research carried out here necessitated the transfer of data from one package to another using interchange files. Conversion programs tended to be necessary when moving and transferring graphics data. It is perhaps possible to view ARC/INFO as merely a storage device performing an inventory role. However, though it undoubtedly fulfilled this role, it performed many tasks that were specific to its capabilities. Analytical and integration functions that are generally viewed as distinctive features of GIS, such as reclassifying attributes, dissolving boundaries, merging polygons and topological overlay, were indeed vital to the study. Yet it is the broad functionality of GIS using the broader definition (*sensu lato*) that offers the greatest potential to the historian. The integrative power of ARC/INFO combined with the statistical modelling capabilities of Ml*n* provides enormous scope for similar studies elsewhere.

The success or failure of the application of GIS to this type of study depends on

[22] Howell, 'The economy, 1660–1793', p 315.

the willingness of the researcher not to forsake the traditional methods and techniques appropriate to the analysis of a diverse range of sources. Though methodologically eclectic, adopting a broad landscape approach in combination with the analytical power of GIS offers a formidable overarching methodology for studying the past. It is easy to see GIS packages as magic boxes where speed, consistency and precision are impressive. Its graphic quality is certainly difficult to resist. Perhaps it is wise, however, to adopt the philosophy that as our experience with GIS matures, we realize that GIS should become simply an extension of one's own analytical thinking. After all, it has no inherent answers, only those of the analyst and as Eastman suggests: 'It is a tool, just like statistics is a tool. It is a tool for thought'.[23]

[23] J R Eastman, *IDRISI Version 4.0 User's Guide*, Worcester, Mass, 1992, p 32.

Farming in Depression: Wales between the Wars, 1919–1939

By R J MOORE-COLYER

Abstract

This article attempts to trace the response of Welsh farming to the depressed conditions which prevailed, in the main, throughout the inter-war years. As the pre-existing system of land tenure, dominated by the large estate, gave way to freehold occupation, the new freeholders were obliged to come to terms with economic conditions not markedly different from those prevailing in the closing decades of the nineteenth century. Whereas co-operative activity helped partially to cushion the blow, the principal response was a drastic reduction in arable farming with increasing concentration on dairying, for which market conditions became progressively more favourable. Even so, economic and agricultural depression came perilously close to damaging the fragile cultural and environmental framework of the country, and it was only with financial help and infrastructural change after the Second World War that the farming community returned to some semblance of relative prosperity.

IN THE recollection of many who lived through it, the inter-war period in rural Britain was one in which the proud farming traditions of the mid-nineteenth century, having emerged from the difficult times of the 1880s and 1890s, were finally sacrificed on the altar of political expediency. As ribbon building cast its ugly shadow on the land and the urban masses descended in ever-increasing numbers on the hitherto tranquil countryside, the farming interest found itself fighting a rearguard action to preserve not only its customary rôle, but in some cases its very existence. If it was not a period of unrelieved depression, the general trend of farm prices between 1921 and the early 1930s was downwards, while operational costs, especially of labour, continued steadily to mount. For those who had sunk wartime earnings into buying their freeholds, the difficulty of making enough profit to service management charges posed particular problems, while those who remained as tenants were hard-pressed to rebuild capital reserves even in the easier years of the middle and later 1930s. The whole period, characterized by a low-cost, 'dog-and-stick' approach left farmers with a profound suspicion of officialdom and a distrust of the promises of politicians which for long remained embedded in the farming persona.

During the Great War agricultural production in Great Britain had been closely controlled by the County War Agricultural Executive Committees, and however much these may have been disliked and distrusted by the farming community, the fact remained that the activities of these bodies were essential in a business environment in which farmers first felt the full impact of international affairs on their daily round of work.[1] As the question of post-war policy was debated by a succession of departmental committees, it was generally agreed that the nation's interests would be best served by a concerted attempt to produce more food from home resources, commensurate with acceptable and stable returns to all involved in the farming industry. Producers would ultimately be allowed to operate in an unrestricted market (except in times of national emergency), while every encouragement would be given to establishing a wide-ranging campaign of

[1] E H Whetham, *The Agrarian History of England and Wales, VIII, 1914–1939*, 1978, pp 97–102.

agricultural education under the aegis of the Board of Agriculture.[2]

Any confidence which these proposals raised among the general body of farmers was rapidly to wither in 1921 when the government, faced with a deepening economic crisis and a deficiency payments bill of £20 million, repealed the 1920 Agriculture Act which had promised a four year guarantee of prices for selected items of farm output. Hence the legendary 'Great Betrayal' which was to sour relations between farmers and governments in the decades ahead.[3] 'Betrayal' it may have been, but the simple fact was that the problems faced by farmers from the mid-1920s into the later 1930s were more a reflection of world surpluses of food products than the withdrawal of price guarantees for wheat and oats which, when all said and done, represented only a modest component of total UK agricultural production. As British farming faced the general price fall following the brief post-war boom, the national market became a dumping ground for world food products. By the mid-1920s the UK absorbed some 27 per cent of world wheat exports and 20 per cent of feed grains, while imports of meat, butter and cheese rose by 44, 59 and 28 per cent respectively.[4] Agitation for government assistance and tariff reform fell largely on deaf ears, and beyond minor legislative changes (leading, for example, to the de-rating of farm dwelling-houses), successive administrations were not prepared to see farming as a charge on public funds.[5] Meanwhile, real agricultural costs were rising and with the introduction by the Labour government of the Agricultural Wages (Regulation) Act in 1924, wage levels rose to represent 25–30 per cent of farm costs, so that farmers were increasingly forced to turn their attention to those enterprises giving the highest return to labour input.[6]

Following the Wall Street collapse in 1929 the gloom deepened within an already acutely depressed market for world agricultural products, and over the three years from September 1929 UK farm prices fell by 34 per cent. If the Ministry of Agriculture was sympathetic to the plight of many farmers, the Labour government of 1929–1931 steadfastly refused to take protective measures even though the index of crop prices had fallen to 74 from a 1927–1929 base level of 100.[7] But change was afoot, and against the anti-protectionist polemics of Beveridge and his followers, the 1931 National government, with its powerful Tory phalanx, ushered in a policy based on protection and subsidized support.[8] A series of moves, culminating in the Import Duties Act of 1932 and the Ottawa Agreement of the same year created a range of protective measures embodying built-in preferences for Imperial primary products in the UK market. The theoretical difficulties of reconciling the apparent incompatibility between protection and Imperial preference were circumvented by negotiating trade agreements which ensured that low-price food policies were combined with Exchequer-funded subsidies to help agriculture.[9] In this sense, the problematic circle had been squared; home living costs had been kept low, and a gesture made towards the farming industry.

As *laissez-faire* attitudes were progress-

[2] Cmnd 8095, *Departmental Committee on the Production of Food in England and Wales, 1915*; Cmnd 9080, *Sub-Committee of Reconstruction Committee, 1918*; Cmnd 665, *Royal Commission on Agriculture, Report, 1920*.

[3] E H Whetham, 'The Agriculture Act, 1920 and its repeal – the "Great Betrayal"', *AHR*, 22, 1974, p 48; A F Cooper, 'Another look at the "Great Betrayal"', *AH*, 60, 1986, pp 80–104.

[4] Viscount Astor and B S Rowntree, *British Agriculture: The Principles of Future Policy*, 1938, p 113.

[5] M Tracy, 'Fifty years of agriculture policy', *J Ag Econ*, 27, 1976, p 332.

[6] J Brown, *Agriculture in Britain, 1870–1947*, Manchester, 1987, pp 83–84.

[7] M Tracy, *Government and Agriculture in Western Europe, 1880–1988*, 3rd ed, 1989, p 159.

[8] W H Beveridge, ed, *Tariffs: the Case Examined*, 1931.

[9] T Rooth, 'Trade agreements and the evolution of British agricultural policy in the 1930s', *AHR*, 32, 1985, p 190.

ively abandoned, and guaranteed prices offered for wheat, barley and oats together with a flat-rate subsidy for cattle, further help was given in the form of the 1931 and 1933 Agricultural Marketing Acts, by which marketing boards for milk, pigs, bacon, potatoes and hops were eventually established. Since largely unrestricted Imperial competition and competition from foreign produce subject to relatively low duties would alone give little protection to UK farmers, it was believed that marketing schemes obligatory on all producers would introduce an element of price stability. Ultimately these schemes were viewed by the authorities as largely painless alternatives to full tariff protection.

The various protectionist measures led to increased agricultural production between 1931 and 1939, and although the general price index edged up from 76 in 1933 to 89 in 1937, overseas sources were providing 65 per cent of Britain's food by that year.[10] Effectively, the various limited quotas and tariffs had shifted the bulk of the market away from the foreigner towards the Imperial producer, and although the British farmer had been spared the worst excesses of world competition, he was still obliged to operate under less than favourable conditions. In summarizing the rather bleak picture, and underlining the lip-service paid to the farmer, Malcolm Muggeridge commented laconically:

> If the Preservation of Rural England was a cause which attracted adherents, and sometimes money, the Productivity of Rural England aroused little concern. The Ministry of Agriculture was the grave of the political expectations of its successive occupants. Quotas and bounties and, later, marketing schemes, would not make the soil increase its yield. The harvest was largely pensionable officials, of these a fine crop.[11]

Ashby and Evans' admirable 1944 summary apart, the scholarly literature yields little coverage of Welsh agriculture throughout this troubled period.[12] This is the more surprising in view of the existence of flourishing agricultural departments at the University Colleges of Aberystwyth and Bangor, the coming to maturity of the Welsh Plant Breeding Station, and the successful establishment and expansion of the Welsh Agricultural Organisation Society during the 1920s and 1930s.[13] Scientists and rural economists from these various centres published extensively on agricultural issues specific to the Principality in two somewhat under-utilized sources, *The Welsh Journal of Agriculture* (1925–1943) and *The Journal of the University College of Wales Agricultural Society*, of which the first number appeared around the turn of the century and which continues to run to the present day. In drawing substantially on these sources, together with the agricultural returns and local newspapers, the present article attempts to outline some aspects of the pattern of Welsh agriculture between the wars. The almost total absence of reliable runs of farm accounts for this period precludes detailed analysis at the individual farm level, while the bias towards south-west Wales reflects a combination of agricultural diversity in the south-western counties and the interests and experiences of contemporary writers.[14]

[10] Tracy, *Government and Agriculture*, p 161.
[11] M Muggeridge, *The Thirties*, 1940, p 198.

[12] A W Ashby and H Evans, *The Agriculture of Wales*, Cardiff, 1944.
[13] R J Moore-Colyer, *Man's Proper Study, A History of Agricultural Science Education at Aberystwyth, 1878–1978*, Llandysul, 1981.
[14] Much of the material published in the *Welsh Journal of Agriculture* [*WJA*] between 1925 and 1943 reflects the research interests of the biologists and social scientists working at the University Colleges at Aberystwyth and Bangor and the recently-established Welsh Plant Breeding Station. Analysis of the subject matter of the various articles is highly instructive. Of 401 articles and papers, 31 per cent were concerned with grassland and forage production, 19 per cent with dairying and dairy technology and 7 per cent with sheep and beef cattle. Of the remainder, 10 per cent covered plant pathology, entomology and weed control, while the final 10 per cent reviewed developments in farm management economics and agricultural marketing. There are no obvious changes in emphasis over these subject areas between 1925 and 1943.

I

Any consideration of structural change and developments in farming practice in the Principality needs to be set against a somewhat depressing background of indigenous rural depopulation and the steady decay of the rural craft tradition. 'Day by day, year by year, tree by tree, acre by acre, the old England perishes away' wrote Clough Williams Ellis in 1930, thereby echoing the widely-held view that the inexorable drift of people from the countryside – offset, to some extent, by an inflow of townspeople seeking a rural retreat – represented a haemorrhaging of much-vaunted rural values. Such matters were especially gall and wormwood to the more reactionary elements in the Conservative party who sought to restore the mythical 'old English (Welsh)' peasantry with its alleged natural instinct for patriotism.[15] Yet there was an inevitability to this rural exodus and so long as urban wages remained substantially above those in rural areas, and standards of rural housing, education, medicine provision and social amenities lagged behind those in the towns, the establishment of Rural Industries Boards and other inducements would do little to reverse the trend. Throughout Wales declining rural population in the 1920s was the continuation of a pre-existing trend, so that in the counties of Montgomery, Radnor, Anglesey, Pembroke, Brecon and Cardigan, the 1931 census highlighted an extenuation of a population decline already in existence before 1914. Indeed, such was the economic state of agriculture and rural industry that of all Welsh counties, only those of Carmarthen, Denbigh and Flint returned higher populations in 1931 than in 1921.[16] Concurrent with the decline in the population was the decay of the ancient traditions of local craftsmanship and rural industry and the gradual dissolution of the essentially self-supporting local community.

It is difficult to quantify the effects of such change on patterns of employment and the general Welsh rural economy of the 1920s and 1930s, yet there may be some grounds for arguing that the decay of indigenous rural industry had important psychological effects which framed attitudes towards farming and rural life. As the closely-knit and cohesive fabric of rural society, with its reciprocal duties and obligations began to disappear, it carried away with it the quiet pride and satisfaction characteristic of localism. In so doing, it may have helped to usher in the 'make do and mend' and rather ramshackle approach so characteristic of the 1930s; the view that a relict bedstead would fix a gap in a hedge as effectively as an hour's work with a billhook and hedge knife. Perhaps it was not economic circumstances alone which led to the creeping dereliction spreading inexorably through Wales and much of England so deplored by R G Stapledon and his disciples?[17]

Some aspects of what several academics and ruralist pundits perceived as the increasing scruffiness of the Welsh countryside may have arisen as a direct consequence of an advancing pattern of owner-occupation. The social, political and fiscal reasons for the break-up of Welsh landed estates are beyond the scope of the present article, but the result was that in Wales as a whole, owner-occupation advanced from 10 per cent of total acreage in 1909 to 39 per cent in 1941–43.[18] Before the Great War, sales

[15] S B Ward, 'The environmental conservation movement in Britain, 1870–1980', *Acta Museorum Agriculturae*, 18, 1985; D N Jeans, 'Planning and the myth of the English countryside in the interwar period', *Rural History*, 1, 1990; D Lowenthal, 'British national identity and the English landscape', *Rural History*, 2, 1991.

[16] J Saville, *Rural Depopulation in England and Wales, 1851–1951*, 1957, p 48.

[17] See, for example, R G Stapledon, *The Land Now and Tomorrow*, 1935.

[18] This compared with 12 and 33 per cent in England (Ashby and Evans, *Agriculture of Wales*, pp 90–99). For the decline of the Welsh estate see, *inter alia*, J Davies, 'The end of the great estates and the rise of freehold farming in Wales', *Welsh Hist Rev*, 7, 1974; R J Moore-Colyer, 'The gentry and the county in nineteenth century Cardiganshire', *Welsh Hist Rev*, 10, 1981.

had primarily comprised outlying land, but between 1918 and 1922 virtually every major Welsh landowner placed at least part of his estate on the market, in a manner which mirrored the pan-European redistribution of land described by J A Venn in 1933 as the 'Green Revolution'.[19] Having no legal security of tenure, and fearful of outside buyers subjecting them to quantum increases in rent (or even eviction), tenants flocked to gain liberty and status by purchasing their holdings. Given that two-thirds of Welsh farmers in 1926 had no other occupation than that of residents or workers on the parental farm, and that three-quarters of them were farmers' sons, their anxiety for future security on the land was hardly surprising.[20] Thus, when the Rhagat estate in Merionethshire was sold in 1920, almost all farms were purchased by tenants, a pattern repeated in the case of the Glanusk and Trefalwyn estates in Breconshire and Denbighshire. Desperate to cling to their holdings under any circumstances, tenants often bid grossly inflated prices of between 30 and 40 years purchase, when a figure of 20 years purchase would have been considered a more appropriate valuation.[21] Under normal circumstances sitting tenants were given first refusal to purchase and offered the opportunity to reach a private agreement with the estate office, in which cases sales proceeded without acrimony.[22] But where a landowner failed to come to terms with his tenant and opted to sell by auction to the highest bidder, local rivalries and tensions could lead to threats, and even acts of violence. When a butcher outbid a sitting tenant during the course of the sale of the Velinnewydd estate at the Castle Hotel, Brecon, in December, 1919, he was dragged from the auction room and violently assaulted by a group of tenants in an action which sparked off bitter local controversy.[23] In like manner, on those rare occasions when tenants were sent notice to quit to ensure a freehold sale, local pressure was brought to bear on an estate and its agents. This occurred in the case of the sale of the Camrose (Pembrokeshire) estate when tenants gathered at the auction were exhorted by the secretary of the Pembrokeshire Farmers' Union to demonstrate their collective loyalty by refusing to bid for farms. The secretary's intervention resulted in the withdrawal of notices to quit by a somewhat chastened Camrose agent and, incidentally, a steep increase in Farmers' Union membership.[24]

The new freeholders encountered serious difficulties in the inter-war years. To many, the prices paid for their farms had not seemed excessive relative to the inflated prices of agricultural outputs in 1918–1920 and a mortgage rate of between 4 and 6 per cent, but as the index of agricultural prices began to decline against an increase in the real value of wages, recent purchasers found repayment of mortgages increasingly burdensome.[25] The necessity to raise mort-

[19] J A Venn, *The Foundations of Agricultural Economics*, 1933, p 100.

[20] A W Ashby and J M Jones, 'The social origin of Welsh farmers', *WJA*, 2, 1926, p 19. Life may have been difficult on the smaller farm, yet as one farmer put it to Alwyn Rees in the 1940s, 'Cyw a fegir yn uffern, yn uffern y ayn fud' (A chicken reared in hell will want to stay in hell).

[21] Davies, 'Great estates', pp 199–201. Of 717 sales studied by Ashby and Howell in 1927, average per acre price reached £19 14*s* 0*d* between 1915 and 1925, with the highest prices being realized in the counties of Glamorgan, Monmouth and Pembroke, and the lowest being returned for Cardiganshire and Carmarthenshire. To some extent, farm size reflected price per acre, with farms of less than 50 acres fetching £30–£60; 50–150 acres, £15–£25, and those of over 150 acres realizing £4–£22, depending upon land quality: (A W Ashby and J P Howell, 'Rents and prices of agricultural land in Wales, *WJA*, 3, 1927, pp 6–22.

[22] As in the case of the Cefn Mably estate in Glamorgan where farms not purchased by sitting tenants were offered by auction and acquired either by local businessmen as investment opportunities, or by former tenants keen to extend the acreage which they had already bought privately: P Riden and K Edwards, *Families and Farms in Lisvane, 1850–1950*, Merton Priory Press, 1993, pp 56–88.

[23] R Phillips, *Tredegar: The History of an Agricultural Estate, 1300–1956*, Newport, 1990, p 222.

[24] W R Morgan, *A Pembrokeshire Countryman Looks Back*, Tenby, 1988, p 80.

[25] R U Sayce, 'Further queries and suggestions for the study of local history in Powysland', *Mont Coll*, 57, 1962, p 187.

TABLE 1
Percentage distribution of Welsh farms according to size class

Size class (acres)	*Percentage distribution of holdings*		*Percentage of cultivated land area*	
	1913	*1939*	*1913*	*1939*
1–5	16.8	13.4	1.3	1.0
6–20	31.5	30.2	7.8	7.3
21–50	21.6	24.1	16.0	17.5
51–100	16.9	19.5	26.9	30.0
101–150	7.4	7.7	19.7	20.0
151–300	5.3	5.8	23.0	19.7
300+	0.5	0.4	5.3	4.5

Source: A W Ashby and H Evans, *The Agriculture of Wales*, Cardiff, 1944.

gage repayments precipitated a withdrawal of capital from the business of farming to the business of landowning, and those who had bought in a period of relative prosperity saw their investment decline sharply in value during the deflationary 1920s. Indeed, some owner-occupiers abandoned the struggle and sold out to their neighbours, so that the total number of holdings in the Principality fell from 63,547 to 58,024 between 1913 and 1939.[26] Yet most farmers, large and small, tenants or freeholders, survived the deflation as a result of progressive belt-tightening and the exploitation of unpaid (or underpaid) family labour.[27] In some cases, the availability of extensive upland rough grazings (not included in the statistics before 1960) served as a safety valve, while the smaller farmer in the scenically-attractive lowland areas was able to exploit the growing tourist trade by taking in paying guests.[28] However, as Table I suggests, if the generally adverse economic conditions of the 1920s and 1930s led to a reduction in total holding numbers, they had little real effect on the distribution of farms within different size classes. The traditional pattern of essentially small farms continued to persist until the outbreak of the Second World War with some two-thirds of total recorded holdings encompassing less than 50 acres, although these accounted for a mere quarter of the farmed acreage.

In an agricultural economy based essentially on small farming units reliant, to a great extent, on family labour and possessed of limited capital reserves, mutual co-operation in a whole range of husbandry activities had long been enshrined in the Welsh farming ethos.[29] Whereas co-operation in haytime, harvesting and other activities might be seen to have acted as a disincentive to individual initiative, it was nevertheless fundamentally important to the operation, if not the survival, of many smaller farming enterprises, and at the turn of the present century progressive opinion was of the view that much progress could be made by building on the co-operative tradition. However, despite valiant efforts by various bodies to establish co-operation in both input acquisition and product marketing, co-operative organization was of strictly local, and often short-term impor-

[26] Data on holding numbers in the agricultural statistics and elsewhere need to be interpreted with some caution since many farms were worked jointly, while others (especially among the smaller acreages) were held by people whose main livelihood lay outside farming. This was particularly the case in locations close to industrial areas where miners, publicans, butchers and other workers frequently held small farms, either as owners or tenants. In the upland Montgomeryshire parish of Llanfihangel yng Ngwynfa where there were 114 holdings in 1939, 23 of the 32 occupiers of farms of less than 20 acres had by-employments: A D Rees, *Life in a Welsh Countryside: A Social Study of Llanfihangel yng Ngwynfa*, Cardiff, 1950, p 23. Moreover since the returns ignored holdings of less than 1 acre, occupation of small areas of land by 'non-farmers' is probably consistently underestimated.

[27] Davies, 'Great estates', p 205.

[28] J M Thomas, *Yesterday's Gower*, Gomer Press, 1982, pp 118–19.

[29] See, for example, R J Moore-Colyer, 'Crop husbandry in Wales before the onset of mechanisation', *Folk Life*, 21, 1983, pp 49–70.

TABLE 2
Quinquennial areas of farmed acreage (thousands of acres)

Period	*Rough grazing*	*Permanent pasture*	*Total arable*
1915–19	1379	2111	854
1920–24	1541	2049	781
1925–29	1645	2116	659
1930–34	1724	2120	628
1935–39	1772	2139	571

Source: Agricultural returns, 1915–1939.

tance as far as the selling of farm output was concerned, and to all intents and purposes a state of marketing anarchy would await the setting up of the Marketing Boards in the 1930s.[30]

II

The years between the wars witnessed a steady, but readily perceptible, change in the overall pattern of the farmscape as the acreage of arable cropping declined in the face of an increase in the areas of rough grazing and permanent pasture (Table 2). Consonant with the reduction in arable and pulse crops, wheat as a proportion of the total fell by half to 8.5 per cent by 1939, while the oat acreage expanded to comprise 70 per cent of the total by the end of that year. Cereals were a relatively minor component of farm income (with, for example, only 25 per cent of wheat, 33 per cent of barley and 15 per cent of oats being sold off Welsh farms in 1923), but they were, nevertheless, an essential adjunct to livestock production.[31] Despite the high unit costs involved in cultivating small acreages on the average livestock farm, oats in particular, with their tolerance of acidic soil conditions, were regarded by many as a *sine qua non*.[32] This applied equally to roots and green crops and as the acreage of turnips and swedes fluctuated around 40 and 50 per cent of the total in this category, green crops (especially kale and fodder cabbage) advanced from 7 per cent in 1915 to 22 per cent in 1939, in parallel with the dramatic expansion of dairying throughout the Principality. Potatoes, meanwhile, grown for domestic (and residually livestock) consumption on most lower-lying farms, represented one-quarter of the root/green crop acreage over the whole period. In Pembrokeshire, however, where pioneering work on the early crop undertaken by W E D Jones, the county agricultural organizer, was yielding fruit by the mid-1930s, potato production came to assume major importance in the farming economy.[33] At the local level, the husbandry of horticultural and market garden crops was also given some encouragement with the passing of the Horticultural Produce (Emergency Customs Duties) Act of 1931. Sheltered valleys on the coastal belt, blessed with a seasonal tourist trade, were ideal for this purpose, and the seaside town of Aberystwyth, for example, received regular locally-grown supplies of peas, carrots and brassicas during the summer season. But this was, of course, a purely seasonal and very small-scale trade, and for much of the year most of Wales relied on external sources of supply for its vegetable and salad foods.[34]

Inevitably, though it was the grassland acreage of Wales which provided the main-

[30] For cooperation, see J Jones-Davies, 'The history of the agricultural cooperative movement in Carmarthenshire', *Carm Antiq*, 1, 1942, pp 40–42; J M Jones, 'A review of agricultural cooperation in Wales', *WJA*, 6, 1930, pp 61–62; J M Williams and D Davies, 'Agricultural cooperative societies in Wales: a review of three years trading in farm requisites', *WJA*, 10, 1934, pp 64–74; W H Jones, 'Agricultural requisites societies in Wales', *WJA*, 15, 1939, p 27; T J Jenkin, 'The expression of Welsh agriculture', *JUCW Agric Soc*, 24, 1932, pp 5–7; W H Jones, 'Cooperative marketing of farm products in Wales', *WJA*, 15, 1939, p 21; W H Jones, 'Agricultural cooperative societies in Wales, 1933–1935', *WJA*, 13, 1937, p 109.

[31] A W Ashby, 'The place of cereal growing in Welsh agriculture', *WJA*, 2, 1926, p 40.

[32] J M Jones, 'Capital and equipment on some Welsh farms', *WJA*, 2, 1926, p 88.

[33] D Rees, *Rings and Rosettes; The History of the Pembrokeshire Agricultural Society, 1784–1977*, Gomer Press, 1977, pp 126–27; W H Jones, 'Farm productivity in Pembrokeshire', *Agriculture*, 60, 1954, p 334.

[34] J A Smith, 'The production and marketing of market garden produce in the Aberystwyth area', *WJA*, 11, 1935, p 61.

stay of the economy and yielded the bulk of farm income in terms of meat and dairy products. In the UK as a whole, improvements in grassland husbandry had lagged behind the major advances in arable agronomy of the mid-nineteenth to the early twentieth century, and by the end of the Great War grassland management had changed little from that prevailing a hundred years previously. Of the 4.5 million grassland acres of Wales in the early 1930s, more than half were dominated by *Agrostis* and *Molinea/Nardus* associations of low potential productivity, while much of the remainder, where free from the ravages of bracken, suffered from inadequate or neglected drainage.[35] Although government drainage grants had been available since the mid-1920s, these were largely ignored by a landowning and farming population in the grip of depression, and as ditches filled and existing field drains became blocked, the state of Welsh grassland became progressively worse.[36] T J Jenkin, one of the early members of the young Welsh Plant Breeding Station, and eventually its director, complained bitterly of the slovenly appearance of Welsh farms and of the seeming lack of pride of their occupants in their vocation. He told the University of Wales Agricultural Society in 1931:

> I wish that through the influence of the members of this society pride in farming as a vocation with the love of good farming for its own sake could be reawakened in those districts where it has become torpid, and a keener sense of the artistic and the aesthetic cultivated. Our country is a beautiful one and we have no right to make it ugly.[37]

Ugliness, in the view of Jenkin and others of the Plant Breeding Station, was equated with bad farming, and with a zeal almost messianic in its intensity they begged, cajoled and even coerced farmers to come and view the remarkable advances in grass breeding and grassland management effected on the station and in its environs.[38] Working closely with the University Department of Agriculture at Aberystwyth, scientists at the Plant Breeding Station demonstrated conclusively that by combining the use of the new grass and clover varieties with a programme of drainage and liming, practically all the *Agrostis* dominated pastures and much of the *Molinea/Nardus* uplands could be brought into a productive state with relatively little effort. In terms of the national economy this would ultimately result in massive savings in food imports, while at the local level only a thriving pastoral agriculture would facilitate the maintenance of services and amenities and thus stem the flow of outward migration from rural Wales. Time and again R G Stapledon descanted on the virtues of grassland improvement, pointing out that provided something were done about the wholly inadequate farm infrastructure and lamentable rural communications, the stocking capacity of Welsh grasslands could be virtually doubled at modest capital cost, bringing with it immense benefits to the agricultural economy. The farmers were certainly impressed and, shepherded by their county agricultural organizers, they descended by the charabanc load on the experimental plots around Aberystwyth. The *Cardigan and Teifiside Advertiser* regularly reported on these visits throughout the 1920s, and as farmers enthused over the grazing trials, seed production studies and grassland management exercises they '... proved to the world that they were a go-ahead lot of people ... leaving no stone unturned to save themselves from economic ruin'. Moreover, in learning what they could do for themselves without government help, '... how much keener they were to acquire knowledge and wisdom in regard to their

[35] R G Stapledon, ed, *A Survey of the Agricultural and Waste Lands of Wales*, 1936, p 142.
[36] J M Jones, 'Welsh agriculture in transition', *Agriculture*, 60, 1954, p 86.
[37] Jenkin, 'The expression of Welsh Agriculture', pp 10–11.
[38] For details see, Moore-Colyer, *Man's Proper Study*, *passim*.

profession than tradition would have them believe'.[39]

But like all farmers before and since, the Welsh husbandman of the 1920s rarely shifted his focus from his bank balance. Stapledon may have decried the 'does it pay?' argument, but to a man with a mortgage, farming in economically depressed conditions, keeping costs to a minimum was of the utmost importance. Too often in the past had farmers in the Principality been persuaded to undertake expensive 'improvements' demonstrated on the home farms of the gentry, only to find that these bore little relation to the practical and economic realities of their own holdings.[40] This being so it is hardly surprising that while they applauded the efforts of Stapledon and his colleagues, they were chary of investing in their own grasslands merely to produce more food for an already over-supplied market. Accordingly, there was little general improvement in grassland productivity before the later 1930s. By this time, however, the dramatic results of the Cahn Hill Improvement Scheme near Aberystwyth were available for all to see, and government help became available in the form of the 1937 Agriculture Act by which subsidies of 50 and 25 per cent on the cost of lime and basic slag were introduced. This, and the prospect of war – perceived by many farmers as the road to salvation – stimulated some, particularly those with dairy cattle, to activate programmes of grassland renovation.[41] Nevertheless, despite wartime financial incentives to promote land drainage, the plough-up campaign and ley farming, many parts of Wales still retained a distinctly neglected and desolate appearance by the close of hostilities.[42]

Throughout the first three decades of the present century, British consumers were not only demanding a wider variety in their meat diet, but were eating progressively more chilled or frozen meats from Australia, Argentina and elsewhere.[43] As home meat supplies fell from 82 per cent of consumption in the late 1870s, to 40 per cent between 1924 and 1927, frozen or chilled imports provided some three-quarters of the market in industrial south Wales, with inevitable effects on the traditional store cattle trade so important to the farm economy.[44]

The eventual repeal, in 1922, of the long-standing embargo on the importation of cattle from a variety of overseas countries, although favourable to the arable/beef producers of the English midlands and East Anglia, further acted against the interest of the store cattle producer of the west. In reality, the relatively small numbers of imports had only marginal consequences on the overall economics of the trade, yet the debate surrounding the rights and wrongs of permitting the ingress of foreign store animals exposed the dominance of the larger, arable-based farmer over the smaller, livestock-producing sector of the economy.[45] But prior to the wholesale improvements in grassland husbandry following the Second World War, Welsh livestock men had little alternative but to continue to produce store cattle. It is true that in some of the more favoured areas pasture renovation had enabled the production of finished cattle, so that farmers could secure both breeder's and feeder's margin and reduce their reliance upon

[39] *Cardigan and Teifiside Advertiser* [*CTA*], 30 June 1922, 9 Sept 1927, 29 June 1928, 11 April 1929.

[40] R J Moore-Colyer, 'Early agricultural societies in south Wales', *Welsh Hist Rev*, 15, 1986.

[41] A R Staniforth, 'Fifty years of agricultural progress in Great Britain', *Agric Progress*, 50, 1975.

[42] J Sheail, 'Elements of sustainable agriculture: the UK experience, 1840–1940', *AHR*, 42, 1995, p 188.

[43] F Capie, 'Preferences in meat in England and Wales, 1920–1938', *Bull Econ Res*, 28, 1976, p 93.

[44] R Duncan, 'The demand for frozen beef in the UK, 1880–1940', *Jour Agric Econ*, 12(1), 1956, p 83.

[45] S Moore, 'The real "Great Betrayal"? Britain and the Canadian cattle crisis of 1922', *AHR*, 41, 1993, pp 156–60.

demand from the English grazier. Nonetheless, stores still dominated the market. Moreover, store production tended to follow the seasonal pattern of grass growth, and in view of the essentially pastoral nature of the economy, the lack of balance between grassland and arable made continuity of supply a constant problem.[46] But, farmers attempted to make the best of things, and throughout the inter-war years they progressively reduced the ages at which their stores were sold, consonant with increased consumer demand for smaller, leaner animals. Thus the 3 year old 'runt', for so long the principal bovine 'export', had practically disappeared from Welsh farms by the outbreak of the Second World War.

The marketing of these store cattle might best be described as anarchic, or even shambolic. The trade remained largely in the hands of dealers (many of whom were farmers who could no longer survive in a full-time capacity), and since there were far too many of these for the volume of trade, there was a tendency for 'rings' to be formed. By so limiting the number of buyers in a given district, dealers' rings effectively reduced competition and forced down prices. Dealers buying from local farms, of course, secured the best available animals, while inferior material found its way to the local auction markets of which there were more than 2000 in Wales in 1927.[47] Whereas the Livestock Marketing Act of 1937 enabled growing numbers of finished animals to be despatched to abattoirs for sale on a grade and dead-weight basis, individual Welsh producers could rarely offer sufficient cattle to make up an economically viable consignment so that their stock had to be bulked-up with those of other farmers before being carried to distant slaughterhouses. Cattle marketed in this way generally yielded higher returns than those realized at the fatstock auctions where, once again, dealers ring operations ensured that even a marginal increase in supply would cause prices to plummet.[48]

Many of the problems confronting the marketing of cattle were paralleled in the sheep sector which, although of major significance to the hill farm, was also of growing importance on the lowland. While total sheep numbers declined towards the close of the Great War as farmers were persuaded to sell breeding stock for slaughter in response to rapid price increases, flock numbers began to recover throughout the 1920s and 1930s from 3.3 million in 1920 (the lowest level since 1895), to a peak of 4.6 million in 1939 by which year there were some 535 sheep for every 100 cattle in the Principality (Table 3).

Efforts to promote pedigree recording and flock improvement, sponsored by the Welsh Mountain Sheep Breeders Association (founded in 1904) and underpinned by Ministry of Agriculture grant aid channelled through local breed improvement societies, had led to some limited advance in overall flock quality by 1918. Even so, it was widely averred that among the general body of farmers there was an unerring tendency to select the cheapest of rams regardless of quality, and to adopt a deplorably slapdash approach to the culling of ewes.[49] But if breed improvement was making little progress, a steady advance in the quantity and quality of nutritional provision on the lowland farm offered some compensation. A combination of increased hay yields on the more progressive holdings, coupled with the availability of cheaply imported concentrates for cattle, meant that a growing proportion of lowland pasture was available for the sheep flock which had hitherto been forced to take second place to bovine

[46] A W Ashby and T Lewis, 'The cattle population of Wales and the cattle supply', *WJA*, 5, 1929, pp 12–15.
[47] T Lewis, 'The marketing of cattle in Wales, *WJA*, 5, 1929, p 41.
[48] W H Jones, 'Cooperative marketing of farm products in Wales, *WJA*, 15, 1939.
[49] Anon, 'The improvement of Welsh mountain sheep', *JUCW Agric Soc*, 11, 1922, pp 23–24.

TABLE 3
The sheep population of Wales*

Years	*Total (millions)*	*Ewes and rams for breeding (percentage)*	*Sheep of 1 year old and above (percentage)*	*Sheep of less than 1 year old (percentage)*
1915–19	3.83	43.3	24.2	36.5
1920–24	3.46	42.8	17.3	39.3
1925–29	4.02	44.8	14.4	40.3
1930–34	4.26	46.5	11.7	40.8
1935–39	4.44	49.5	8.2	42.3

*As this table is based on the 4 June returns, numbers of younger sheep may be an underestimate for many would have been sold by this date.
Source: as for Table 2.

stock. So, while cattle and sheep numbers tended to increase in proportion, the 1930s witnessed progressive intensification of sheep on the lowland grassland/arable holding.[50] This was further facilitated by a continuing decline in the numbers of 2–3 year old wether sheep which, for generations, had been the prime source of Welsh mutton. As consumers came to demand younger, leaner lambs, and government grading schemes, aimed at achieving carcass uniformity, began to take effect, so age at slaughter was reduced and the proportion of sheep of more than one year old fell from 24 per cent in 1915–19 to 8 per cent in 1935–39 (Table 3). Indeed, by the later period the majority of these older sheep were females being bred as stock replacements. True, mutton continued to be produced in parts of the uplands of Merioneth, Radnor and Brecknock, but over the Principality as a whole, sheep producers on all but the more extreme hills would henceforth direct their attention towards the fat lamb trade.[51]

For the hill farmer, the inter-war decades represented a period of largely unrelieved physical and financial struggle. The rigid structure of the hill system, limited to outputs of wool and store stock by the combined rigours of altitude, elements and soils, and subject to wide variations in lamb yields and the capricious nature of sheep prices, meant that farming at any level was a constant and unremitting challenge. The brisk demand in breeding ewes from lowland producers offered a living in the early post-war years, but the slump in mutton and wool prices to 34 per cent and 62 per cent below the base level of 1911–13 created profound economic difficulties by the early 1930s.[52] Despite recovery in the overall prices of cattle and sheep products between 1934 and the outbreak of the Second World War, hill producers derived little benefit due to the inevitable lag in the adjustment of store prices to the improved returns from finished animals. Meanwhile migration reduced the availability both of family labour and of local co-operative help, and as hill populations fell to 0.5–0.8 persons per 100 acres by 1940, periodic farm tasks became increasingly difficult to perform.[53] Reflecting both the human population decline and the declining ratio of cattle to sheep, the botanical composition of upland swards began to deteriorate as bracken began its insidious spread across the hills. The reduction of the numbers of hill cattle and, to a lesser extent, wether sheep, severely limited the

[50] J G Williams, 'Changes in the sheep population of Wales', *WJA*, 8, 1932, pp 59–60.
[51] E C Harry, 'Some aspects of the sheep industry in Wales', *WJA*, 15, 1939, p 132.
[52] D Grigg, *English Agriculture: An Historical Perspective*, 1989, pp 238–39; E Whetham, *Beef, Cattle and Sheep, 1910–1940*, 1976, *passim*.
[53] This contrasts with 1.5–2.0 persons per 100 acres of lowland rural Wales.

control of the coarser and less productive grass species with clear implications for livestock output.[54] Hill farmers in possession of suitable land followed their lowland colleagues and tried their hand at milk production, although considerations of access, slope and terrain limited the extent to which this was possible. But in essence the inter-war years witnessed a serious deterioration in the fortunes of hill farmers and the physical condition of their holdings, a situation which would only be relieved with the passage of the Hill Farming Act (1946) and the Livestock Rearing Act (1951), by which official financial aid was provided to sustain human and animal populations in the hills and uplands.[55] It is probably not overstating the case to claim that this legislation, in facilitating the application of wide-ranging methods of hill land improvement pioneered at the Welsh Plant Breeding Station, was virtually the salvation of Welsh hill farming. In the absence of grant aid and subsidy, the hills and their human population would ultimately have succumbed to the unwelcome advances of bracken and scrub.

In May 1929, the *Carmarthen and Teifiside Advertiser* covered a demonstration of the new International 'Farmall' tractors, held at Synod Inn, Cardiganshire, an event which seemingly 'caused a great stir'.[56] But, as with kindred mechanical contrivances, this lightweight machine, capable of turning on its own length, failed to make any significant inroads on the primary source of farm tractive power, the horse, in the years preceding the Second World War. Although total horse numbers in Wales declined from 174,000 in 1915–19 to 121,000 in 1935–39, this decline arose, in the main, from a reduction in the numbers of riding and cob animals, and the continued dominance of the horse on the farm was such that by 1939 there were only 1932 tractors in the Principality. Horses, of course, were expensive to keep, profligate in the use of land and, for much of the year, under-utilized. At peak periods of springtime cultivation and haytime they tended to work constantly, but for the rest of the year, apart from autumn ploughing and dung-carting, they ate steadily but worked sporadically. Yet horses remained indispensable and even with the reduction in arable acreage, the increased use of horse-drawn hay mowers, turners and tedders and the need to shift root crops for livestock in the winter months ensured their continued ubiquity.[57] Many regarded the horse as a tried and trusted companion, and if the tractor offered the potential for flexibility and greater efficiency in timeliness of husbandry operations, farmers remained suspicious of investing capital in the early machines which, after all, were of questionable reliability, demanding of off-farm inputs and carried annual depreciation charges. This apart, the work range of the tractor was severely limited prior to the invention of the hydraulic three-point linkage system in 1934–35 and, indeed, there were only some 2000 of these machines in operation in Britain by 1939. Before the tractor became an irresistible force in Welsh agriculture after the Second World War, farmers went to some trouble to maintain and improve the quality both of the native cob (used primarily for market and hack work) and of the Shire, the principal motive force on the land.[58] Aided by grants under the 1914 Livestock Improvement Scheme, local heavy horse societies annually arranged for quality, disease-free travelling stallions to visit their locality to cover members' mares. Typically, the North Pembrokeshire Shire

[54] A W Ashby and J R E Phillips, 'Some aspects of the hill sheep farming in Wales', *WJA*, 17, 1943, p 74.
[55] Jones, 'Welsh agriculture in transition', p 290.
[56] *CTA*, 31 May 1929.
[57] J Davies, 'Horse labour on Welsh farms, 1821–1927', *WJA*, 6, 1930, pp 46–47.
[58] R J Moore-Colyer, 'Horses and equine improvement in the economy of northern Wales', *AHR*, 39, 1991, pp 126–42.

Horse Society hired the stallion 'Folville Blue Blood' at a cost of £250 to travel the area in the 1915 covering season. A grant of £40 under the scheme allowed the 110 society members to have their mares covered at fees of 2 guineas (for farms of more than 100 acres) and £1 8*s* 0*d* for occupiers of smaller holdings.[59] While it is difficult to provide unequivocal data, it is generally evident that the more substantial farmers, if not their lesser brethren, were more readily prepared to pursue equine improvement than to attend to enhancing the quality of their other livestock species.

III

Of the multiplicity of food products sold by British farmers, liquid milk remained one of the few immune to overseas competition. As the image of milk as a food improved along with progressive legislation against adulteration, demand for the product had steadily increased throughout the later nineteenth century when breast feeding by children became less common and tea-drinking became virtually ubiquitous among adults of all classes.[60] Despite Victorian legislation and the provisions of the Milk and Dairies Order of 1908, milk was by no means a totally 'safe' commodity, and if milk production was to be the economic salvation of many farmers in Wales and the rest of the UK in the 1930s, it was perceived by many as 'liquid dynamite' in the earlier decades of the present century. The serious problem of bacterial contamination was vigorously addressed by the newly-established Natural Institute of Research in Dairying at Shinfield, near Reading, whose efforts, along with the activities of government-appointed advisory bacteriologists, lay the basis for the principle of 'clean milk production'. This eventually came to embrace tuberculin testing and the production of graded milk of low bacterial count, both being facilitated by the development of on-farm cooling methods and rapid advances in dairy technology.[61] At the local level, sterling service was performed by peripatetic dairy instructors operating under the aegis of the county authorities or, in the case of south-west Wales, working directly from the Dairy School at the University College in Aberystwyth. Butter making and clean-milk production classes were regularly held in farmhouses, vestry rooms, parish halls, village schools and even the stable yards of local pubs, their activities being set out in the local press. In June 1925, chastely reported Miss R M Evans, the two-week class in dairying at Lampeter successfully came to a close with a tea, concert and 'appropriate' social activity.[62] Three years later thirty maidens and matrons successfully completed a dairy course at Hafod Farm, Verwig, Cardiganshire, during which they were joined by children from the upper standards of the village school who apparently approached the matter of clean-milk production with enthusiasm and gusto.[63] Meanwhile, competitors in the dairy competition held at Boncath, Pembrokeshire, in 1926 were honoured by the lofty presence of Professor R Stenhouse Williams, director of the NIRD, who in congratulating them on their efforts suggested that 'a decent pair of clogs' might more befit a dairymaid than the 'dancing shoes' worn by most of the girls.[64] If patronizing remarks like this failed to sour the milk, they probably did little to advance the cause of the NIRD in west Wales!

Compared with countries on the continent of Europe, consumption of liquid milk in Britain remained low at 20 gallons per head per year in 1925, and the govern-

[59] *CTA*, 19 March 1915.
[60] P J Atkins, 'The retail milk trade in London, ca 1790–1914', *Econ Hist Rev*, sec ser, 33, 1980, p 537.
[61] E C Crossley, 'A half-century of dairying: from tradition to technology', *J Soc Dairy Tech*, 29, 1976, p 5.
[62] *CTA*, 12 June 1925.
[63] *Ibid*, 26 Oct 1928.
[64] *Ibid*, 3 Sept 1926.

ment was anxious to promote consumption as production rose from 20 per cent of gross agricultural product in 1908 to 27 per cent in 1930.[65] To some extent this was achieved by way of the school milk scheme by which schools were provided with milk at a reduced price from accredited producers capable of supplying 'clean' milk. The regular inspection of farm dairy facilities, and the bacteriological examination leading to accreditation, yielded 11,228 accredited producers in England and Wales by 1935, although of that number only 896 were registered in the Principality.[66] Milk production, of course, was characterized by markedly seasonal surpluses; some 20 per cent in the winter and 40 per cent in the summer months.[67] Traditionally, much of the seasonal surplus had been converted to butter and cheese, but by the mid-1920s the pressure of imports had so eroded the market that farmhouse cheesemakers and factories were in rapid decline, while butter-making only remained significant in localities where lack of access to the railways made the liquid milk trade impracticable. So it was that by 1930 three-quarters of all milk sold was in the form of the liquid product, destined primarily for the urban market.[68] Although the level of rail charges was a source of constant complaint, and operation in an unrestricted market not without its risks, liquid milk production was generally profitable. Some farmers were wary of rushing wholesale into a trade which would make them largely dependant on a single product sold on a market subject to periodic glut, but others readily embraced the system, viewing it as a means of riding out the storm of depression which ravaged other sectors of the farming industry.[69]

As was so often the case, progress towards the achievement of clean milk production in Wales lagged behind that of other parts of the UK. To the chagrin of many observers, including some of the more efficient farmers, Welsh dairying at the beginning of the present century had largely failed to come to terms with modern methods. Little attention was devoted to selection of cows according to yield, to rationalizing calving patterns as a means of promoting continuity of milk supply, or to compliance with the legal requirement whereby unadulterated milk should contain not less than 3 per cent fat and 8.5 per cent solids-not-fat. In the meantime, many buildings were totally unsuited to milk production, while the management of cows was only marginally less rudimentary than the outdated wooden utensils used for dairy purposes.[70] It was hardly surprising then, that Welsh butter (the main component of dairy output for those many farmers whose holdings were remote from the railway) was of generally inferior quality and unable to compete with imported Irish, Continental and Colonial supplies.[71] Welsh butter, claimed the Teifi Vale Co-operative Society in 1904, had a bad name and commanded a bad price, especially when in competition with the uniform and graded product from Ireland.[72]

[65] *Departmental Report on the Fluid Milk Market in England and Wales*, 1927.

[66] J R E Phillips, 'The milk marketing scheme in Wales, 1934–35', *WJA*, 12, 1936, p 97.

[67] D Taylor, 'The English dairy industry, 1860–1950: the need for a reassessment', *AHR*, 22, 1974, p 153.

[68] D Taylor, 'Growth and structural change in the English dairy industry, 1860–1930', *AHR*, 35, 1987, p 88.

[69] C Hallas, 'Supply responsiveness in dairy farming: some regional considerations', *AHR*, 39, 1991, pp 14–15; E H Whetham, Supply responsiveness in dairy farming: a note', *AHR*, 39, 1991, p 169.

[70] E Hughes, 'Some observations on dairy farming in Cardiganshire', *JUCW Agric. Soc*, 1, 1909, p 18. In 1917, the year in which the first milking machine in Cardiganshire was installed at Blaenpant, by J E James of Newcastle Emlyn and '*caused quite a sensation*', the Carmarthenshire County Council expressed grave concern over the poor hygiene standards on dairy farms. However, the shortage of labour availability for building repairs and upgrading was exacerbated by wartime conditions. Nevertheless, such was the public concern over the spread of tuberculosis, that they instructed officials to inspect all milk-producing premises and to order defects to be remedied within a specific time if dairying was not to be prohibited on those farms: *CTA*, 6 April and 3 Aug 1917.

[71] Butter and cheese imports in 1900 were valued at £17 million and £5 million annually: W Williams, 'The farmers' needs', *JUCW Agric. Soc*, 2, 1901, pp 11–17.

[72] *CTA*, 10 June 1904.

For generations dairymen in the southern and western counties of Wales had produced casked, salted butter for the industrial markets of the south, but taste for this product had so declined in the face of imports of standardized butters that it had been largely driven from the market. By 1910, for all the well-intentioned promotional and educational efforts of the county councils and the University College of Wales, farmers themselves had done little to change the quality and image of their butter, seemingly viewing the deteriorating market conditions with blithe indifference. In fact, to many, dairying was 'almost beneath their consideration', and as they applied themselves to the more agreeable tasks of sheep and cattle management, they regarded butter-making rather contemptuously as 'women's work'.[73]

From a structural standpoint Welsh dairy farming was hampered by a combination of seasonal irregularity of milk supply and the location of many of the small producers some distance either from a weekly market or from a creamery. Carmarthenshire, very much the centre of the nineteenth-century Welsh dairying industry, was favoured with several creameries by 1880, including a depôt at St Clears which was specifically concerned with the blending of butter. Several decades later further depôts had been established at St Clears, Laugharne and Whitland whence liquid milk was despatched by rail to Cardiff, so that by 1910 the *Cardigan and Teifiside Advertiser* was able to lament the decline of local cheesemaking consequent upon the 'export' of milk from the area.[74] At much the same time, new butter-blending factories were being opened at Llandysul and Newquay in Cardiganshire, their steam-operated machinery processing some 6 tons weekly and thereby saving local farmers the need to sell their butter on the notoriously fluctuating Carmarthen market.[75] Unfortunately, a combination of locational problems, management incompetence and the failure of farmers to appreciate the complexities of the dairy trade, led to the collapse of many of these burgeoning ventures in the medium term.[76] The answer would seem to have been the establishment of co-operative dairy enterprises on the Irish model, in order to ensure that milk, butter, cream and cheese would remain in the farmers' control until they reached the customers' door. This was all the more compelling since as late as 1922 some 30 per cent of Welsh milk (compared with 10 per cent in England) was still being processed into butter. Some inroads, however, had been made by this date, with the four counties of north Wales being served by 30 co-operative creameries catering for remote and inaccessible areas wherein farmers would not previously have attempted to produce milk or dairy products in quantity.[77] From Anglesey, for example, not more than half-a-dozen farmers sold milk to the mainland in the 1920s, but with the opening of a co-operative creamery in Bangor in 1934, an important marketing opportunity presented itself. Aided by increasingly sophisticated motor lorries, some 200 of the island's 620 registered producers were despatching their milk to the Bangor outlet by 1939 and, taking advantage of pricing schemes aimed at reducing winter milk shortages, eventually found it possible to abandon seasonal production in favour of level output. The overall effect of the developments at Bangor was to shift milk away from the traditional systems of store cattle raising

[73] E Evans, 'Dairying in Cardiganshire', *JUCW Agric Soc*, I, 1909, pp 14–18. This may seem surprising in view of the growing importance of dairying to the farm economy. Yet, as A G Street repeatedly observed, the '*cow-keeper*' was universally regarded as socially inferior to the '*proper*' farmer: the man who grew his corn and fattened his stock, however unprofitably.

[74] *CTA*, 2 Dec 1910.

[75] *Ibid*, 20 March 1908.

[76] E Williams, 'The Carmarthenshire butter trade', *Carmarthenshire Antiquary*, XX, 1954, p 74.

[77] R G White, 'Cattle breeding and dairying in Wales', *JUCW Agric Soc*, II, 1922, p 13.

and localized butter making to wholesale trading in the liquid product.[78] But despatch of milk or butter to co-operative or wholesale outlet inevitably involved costs, both of rail transport and of transit to the railhead, the latter amounting to 1.54*d* per gallon where a horse-drawn float was employed, and 1.25*d* when produce was carried by motor van.[79] Farmers living in close proximity to the industrial valleys of the south could ignore the wholesale/co-operative system and operate as producer-retailers. Desperate to make some sort of living in the teeth of the prevailing depression, many went into this trade with little knowledge of hygiene matters and a vestigial understanding of its business aspects, and as they engaged in savage price-cutting strategies, few individuals operated at satisfactory levels of profit. Often with minuscule herds of 3 or 4 cows, they delivered liquid milk from door-to-door by float or hand-cart, and since it was necessary to return to the farms shortly after midday to attend to routine tasks and the afternoon milking before trudging off with the evening delivery, this was not a job for the faint-hearted. Many pundits took the view that the local producer-retailer did little to enhance the image of milk, and looked forward to the day when a rational pricing system and a general realization of the benefits of economies of scale would drive these small men of 'inadequate knowledge' back into systems of farming of which they had greater understanding.[80]

Of major significance to milk production and marketing in the Principality was the Milk (Special Designations) Order of 1923 which introduced a pricing system whereby certified and graded tuberculin tested milk commanded a higher return than the ungraded product. Public health and education authorities, drawing upon experience gained in the previous decade, subjected all milk producers to routine inspection of premises and bacteriological examination of milk, before certifying that a given farmer could market his output as 'graded milk'. The additional costs of producing graded milk (including, in particular, the requirement for steel utensils and efficient cooling equipment) were passed to the consumer in the form of a higher price, and the fact that only 5 per cent of the milk retailed in Cardiff in 1933 was of graded quality suggests that consumers, especially in the less affluent parts of the city, were unable or unprepared to pay for this enhanced quality.[81] But steady improvement was afoot, and while there were only 53 certified graded milk producers in Wales in 1931, bacteriologists regularly reported a consistent diminution in levels of bacterial contamination in milk sold from Welsh farms.[82] Yet there were still widespread complaints of inertia. Of the 841,000 cattle in Wales in 1930–34, some 43 per cent were dairy cows or in-calf heifers, and of these only a tiny proportion was subject to any objective system of breeding selection.[83] The provisions of the 1914 Livestock Improvement Scheme had offered subsidies to reduce the cost of obtaining the services of a quality bull, but few farmers apparently bothered themselves with judicious bull selection, while milk recording as a basis for culling remained the province only of the enthusi-

[78] F A Barnes, 'Dairying in Anglesey', *Trans IBG*, 21, 1955, pp 138–40.

[79] J P Howell and H J Meredith, 'Farmers' costs of milk delivery in Wales', *WJA*, 3, 1927, p 45.

[80] W Jones and W Cowie, 'Retailing of milk by producers in the Cardiff area', *WJA*, 10, 1934, p 82.

[81] *Ibid*, p 81.

[82] S B Thomas, 'Some aspects of the graded milk movement in Wales', *WJA*, 8, 1932, p 214.

[83] The structure of the cattle population changed surprisingly little through the inter-war years. From a total of 850,800 in 1915–19, numbers declined marginally in the 1920–24 period and gradually built up to 847,200 by 1935–39, while cattle under 1 year old and 1–2 years old changed little from the mean of 24 and 22 per cent throughout the inter-war period. Meanwhile cattle of over 2 years old declined from 11 to 9 per cent. Although the statistics do not differentiate these various classes, it is probable that many animals in the last three categories were destined to be replacements in the dairy herd.

ast.[84] When the United Counties Milk Recording Society met at Carmarthen at the close of 1922, only 42 herds (692 cows) were being recorded in Cardigan, Carmarthen and Pembrokeshire, and although this had increased to 49 herds (745 cows) by 1924 this was but a tiny proportion of the whole. In emphasizing the vital importance of milk recording and the enhanced price of dairy cows with recorded yields, the *Cardigan and Teifiside Advertiser* exhorted farmers to join recording societies whose activities were '... far from being a mere fad for the indulgence of more prosperous farmers'.[85] Four years later, D J Morgan, the highly active county agricultural organizer for Cardiganshire, reported that with 25 herds being recorded, his county was at the forefront of milk recording in Wales and that if more farmers joined the local milk recording society, the modest membership fee of £1 for the first year and 10*s* for each subsequent year (with a further charge of 6*s* 6*d* per cow recorded) might be further reduced.[86] The apparent indifference of farmers to milk recording was also reflected in their attitude towards grassland management and renovation as a means of improving stocking capacity. Although it was clear to all by the mid-1920s, that the prevailing cheapness of imported cereal and protein feeds would not last for ever, and that a period of low prices and comparatively high costs lurked below the horizon, there was little urgency to adopt the grassland improvement measures so clearly demonstrated at the Welsh Plant Breeding Station. Indeed, it would take a war to reinforce this message, and as late as 1938 some 60 per cent of starch equivalent and 72 per cent of protein equivalent fed to Welsh dairy cows derived from concentrated feeds.[87] The era of milk production from grass and grass products with concentrates as stimulatory adjuncts was essentially a post-war phenomenon.

Directly linked to dairying in many of the lower-lying parts of Wales, pig production expanded in the inter-war years with numbers increasing from 217,000 in 1915–19 to 239,400 at the outbreak of the Second World War. Whereas in the more remote butter-making areas, skim milk tended to be fed to calves, the pig came into its own in those localities from which liquid milk was 'exported', where it was called upon to consume seasonal surpluses. It was for this reason that the counties of Flint and Denbigh (selling milk into Liverpool) and Glamorgan and Carmarthen (supplying the industrial valleys) had among the highest densities of pigs in the Principality. The period under review witnessed important changes in the breed structure of the population as upgrading boars, introduced under the Livestock Improvement Scheme, imposed their genotype on the mixed bag of Middle Whites, Gloucester Old Spots and Large Blacks comprising the bulk of the national herd.[88] The Large White and Landrace, together with the Landrace-like Welsh pig (officially constituted as a breed in 1923) would henceforth come to dominate pig production with clear consequences for the prolificacy, efficiency and maturity characteristic of pigs on the farm.[89] To many producers, however, pig production was regarded as a supplementary or scavenging enterprise, and the drive for efficiency awaited post-war developments in intensification. Cottagers, on the other hand,

[84] E G Owen, 'Dairy farming in Wales', *JUCW' Agric Soc*, 17, 1928, p 39.

[85] *CTA*, 5 Jan 1923, 11 and 19 Jan 1924.

[86] *CTA*, 20 Jan 1928. John Lewis, the senior milk recorder in Cardiganshire took 539 samples from individual cows in 1928, 58 of which were below the 3 per cent fat standard required by law. Subsequently Lewis went on to become director of dairying at the University College of Wales, which post he held until the early 1970s.

[87] These figures fell to 51 and 57 per cent by 1942 as a consequence of substitution by hay, straw and root/green crops: J D Griffiths, 'The changeover to wartime milk production', *WJA*, 17, 1943, p 36.

[88] *CTA*, 24 Dec 1923.

[89] T Lewis, 'The production and marketing of pigs in north Wales and Cardigan', *WJA*, 6, 1930, pp 67–73.

continued to take the pig very seriously, and the exclusion of holdings of less than 1 acre from the statistics, probably underestimates the importance of the pig to the economy of the small holder or by-employment part-time farmer. As the Begelly (Pembrokeshire) smallholder W R Morgan recalled in his memoirs as he described taking the family sow on a two mile journey to receive the services of the local boar, the cottager of the 1920s continued to rely upon the bacon pig to supply his family with meat and lard for the winter months.[90]

IV

The pioneering work of the Aberystwyth-based Assistant Advisory Economist for Wales, J Pryse Howell, provides invaluable data for an assessment of the varying financial fortunes of different categories of Welsh farms during the difficult years of the 1930s. Howell undertook detailed annual surveys of between 50 and 60 farms of over 20 acres in extent, with the objective of ascertaining fluctuations in farm income on four general classes of holdings. These comprised 'Cattle and Sheep (Poor land)', generally upland farms with a high proportion of rough grazings; 'Cattle and Sheep (Better land)', broadly similar holdings but with a lower proportion of rough grazing; 'Mixed (lowland) Farms'; and 'Cattle/Dairy Farms', which were essentially lowland operations with primary emphasis on dairying.[91] Given that the number and size of farms within the different categories varied each year, direct comparisons are of questionable value, although transposing the figure to a per 100 acre basis as in Table 4 allows for meaningful comparisons of temporal changes in income of these generally undercapitalized holdings.[92]

The exclusion of holdings of less than 20 acres from Howell's surveys obviates any discussion of the general effect of depressed agricultural conditions on the plight of the part-time farmer or smallholder. On the other hand the data highlight the stark financial realities faced by full-time farmers on the various categories of holdings where, in the broadest of terms, the best returns were obtained by those farms with the lowest proportion of tillage crops and the minimum of hired labour. The depression of 1929–32, in effect, led to significant financial loss for many Welsh farmers, and their capacity to surmount such losses in the later 1930s depended largely upon the type of farming system they pursued. Since, on all farms, some 75 per cent of capital was invested in livestock, 8 per cent in crops and 17 per cent in implements of various descriptions, the economy was highly sensitive to fluctuating livestock prices. Table 5, in which total farm receipts are set out on the basis of farm size, further underlines this point.

In all cases livestock and livestock products yielded in excess of 90 per cent of output, and it is particularly noteworthy that on the smallest farms, sales of pigs and poultry/eggs represented a disproportionately high component. Poultry, in particular, regarded as the perquisite of the farm women, could be kept at low cost with cheap imported maize, and with the introduction of breeds like the Rhode Island Red and Red Leghorn in the 1920s, the potential for egg production was substantially increased. Throughout Wales as a whole, poultry numbers rose from 3 million in 1921–25 to 4.7 million in 1935–39 and although by the mid-1930s egg prices

[90] Morgan, *A Pembrokeshire Countryman*, p 52.

[91] Howell's assessment of farm income represented the margin between gross output and gross expenditure corrected for valuation changes. Expenditure on hired and family labour was included, together with a figure to take account of perquisites and the value of board and lodging *in lieu* of wages, besides which a value was attributed to the quantity of farm products consumed in the house. In effect, farm income provided the reward to the farmer and his wife, and return on capital employed.

[92] Average capital deployed per 100 acres between 1925 and 1934 was as follows: cattle and sheep (poor land) £388; cattle and sheep (better land) £815; mixed farms £917; cattle/dairy £1153.

TABLE 4
Farm incomes in £ per 100 acres on Welsh farms, 1929–1939

Years	*Cattle and sheep (poor land)*	*Cattle and sheep (better land)*	*Mixed farm*	*Cattle/dairy*
1929–30	80	122	70	351
1930–31	56	152	87	168
1931–32	−4	−20	36	140
1932–33	−18	5	−50	68
1933–34	27	0	8	169
1934–35	32	44	260	163
1935–36	36	87	178	240
1936–37	58	54	211	130
1937–38	54	74	189	221
1938–39	12	3	131	239

Source: J P Howell, 'The financial results of different types of farms in Wales', *WJA*, 12, 1936; *WJA*, 13, 1937; *WJA*, 14, 1938; *WJA*, 15, 1939.

TABLE 5
Percentage receipts on Welsh farms of various sizes, 1929–1938

Produce	*Under 50 acres*	*51–99 acres*	*100–149 acres*	*Over 150 acres*
Cattle	14.9	19.5	26.9	27.3
Dairy products	35.4	37.8	27.0	23.9
Sheep and wool	5.4	13.0	17.9	20.4
Pigs	22.4	10.8	12.3	14.3
Poultry and eggs	18.0	10.3	5.4	5.0
Horses	0.6	1.7	3.1	3.1
Crops/sundries	3.3	6.9	7.4	6.0

Source: as for Table 1.

fell relatively faster than feed costs, modest-scale poultry production continued on many farms, following an overall increase in egg sales of 59 per cent between 1931 and 1934.[93] Given that some 300 million eggs were annually consumed in Wales relative to an output of 150 million, there was potential for further expansion, yet this was restricted by farmers' unwillingness to divert grain from other livestock to what many misguidedly saw as little more than a 'pin-money' operation.[94]

It is clear from Table 4 that the first four years of the 1930s provided little or no real surplus for private expenditure, and in many cases farmers were obliged to draw upon earlier savings for this purpose. While the Ministry of Agriculture's index of farm prices fell from 126 in 1929–30 to 86 in 1933–34, feed and fertiliser costs fell by a mere 10 per cent, with labour costs soaring to some 70 per cent above pre-war levels.[95] There was gradual, if fluctuating, improvement over the next five years, yet the fact remained that on the two categories of cattle and sheep farms, income averaged a derisory 4*s* per week per 100 acres between 1935 and 1939. This contrasts to 48 *s* and 60*s* on mixed and cattle/dairy holdings, the fortunes of the former group being largely dependent on producing a high proportion of output in the form of store or finished cattle, or animals suited as replacements for farmers managing

[93] Once again, exclusion of holdings of less than 1 acre from the statistics must inevitably have underestimated poultry numbers: J S Smith, 'The profitableness of poultry enterprises in Wales', *WJA*, 13, 1937, p 117.

[94] *CTA*, 8 Aug 1929.

[95] J P Howell, 'Economic depression in Welsh farming', *WJA*, 11, 1935, p 12.

dairy herds. It was the latter, for all the deficiencies described earlier, which weathered the depression. Taken as a whole, acceptable working profits on Welsh farms in the 1930s depended very much on the extent to which they had either developed specialist dairying operations or, in the case of mixed lowland units, contributed to the expansion of dairying by way of heifer rearing or the production of fodder for sale.

V

The evidence presented above suggests that against a background legacy of inadequate farm buildings, shortage of capital and deeply-seated conservatism, Welsh farmers attempted, where it was practically feasible, to accommodate depression by adopting dairying systems. Armed with advice from peripatetic dairy instructors and supported by the increasing availability of organized markets for their product, especially after the inception of the Milk Marketing Board in the mid-1930s, they effectively adjusted to the expanding national demand for liquid milk. Yet in this, and other areas of farming activity, they appear to have been reluctant to invest in innovative measures. There were, after all, plenty of new ideas abroad, emanating from the Ministry of Agriculture, the National Institute of Research in Dairying, the Welsh Plant Breeding Station and elsewhere. Milk recording, the use of quality bulls and rams, grassland improvement and other measures were practical techniques which could be put into effect at relatively little expense and which, in the medium term, would yield abundant rewards. But farmers were suspicious. Well-schooled in the memory of the often scatterbrained 'improvement' schemes of many nineteenth-century Welsh landowners, they took a sceptical, if not jaundiced, view of investing time and money in land and livestock improvement where the prospect of short-term profit was remote. Grassland renovation was all very well – and many farmers expressed their interest in regularly visiting the Plant Breeding Station and attending local lectures on the subject – but there seemed little purpose in improving grazing merely to flood an already overburdened market with more store or finished sheep and cattle. Faced with a depressed market for most farm products, it seemed logical to cling fast to one's limited savings and only to invest in agricultural improvement in the unlikely event of capital being generated from profits. As bank managers clamoured for interest repayments on recently-purchased farms, little cash remained for management income, let alone capital accumulation and expenditure, and as confidence fell, many of the basic tenets of good farming were abandoned. In a sense, this initiated a vicious cycle whereby bad farming resulted in dereliction, leading to psychological depression and further bad farming, a cycle which, incidentally, may yet prove to be in its early stages at the present stage of the twentieth century. In any event, throughout much of Wales, economic and agricultural depression came perilously close to permanently damaging the fragile cultural and environmental framework of the country, and it was only with financial help and infrastructural change after the Second World War that the agricultural community returned to some semblance of relative prosperity.

A Forum for Organic Husbandry: The *New English Weekly* and Agricultural Policy, 1939–1949

By PHILIP CONFORD

Abstract

This article identifies the *New English Weekly*, a review of economic, political and cultural issues which ran from 1932 to 1949, as the most important publication in the development of the British organic husbandry movement. It defines this movement and summarizes its various strands, including concern about health and nutrition, rural reconstruction, de-forestation, and the dangers of a mechanistic approach to natural processes, all of which were to be found in the *New English Weekly*. The article concentrates on those strands most concerned with agriculture, and on the period from the outbreak of war to the paper's closure, a decade which saw the movement coalesce and define its philosophy of husbandry. A study of the *New English Weekly* during this period demonstrates that all the major figures in the organic movement could be found in its pages as it dealt with questions of farming policy and food production; the consequences of mechanization; the threat of soil erosion and dwindling fertility; and methods of restoring and maintaining the soil's humus content. Although the paper was not primarily aimed at a farming readership, many of its contributors became founder members of the Soil Association. The years following the *New English Weekly*'s closure saw agricultural policy develop in an entirely different direction from that which it had advocated, but it had played a central role in establishing an environmental philosophy which would make itself heard more strongly from the 1960s onwards.

PRIOR TO the establishment of the Soil Association in 1946, the most important journal in the history of the organic husbandry movement was a 'Review of Public Affairs, Literature and the Arts', founded to propagate the monetary reform doctrines of Social Credit, and including on its editorial board T S Eliot, poet and critic, and P L Travers, the author of *Mary Poppins*.[1] In June 1940 a reader complained to the journal in question, the *New English Weekly* (*NEW*): 'I'm a little suspicious of the "manure-complex" of the N E W... Maybe you're right; but this 'vegetation myth and magic" business seems to me to be playing the very devil with Social Credit'.[2] In retrospect, though, the *NEW*'s significance will more probably lie in its advocacy of organic farming and its environmental concerns than its commitment to monetary reform. The two movements overlapped considerably, but whereas Social Credit is now a historical curiosity the organic movement has grown in influence.

Before some of the evidence supporting this claim for the *NEW*'s importance is considered, an explanation of the term 'organic husbandry movement' is required. It is used in this article to refer to that group of people who, during the 1930s and 1940s, were concerned about the following perceived issues: rural decline and the imbalance of urban and rural in Britain; agriculture's central importance to national life, and the desirability of greater self-sufficiency; the spectre of soil exhaustion and the need to increase humus; the possible dangers of mechanization and widespread use of artificial fertilizers; the social

[1] Social Credit was an economic theory developed by Major C H Douglas, which attacked the banks' monopoly of credit creation and urged the distribution of a National Dividend to enable all members of the nation to buy the goods which the nation produced. For a full account of its development and ideas, see J L Finlay, *Social Credit: The English Origins*, 1972.

[2] *New English Weekly* [*NEW*], 27 June 1940, p 124.

benefits of encouraging smaller, mixed, family farms in preference to large-scale commercialized specialist ones; the poor quality of national nutrition, and the relationship between food production methods and health. Underlying all these concerns was the conviction that living processes must be interpreted biologically and ecologically, and that any chemical, mechanistic or purely economic approach to agriculture was at best inadequate and at worst destructive. Human beings should seek through science to understand and work with the natural order, instead of exploiting the environment in order to satisfy ever-increasing demands.

I

This outline demonstrates that the organic movement involved much more than opposition to artificial manures and the Rothamsted approach to fertilizer science. It drew together various concerns which had been gathering strength since the late nineteenth century. Anxiety about the use of artificials had been expressed between 1890 and 1914 by Poore, Elliot and Eiloart, who had warned of the possible dangers of abandoning the 'Rule of Return' of wastes to the soil. As Gould and Marsh have recounted, this period also saw considerable interest in various attempts at rural reconstruction, though the Rural Reconstruction Association itself was not founded until 1926, when the post-war 'Great Betrayal' of farming was followed by severe agricultural depression.[3]

During the 1920s the health and nutrition strand of the organic movement developed, with Robert McCarrison's experiments in India on diet, the early days of the Pioneer Health Centre in south London, and the work of Edgar J Saxon in promoting natural health and a wholesome diet through his journal *The Healthy Life* (re-constituted as *Health and Life* in 1934). Following the crisis of 1931 the movement's political and economic aspects grew more prominent. Social Credit was offered as the solution to the nation's ills, and ruralist movements took on a nationalist tinge, opposing liberalism and free trade in favour of a revived peasantry. McCarrison returned to England in the 1930s, as did the agricultural scientist Sir Albert Howard, whose researches in India were central to the organic movement. Throughout the decade he promoted the system of composting whose positive effects on plant and animal health he had demonstrated at the Institute of Plant Industry in the state of Indore. The 1930s also saw develop, through the Anglo-Catholic 'Christendom' movement, a religious philosophy based on the idea of a Natural Order, which, it was argued, provided the justification for obeying the Rule of Return, through which man co-operates with God's creation.[4]

In 1941 a loosely-organized group, the 'Kinship in Husbandry', was formed in order to promulgate this outlook. Called together by the Wessex farmer Rolf Gardiner, it sought 'to percolate many movements', including the Rural Reconstruction Association and, later, the Soil Association. Several key figures in the organic movement were members or guests of the Kinship. In addition to Gardiner these included the landowners Viscount

[3] For pre-1914 concern about soil fertility and the possible effects of artificials, see G V Poore, *Essays on Rural Hygiene*, 1893; R H Elliot, *The Clifton Park System of Farming*, 1943; and A Eiloart, *No Plant Disease*, nd [1913 in Bodleian Library catalogue]. For discussions of late nineteenth and early twentieth-century concerns about rural reconstruction and 'back to the land' movements, see P C Gould, *Early Green Politics*, Brighton, 1988, and J Marsh, *Back to the Land*, 1982.

[4] On McCarrison's experiments in diet, see R McCarrison, *Nutrition and Health*, 1961. On the Pioneer Health Centre, see I H Pearse and L H Crocker, *The Peckham Experiment*, 1943. On ruralist nationalism, see A Bramwell, *Ecology in the Twentieth Century*, 1989, pp 104–30 and 133–50; R Griffiths, *Fellow Travellers of the Right*, 1983, pp 317–29; G C Webber, *The Ideology of the British Right: 1918–1939*, 1986, pp 57–68; and P Wright, *The Village that Died for England*, 1996, pp 150–202. On Howard's work in India, see L E Howard, *Sir Albert Howard in India*, 1953. For an example of the work of the Christendom Group, see M B Reckitt, ed, *Prospect for Christendom*, 1945.

Lymington (later the Earl of Portsmouth) and Lord Northbourne; the writers Edmund Blunden and H J Massingham; farmer-writers Adrian Bell and Ronald Duncan; the agricultural journalist Laurence Easterbrook; Jorian Jenks, first editorial secretary to the Soil Association; and Philip Mairet, editor of the *NEW* from 1934.[5] Howard and McCarrison influenced this group, as did Sir George Stapledon, the agronomist and grassland expert, and Dr G T Wrench, who, like Howard and McCarrison, had spent several years in India. Howard also influenced the Wiltshire farmer and racehorse-breeder Friend Sykes and the fenland market-gardener Roy Wilson, both of whom practised and advocated his methods; while McCarrison's studies of nutrition and deficiency diseases influenced the general practitioners Dr K E Barlow and Dr Lionel J Picton, and the founders of the Pioneer Health Centre, Dr G Scott Williamson and Dr Innes Pearse. One other major figure must be mentioned: Lady Eve Balfour, whose 1943 book *The Living Soil* synthesized the ideas of Howard and McCarrison in a form which aroused great interest and made feasible the founding of the Soil Association.

Through his editorship of the *NEW* Mairet provided a forum which enabled a coherent philosophy of 'husbandry' to emerge. Other publications dealt with specific aspects of the organic philosophy: Saxon's *Health and Life*, which concentrated on diet and gardening, with occasional forays into Social Credit; *Trees*, the journal of Richard St Barbe Baker's international association, Men of the Trees; and *Christendom*, which provided the theological perspective. Lymington's short-lived *New Pioneer* represented the extreme right wing of the movement. Howard joined battle with the forces of fertilizer orthodoxy on their own ground.[6] But it was only in the pages of the *NEW* that all these strands were brought together and worked into a coherent view of agriculture's nutritional, social and spiritual importance to national life. More comprehensively, the journal's philosophy of husbandry provided a critique of the way in which industrial civilization was treating the natural world.

The *NEW* was founded by A R Orage, who edited it until his sudden death in 1934. When in charge of the journal the *New Age* (from 1908 to 1922) he had been regarded by many as the most brilliant editor of the time. At first an advocate of Guild Socialism, he was converted to Major C H Douglas's panacea, Social Credit, in 1919. He left the *New Age* to spend nearly a decade abroad studying and teaching the esoteric system of G I Gurdjieff. In the wake of the Great Crash of 1929 Orage believed that the subsequent economic crisis 'would be the supreme opportunity for the Douglas criticism and propaganda... He returned to England in 1931, determined either to return to the *New Age*, or if that proved impossible, to found a new paper of his own'.[7] It did prove impossible, and he founded the *NEW*, which first appeared on 21 April 1932. Mairet, who had known him since 1919, joined the paper as his assistant and succeeded him as editor.

Mairet had lived at two rural communities: C R Ashbee's Guild of Handicraft at Chipping Campden, and the Sussex religious community of Douglas Pepler and the sculptor Eric Gill.[8] Under his editorship the *NEW* began to show increasing interest in agricultural policy and the associated issues of national health and nutrition.

[5] On the Kinship in Husbandry, see R Gardiner, *Water Springing from the Ground*, Fontmell Magna, 1972, pp 196–203, and the Earl of Portsmouth, *A Knot of Roots*, 1965, pp 85–95.

[6] See for instance, A Howard, 'The restoration and maintenance of fertility', *J Farmers Club*, February 1937, and 'Experiments with pulverised refuse as a humus-forming agent', *The Fertiliser, Feeding Stuffs and Farm Supplies Journal*, 26 July 1939, pp 401–03.

[7] P Mairet, *A R Orage – A Memoir*, 1936, p 107.

[8] See P Mairet, *Autobiographical and Other Papers*, Manchester, 1981, pp 30–40 and 120–28.

Despite the view of the correspondent quoted at the beginning of this article, these issues never conflicted with the commitment to Social Credit, which argued that economic reform would prevent the destruction of soils and food for the sake of profit and ensure that the whole population would be guaranteed sufficient income to enable them to buy fresh, protective foods.

The *NEW*'s service to the organic cause was so extensive that only certain aspects of it can be indicated here. This article will concentrate on the ten years from the outbreak of the Second World War to the journal's closure in 1949. This was a period of prolific activity and rapid development in the organic movement, which took advantage of wartime interest in agriculture to press its case. Many of the most significant texts in the organic canon were published between 1939 and 1947, and the Soil Association was founded in 1946.[9] The *NEW* devoted space to all the major figures in the movement, and therefore has a unique importance in its history. It is not feasible here to examine the *NEW*'s treatment of all aspects of the movement; this paper will focus on its coverage of farming policy and food production; mechanization; soil erosion, and the maintenance and restoration of fertility.

II

The *NEW* first appeared when *laissez-faire* agricultural policies were being abandoned after nearly a century of free trade. 1932 saw the imperial conference at Ottawa, the passing of the Wheat Act, and the appointment of the corporatist Walter Elliot as Minister of Agriculture. The far-reaching Agricultural Marketing Act had been passed the year before and a second would be passed the year after. Other steps to prevent further disasters for the hard-pressed farming community followed as agriculture began to recover. Later in the decade agriculture benefited as the government moved to ensure increased self-sufficiency in the event of war.[10]

During the 1930s a number of agriculturalists argued for a coherent and comprehensive policy if British farming were to remain viable. The dominant school of thought was represented most notably by Viscount Astor, Sir Daniel Hall, Keith Murray, C S Orwin and B S Rowntree, who denied the necessity of mixed farming and argued instead for specialization, emphasizing the importance of an efficient commodity production to be achieved through scientific advance, mechanization, and new management methods. If such methods were to be adopted farming units would need to be larger and peasant farmers would gradually disappear. The optimistic mood is exemplified by Astor and Rowntree:

> the tempo of invention and discovery has been enormously quickened during the last thirty years, so that the present era is sometimes referred to as the period of 'The Second Agricultural Revolution', and the methods of farming being evolved as a result of recent research work are referred to as 'The New Technique'.[11]

The organic school shared Astor and Rowntree's concern for the future of agriculture, but the use of the word 'technique' in the above quotation indicates the difference between the two approaches. For supporters of organic husbandry agriculture was essentially an art, or a form of care,

[9] See, for instance: G V Jacks and R O Whyte, *The Rape of the Earth*, 1939; A Howard, *An Agricultural Testament*, 1940; Lord Northbourne, *Look to the Land*, 1940; H J Massingham, ed, *England and the Farmer*, 1941; K E Barlow, *The Discipline of Peace*, 1942; the Earl of Portsmouth, *Alternative to Death*, 1943; F C King, *Gardening with Compost*, 1944; H J Massingham, ed, *The Natural Order*, 1945; L J Picton, *Thoughts on Feeding*, 1946; F Sykes, *Humus and the Farmer*, 1946; and L T C Rolt, *High Horse Riderless*, 1947.

[10] For a survey of agricultural policy during the 1930s, see J Brown, *Agriculture in England: A Survey of Farming, 1870–1947*, Manchester, 1987; A F Cooper, *British Agricultural Policy 1912–1936: A Study in Conservative Politics*, Manchester, 1989; and E H Whetham, *The Agrarian History of England and Wales, VIII, 1914–39*, 1978.

[11] Viscount Astor and B Seebohm Rowntree, *British Agriculture*, Harmondsworth, 1939, p 403.

not a matter of applying a technological or managerial principle for the sake of efficiency. The outbreak of war in 1939 provided, in their view, an opportunity for Britain to establish agriculture at the heart of its economy and society. It was therefore vital to adopt an entirely new policy towards the land, 'in which renewal of fertility as well as a square deal for farmer and labourer would be assured'. Those still of an 'urban mind' would have to be convinced that 'a fertile soil is the nation's greatest possession'. The distinguished agriculturalist Lord Bledisloe, who sympathized with the organic school, wrote a long letter to the *NEW* in which he urged the entire reconstruction of the agricultural industry. Although reluctant to support nationalization, he suggested the conversion of free-holds into 999-year leaseholds, with covenants on the use of land for the optimum advantage of the British public. Another prominent enthusiast for reconstruction was Sir Daniel Hall, whose book *Reconstruction and the Land* was mauled by H J Massingham in a review entitled 'Farms as Firms'. In Massingham's view Hall's assumptions were those of profit-making and industrialism; the state's interests seemed indistinguishable from those of a joint-stock company. Massingham condemned Hall as 'anti-organic', and argued that he opposed mixed farming even though his book contained a table showing the highest production per acre to be in countries where mixed farming was common.[12]

From the organic perspective the interest in agricultural reconstruction was therefore not without its darker side. The *NEW*'s 'Notes of the Week', under the subheading 'Red Light over Agriculture', drew attention to the 'commercial rationalizers' who were 'muscling in to this agricultural business'. There was danger of a post-war 'planning' which would condemn farmers as inefficient and recommend that they should 'be superseded by "scientific" commissars running big collective farms with more machinery and chemicals'. Ronald Duncan, who contributed a 'Husbandry Notes' column for much of the war, pointed out in a letter that farms in Wiltshire – large-scale, mechanized, and using artificials – produced less wheat per acre than small, mixed farms in north Devon still using horse-ploughs. A reviewer, J J (presumably Jorian Jenks), agreed there was a danger of too much planning, but excepted the case of land utilization because 'it seems imperative that there should be a definite, authoritative and (as far as possible) agreed design to which all must conform'. Britain would have to adopt a simpler way of life, relying more on her own resources. The danger, in the eyes of the organic school, was that 'efficient' husbandry might mean sacrificing soil fertility. Preferring to measure efficiency in terms of output per acre rather than output per man, the *NEW* argued for a maximum-production policy which would require one million more land workers.[13]

Well before the war ended the journal was trying to anticipate the post-war situation. It believed food shortages and the threat of famine to be likely, particularly in the conquered countries; but Montague Fordham of the Rural Reconstruction Association warned that agriculture had been betrayed after the First World War and that its importance was likely to be forgotten once the Second ended. For Jenks, on the other hand, the more probable danger was the '*a priori* type of economist whose model is the industrial system'. Industrial models of efficiency aimed to minimize both the wages and the numbers of those employed, but Jenks believed that

[12] *NEW*, 25 April 1940, pp 3–4; 29 Aug 1940, p 215; 1 Jan 1942, pp 93–94.

[13] *NEW*, 12 March 1942, p 183; 18 Feb 1943, pp 155–56; 21 Jan 1943, p 116; 24 Feb 1944, pp 155–56.

after the war the government would be well advised to offer good terms to the workers in mining, fishing and agriculture. Reviewing Massingham's *Men of Earth*, S Sagar said that the chief question it raised was, 'What is going to happen to rural England? I know farmers think they are going to be once more sold down the river... I do not think we shall be able to let England return again to weeds and scrub... The land of England will have to be worked. The question is how. Will it be by mechanized scamping? If so, our last state will be worse than the present one'. Evidence from the United States was adduced by Bernard Raymond of Ohio, supporting Sagar's view. He reported that in 1943 yield per acre in that state was down for all principal crops, but that 'Washington continues to insist that the mechanization of agriculture is the answer to the labour problem on the farm'.[14]

In Britain the war led to a rapid increase in mechanization and the use of artificial fertilizers. Influential voices, like that of Sir Daniel Hall, supported concepts of efficiency based on the measure of output per man, and on the creation of larger farming units. The *NEW* did what it could to oppose these trends in the post-war years. 'Notes of the Week' for 4 July 1946 provide a clear statement of the *NEW*'s stance on post-war agricultural policy. The job of the Ministry of Agriculture was

> to have clear and correct knowledge of the functions of agriculture both in human economy as a whole and in the national economy, and to have a policy that will secure, defend and assist the agriculturists to fulfil those functions. In present circumstances, that means a policy which can reconcile modern civilization with the immemorial and indispensable functions of husbandry.

British agriculture depended on the aid of nearly a quarter of a million overseas workers; but since, argued the writer of the 'Notes', the countryside was not merely for leisure, our own land must be used for production. Referring to the ministers of state responsible for post-war policy, the writer posed the question: 'Will they be possessed by the technological mania, and try to "industrialize nature" – flatten the hedgerows, multiply tractors, try to mechanize and chemicalize everything and to multiply yield per man hour regardless?'[15]

Philip Oyler, a member of the Kinship in Husbandry, argued for a very different policy. In his view, everything possible should be done to increase both fertility and the use of manpower, with towns obliged to return wastes to the land for the sake of intensive cultivation. Land settlement should be encouraged. Oyler, who was to write books on French peasant farming, cited the example of the French Revolution, suggesting that workers be given land rather than higher wages. He argued that output per acre was highest on mixed farms from 50 to 100 acres in size, and that Orwin, Astor and Rowntree were encouraging an approach which would increase soil erosion.[16]

The prospect of food shortages continued to haunt the *NEW*'s views on agricultural policy. The pseudonymous columnist 'Pontifex III' insisted: '– the World *is* short of food and... the prospect is for increased stringency, until a revolutionary change of attitude and practice in agricultural production has occurred and made considerable progress'. 'Notes of the Week', discussing the Agriculture Bill, referred scathingly to the 'confidence of our economists that industrial civilization will always be able to get cheap foodstuffs by ravaging the fertility of one area and then of another'.[17] 'Pontifex III' referred in the autumn of 1947 to the financial dimension of European food shortages:

> The World Food Council draws urgent attention to these physical facts, as well as to their aggravation

[14] *NEW*, 3 July 1941, pp 108–10; 25 Feb 1943, p 162; 10 Feb 1944, pp 137–38; 30 March 1944, p 202; 27 April 1944, pp 16–17.

[15] *NEW*, 4 July 1946, pp 114–15.

[16] *NEW*, 25 July 1946, pp 144–45.

[17] *NEW*, 2 Jan 1947, p 112; 3 July 1947, p 101.

by the exchange instability which is preventing mutual marketing of local surpluses across European frontiers. They give warning that 'dollar shortages will mean a reduction of acreages in the producer countries and an extension of the crisis beyond next year's harvest'.[18]

In the view of the organic school, Britain could no longer rely on overseas countries, since those countries were themselves now industrializing and would be less interested in importing our manufactured goods. It followed that 'the only way for each currency area to be sure of its food is to grow it'. In doing so, however, it was essential to avoid over-taxing the land's productive capacity. The *NEW* feared 'State farms run upon industrial ideas', which would result in a 'disastrous... fall in productivity per man per acre'. But it saw Business as equally destructive, as Carey McWilliams's book on United States migrant workers, *Ill Fares the Land*, demonstrated. Reviewing it, Reginald Snell wrote of Business's 'ignorant pursuit of mechanization and monoculture, and the consequent debilitation and erosion of good farm land'. The fundamental threat was any system of 'large economic farm units', since they destroyed family farming. In a letter to the *NEW* H J Massingham referred to R M Lockley's book *The Island Farmers*, which had praised family farms for their high productivity. Massingham's first contribution to the *NEW* had referred to a 'diseased' economic system. As the paper drew to its close he applied the same epithet to Britain's farming: 'No agriculture can possibly be other than diseased when it... moves or stagnates at the whim and dictate of a centralized industrialism'.[19]

To the last, the *NEW* attributed farming's problems to the dominance of industry and finance, rejected purely economic assessments of agricultural efficiency, and saw the future in terms of an increased rural population practising intensive husbandry in the interests of national self-sufficiency.

III

During a protracted debate with John Middleton Murry in the *NEW*'s correspondance columns, H J Massingham insisted that 'output per man' was an industrial criterion of measurement, by which standard a depopulated countryside would be more efficient than one where there was intensive employment of labour.[20] Since the *NEW* was concerned about the decline of rural life, it tended to be hostile to machines, whose numbers expanded rapidly during the war. Between 1938 and 1946 the number of tractors used rose from about 70,000 to 179,000; and whereas in 1933 a mere 33 combine-harvesters were in use, by 1946 this had risen dramatically to more than 3000.[21]

The *NEW*'s attack on mechanization gathered momentum slowly; indeed, the first issue struck a note of optimism. 'The fundamental problem... is one of Money', it declared, 'since Science has settled every other'. Shortly before the war, though, signs of unease manifested themselves. A correspondent drew attention to a speech by Mr D R Bomford, of the Bomford Brothers agricultural engineering firm, to the Royal Society of Engineers, in which he had advocated increased use of diesel tractors and inorganic manures. Another correspondent wrote of the dangers of such a policy: loss of fertility, control of food production by the few, and increased unemployment. B A Keen, assistant director at Rothamsted research station, wrote to the *NEW* to say that the trend of industry in general was to have fewer workers, and agriculture would not be

[18] *NEW*, 9 Oct 1947, p 196.
[19] *NEW*, 16 Oct 1947, p 2; 5 June 1947, p 66; 29 Nov 1945, pp 65–66; 9 Sept 1948, p 204; 21 April 1932, p 21; 19 May 1949, p 67.
[20] *NEW*, 9 June 1949, p 107.
[21] See K Blaxter and N Robertson, *From Dearth to Plenty*, 1995, p 62, and HMSO, *A Century of Agricultural Statistics: Great Britain 1866–1966*, 1968, pp 61 and 71.

exempt. Such an argument was guaranteed to strengthen the organic school's conviction that agriculture must not be regarded as an industry.[22]

Rolf Gardiner reviewed Captain R G M Wilson's pamphlet *I Believe: An Appeal for the Land*, an attack on mechanized, chemical farming by a disciple of Sir Albert Howard. Gardiner's views on rural restoration provoked debate with a certain Mrs Gladys Bing. Referring in particular to the flax industry, he saw mechanization as wasteful in comparison with manual methods, and argued that the machine is only a tool and should be subject to wider considerations. Certainly, machines were useful for breaking up derelict land, but once that had been done care and organic manure were essential. Mrs Bing, with thirty years of rural work behind her, did not dispute the importance of soil fertility, but dismissed Gardiner's vision of communal manual labour as unrealistic, saying that 'pretty pictures of happy families singing as they sweat are mere wishful thinking'.[23]

The organic school defined the issue as whether farming was to be seen as a cultural activity or a form of industrial production. If the latter, they argued, the logical conclusion was to apply industrial standards of efficiency to the methods used, increase the use of machinery at the expense of animals and men, and replace the lost fertility with chemical manures. For the organic school this was courting disaster by basing policy on a philosophical error, that of conceiving of Nature mechanistically. In Jorian Jenks's view 'mechanitis' was one of the 'Diseases of Our Time'. 'Notes of the Week' accepted that profligate use of natural resources had occurred in all ages, but argued that 'the results of it have been magnified out of all proportion by modern power-techniques'. We were in danger of developing a mechanized food production 'driven on at a breakneck pace, with tractors, bull-dozers, combine-harvesters and every outrage that mass-mechanism can perpetrate upon normal husbandry'. The costs of such a system would outweigh the benefits, since it would create unemployment. 'Some people entertain a comfortable illusion that machinery is taking the most toilsome work out of agriculture; which might be true if mechanization meant adding the machines to the men instead of substituting them. And in England agriculture is mainly the work of small and moderate sized farms'; farms which the use of machinery would render diminishingly viable. One contributor to the *NEW* suggested that, paradoxically, mechanization could work against industry. Paul Derrick, a socialist and agricultural trade union official, pointed out that many rural communities could no longer support light industry because mechanization had reduced the local population. The 1948 Economic Survey 'regarded agriculture as one of the under-manned industries'.[24]

The final phase of the *NEW*'s existence was marked by a prolonged debate on the role of the machine in agriculture, as John Middleton Murry engaged with H J Massingham in response to comments by the latter in a review of Martin Thornton's *Rural Synthesis*. Massingham considered Thornton to have too much faith in the machine, which provoked Murry to complain of 'arbitrary anathemas against the "artificial" – machine or manure'. Massingham held that although machines were not in themselves bad they were, unlike nature, standardized and inflexible, with the effect of encouraging large-scale extensive farming. In his turn, Murry referred to the use made of machinery by Friend Sykes and Sir George Stapledon. The countryside indeed

[22] *NEW*, 21 April 1932, p 2; 23 Feb 1939, p 308; 25 May 1939, p 100; 2 March 1939, pp 323–24.

[23] *NEW*, 24 July 1941, pp 143–44; 21 Aug 1941, pp 179–80; 4 Sept 1941, pp 195–96.

[24] *NEW*, 31 Aug 1944, pp 152–53; 24 April 1947, p 10; 10 July 1947, p 111; 23 Sept 1948, p 217; 30 Dec 1948, pp 137–38.

required fertile land cultivated by contented workers, but an experimental approach to farming techniques would lead to a more appropriate use of machinery.[25]

IV

The world survey of soil erosion, *The Rape of the Earth*, by G V Jacks and R O Whyte, was one of the organic movement's key texts. Although erosion was not a serious issue in Britain, the American 'Dust Bowl' and the erosion evident in parts of the Empire, particularly Africa, were seen as an ominous warning of what could happen if the soil were over-exploited. The year after the book appeared, G V Jacks wrote for the *NEW* on 'Soil and Soil Evolution', suggesting that Britain was living off reserves of fertility built up over several centuries. For Dr K E Barlow this implied that we '*must* impose a limit to industrial expansion'. An article by J J Zeal (quite possibly Jorian Jenks, who spent much of the 1920s in New Zealand) described in detail the destruction of soil in New Zealand, and referred also to the United States, Canada, Russia and Australia.[26]

Proposals in 1943 by the United Nations Conference on Food and Agriculture were likely, in the *NEW*'s opinion, to exacerbate the threat of soil erosion. Its report stated that industrial expansion must precede the long-term rehabilitation of agriculture; in other words, commented Jorian Jenks, the conference wanted to flog the earth still further and remove barriers to international trade, barriers which had been 'one of the very few forms of protection which the soil has had'. The Earl of Portsmouth, like most members of the organic school, blamed commercial and financial interests for soil erosion. According to S Sagar, reviewing Portsmouth's *Alternative to Death*, it was 'one of the main arguments of the book that it is because the soil has, in effect, been run by the centralized power of international finance that it is now running away with such alarming rapidity in America, Canada, Australia and elsewhere'.[27]

Beyond the economic issues Barlow identified a religious dimension: 'The dismal story of soil erosion is a reminder of the sanctions which Natural Law can and does impose upon the law breaker'. A long-term view of resource use was required: one in accordance with respect for Natural Law. 'Farming systems which exploit the soil are laying up great trouble and expense for the future, but in the short run their costs are cheaper than those of farming systems which aim at putting back into the land what is taken from it'.[28]

Soil erosion was a serious problem in South Africa, and, as in the United States, it had become evident that a national effort was required in order to restore fertility before damage proved irreparable. Reviewing H H Bennett's *Soil Erosion and Land Use in South Africa*, Sir Albert Howard attributed the problem to 'the plundering instincts of Western people'. Peoples who exploited and ruined soils did not deserve, in the *NEW*'s opinion, to be considered 'progressive'; a progressive civilization was 'one that does not consume all it produces, one that does not live hand-to-mouth, but, with respect for the past and care for the future, it accumulates "capital"'. A true economy would not squander soil fertility for the sake of short-term profit. J A Chapman's review of Wrench's book *Reconstruction By Way of the Soil*, a wide-ranging survey of different civilizations' attitudes to man's fundamental resource, was entitled 'Mankind as Prodigal Son'.[29]

The post-war period witnessed the débâcle of the Groundnuts Scheme in East

[25] *NEW*, 19 May 1949, pp 67–68; 2 June 1949, p 89; 9 June 1949, pp 107–08; 28 July 1949, pp 190–91.
[26] *NEW*, 1 Aug 1940, pp 179–80; 29 Aug 1940, p 213; 25 June 1942, pp 84–85.
[27] *NEW*, 26 Aug 1943, pp 137–38; 18 Nov 1943, p 41.
[28] *NEW*, 8 June 1944, p 69; 23 Nov 1944, p 48.
[29] *NEW*, 21 Feb 1946, p 181; 4 April 1946, p 239; 3 Oct 1946, p 206.

Africa, and the *NEW* was predictably sceptical about such super-imposed monocultural methods, forecasting a biological backlash. Rolf Gardiner, who knew Africa well, reported severe erosion in Uganda and Nyasaland, while there were fears that the interior of South Africa too would become a wasteland. Gardiner referred to the way in which husbandry was now becoming a live issue, referring to various bodies who were working for 'the maintenance of balance in the work of landscape development and a strenuous fight against waste and destruction of all sorts'. 'Pontifex III' predicted that 'all, and more than all, that has been extracted at the expense of the native populations and of the soil will have to be repaid and replaced'. Africa's situation was desperate 'unless and until her peoples learn to care for and cherish her poor soil as devotedly as they now grub beneath it for gold and diamonds'. Another correspondent wrote of the 'mischievous effect of modern short-term cash crop methods upon fertility' and of 'the disastrous effect of chemical, non-humus fertilizers upon soil fertility'. The *NEW* pointed out that even the *Economist* was forced to note the continued soil erosion in the mid-western United States.[30]

In the view of 'Notes of the Week' the 'rape of the Earth' had become a 'world disease', and they paid tribute to the late President Roosevelt, whose 'name is written in history for his initiation of flood and erosion control in the USA, as surely as for his contribution to the defeat of the Hitlerian revolution'. For Sir John Boyd Orr, soil erosion was a greater threat to human existence than the atomic bomb.[31]

V

Sir Albert Howard was the most influential advocate of humus farming. 'Pontifex III', in his obituary of Howard, described him as the man who 'led the world in the constructive alternative to artificial fertilizers', and revealed that Howard had from 1936 onwards 'often and generously contributed to this journal, as a specialist writer, reviewer and adviser'.[32] The first signs of the 'manure-complex' appeared about a year after Howard began his association with the paper, and the case for humus was represented with increasing frequency during the war, as a reaction to the rapidly developing use of artificial fertilizers.

Use of artificials had remained fairly constant, at a low level, between the wars; indeed, Lord Bledisloe commented, in his foreword to the 1936 symposium *Profit from Fertilizers*: 'Many of our land cultivators, however, use fertilizers in but small quantity, if at all'.[33] Nor was the value of farmyard manure and humus denied: the Ministry of Agriculture Bulletin *Manures and Manuring*, prepared by H V Garner of Rothamsted, insisted that although artificials were 'an essential feature of modern farming', dung was necessary as the means by which 'the land is lifted to a higher plane of fertility and a solid foundation is laid for the action of the inorganic fertilizers that may be required to meet the immediate needs of heavy crops'.[34] In the view of the organic school, though, the most effective creation of soil fertility was achieved by the oriental peasants described in F H King's *Farmers of Forty Centuries*, to whom artificials were unknown.[35] Any agricultural policy which encouraged a break from the Rule of Return of wastes to the soil was to be regarded with suspicion.

Nevertheless, the correspondence columns did grant some space to defenders of artificials. A H Brown wrote of his success with them, claiming that crops could be

[30] *NEW*, 25 Dec 1947, pp 105–06; 21 April 1949, p 17; 3 July 1947, p 102; 23 Oct 1947, p 16; 20 Nov 1947, p 52.
[31] *NEW*, 4 Nov 1948, pp 39–40; 16 Dec 1948, p 117.
[32] *NEW*, 30 Oct 1947, p 20.
[33] H V Garner *et al*, *Profit from Fertilizers*, 3rd ed, 1948, p 5; see also D Grigg, *English Agriculture: An Historical Perspective*, 1989, pp 72–73.
[34] HMSO, *Manures and Manuring*, 1938, pp 2 and 9.
[35] F H King, *Farmers of Forty Centuries*, 1927.

grown indefinitely through 'sensible manuring with balanced fertilizers'. Sir Albert Howard quickly counterattacked, saying that artificials became simply unnecessary when humus was applied to the land.[36]

Rothamsted celebrated its anniversary in 1943, and the *NEW* took the opportunity to publish an article by Jorian Jenks on 'The Great Humus Controversy'. Jenks was not an uncompromising opponent of artificials; he saw them as a valuable supplement to, though in no way a substitute for, muck and compost. What he disliked was the attempt to force up output without increasing expenditure on manpower. 'Many farmers view with profound misgiving the double boost given to the use of nitrogenous stimulants by the chemical combine and the Ministry of Agriculture'. Howard wrote in to support Jenks's argument, casting doubt on the validity of Rothamsted's 'Broadbalk' experiments by pointing out that the field plots had new seed every year. He believed that without the fresh seed the wheat would have lost the power to reproduce after about twenty-five years.[37]

The 'great humus controversy' reached the House of Lords in the autumn of 1943, when noble sympathizers with the organic movement – Lords Bledisloe, Glentanar, Portsmouth, Teviot and Warwick – criticized the Ministry of Agriculture's policy on artificials. 'Pontifex III' quoted and commented on part of the reply given by the Duke of Norfolk, joint Parliamentary Secretary to the Minister of Agriculture:

> 'I wish to deprecate any suggestion of antagonism between chemical fertilizers and humus. There is no evidence that a *balanced use* of fertilizers has a harmful effect on soil, crops or man' (my italics) or, I might add, on the influence and profits of the ICI.[38]

A fortnight later 'Notes of the Week' returned to this debate. An unnamed correspondent had written saying that he had used no chemicals for several years but was now being ordered to do so by the local agricultural committee. The writer of the 'Notes' scented collusion between the government and the fertilizer manufacturers. Similarly, Rolf Gardiner considered chemical combines to be fostering the view that humus was not necessary. 'Pontifex III' referred to another organic farmer concerned about government pressure: Friend Sykes had written an article for the *News Letter on Compost* saying that he was resisting the Ministry of Agriculture's encouragement to produce excessive amounts of milk and stimulate the soil by means of chemical agents.[39]

The *NEW* reviewed many of the important works which were published during the war. Stapledon analysed Lady Balfour's *The Living Soil* sympathetically, though not uncritically; he felt she was too lyrical about the balance of Nature and overlooked the fact that the highest degree of fertility is likely to be found in man-made soils. He noted that she attached more weight to Howard's writings than to 'the researches of the more orthodox of the soil chemists and bio-chemists'. But he also stressed our ignorance of all the factors in the environment that affect us and our health, and said it would be unscientific to assume Lady Eve was wrong. Stapledon also reviewed Gardiner's *England Herself.* W T S (presumably W T Symons) reviewed Northbourne's *Look to the Land.* Massingham's symposium *England and the Farmer* received a mixed review from the Nietzschean A M Ludovici, but his later symposium *The Natural Order* received wholehearted approval from the Revd Joseph Dalby. Portsmouth's *Alternative to Death* was reviewed, as we have seen, by S Sagar; Portsmouth's remedy for civilization's ills was to recognize human depen-

[36] *NEW*, 2 Oct 1941, p 232; 9 Oct 1941, p 243.
[37] *NEW*, 25 Feb 1943, pp 161–62; 11 March 1943, pp 183–84.
[38] *NEW*, 4 Nov 1943, p 23.
[39] *NEW*, 18 Nov 1943, p 38; 16 July 1942, p 114; 30 Nov 1944, p 55.

dence on the soil and return humus to it.[40] This emphasis on the Rule of Return can be found in all the above works.

The same approach continued in the post-war period. Howard's edition of Darwin's writings on the earthworm was reviewed shortly after the European war ended, and his major survey of the organic movement's philosophy and development, *Farming and Gardening for Health or Disease*, was reviewed a few months later. The paper also granted space to a book critical of the humus school, Donald P Hopkins' *Chemicals, Humus, and the Soil*, which Stapledon reviewed. The review elicited a letter from Massingham, urging that we should be 'over-cautious in accepting the claims of chemists to order and control the forces of life', and reminding readers that artificials had been seen by the landowner R H Elliot as a form of decadence. What was essential was a 'healthy organic soil'.[41]

Friend Sykes's first book, *Humus and the Farmer* was reviewed by J J (presumably Jorian Jenks), who praised Sykes's methods for having 'a much sounder basis than has most of the scientific advice and technical instruction now so widely publicized as the future salvation of agriculture'. A fortnight later Howard referred to Sykes's book, and offered another successful example of organic methods, Newman Turner's farm in Somerset. Howard was an enthusiast for municipal composting as a means of creating humus, and an article on this topic, entitled 'Sewage, Salvage, Soil and Sanity', was contributed by Cecil D Bachelor, who argued that there would be no need to import artificial fertilizers if more councils followed the lead of those which were de-hydrating, pulverizing, and bagging sewage sludge. Six hundred thousand tons of sludge, produced each year, plus composted waste-matter, could make six million tons of compost annually, he said.[42]

Finally, it should be noted that the *NEW* covered the establishment of the Soil Association, 'Pontifex III' devoting a paragraph to its aims:

> The Soil Association, whose inaugural Meeting was held in London on May 30, presided over by Lady Eve Balfour, gives promise of thorough investigation into the basic principles of agricultural production, and the steady publication of the findings of its research into the basic requirements of fertility and quality in plants and animals, and the resistance of both to pests and diseases.

The paragraph went on to give the association's address and to refer to its forthcoming journal.[43] The drive for humus-based fertility enjoyed consistent support in the pages of the *NEW*.

VI

What with the founding of the Soil Association and the plethora of books on organic husbandry published during and shortly after the war, the organic movement would have been justified, in the late 1940s, in feeling optimistic about its future; yet by the mid-1950s the tide was flowing strongly away from it. Important figures had died in the meantime: Howard in 1947, Picton in 1948, Massingham in 1952, and Scott Williamson in 1953. Portsmouth grew increasingly disillusioned with Britain and spent more time abroad. Stapledon entered a long period of invalidism. The Pioneer Health Centre closed in 1951, and Dr K E Barlow failed, in the post-war years, to establish a similar project in Coventry.[44] The *NEW* could no longer survive financially and closed in September 1949.

[40] *NEW*, 9 Dec 1943, pp 66–67; 27 Jan 1944, p 121; 13 June 1940, p 94; 16 Oct 1941, p 250; 22 Feb 1945, pp 144–45; 18 Nov 1943, pp 41–42.

[41] *NEW*, 12 July 1945, p 115; 17 Jan 1946, pp 133–34; 14 March 1946, pp 212–13; 28 March 1946, pp 235–36.

[42] *NEW*, 13 June 1946, p 90; 27 June 1946, p 111; 26 Feb 1948, pp 192–93.

[43] *NEW*, 20 June 1946, p 96.

[44] See the Earl of Portsmouth, *A Knot of Roots*, pp 211–12. On the closure of the Pioneer Health Centre, see C Ward, 'Fringe benefits', *New Statesman and Society*, 29 Sept 1989, p 33. On the Coventry Family Health Club, see K Barlow, *Recognising Health*, 1988, pp 112–19.

More important were the developments in national agricultural policy. Members of the organic movement welcomed the security which the 1947 Agriculture Act gave farmers; but in their view the implications of its approach to productivity were ominous, since it continued on the path of efficiency measured by output per man, with concomitant increase in mechanization and use of artificials, and decrease in the number of small, mixed farms. The number of agricultural workers, which had risen during the war, resumed its long-term downward trend, entering a period of particularly rapid decline in the 1950s. Between 1946 and 1958 the number of tractors being used in England and Wales increased from 179,846 to 430,805, and of combine-harvesters from 3253 to 39,890. In 1946 just over half-a-million horses were used in agriculture, but by 1958 they were no longer regularly enumerated in the annual agricultural census.[45]

Application of inorganic fertilizers had approximately doubled during the war. 'There is little doubt', state Blaxter and Robertson, 'that the increased use of fertilizers contributed greatly to the increased farming output during the Second World War'.[46] This trend continued after the war, whereas 'the use of farmyard manure declined after 1945; indeed in some parts of England the disposal of dung has become a problem'.[47] According to David Grigg, 'the decline of the small farms and the increasing dominance, in terms of land occupied, of the large farm, is the principal structural change' of the forty years from the late 1940s.[48] A more recent – and considerably less detached – writer on post-1947 policy, Graham Harvey, sees the results of the Agriculture Act as catastrophic. In particular he regrets the loss of the smaller, mixed farm, referring approvingly to the descriptions of such farms which H J Massingham wrote in the 1940s, and which compared the yeoman husbandman favourably with the industrial farmer.[49]

However, the greater crop yields of the post-war decades and the increased efficiency of British agriculture suggested that technology rather than husbandry held the key to ever-expanding productivity. In contrast with the buoyant mood of mainstream farming the Soil Association journal *Mother Earth*, edited until his death in 1963 by Jorian Jenks, would have appeared overcautious and irrelevant. The publication of Rachel Carson's *Silent Spring* that year suggested, though, that such caution might after all have been justified.

It is unlikely that many people even in the organic movement itself know of the journal which first provided a forum for the movement's founders. The *NEW* was not registered with the Audit Bureau of Circulation Ltd, and a valedictory article in September 1949 admitted, 'The circulation it can attain is limited'.[50] Philip Mairet wrote in the same issue:

> Our work has been of wider effect than the provision of a place for intelligent comment and controversy, or of a seed-bed for ideas. Some of the causes we have espoused have drawn a vital strength from our weekly insistence, which has promoted action upon them elsewhere. They will go on, and we shall presumably find ways to continue to serve them.[51]

It has not been possible here to examine the *NEW*'s coverage of health and nutrition, rural life, or forestry, but its contribution to the cause of organic farming should be clear. Its contributors went out to preach, debate, and advise; and Barlow, Gardiner, Jenks, Massingham,

[45] Grigg, *English Agriculture*, p 144; HMSO, *Century*, p 71; Blaxter and Robertson, *Dearth*, p 28.
[46] Blaxter and Robertson, *Dearth*, p 80.
[47] Grigg, *English Agriculture*, p 76.
[48] *Ibid*, p 120.
[49] G Harvey, *The Killing of the Countryside*, 1997, pp 107–8.
[50] *NEW*, 8 Sept 1949, p 205.
[51] *NEW*, 8 Sept 1949, p 207.

Picton, Portsmouth, Sykes, and Scott Williamson were founder-members of the Soil Association. In this, and in other ways, they gave impetus to the theory and practice of organic husbandry. When the full history of the movement's development is written, the *New English Weekly*'s role will demand a central place.

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Conference Report: Spring Conference 1998

By CHRISTINE HALLAS

ONCE participants had managed to negotiate the winding roads of rural Shropshire and discovered the pleasant small campus with its unexpected bonus of a home farm providing produce for our meals, the conference settled into its usual format of comfortable excellence. Professor Woodward (Hull) whetted appetites with his paper on 'Straw, bracken and the Wicklow whale: the use of natural resources in post medieval England', he explored the opportunistic approach to resources in sixteenth- and seventeenth-century Britain. He emphasized the importance of an economy that was goods and service rather than money based. He concluded by noting that while virtually every part of a stranded whale would have been used 400 years ago, today Britons 'will just go to gawp' and, failing to refloat the whale will leave the valuable resource to rot on the beach.

Dr Paul Stamper (English Heritage) provided a context for the conference field trip by using estates in Shropshire and adjoining counties to demonstrate the adoption in the eighteenth and nineteenth centuries of extravagant designs drawn from such diverse architectural styles as Gothic, Palladian and Chinoiserie. His excellent slides showed how landscaped parks and gardens along with fowl houses and piggeries were part of display and a statement by the owners of their status. The Australian criminal in the form of the cattle rustler was the subject of the first lecture on Tuesday. Professor John Perkins (New South Wales) contested the accepted view of Australia's development in the nineteenth century being solely on the basis of sheep. He demonstrated the vitally important role of cattle (domesticated and feral) as the main provider of local food, a beast of burden, a provider of hide and a 'long grass muncher' to enable sheep to graze shorter grass. Through careful analysis of the different types of cattle thief Professor Perkins demonstrated the upward mobility of criminals. Cattle and cattle theft, he argued must be seen as a significant element in the development of the Australian economy.

Paul Booth, in the next paper, brought the audience back to England with his fascinating exploration of the inter-relationship between pastoral farming, leasing and social change in fourteenth-century England. Dr Roger Dalton (Derby) built on the work of David Taylor and others to present his own researches into the development of the south Derbyshire cheese industry 1770–1870. By an analysis of newspapers, tithe records and MAF returns he showed how farmers, by progressively moving into dairying and particularly into cheese, were responsive to the country's changing demands. Dr Dalton adopted a livestock unit designation to identify the growth of the changing industry and through this method was able to demonstrate the increasing specialization of Derbyshire farmers. He concluded that as the result of a variety of factors, size of farms and dairy hands increased and productivity of cheese makers rose significantly. The afternoon was taken up with an interesting symposium on 'Farm production in England 1700–1914' led by Professors Becket and Turner and Dr Afton. The speakers identified the aims of their research project and gave a report on research findings to date. This resulted in a lively discussion about both the methodologies and the conclusions being drawn from the evidence.

The formal sessions of the day concluded with Professor van Zanden (Utrecht) giving the Chaloner Memorial Lecture on 'The paradox of the marken'. This fascinating paper explored the exploitation of the commons in eastern Netherlands by rural society. Professor Zanden demonstrated how, in order to protect this valuable resource, local communities sought to regulate the commons (marks) and make them sustainable. During the paper Professor Zanden drew interesting parallels with the British experience and pointed out that in both countries very little research has been undertaken on common rights and their development. As the paper progressed we were shown how regulations were established in the thirteenth and fourteenth centuries when original forests were threatened by over exploitation. Based on a moral economy these rules continued to control the activities of peasants until tensions increased in the sixteenth and seventeenth century with population expansion and the resultant serious exploitation. The situation was redeemed in the seventeenth and eighteenth centuries with a balance being attained. Subsistence was enabled to continue paradoxically

because of the gradual commercialization of agriculture. However, by the nineteenth century attitudes were changing and after resistance from the peasants the marks were dissolved.

A splendid day of lectures was concluded by a well earned rest in the form of the Conference Reception and Annual Dinner. The only sad note of this occasions was the announcement of the retirement of our President, Dr Joan Thirsk. Earnest discussion and revelries continued late into the night when, having drunk the bar dry, some delegates reconvened in a common room to find out what happened to 'Albert and the Lion'.

The following morning started in sober manner with the Annual General Meeting but gathered apace when Leigh Shaw-Taylor extended Professor Zanden's topic by asking in his paper, 'Did labourers really have common pasture rights?' He took issue with the Hammond/Neeson thesis and by linking three types of document – claims to property; Land Tax assessment; and militia ballot lists for selected areas in Cambridgeshire, Hertfordshire and Buckinghamshire – proceeded to show that the view that common rights were held extensively by labourers was not sustainable. The beneficiaries of common rights were farmers, artisans and people of similar wealth. The final paper of the conference was given by Andrew Gritt who examined 'Estate housing in south-west Lancashire 1750–1850'. He demonstrated how, due both to endogenous and exogenous factors rebuilding of estate houses in this part of Lancashire did not occur to any significant extent until the nineteenth century. As the paper progressed the complex linking of factors was clearly highlighted with the changing structure of farming, increased wealth in the area, the opening of Leeds/Liverpool canal, and a rise in social status of many owners being shown to be responsible for significant improvement in the provision of estate dwellings.

The final lunch of the conference was followed by an excursion to Leighton near Welshpool. The Spring Conference has always provided a forum for established scholars and new researchers and this year's offering followed the tradition. The excellent papers coupled with lively discussion made it a most enjoyable event.

Review Articles

ZVI RAZI and RICHARD SMITH, eds, *Medieval Society and the Manor Court*, Clarendon Press, 1996. xvi + 709 pp. £70.

It falls to an early modernist consumer of court rolls to review this excellent book and gawp at the richness of the medieval documentary record. Smith and Razi have assembled fifteen essays, all save two new, around the loose theme of the manorial court, its records and and the light they shed on medieval society. Some are directly concerned with court rolls and the techniques for their exploitation. One or two are 'think pieces' concerned with more general questions of law: others offer detailed reports on research utilising medieval manorial records. The editors contribute a helpful review of earlier work on court rolls. Halfway through the volume, Paul Harvey contributes what is almost a second introduction reviewing recent work on the peasant land market in medieval England. At the end is an substantial appendix of surviving court rolls series and a full and helpful bibliography.

As the editors point out in their opening chapter, court rolls, as a record type, are a peculiarly English phenomenon, unknown elsewhere in Europe. It now seems well established that court rolls appear about the 1230s and become relatively common during the 1260s when a significant number of the surviving court roll series commence. Early courts were relatively simple in their procedures. They became much more elaborate by adopting the methods of the crown's courts and, as a tool of manorial discipline, acquired teeth by developing presentment juries, sometimes in the face of tenant hostility. Smith and Razi suggest that early courts were designed less to discipline servile tenants than to attract free tenants into the court. One can see why plaintiffs who had a choice of court in which to litigate might not wish to go to a court whose decisions went unrecorded. The maintenance of formal records in emulation of the royal courts was an incentive to sue there rather than elsewhere. May we presume that without the keeping of formal records, there were problems in the enforcement of the court's decisions?

This is challenging stuff but ultimately beyond proof. There are two separate developments running side by side. The first is the increasing sophistication of the court, the second the increasing sophistication of its record keeping. Whilst the emulation of the royal courts is convincingly made (and by Hyams too in the following chapter), is the development of record keeping a reflection of the need of landlords to offer evidence of the proof of jurisdiction in the age of *quo warranto*? If lords were trying to stop their tenants (free and servile) transferring land by private charter, then again, the tenants would wish to have the reassurance of a written record of the transaction. Would it be helpful to see one of the lord's ambitions as being to secure a monopoly of record keeping within the village? Indeed, the problem may be that the keeping of written court rolls served so many purposes it is hardly possible to attribute the commencement of the practice to the needs of any one. Certainly the essay defines a problem: but it does not provide a definitive answer before it passes onto another tangential matter, the number of literate clerks in the thirteenth-century countryside.

Hyams contributes a scintillating essay on 'What did Edwardian villagers understand by law?' This returns to villeins their legal personality outside the manor. Like many others, I had understood that the villein could not sue in the royal courts. Hyams makes the point that the villein could sue, but his opponent could bar his action by exception of villeinage, but he was not bound to do this and the royal courts came to 'restrict the right to plead an exception of villeinage to the plaintiff's own lord' (p 71). So the manorial court lacked a monopoly jurisdiction over its inhabitants. Villagers, some of whom were serfs, could appear in a wide range of legal fora. Equally importantly, by the end of the thirteenth century manorial courts employed procedures and terminology borrowed from the royal courts, so much so that Hyams feels able to regard them as the incipient lowest stage of an integrated system of justice. Hyams then goes on to develop ideas of what the villager understood by 'law'. A stimulating essay and not only for medievalists.

Bonfield's 'What did English villagers understand by "customary law"?' takes Hyams as its starting point and then proceeds at a tangent. Bonfield is at pains to show that the manorial court did not simply apply royal law to the situations they adjudicated. Instead, Bonfield identifies three ways in which the court might arrive at decisions. It might employ precedent, whether collective memory or the rolls themselves; it might create custom by applying a rule selected from amongst several possibilities to bring about the appropriate just outcome; or the court might reason inductively to reach the result between the parties which they would wish to see transpire.

I have a great deal of sympathy with the arguments of both Hyams and Bonfield. One way to resolve their apparent conflict is to recognize the multi-functionality of the court. Later jurists would hold that the court leet was indeed a royal court

dealing with criminal and civil actions. The court baron was, in effect, the lord's administrative court dealing with the punishment and regulation of his tenants and officers. The final function, adjudicating the descent of tenements, was neither one nor the other. In one sense the lord had no interest in who his tenants were provided they paid his fines and rent (and were perhaps not free tenants). The tenants however had a great interest in the descent of land, and I would suggest that where there was doubt, their approach was akin to equity rather than the application of hard and fast rules especially in circumstances where no precedent applied. The sixteenth-century sources persuade me that custom might be created and amended to produce equitable outcomes.[1] In practice I think that it is probably impossible to distinguish between Bonfield's second and third options: but it remains the case that controversy creates the rule. I would also disagree with Bonfield on another matter. Where he seems to take the manor as a sealed institution, I would argue that notions of equity circulated amongst tenants in the market place, amongst stewards, court keepers and attorneys. The manorial jury reflected the views of a wider society. Each manorial court developed its own customs, it is true, but what Bonfield fails to appreciate is that in important respects, eg the treatment of widows, these customs are broadly regional and in practice the variation between manors is probably quite small. Nor does he really consider the extent to which the resolution of individual cases was determined not by the manorial jury but by reference to stewards, noble councils and nobles themselves to whom the tenants were well used to appeal. The post-medieval material shows instances of manorial lords interfering in the descent of tenements, sometimes to undo injustices, on other occasions to exercise their own patronage on behalf of their servants. Are we to believe that this did not go on earlier? The later material also shows instances of all the copyholders of estates believing that they shared customs – the custom of the estate as it were. What clearly made for uniformity was the controlling hand of a steward travelling from manor to manor (in much the same way as it was said that the assize judges kept the common law common). When Bonfield tells us that the court rolls of Hatfield Chase in Yorkshire are full of juicy leading cases, is that because it was part of the Duchy of York with a professional secretariat? A further point which neither Bonfield nor any other contributor considers is whether the tenants of the manor had access to the court rolls. I think not. In any case the language of the record would obviously be a bar. For the tenants, the custom of the manor was their recollection of the court's actions rather than the written minute of the court's business. Hence I think that there are questions which Bonfield has (in this essay at least) left unexplored, but like others, I eagerly await his *Selden Society* collection of cases edited with L R Poos.

Elaine Clark continues her studies of the transfer of land by the elderly, on this occasion looking at instances where people surrendered land to executors with instructions for its sale after their deaths to pay for masses or charitable donations. My problem with this paper (and her parallel articles) is that her material is drawn from a limited spatial region and seems to be characteristic of a particular period of demographic crisis. The paper is also essentially non-quantitative. Whilst table 5.1 offers figures for the particular types of cases under consideration here, the figures are never placed in the overall context of the transfer of property on the manors she considers. Franklin's paper on a movement of servile tenants at Thornbury (Glos) is much more substantial but ultimately strangely unsatisfying. I found it quite hard to work out what actually happened. This was a noble manor with a succession of aggressive lords. A movement of labour service refusals which started in 1331–2 may have been broken in 1333 following a visit by the lord. The movement revived in 1337–8. The following year the tenants moved a petition against their bailiff and the lord sent his chief steward to investigate. The empanelled jury, including villeins, produced a further series of complaints against the bailiff. The bailiff refused to be tried by a jury consisting wholly of villeins: a second jury was empanelled which threw out the allegations and fined its predecessor £20. By the later 1340s services were again being refused and tenants were withdrawing from the court. This is a fascinating study of high pressure manorialism. But Franklin's evidence fails him at crucial moments. And was the movement aimed at the lord or his bailiff, the latter a gentleman with sufficient standing to serve as an MP for Gloucester and Gloucestershire? I was left with the feeling that the matter was not bottomed, perhaps could not be bottomed. Ralph Evans writing on Merton College's manor of Thorncroft (Leatherhead parish, Surrey) is perhaps too comprehensive. Possibly because labour services here were fairly light, there was little challenge to the court whose main purpose, Evans argues, was to protect the lord's interests. At some moments the wardens of Merton were personally involved in the administration of the manor and the descent of tenements. Evans is helpful on the descent of servile tenements. He shows how the lord was capable of protecting the rights of heirs even after a non-family tenant

[1] The following comments anticipate a fuller exposition of my work on manorial courts and tenurial conflicts in Chancery.

had been admitted. Barrell, Davies *et al* on the Dyffryn Clwyd court roll project offer an interim statement on its methodology and the possibilities for analysis which their data permits. There is useful material on the complications of Welsh kinship and money lending, but the chief interest is in the computerization of their data, to which I will return.

Razi offers a short paper on kinship interaction in Halesowen arguing for extended families there. Pre 1349 Razi sees attempts by the larger tenants to keep as many of their relatives on the land as possible, forming what must have been almost hamlets of related conjugal families, whilst poorer tenants had to expel children and had correspondingly fewer locally resident kin. Schofield is the only contributor who deals solely with post-Black Death circumstances, showing how the monks of Westminster tried to keep their view of frankpledge alive at Birdbrook (Essex). Taking his cue from Britnell's recent work on commercialization, Richard Smith discusses the weekly market at Botesdale in Redgrave, Suffolk. Smith is able to show a busy countryside with large numbers of landless dependent upon the market for foodstuffs, but also able to sell their labour and the products of their labour. Whilst he seems to suggest that the presence of a market speeded the land market and the differentiation of the peasantry, it would be interesting to know whether the process of differentiation proceeded any faster here than on manors which lacked a market and whose peasants therefore had to travel. Can Smith discover the sort of distance decay curve in wealth found by Biddick?[2] The penultimate essay – by Rodney Hilton on the borough of Thornbury (Glos) – is slightly at variance with the others. Hilton is immediately up against the problem that as burgage tenure prevailed in Thornbury, the borough court rolls do not note the transmission of land and so the death of tenants. This makes the construction of genealogies difficult. The paper is really an elegant essay on the inferred oligarchy and economy of the borough as seen through the court rolls.

The final chapter, by Harold Fox, is perhaps the finest of all the research contributions to this volume. Fox starts with the lists of men – *garciones* – found in the court rolls of Glastonbury Abbey from 1265 onwards. These were interpreted by Postan as licences for migration, but Fox turns this on its head and shows that they were landless men living on the manor, a strata normally invisible. Fox is able to show that other lords obliged landless men to undertake seasonal labour services, but *chevagium garcionum*, Fox argues, is in reality a tax on labour – one might suggest the secular equivalent of the tithe on wages. This is achievement enough, but Fox then goes on to argue that some of the Glastonbury *garciones* are servants in husbandry and that they were required because a moderate sized tenement, after the satisfaction of labour services, needed more labour than could be supplied by family labour alone, and that logically this need could best be satisfied by the employment of co-resident servants. The conjunction of tenement size and labour services on some manors meant that there were local opportunities for employment, but elsewhere migration was compelled. Hence, it now appears that where holdings were large and labour services heavy, the employment of servants in pre-Black Death England can be expected, and that it follows that the Statute of Labourers was giving statutory backing to a system of labour which already existed. Overall, Fox's chapter defies rapid summary: I can only recommend that you read it.

At the end, having enjoyed the individual dishes, some comments on the overall cuisine seems in order.

Whilst methodological issues intrude into the book from time to time, there is no essay specifically devoted to them. The book reprints the spat between Poos, Razi and Smith from *Law and History Review*, mistakenly I thought, as this is already familiar and merely adds to the price of the book. It is not a substitute for an agreed statement by the protagonists, nearly a decade on, about how the issues dealt with there should be approached. There is relatively little on the computer methodologies to be employed. Smith refers to his own students using a relational database, Paradox, to analyse court rolls. The Dyffryn Clwyd project used a text based system, Idealist, which, I assume, avoided the need to avoid coding transaction types and individuals, and has a synonym search function which allows for collective searches. (For instance one might search for all instances of textiles rather that one textile type at a time.) Ultimately I wondered how much of an aid to research this database was over an indexed transcript. The sheer volume of these court rolls restricted the research team to two short chronological periods, allowing for a pre- and post-Black Death comparison, but precluding a dynamic analysis of the fortunes of individuals over extended periods. Time will tell how well conceived this project was. At the University of Central Lancashire Dr Henry French and I have been using Access to analyse one element contained in post-medieval court rolls – the land transactions. Three projects, three databases, one text based, two relational. Some agreement over procedures would be useful: some tips in print over, say, the treatment of

[2] K Biddick, 'Medieval English peasants and market involvement', *Journal of Economic History* 45, 1985.

individuals bearing several names would doubtless save future workers a great deal of time.

I thought too that most of the writers found pre-Black Death court rolls a great deal more attractive than later court rolls. The only writer to deal directly with the problems the Black Death brings for manorial administration is Schofield on frank-pledge in his Essex manor. Of course, later court rolls are poor cousins to those dating from the period of high pressure manorialism. The decline of serfdom obviously removes a lot of the fine detail about individuals. But there is almost a hiatus between those of us exploiting sixteenth-century materials and the writers here, and there are questions to be asked. What, for instance, did fifteenth-century tenants understand by custom? Schofield makes the interesting point that the turnover of tenants in Birdbrook was so high that the body of older tenants who knew about the custom of the manor of Birdbrook disappears. Is this universally so, and if so, when is the memory of the custom of the manor reconstructed? I would hazard a guess that 'custom' exists only in periods of high demographic pressure when access to, and the inheritance of land, is at a premium. The period 1250–1350 can be seen as a century when custom mattered, 1350–1450 a century when it did not, 1450–1550 a century when it reappears and 1550–1650 the century when it is challenged by lords and staunchly defended by tenants.

Questions of regionalization are also less prominent in the book than I would have liked. Here there are two points that I want to make. The first is that there is nothing directly on the grumbling argument that the character of the land market in the west Midlands (with a trade in whole or fractional virgates) was different to that in East Anglia where the currency was the individual open field parcel Fox does make some comments on this, suggesting that where holding size was very small (as in East Anglia), we would not expect to find servants in husbandry. Again, one would like some authoritative statement on where we stand on this.

The second point is the regional bias in this book. There is an element of imbalance in the essays. With the exception of the Dyffryn Clwyd piece, all are concerned with classic lowland England, ie south of the line running from the Severn to the Wash (see map 0.1 for this). Perhaps contributors were not available to write on the surviving court rolls series from northern England, such as Wakefield, Hatfield or the manors of the bishopric of Durham. But the Appendix of surviving court roll series also makes it clear that there is a shortage of adequate materials from the north, and the north-west in particular. Cheshire, Lancashire, Westmorland, Cumberland and Northumberland are simply absent from the survey. The situation in Cheshire is, I think, not quite as bad as this might lead one to suppose. Overall though, there is certainly a lack of manorial material from the north-west and one wonders why. In part it is merely misfortune. When the court rolls in Clitheroe Castle were inspected in 1580, it was found that they stretched back to Edward III but 'the most part of them [are] so decayed and consumed that they will not hold together to be open and looked into so that no perfect survey can be taken of them'.[3] It may be that the humidity of the Lancashire climate, which, myth has it, so favoured cotton spinning, was the very death to court rolls. But there are questions to be posed about the intensity of medieval manorialism in parts of the north which someone ought to explore.[4]

At a number of points the contributors to this book promise extended accounts of their findings in the future. As an interim statement, the book is a considerable achievement, a great pleasure to read and muse over. After these riches, who is going to produce a parallel volume on the manor court in the two centuries before the Civil War? Someone ought.[5]

R W HOYLE

JOAN THIRSK, *Alternative Agriculture: A History from the Black Death to the Present Day*, OUP, 1997. xi + 365pp. 26 illus. £25.

Many years of research have gone into the making of this important and intriguing book. It provides an historical survey of the efforts made to find uses for land as alternatives to 'mainstream agriculture', meaning the production of cereals and meat. The investigation of this theme has resulted in the illumination of many diverse and obscure corners of agricultural history, corners which most of the subject's practitioners have neglected completely or have seen as unimportant dead ends. Joan Thirsk's achievement is to give these alternative crops their due significance in the progress of the industry, and to explain their advantages and disadvantages. Thus we have here remarkably interesting and valuable

[3] W Farrer, ed, *The Court Rolls of the Honor of Clitheroe*, III, 1913, pp v–vi.

[4] Michael J Bennett, *Community, Class and Careerism. Cheshire and Lancashire Society in the age of Sir Gawain and the Green Knight*, 1983, pp 91–97 offers some evidence for Cheshire and Lancashire south of the Ribble but admits that '...little is known regarding the tenurial status of most Cheshire and Lancashire peasants ...' (p 97).

[5] Since this review was drafted, I have seen C Harrison, 'Manor courts and the governance of Tudor England', in C Brooks and M Lobban, eds, *Communities and Courts in Britain, 1150–1900*, 1997, which argues for the continued importance of the courts and calls for more work to be done.

discussions of the cultivation of rapeseed, woad, madder, mulberry trees, safflower and weld, as well as the early development of vines and tobacco.

This is in the course of an examination of the historical development of alternative agriculture, set in four fairly well-defined periods: between the Black Death and about 1500; in the century after 1650; in the sixty years after 1879; and from the 1980s onwards. In each of these 'disjunctures' the introduction and expansion of various forms of alternative land use were influenced by far-reaching changes in the economic environment. In the first period, following the Black Death, shortages of labour and declines in markets led to a search for alternatives to grain and meat. The scarcity of material for this period does not permit a very detailed discussion but there was an expansion of dairying and of the keeping of sheep for their wool and for making cheese from ewes' milk; while among the wealthy there was a greater interest in rabbit warrens, deer parks, fish ponds and dovecotes. The growing of saffron, used as a dye and also in medicine, flourished in eastern England, and there was a growth of pasture leys in the common fields, as witnessed by the increased regulation of this practice in village by-laws from the fifteenth century.

It has been possible to treat the second period of innovation, between 1650 and 1750, much more fully. Population growth stagnated and prices of 'mainstream' products fell to unrewarding levels. It was significant, therefore, that from 1656 parliament allowed farmers to export grain, cattle, horses and dairy produce, subject only to home prices not rising to scarcity levels. There was accordingly a revival of rabbit warrens, deer parks, fish ponds and dovecotes on the part of the gentry, as well as a new interest in establishing plantations for timber. But more portentous was a greater flexibility in land use, with clover, lucerne and sainfoin eventually achieving a place in arable rotations. Labour was more plentiful, and so crops which required many man-hours to cultivate were favoured, including those found in market gardens, while the growing of vegetables spread to the poor.

Among the new or newly-encouraged crops were tobacco, saffron, turnips, potatoes, carrots, Jerusalem artichokes, cabbages, liquorice, mustard seed and canary seed; and hops, a crop already established in the fifteenth century, became more widely grown under the influence of profitable prices. In some instances the original stimulus to innovation or expansion was an external one: in the case of rapeseed the advantages which arose when it was used to replace imported olive oil; in that of woad, a home-grown alternative to an increasingly expensive imported commodity. In general, the growing importance of alternative crops after 1650 may be seen in their coming to figure in tithe disputes: this was particularly so for hops and flax, and for a wide range of vegetables and fruit. There were others, however, which failed to spread widely, or failed to persist, such as mulberry trees (for silkworms), madder (used as a dye and in medicine), safflower and weld (also dyes), and vines.

The third period in which alternative agriculture expanded, between 1879 and 1939, differs in important ways from the two earlier ones. So far from the population declining or stagnating, in this period it continues to rise, if at an increasingly slower rate. The home markets were thus expanding, and the growth in demand was further stimulated by the spread of industry and a substantial improvement in living standards. It was of course the rising flood of imports which depressed prices, especially for cereals but also in some degree for meat, wool, butter, cheese, bacon, vegetables and fruit. There was again a renewed interest in crops used for industrial processes, and also experiments with tobacco, the cultivation of sugar beet (which, however, proved successful only after intervention by the government in the 1920s), and the commercial exploitation of game reserves by landowners. But the major change in the period was the structural shift away from cereal growing to pasture, especially for milk production, together with a substantial expansion of the acreage devoted to orchards, soft fruit, vegetables, and flowers. Gross production figures produced in 1927 showed that by then milk and dairy produce comprised as much as 26 per cent of the whole, fruit, vegetables and flowers made up a substantial 11 per cent, and poultry and eggs a considerable 7 per cent.

The Second World War, the much more positive post-war government policies, and subsequently the Common Agricultural Policy, restored prosperity to mainstream farming. By the 1980s, however, as Joan Thirsk points out, the measures had been taken too far and problems of over-production in cereals, milk, and other produce led to a new revival of alternatives including rapeseed, flax, herbs and aromatics. Drawing on the historical evidence, she argues that the way forward must be found in diversification and specialisation, with new initiatives more likely to come from individuals than from governments concerned with formulating general agricultural policies.

This story, with its many references to historical antecedents and similarities, is certain to arouse great interest and gives much food for thought. Among the observations which come to mind is one concerning the role of improved efficiency in mainstream farming, an aspect which is not neglected here but perhaps is rather underplayed. The

great expansion of output made possible by innovations incorporated into mainstream farming and the cultivation of former waste lands—both originating in part in alternative agriculture—is of course a key feature of past centuries. Even more important for the present day are the enormous increases in output made possible by the progress in agricultural science and technology since the 1930s, and particularly since the Second World War: advances in fertilisers and pesticides, machinery and the electrification of farms, new and highly productive strains of seeds, and the role of artificial insemination in livestock breeding, to mention only the more obvious. As an example in what has become a major branch of British farming, improvements in the breeding and feeding of dairy cattle have caused the average yield of milk to rise rapidly since the Second World War: in only the ten years after 1970, for instance, milk yields increased by from 10 to 19 per cent, varying with the breed concerned. The very real agricultural revolution, of which this is just a small example, is undoubtedly at the root of present-day problems of overproduction.

Another point for further consideration is the part played by living standards in the periodical resurgence of alternative agriculture. Clearly, while a number of the developments after the Black Death were related to the needs of the wealthy, as were the similar changes after 1650, in the longer term it was the market provided by the rising general population, and especially the rising non-agricultural population, which became predominant in the growth of alternative agriculture. General living standards are believed to have improved considerably in 1650–1750, and certainly rose markedly in the later nineteenth and the twentieth centuries. And, for the intervening period between 1750 and 1850, there is also some substantial evidence that consumption per head was rising, not only of the staple foodstuffs but also of dairy produce, fish, fruit and vegetables. Thus, by the later nineteenth century, aided by the cheapening and greater efficiency of transport, some of the former products of alternative agriculture were becoming staples which claimed their part in mainstream farming. This change went further still in the uneven but general long-term progress of living standards in the present century. The question arises, therefore, whether 1879 to 1939 is as clear-cut a division as is argued.

In another way the first two periods of alternative agriculture may be seen as very different in kind from the post-1879 era. The difference centres on the question of scale. For obvious reasons no figures are available for the acreages affected by the alternative uses of land in the two earlier periods. This reader obtained the impression that in the post-Black Death period they were probably quite small in relation to the total area of land used for production. The 1650–1750 period has evidence for the widespread cultivation of certain crops, and a number of these were capable of integration into the patterns of mainstream agriculture. The bulk of the evidence, however, appears to indicate the use of small closes for many of the crops, and in some instances the innovations were encouraged by the possibility they offered of a means of cultivating waste lands. Again, a number of the new crops had important drawbacks, requiring for example substantial capital and investment in equipment, or involving heavy labour demands at seasons which clashed with the labour requirements of other types of farming. One must suppose, too, that the availability of suitable soils, of markets, and of transport facilities, were other inhibiting factors.

It may be, then, that many of the innovations of the two earlier periods were of the nature of offering *supplementary* sources of income rather than *alternative* ones, for if the bulk of farming remained little affected by the new developments 'alternative agriculture' may not be the most appropriate description. The 1879–1939 period presents a quite different aspect, for here there was indeed a major shift in land use, with many farmers forced by economic conditions to change radically the sources of their incomes. So much was this so that for great numbers of farmers the alternative uses of land became their new mainstream farming. At the present, as Joan Thirsk suggests, we may be seeing the beginnings of a further shift in land uses, finding completely new directions, or going back to 'innovations' which had been tried centuries before. How far the present changes will go it seems rather too early to say.

Whatever reservations one may have, we must all be grateful to Joan Thirsk for a book which provides so much interest and stimulus to discussion. It is, as one would expect, beautifully written, and is attractively illustrated and handsomely produced. And, certainly, those many obscure crops which we neglected before must now receive their due in more balanced accounts of our agricultural history.

G E MINGAY

Book Reviews

L T EVANS, *Crop Evolution, Adaptation and Yield*, CUP, 1996. x+500 pp. Pbk £22.95.

Since its publication in hardback in 1993, Lloyd Evans's book has gained many plaudits, reinforcing the author's established reputation as one of the leading plant physiologists of the present day. Its republication in paperback gives agricultural historians the opportunity to acquire a volume which is both an authoritative guide to the methods and concerns of contemporary plant science, and a comprehensive overview of the history of food crops since the neolithic.

Evans's confessed motivation is an urge to encourage dialogue between the two cultures within biology, 'of *Drosophila* and *Arabidopsis* on the one hand, and of wheat and soybeans on the other'. The past, present and future of our food crops, he argues, deserve at least the attention and status accorded areas of pure research. The central focus of Evans's book is yield and its development. An introductory chapter provides an overview of the whole field. One section contrasts the reversal of the Malthusian metric (the means of subsistence has increased consistently faster than population) with the persistent fear that Malthusian pessimism is about to be vindicated. Another provides a brief and up-to-date survey of current thinking about the origins of agriculture. The book then opens out into a succession of thematic chapters. These provide substantial and wide-ranging surveys of yield and world food supply, the domestication of crop plants, adaptation and yield ecology including plant diffusion, physiological aspects of crop improvement, the trends and limits of yield increase, inputs and the efficiency of crop resource use, and the future of yield. A bibliography running to almost 2000 items rounds off the volume.

Though rigorous in its presentation of the work of crop scientists, the book does not make excessive demands on the non-scientist. In return for a moderate investment of effort, the non-scientific reader is rewarded with a magisterial and highly readable interpretative survey of great value as a means of contextualizing individual research activity, whether contemporary or historical, within the extensive but probably unfamiliar research area of plant science. For those needing to know more about, say, the CO_2 exchange rate and its implications, or the concept of the harvest index, Evans supplies enlightenment. This book should find a place on the shelves of all agricultural historians interested in yield improvement and its causes.

JOHN R WALTON

DELLA HOOKE, ed, *Pre-Conquest Charter-Bounds of Devon and Cornwall*, Boydell Press, 1994. viii+239 pp. 9 pls; 38 maps. £29.50

Well-nigh two thousand pre-Conquest land-grant charters survive –documents recording the ownership of, or rights over, estates in Anglo-Saxon England. Very many incorporate a detailed description of the boundaries of the land in question which, given a degree of scholarly detective work, presents the possibility of reconstructing a graphic picture of the ancient landscape.

They begin and end with Latin sentences which roundly declare who granted what to whom and in what circumstances – formulae which incidentally serve to establish an authoritative quasi-legal air. But when it comes to the practical matter of saying exactly what comprised this land, the boundaries are set down in meticulous detail, often in a smaller, meaner hand, and always in the plain Anglo-Saxon prose of those who knew and worked the land. No one should be mistaken: '... then down to that hawthorn tree' – immaterial for the time being whether 'that hawthorn tree' would still exist a century later.

Attracting old-fashioned antiquary and scientific field-worker alike, the Anglo-Saxon land-grant charter offers a rambler's view of the locality in question. Many of us, at one time or another, have attempted to trace these boundary-lines over what we considered a piece of familiar terrain – and failed. Easier said than done! The significant hawthorn tree is long gone and wolves no longer haunt that particular hollow. Notoriously difficult to read on the page – and even more difficult to follow on the ground – they require not only philological and historical expertise, but also a rare eye for topography. All these Dr Hooke clearly has.

In this volume she presents a detailed study of all the topographical information to be gathered from the four dozen or so charters (31 in Devon, 22 in Cornwall) which contain such boundary clauses. Their survival and distribution is relatively sparse compared with, say the number from Worcestershire (the subject of the author's first *essai* of this kind); and there is only one significant cluster: around Crediton.

Our view of the Anglo-Saxon world tends to be coloured by our ancestors' dramatic poetry or arcane theology. Such material as Dr Hooke provides permits us a genuine entrée into the day-to-day landscape they inhabited: a world of now-gone pig-sties and pear-trees, but also banks, ditches, woods and roads, many of which remain and can be identified with recognizable features in the

present-day scene. One by one, each boundary-clause is translated and elucidated and the results entered on a neat, uncluttered sketch-map (though the route might have been easier to follow if the system of numbering adopted for the narrative had been shown on the maps also). The fact that elements of individual estates can sometimes be found to correspond wholly or in part to early nineteenth-century parish bounds suggests a significant continuity of early land-division systems through the medieval period and into the early modern pre-enclosure landscape.

Since this is clearly going to be a standard work of reference for the foreseeable future, it is a pity that these boundary clauses should have been divorced from their original context. The decision to omit the Latin tops and tails gives an unreal sense of both the appearance and intent of these documents. Although the editor abstracts significant particulars as to date, grantors and suchlike, we must turn back to nineteenth-century editions for contextual material which might well prove significant to future enquirers.

The instinct to furnish a full scholarly edition was clearly present: indicated by the inclusion of manumission records with no discernible landscape interest, and the fact that original text is printed in a particularly conservative form. There is no obvious advantage in retaining palaeographical niceties such as the dotted *y* or *ȝ* graphs, now rarely used even by philologists. Use of the *wyn* graph is especially problematic inasmuch as it can result in confusion between *w* and *p*. Indeed, the Anglo-Saxon scribes themselves made mistakes. Thus *woldrisoc* for *poldrisoc*, 'briery dell' in Tinnell, ignored here but commented upon by W B Sanders in the Ordnance Survey's *Facsimiles of Anglo-Saxon Manuscripts*, II, 1881.

However, the author's objective – in which she is wholly successful – was to consider only what was of immediate geographical interest. In dealing with issues of specific locality, largely ignored by editors with institutional or philological interests, she has made a very substantial contribution to the sum of our understanding of the region. In some other respects she is less secure. For example: Crediton was not in fact well-known in the pre-Conquest period as the birth-place of St Boniface (merely a late medieval assumption); we do not know that the Danes destroyed Exeter Cathedral library in 1003 (an inference at most); on p 17 King Alfred's will is quoted in such a way as to give the impression that his Cornish estates were all bequeathed to Edward the Elder (actually divided between Edward and Æthelstan).

One or two entries could have done with some blue-pencilling. Guide-book information about a granite mansion which we are told was designed by Lutyens for Mr J C Drewe and built between 1911 and 1930 is undeniably interesting but adds little to the study in hand. (Considerable use is made of Hoskin's popular but now dated county survey.) By the same token the relevance of some of the plates is none too obvious. Cross reference in the captions might have helped. Indeed, certain plates might prove misleading to untutored eyes, inasmuch as very little of the scenery, buildings or stock will resemble what the Saxon saw.

The translations seem accurate, though naturally with such difficult material, it is inevitable that there should be disagreements as to interpretation of detail. Discussion of some alternatives would have been useful. It might have been interesting to see why *walu* (in Ayshford) should be rendered 'foot' of the dyke rather than 'ridge', or why *odencolc* (in South Hams) need be 'lime-kiln' rather than 'threshing-floor'. There is usually a wider semantic field than the simple one-for-one equation most of us would like to assume. For example *hwit* is not necessarily 'white' but 'shining', nor *beorg* necessarily a barrow (Northill). Some possibilities are simply ignored. For example, there is no attempt to explain *sulh* ('plough') *ford* (in Crediton); while *Bigulfes burh* (between Wiggaton and Ottery) and *Grendeles pyt* (Crediton) are calling out for etymological comment, if not literary gloss. Even so, a prosaic warning: we cannot presume that all topographic names were directly 'meaningful' throughout this period. Certainly British names such as Creedy or Nymet must already have seemed as arbitrary as their Anglo-Saxon counterparts now often appear to us. It should not go unmentioned that the author's introduction readily acknowledges that 'correct solutions are probably almost impossible to attain'.

The English Place-Name Society's volumes on Devon, now sixty years old, are relied upon to supply the general toponymic framework, although since the 1920s and 1930s etymological interpretation has advanced in one important respect: place-name specialists no longer so readily suppose a personal name must be involved. It is now more likely to be believed that *malleberge* in the South Hams derived from the plant-name *meargealla* 'gentian', rather than from one Mærla. In general more reference might be made to A H Smith's *English Place-Name Elements*, English Place-Name Society, XXV-XXVI, 1956; (only part 2 is mentioned in the bibliography).

The sole index supplied is merely an *index locorum*. In addition there is the beginnings of a glossary of topographical and land-use terms, and of plants and animals referred to in the charters. But without page references this tantalising list is of limited use.

It is not possible to seek, for example, the frequency or even location of a 'cow-yard' (**buorth*) or 'pig-sty' (*hlose*). And it could well be enlarged, to point to examples: *æl-broc* 'eel-stream' (Meavy), *swin-haga* 'swine-fence' (South Hams), or *pyrian* 'pear-tree' and *team-pol* 'breeding-pool' (Topsham).

It is vocabulary such as this which brings the former landscape alive. Of course, the area covered by this volume is probably the most varied in the entire country, and the surviving documents most meagre. But it is disappointing that out of all this remarkable detail in respect of individual estates, no general narrative synthesis or thesis can yet emerge. We still have no picture of the Anglo-Saxon landscape as a whole. It is possible that in due course, supplemented with additional data from adjoining regions, the glossary of terms we are given could allow a number of diagnostic and very vivid, albeit partial, glimpses into the Anglo-Saxon world. As yet these possibilities remain undeveloped. What we have here is essentially a handbook for field-workers. As such, it will be constant source of reference; and it is to be hoped that we might expect further volumes in the series.

M J SWANTON

CARLA RAHN PHILLIPS and WILLIAM D PHILLIPS, JR, *Spain's Golden Fleece: Wool Production and the Wool Trade from the Middle Ages to the Nineteenth Century*, Johns Hopkins UP, 1997. xviii+441 pp. Illus. £41.50.

Despite the prominence which historians have given to the gold and silver which poured into Spain from her American colonies in the sixteenth and later centuries, the authors argue that the production and trade in fine quality Merino wool generated more foreign and domestic income than any other component of the Spanish economy in the three centuries after 1450. This is the first full-length and detailed study of Spanish wool production and trade in English or Spanish, and it questions many of the long-held views about the alleged backwardness of the Spanish rural economy. The result of many years work in the archives, the book is divided into three parts.

Part I, called 'Sharing a meager land' is an overview of the main trends in wool production between 1450 and 1836. This begins with a description of the ecology of Spain which stresses how much of the land was, and still is, unsuited to crop and intensive livestock production, but comprises upland pasture of only moderate quality. From this arose the traditional transhumant sheep husbandry, in which the sheep spent the summer months on the high mountain plateaus of northern Spain around Segovia and Burgos, and migrated in the autumn to the lower, but still upland, pastures of Extremadura and La Mancha, some 300 or 400 miles to the south-west for the winter, returning again to the northern pastures in the spring. In between the sheep were sheared and their wool was washed in hundreds of special shearing sheds and washing centres scattered through central Spain. Several million sheep were involved in these annual migrations, which sometimes extended for as much as 500 miles, and the organisation of these huge treks makes a fascinating story. The period 1450 to 1580 was the golden age of Spanish wool production, as it was of the country's imperial power, and it was followed by a period of depression and disorganization lasting from about 1580 to 1680. The sharp crisis between 1580 and 1713 – the period of the wars against France, and of the Spanish succession – was followed by a considerable revival after 1713 under the new Bourbon monarchy. The authors estimate that the production of washed wool rose continuously from about 10 million pounds in 1492 to about 28 million pounds in 1762, before falling sharply during the Napoleonic invasion of Spain. This growth was however masked by violent fluctuations in wool exports, which rose from five to 14 million pounds between 1492 and 1550, before falling steadily to about 3.5 million pounds in 1717. They then rose sharply to a new peak of 15 million pounds in 1770, before subsiding again to five million pounds in 1822. All this is clearly shown in a useful graph, based on detailed appendices of production, exports, prices, flock sizes, etc, which is one of the most valuable parts of the book.

Part II, called 'Wool production', gives a detailed analysis of the cycle of transhumant production and the processes of shearing and washing the wool, and the lives of the shepherds, shearers, washers and wool transporters. This is then followed in Part III, 'Marketing and the wool trade', by a discussion of the role of marketing, transporting, and the domestic manufacturing of wool. Interestingly the authors argue that, contrary to widely held beliefs, the Spanish domestic clothing industry was far from insignificant, and in fact, in most years purchased far more of the wool than was exported. Although this is probably true, their estimates of total production and internal consumption are far less robust than the export figures, for which taxation returns survive. It is also true that it was the highest quality wool which went for export, Spanish Merino wool being the best wool available on the international market. The main export trade – about three-quarters in most years – was from the northern ports of Bilbao, San Sebastian and Santander to the woollen industries of Belgium and the Netherlands, most of the remainder going from the south-eastern ports of Murcia and Alicante

to Livorno in Tuscany. After the revolt of the Netherlands in 1568, this Italian trade became more important, but was also limited by the decline of the Italian woollen industry in the seventeenth century. Although foreign merchants, especially Flemish, Dutch and Italian, played an increasingly important part in the wool export trade, Spanish merchants, especially those of Burgos initially, and later of Madrid, always played a prominent part in the trade. The received view of the Spanish woollen trade, based on Julius Klein's study of the Mesta (1920) the organization of flockowners who maintained the transhumant trackways, was that the maintenance of transhumance damaged Spanish agricultural production, by restricting the amount of land available for cropping. The authors, however, contest this view, and argue that much of the land traversed by the transhumant flocks was unsuitable for crop production, and that transhumant wool production was the best use of Spain's limited land resources.

This is a splendidly detailed study of an aspect of Spanish agrarian history which is of much more than purely Spanish interest, for much of the economic growth which took place in Europe in the early modern period revolved around the Italian and Flemish woollen industries, both of which were crucially dependent on Spanish wool. This well-illustrated book is an important contribution to European as well as Spanish economic history.

MICHAEL HAVINDEN

PETER WYATT and ROBIN STANES, eds, *Uffculme: A Peculiar Parish. A Devon Town from Tudor Times*, Uffculme Archive Group, 1997. xv+323 pp. 14 figs; 22 plates. £12.

Uffculme has a unique place in Devon's history, not because it is particularly beautiful or important, but because of a fortunate historical accident. In about 1543 it was transferred from the diocese of Exeter to that of Salisbury, and thus became a peculiar jurisdiction, with the result that its 541 wills and 266 probate inventories (between 1528 and 1843) were lodged in Wiltshire and so escaped the bomb which in 1942 destroyed virtually all of Devon's probate records. Thus Peter Wyatt, Robin Stanes and their collaborators have been able to reconstruct the life and economy of Uffculme with a wealth of detail which could not be equalled for any other community in Devon. This book, and its companion volume (*The Uffculme Wills and Inventories*, Devon Record Society new series, 40, 1997) are the result of ten years' devoted work by a local history class of Exeter University's Department of Continuing and Adult Education, and it is a formidable achievement.

Situated in the Culm valley in east Devon on the old road from Exeter to Wellington, Uffculme is in a hilly, pastoral region of early enclosure, except for its commons on the Blackdown hills. Its agriculture was traditional based on small farms, which were mainly devoted to livestock, though small acreages of corn were grown probably for local consumption. Most of the farms seem to have been in the 20 to 50 acre size range judging by the numbers of livestock kept. In the period 1575 to 1601 the average farmer kept 6 to 7 cows and 23 sheep. By 1688 to 1731 this had barely increased (7 cows and 27 sheep), showing a stable agricultural economy. The population however grew much more rapidly than the national trends, from some 830 people in 1570 to some 2200 by 1713. This was the result of a prosperous woollen cloth industry making the prestigious Devon serges. A short review can only touch on the wealth of detail in this admirable book, which should be studied by all those interested in the history of the south-west.

MICHAEL HAVINDEN

SUSAN NEAVE and STEPHEN ELLIS, eds, *An Historical Atlas of East Yorkshire*, University of Hull Press, 1996. xi+160 pp. £17.50.

A benign virus is happily rampaging up and down the eastern side of England. Since *An Historical Atlas of Suffolk* appeared in 1988, similar volumes have been published for County Durham (1992), Norfolk (1993), Lincolnshire (1993), and now East Yorkshire (in fact, the historic East Riding). Other atlases are known to be in preparation, and one confidently expects the virus to break out soon in the west and south of the country. Dedicated to Alan Harris who died in 1995, this attractive and stimulating atlas of the East Riding contains 60 distribution maps which generally follow the pattern of having a map on the right-hand side of each opening and a short explanatory text opposite. The text is supplemented by occasional illustrations, graphs and bar-charts, and at the back are notes, bibliography, index and a key-map of the county's parishes and townships. The twenty-three contributors comprise an archivist, museum curator, two members of an archaeological unit, three other specialists and fourteen academics drawn from five universities (mainly from the University of Hull which also provided the two general editors).

The atlas covers a span of 10,000 years but is primarily concerned with the history of the East Riding from the eleventh to the twentieth centuries. As the editors claim, it brings together 'a wealth of recent research' by historians, archaeologists and geographers and, as such, it cannot fail to be an immensely useful, interdisciplinary work of reference for all those interested in local and regional

studies. More importantly, because it summarizes many current debates and problems of interpretation, it will raise new questions and help to give shape and direction to future research. Although such productions are open to the criticism that administrative counties are artificial straight-jackets unsuitable for some subjects (for example, prehistoric cultures, communications and trade), one rejoices that several maps in this atlas have been made directly comparable with those of the adjacent Lincolnshire atlas. It is also noteworthy that, in a largely rural area, considerable attention has been paid to towns, large and small. Not only is the topographical growth of the great port of Hull traced from the thirteenth century, but also its contacts with the wider world (whaling in the Arctic, and fishing off Iceland and in the Barents Sea).

The maps of this atlas are grouped under nine major headings which range from archaeology and settlement to religious allegiance and, most original of all, episodes of local unrest. A final section offers a most useful cartographic summary of the administrative history of the county. While most of the subjects mapped, and sources used, are those which might be expected and which invite comparison across county boundaries, a few are certainly unique to the East Riding. Good examples are the Arras Culture of the Iron Age, the square-ditched barrows which sometimes contain the remains of wheeled vehicles, and the perpetual erosion and deposition of Spurn Point, Yorkshire's own wobbly Land's End. One is perhaps surprised that no attention was paid to the Anglo-Saxon and Danish periods, to the spatial extent of parliamentary enclosure, or to the growth of coastal resorts like Bridlington and Hornsea. But, as the editors rightly say, in such an enterprise much depends on the availability of contributors (as well as of basic sources yielding information which can be mapped).

Most of the individual maps are elegantly and clearly drawn, often in two colours and with readily understandable conventions. They raise a host of interesting problems which need to be pondered. In particular we may wonder how far we are seeing the influence of soils and geography, how far social and economic forces, and how far the influence of individuals. Sometimes we may also query the basic sources and their completeness or reliability. To this reviewer the only unsatisfying maps are one dealing with agricultural land-use in the mid-nineteenth century which is visually off-putting, two illustrating nonconformity which strangely overlap and use different symbols, and one illustrating the changing distribution of reptiles, which seems out of place in an historical atlas.

These are minor criticisms, for there is something in this volume for every kind of historian. Those interested in the general character of the county will note the high numbers of townships, chapels of ease, ecclesiastical peculiars, deserted settlements, Methodist chapels and National schools. Those looking for finer detail will be fascinated to learn that Sir Tatton Sykes II of Sledmere, between 1863 and 1913, built seven new churches and restored eight others; that the Druids Friendly Society were particularly strong in Holderness; and that Butlin's holiday camp at Filey had its own railway station until 1977. Let us hope that more historical atlases of individual counties appear in the next decade, and that the gaps between them are rapidly closed. Not only are they successful commercially and influential at all levels of education, but they stimulate us all into thinking more critically about historical distributions – both within and across administrative boundaries.

DAVID DYMOND

JOHN BROAD and RICHARD HOYLE, eds, *Bernwood: The Life and Afterlife of a Forest*. University of Central Lancashire, Preston, 1997. xvi+126 pp. 8 plates, 4 in colour, 9 tables, 9 maps, 2 figures. £9.95, including p and p.

The former forest of Bernwood comprised the south-west Buckinghamshire villages of Boarstall, Brill and Oakley. To historians of agriculture and settlement, Boarstall is remarkable for its medieval map, dated to 1444–46 and well reproduced here. Archaeologists know Brill for a medieval pottery industry whose wares had a wide sale over the southern midlands. The present-day landscape includes woods to the west of Oakley, on the county boundary, but otherwise bears few obvious reminders of the former forest. Air photographs of the 1960s reproduced in the book show the undulating hedged lands to the north-west of the foot of the Chiltern scarp, a scene more recently modified by amalgamation of fields and by changes in villages brought within reach of London by the nearby M40 motorway. The most obvious clues to a former economy are the clay-pits of Brill, still clear from the air.

Written sources cover the history of the royal forest from pre-Conquest origins to the disafforestation of 1632. In the first chapter, Isobel Harvey outlines these, and hence the purpose, administration and economy of the forest. She assesses how far Brill could be described as a medieval urban centre for the district. In the succeeding two chapters, Richard Hoyle examines evidence for the landscape of the forest, successively over the Middle Ages and in the 80 years before disafforestation, when landownership and forest administration were

in the hands of the Dynham family: their term is illustrated by three colour reproductions of maps of 1590–91. John Broad surveys the events and immediate consequences of the end of the royal forest, and the pattern of smallholder poverty seen amongst the descendants of those who received exiguous compensation for lost rights. The set of essays is completed by Rachel Thomas, who examines ecological aspects of forest management, from wood pasture to intensive coppicing.

The editors have been successful in showing the tensions found in the management of a traditional hunting forest and in the retreat from that tradition. The conflict between stock-keeping and the management of woodland, between the medieval hunting interest and the agriculture of the woodland fringes, and between commoner and encloser in the post-medieval centuries, are amply illustrated, as is the evolution not just of these relationships but of the landscape itself. There were of course break-points in this evolution; one was the acquisition of Bernwood by the Dynhams in the 1540s, but far more significant was disafforestation almost a century later. The latter was followed by rapid enclosure, for coppice, grazing or arable, over the middle decades of the seventeenth century. By comparison, the changes over the following three centuries were less radical: parliamentary enclosure was barely an issue, being briefly referred to for Oakley, and many field boundaries are still recognisably those of the sixteenth century or even reflect earlier woodland divisions.

There are however questions which have been prompted by research into the economy of other forests and of their forest-fringe industries which could have been more directly approached here. Assessment of the nature and extent of coppicing in Bernwood is made no easier by the scattering of references, which are the harder to assemble due to the absence of an index. In fact the best digest of wood production is in Rachel Thomas's final chapter. The issue particular to this district is how far the vigour of coppicing was linked with that of the industries of Brill, whose medieval potteries and later brickyards must be expected to have been significant buyers of fuel. Was the dwindling activity of the Brill potters, who appear to have failed to follow the fifteenth- and sixteenth-century fashion for small vessels, transmitted to woodland management? Was this decline of pottery production balanced by brick-making, or was there an interval before late-sixteenth and seventeenth century fashions in building brought prosperity to the brick trade and made for the survival of managed woodlands?

DAVID CROSSLEY

MARYANNE KOWALESKI, *Local Markets and Regional Trade in Medieval Exeter*, CUP, 1995. xvi+442 pp. 7 figs. £60.

Although the focus of *Local Markets and Regional Trade* is on the city of Exeter, the book is so utterly comprehensive that it contains almost as much for agrarian as for urban historians. For example, a chapter on the occupational structure of Exeter in the late fourteenth century – the period on which the book is focused – may be read as an essay on processing the products of the land within the area from which the city drew its supplies. About 60 per cent of recorded heads of household were engaged in handling such products. Some eleven or so male bakers provided bread; a number of cooks heated up meat pasties and chicken legs, to be eaten on street corners or carried away to bedsits just as today; a large number of innkeepers kept up establishments at which visitors to the city, many of them traders, lodged with their horses and which were therefore great consumers of oats and of beans and peas made into horsebread. Among the products of pastoral farming, wool (or perhaps yarn) was brought to the city in large quantities to give livelihoods to many poor households and to capitalistic clothiers who may already be discerned in late fourteenth-century Exeter; there was also a very active market in meat and hides.

Another chapter which touches a good deal on the countryside is entitled 'Internal trade and the hinterland', dealing with networks of trade in all commodities except those which arrived by sea (covered in a separate chapter). Because of the ubiquity of credit in medieval commerce and because of the excellence of the records from Exeter's mayor's court and its satellites – and given a great deal of sophisticated record linkage and patience on the author's part – a remarkable picture has been drawn up of the city's hinterland, undoubtedly the best reconstruction of its kind which has yet been carried out for any medieval provincial town. Or perhaps one should say hinterlands, because one of the most important and novel findings of this book is that a town's sphere of influence was made up of many partially overlapping areas, each for a specific commodity and each with a particular configuration of its own influenced by physical geography and the pattern of farming regions. For example, butchers who came to Exeter in order to sell cattle for meat tended to be graziers from the Exe valley itself, wide by Devon standards and with lush marshland as well as improved grazing grounds, or from the valleys of its tributaries, the Creedy and the Culm. That two of the places from which butchers still operated in the late fourteenth century were called Cowley and Cowick – both names with respectable pedigrees – testifies to the

fact that these patterns of supply were already established when Exeter was an Anglo-Saxon *burh*. A by-product of the large urban demand for meat was an active trade in hides. Some buyers came from small towns quite close to Exeter but others travelled over longer distances from Dartmoor border towns. The latter group would have had their own tanning industries generated by the pastoral economy of the Moor and it is interesting to see their tanners coming to Exeter because of the abundance of hides on the market there, by-products of slaughter of cattle for urban meat consumption. Even for one type of animal, therefore, there were two hinterlands, one for suppliers of meat, the other for buyers of hides. Fish was brought into Exeter for sale, by land and by the coasting trade, from coastlines and estuaries to south and east, but more remarkable was the hinterland for buyers at this significant redistributive centre in the fish trade. Some came from small inland towns in Devon, but there were also buyers from towns in eastern Somerset and Dorset. Both of these counties have their own fish-full coastlines and one may suggest that their fish-traders were lured to Exeter partly by the cheap prices there and also by their perception of the profits to be had in selling fish on, to markets in the land-locked counties to the east. For the fish trade there were, again, two different hinterlands, one for sellers, the other for buyers. Maryanne Kowaleski's researchers will put a stop, once and for all, to our practice (and I am guilty here) of drawing circles (or, even worse, hexagons) around medieval towns.

These brief comments on topics of agricultural interest in Maryanne Kowaleski's book do not do full justice to its structure, nor to the methodological innovations which it contains, nor to the wealth of topics covered. The progressive structure is logical and easy to follow: from Exeter's regional setting to the governance, economy and occupational structure of the city, then to the sea-borne trade, with an important section on overland redistribution of imports, and finally to overland trade in local commodities. Methodological innovations include a highly sophisticated manipulation of surnames, once called 'nominal record linkage' but now 'prosopographical analysis' or (better) 'collective biography'. Names in a murage roll of 1377 are linked to names in cases heard before the city's courts, in local customs accounts for the port of Exeter (names of ship-owners and importers) and in a host of other sources of local and national provenance; but this is not all, for the method is also extended outwards so that names in records (where they exist) of small towns and rural manors in the surrounds are linked to names in the records of city and port to give those remarkable insights into hinterland mentioned above.

Along the way many and diverse important issues are tackled, including urban decline in the later Middle Ages (with Exeter not badly affected), the reliability of the 1377 poll tax (a favourable verdict in the case of Exeter's record which may be compared with the murage roll of the same year), the previously under-rated extent of coastal trade and the establishment of local markets (with a now complete list of Devon's markets and fairs). In short, the acclaim already given to this book results from the fact that it has a very great deal to offer to historians of every kind and persuasion.

HAROLD FOX

DEL SWEENEY, ed, *Agriculture in the Middle Ages: Technology, Practice and Representation*, University of Pennsylvania Press, 1995. xiii + 371 pp. 70 illus. £46.50 hbk; £17.95 pbk.

The thirteen articles in this book originated as papers at two different conferences, one on land and labour and the other on the image of the *rusticus*. It is hardly surprising, then, that the scope of this volume is remarkably eclectic. The reader is offered an enticing choice of subject matter, time, place and methodological approach, from England to Arabia, the fifth to the fifteenth centuries, and from agricultural production to artistic representation of pigs. A steady introduction and thoughtful afterword attempt valiantly to forge some coherence into the volume.

Yet coherence is elusive under such conditions, a problem exacerbated by the uneven length and, very occasionally, quality of the essays. The themes of these essays are too wide and varied for this volume to be regarded as a textbook, although individually they adopt a broad and accessible approach wherever possible. This stylistic accessibility creates a considerable strength out of the volume's inherent weakness, and ensures that some clear, forceful and stimulating ideas emerge from such varied perspectives. The treat for the English agricultural historian is Bruce Campbell's fine survey of the crisis of the early fourteenth century, crammed with enough common sense and clarity to make undergraduates (who perennially grapple with this subject) rejoice. Interestingly, it contains Campbell's clearest statement to date on the nature of this crisis. He argues that the English economy probably did not possess serious structural or technological weakness, but that its markets were severely disrupted by war and taxation which in turn induced environmental degradation and ecological decline. This essay deserves to be read widely.

MARK BAILEY

PHILIP T HOFFMAN, *Growth in a Traditional Society. The French Countryside, 1450–1815*, Princeton UP, 1996. xv + 362 pp. £30.

For this reviewer, Philip Hoffman's book started well, contesting robustly the conventional view of French agriculture as a thoroughly stagnant sector of the economy throughout the early modern period. French historians generally agree that their peasants were sunk in the torpor of hidebound routines until some time after 1750. Yet historians of the same period in England cannot but look incredulously on such wholesale condemnation, when they collect so much evidence of farming innovations brought to England by French and Flemish immigrants, cultivating hops, woad, rapeseed, sainfoin, lucerne, improved vegetables and fruit, and keeping poultry more intensively. The black picture of the French scene is, in fact, seen through English eyes, viewing the need to feed a rapidly growing industrial population with cereals and meat, and excluding all those products that did not count towards that effort.

From a different standpoint, from that of the farmer who had to make a living in changing economic conditions, cereals and meat did not always yield the most satisfactory living. He could do better by mixing his cereals and meat with other produce. Diversification had notable merits in certain phases of the early modern period, even in England, and still more in a large country like France which, until the eighteenth century, had no adequate internal transport system to carry its produce far afield. The author of this book does not come round to commending diversification, and that is a disappointment, but some of his evidence collected in local archives may, in the end, feed into that better understanding of the French agrarian economy. His suggestion that the cheese producers of the Massif Central made substantial progress in the eighteenth century is credible in the light of a similar development, starting somewhat earlier, in England. The successful growth of productivity in the Paris basin and in arable Normandy in certain periods in the sixteenth and seventeenth centuries, whenever war or heavy taxation did not wreak havoc, will come as no surprise to English historians watching the stimulus of the London market on some of its nearest farming regions; and they will readily accept the suggestion that urban manure greatly enhanced productivity. More generally, the suspicions of the author that regions of more intense cultivation, notably Flanders, would have furnished even better illustrations of growth match well with English experience. In short, English readers will regret the author's failure to use more lessons from the English experience to frame his work.

The problem on which the author concentrates most of his 200 pages of argument do not for the most part concern the details of local farming routines, however. He first despatches the notion that French peasant farmers pursued only subsistence, showing satisfactorily how they were drawn into the commercial world at many points, through renting land, offering their own labour, or buying it in, and securing credit. He takes pains to demonstrate the rationality of landlords charging higher rents for small farms than large. Then he turns to his prime task of measuring growth nationally, while using local evidence. But since the search for what he calls total factor productivity, or TFP, is an unattainable goal by the direct method, he deems it reflected in the rental value of land. Other evidence is adduced where possible on wages (though they are urban wages) and grain yields, but as doubts arise about the validity of his calculations, he dismisses them ever more cheerfully as the narrative proceeds. Not all readers will swallow the algebraic equations, but they may accept his wholly plausible conclusion that positive growth can, indeed, be found in France during the early modern period; traditional society was not immobile, small farms were not by their nature unproductive, and different regions successfully fostered specialities. Vineyards, dairy produce, and sainfoin receive mention (though not in the index) alongside grain and meat, but not lucerne, rapeseed, woad, mulberries, vegetables or fruit.

In a final summary, Hoffman is inclined to place more emphasis on national events and political influences, war, taxation, and revolution, in obstructing agricultural performance, than conservative peasants, but he knows too that the wide world of regional differences has to be further explored. 'It is folly,' he confesses, 'to generalize about an entire country in early modern Europe', 'the regional and temporal variations were paramount.' Historians who have built up their agricultural structures from below will welcome this honest conclusion. The time is ripe to judge French agricultural performance not by cereal yields alone, but by all the produce from the land, regionally differentiated. It is an exciting challenge that could open a new debate, in which Hoffman, but not perhaps TFP, may be cited hereafter.

JOAN THIRSK

ANNE TARVER, *Church Court Records: An Introduction for Family and Local Historians*, Phillimore, 1995. 143 pp. Illus. £12.95.

The records of the church courts have been a dark corner in the archivists' cupboard for as long as the cupboard has been installed. It was the 'revolution' in English Reformation studies, a feature of the 1960s and 1970s, which first placed the door ajar

when historians such as Ronald Marchant and Ralph Houlbrooke began to peer nervously inside, but their forays into the unknown covered only comparatively short time spans and specific parts of the country. Despite more recent work by Jim Sharpe and Martin Ingram much still remains to be done, particularly in so far as these records relate to the medieval period and the last years of the ecclesiastical jurisdiction in the eighteenth and early nineteenth centuries. With regard to broadening the awareness of church court records beyond this tight-knit group of professional historians even less has been achieved. This is why this book breaks fresh ground and is a welcome addition to the very limited literature on this important, but neglected, area of study.

Anne Tarver begins by highlighting exactly why these records have slipped the net of history and are, in her view, 'virtually unexplored'. Not only do they frequently repose in unexpected places with less than adequate indexing facilities, they are also often difficult to read and contain a high proportion of frustratingly abbreviated Latin. Most challenging of all, perhaps, church court records are underpinned by the complexities of canon law, a basically medieval legal code unfamiliar to most people in the twentieth century. Thus there are considerable obstacles to overcome if this 'dark corner' is to be illuminated, yet this is the demanding task which the author has set herself. Aimed at family and local historians, essentially non-professionals who might be encountering these records for the first time, the book is an attempt to make the jurisdiction of the church comprehensible and to underline the tremendous potential that these records have in all sorts of historical research.

After a description of the 'process of law' – introducing proctors and apparitors, citations and interrogatories – the book goes on to examine the five key areas of church court activity. The most voluminous of these was 'office business', comprising a range of cases broadly defined as 'criminal' in the context of canon law: failure to attend church, abusing the clergy and, most important of all, sexual crime in the form of incontinence and fornication before marriage. Alongside of this the courts were also dealing with 'instance business' comprising cases involving probate, matrimonial affairs, tithe, and defamation. Within this broad spectrum a huge amount of data relevant to local and family history is thrown up. Not just the bizarre and unusual such as 'jactitation of marriage', in other words falsely claiming to be married or contracted to marry, but also the mainline, such as the importance in 'a gossip-laden society' of maintaining one's 'good name' and reputation through prosecutions for defamation. Of all the varied types of record introduced it is the depositions which are arguably the most valuable, because not only do they provide vital information about the deponent (age, occupation and degree of literacy), they also tell us, often in intimate and graphic detail, of the cases under review. How, for example, Andrew Dunton beat his wife 'so that her arms sometimes were black and blew... and it was common for him to threaten and damn and curse her soe as to make the said Mary quake and tremble'. These insights into the lives of quite ordinary people are not replicated in other sources.

The author opens up this unseen world to the reader in a manner which is well informed and which successfully conveys her very considerable enthusiasm for the subject. For her interpretation she relies heavily on Richard Burn's *Ecclesiastical Law*, a standard text, and most of her examples are drawn from the cause papers of the Consistory Court of Lichfield and Coventry in the eighteenth century with which she is most familiar. The book is therefore rather more limited in terms of time and space than its title implies and the use almost exclusively of fairly late documentary examples (mostly in English) might be seen as giving a misleading picture to the general reader as to the accessibility of these records. Certainly the points concerning difficult palaeography and abbreviated Latin, noted in the Introduction, were not followed through in the text.

One of the main strengths of this book is the numerous documentary examples used to illustrate the themes explored and though the verbatim transcriptions of these are generally accurate the mode of reproduction of the documents themselves is not so satisfactory. They appear to have been copied by a process of electronic scanning and though this is more economical than conventional photography it is by no means as effective, especially in view of the fact that many of the examples have been reduced considerably in size to meet the publisher's page format. Indeed, many of the original documents (for example, those on pp 36, 47 and 66) are so small and so fuzzy as to make them almost totally illegible and in these circumstances it is debatable whether or not it was worth reproducing them at all.

It would have been good, perhaps, if the book could have moved beyond the merely descriptive and suggested ways in which these records could be put to use. Clearly for family historians the information likely to be derived about individuals is their major attraction; but for local historians there are more subtle techniques of quantitative analysis which might yield useful conclusions about the changing nature of communities in the past. These could have been briefly explained and set

out in an additional chapter on 'Using Church Court Records'. But to be over critical of a book which has done so much to break fresh ground would be churlish. Despite the reservation about the quality of the documentary reproductions, Phillimore have done a good job in putting together a book which is both comprehensive and authoritative. Anne Tarver has placed church court records within the grasp of the rank-and-file local historian. As she says, 'These documents may appear intimidating, but with a little patience, knowledge and practice they can reveal information available from no other source'. It is to be hoped that her challenge will be taken up and that the archivists' dark cupboard finally sees the full light of day.

DAVID MARCOMBE

ALEXANDER FENTON, *The Northern Isles: Orkney and Shetland*, Tuckwell Press, 1997 [first published by John Donald, 1978]. Pp. x+721. Pbk. £20.

As Fenton remarks, 'the world was wide for these little islands' (p. 460). Norse influence lasted directly for half a millennium after the ninth century, and persisted indirectly thereafter. From 1500, Hanse traders and Dutch fishermen made their mark, but the neighbouring Scots exerted the most pervasive modern influence. Given their geographical position, it is unsurprising that Orkney names connected with turnip cultivation originate in north-east Scotland, while the sea-language of fishermen contains some 430 Norse terms in Shetland but only twenty in Orkney. Though essentially a farming area long influenced by its southern neighbour, between 1840 and 1870 Orkney underwent an agricultural transformation that saw draining, liming and enclosure accompanied by owner occupation and direct tenancy. By contrast, Shetland's revolution concerned fish, specifically King Herring. Change here was dramatic and the effect highly concentrated: from curing 1100 barrels and occupying 50 boats in 1874 to 300117 barrels and 932 vessels just ten years later. By this time, 98 per cent of the Shetland's exports consisted of herring produce. Orkney remained unspecialized, and even by the 1930s, 80 per cent of fishermen there were part-timers, otherwise occupied as farmers.

Merchant lairds did much to 'improve' land use, housing, equipment and social organisation, but they were not always popular. Archer Fortescue was dubbed 'the Devil of the Hills' for his attempts to square off runrig, herd cattle and exact fines for those that trespassed, whilst kelp-burning to satisfy the demands of crown glass manufacturers was believed to prevent women bearing children and cause bad crops, and riots ensued. Equally, however, it provided work for women and older people. External demands secured markets far afield for a succession of locally important exports – Shetland ponies to work in coal mines, lobsters and gannets for London high tables, straw hats, woollen products, even – on one occasion – peats shipped to Australia. It was outside companies, too, that developed the fisheries, while the Hudson's Bay Company and whalers heading for Greenland and the Davis Straits stopped by to employ young men in considerable numbers between 1740 and 1920. While this outlet caused a measure of selective emigration, it also affected the land, as returning men outbid local farmers for rents. Incomers attracted by the herring were largely seasonal, with over 20,000 staying on Unst in 1882, although permanent immigrants from Banff to Lerwick were notable by their surnames, speech and endogamous family links.

Whatever they may have exploited or exported, some smaller islands lacked diverse resources. A ditty immortalizing 'the little island of Sanday, where the coos shit fire' (p. 208) testifies to reliance on dried cattle dung for fuel. Meanwhile, the main support of the Foula folk consisted of sea-fowl plucked from the cliffs at considerable risk to human life. Others, though plentifully endowed, were slow to innovate: if, on Fair Isle, 'the feeding was so good and the sheep so fat that they fell down of their own accord on being chased around the rock' (p 456), equally no reaper came there until 1950, and this remained unused 'until it could be tied behind a Ferguson tractor that was got in 1961' (p 347). The combine harvester first reached Papa Westray in 1973. In former times, scurvy had prevailed owing to a near exclusive dependence on fish, while, 'in 1762, a complaint was made that the burning of seaweed for kelp had left the limpet-bearing rocks unprotected by ware-blades, so that the limpets fell off in the heat of the sun and the poor were deprived of their sustenance' (p 542).

This fragile living was underpinned by a blend of communality and ingenuity. Hill land was considered common property (even when it was not), sheep ran together and were worked together. Similarly, neighbours helped one another with peat cutting and the harvest. Although attendant customs are alluded to, the author concludes that discussing working practices and organization was 'more than enough for one book' (p 623). Detail is certainly not eschewed, the range of different names for, say, fish at different stages of growth reflecting the necessary level of interest taken in such an essential means of both subsistence and commerce; likewise with the eighteen pages on sheep identification marks. In lands largely treeless, driftwood from shipwrecks made good doors, beds and fireplace surrounds; cockleshells were burned to make lime for whitewashing; every part of a slaughtered animal

was used, its flesh eaten, salted, the hide made into shoes, clothing and ropes, the fat used as lamp oil, the carcass as manure.

Such was the way with any peasant community, but Fenton's skill is to document precisely local influences and variations, not just between islands, but between Orkney and Shetland, Scotland and the Nordic countries. The use of language as an historical resource enables him to pinpoint 'what is indigenous and what is intrusive' (p 624) with magisterial accuracy. Supported by photographs, diagrams and extensive references, this reprint is already a classic of European ethnology, remaining unsurpassed as a comprehensive resource. Oil is excluded from the saga, yet its impact has changed life massively, rendering this record if anything still more valuable.

ANDREW BLAIKIE

M E TURNER, J V BECKETT, and B AFTON, *Agricultural Rent in England, 1690–1914*, CUP, 1997. Pp. xix+356. £45.

Old stagers may well experience feelings of apprehension mingling with those of pleasurable anticipation on opening what could turn out to be the definitive account of the course of rental history, in case it exposes grave flaws and glaring inconsistencies in the story they have been telling one another over the years. Rest assured, there is no need to panic, it is a very well mannered book which politely confirms rather than upsets the generally received wisdom on what happened to agricultural rents between 1690 and 1914. This is done by assembling a dataset in one of the most meticulous, methodical, fastidious, and altogether impeccable operations of historical data collection and processing ever attempted by agricultural historians. Rigid criteria were adopted to determine what rental data would be allowed into the count, whether from private estate records, institutional records, or (in practice this meant information given to the 1894 Royal Commission on Agriculture) official records: the figures had to be for rack rents, there had to be a fairly long run (30 years or more), there had to be a reliable indication of the acreage to which the rent figure related, preferably there had to be a side by side record of the rent actually received and of the agreed rent, and within a proviso that reasonably representative geographical coverage was attained there was a preference for collecting figures from large estates because that maximised the total acreage covered by the exercise. The result is an annual rent series presented in three appendices of rent received, rents assessed, and the two combined where both were entered in a single record, and in several graphs in the text (which it must be admitted become hard to read when more than one item is graphed, owing to the cumbersome computer graphic symbols employed, which tend to overlap and merge into each other). Around this core data, informative discussions of previous rent histories, of the general course of agricultural history, of agricultural depressions, and of regional differences, are arranged.

The authors are understandably euphoric on the successful conclusion of their labours, announcing that they have produced a definitive rent index and claiming thereby to have solved all the problems of modern agricultural history. 'We now know what happened to the agricultural sector of the English economy between the late seventeenth and the twentieth centuries' is their triumphal concluding claim. Perhaps this idle boast was inserted with half an eye on impressing the assessors in the approaching Research Assessment Exercise; certainly there is a hint of the RAE's premium on instant research in the disclosure that ease of making extracts rapidly from an estate record was a significant factor in deciding which records to use. Probably the authors do not believe their own propaganda, for if true it would pretty well make all modern agricultural historians, a group of which they themselves are distinguished members, redundant. The nature of their achievement can be better appreciated in a more modest context.

The rigorous application of the self-imposed criteria for inclusion in the rent series means that for the early part of the period extremely few estates have qualified, which is unsurprising given the haphazard nature of much estate management and record keeping before the later eighteenth century, and given the situation that many farms, maybe even the majority of farms, were not let at rack rent at that time. Thus, the first 25 years of the series are represented by figures from no more than one or two estates, covering about 9000 acres at most and both in Yorkshire, and it is not until the last quarter of the eighteenth century that the team has captured consistently more than 100,000 acres and 15 to 20 separate estates. It is with the nineteenth century that the coverage becomes seriously impressive, climbing towards a peak of $1\frac{1}{4}$ million acres and 77 separate sources by the 1880s. The account of the process of composing the rent index and the explanation of the methodology employed are extremely detailed and completely transparent in spelling out the thin coverage of the first 50 or 60 years. Understandably, no attempt is made to specify the geographical coverage of the index before 1750, for which date a map reveals that figures from 13 counties (just less than one-third of the total) were included, but with a large swathe of counties running from East Anglia

through the southern Midlands to the South West unrepresented. By 1850 only 13 counties were not represented and in 7 counties the index recorded the rents of over 5 per cent of the agricultural land, while overall about 2 per cent of the total cultivated area of England had been netted in the trawl. In the light of these figures it is curious to claim that a definitive rent index has been produced for the entire period 1690–1914, unless the word 'definitive' is being used in an unusual sense to mean that those records which have been consulted have been accurately and exhaustively consulted and no further information could be extracted from them. On the other hand, the casual reader might suppose the statement to mean either that no other rent records exist for the period 1690–1718 apart from those of Castle Howard and the Emanuel Hospital estate in the East Riding which are used in the study, or that any other rent records for the period could not alter the index; neither is credible.

The authors would indeed be the first to admit that the early part of their index needs strengthening if at all possible. Thus their observation that the index does not reflect the 'Mingay Depression' of the 1730s and 1740s is as much an observation about the index as it is an observation about the depression, and although it is possible, even probable, that any depression at that time was restricted to specific regions and farming types, the index is not sufficiently firmly based to establish this. Nor, given the partial nature of the index for this period, is it more than a case of the pot calling the kettle black to contrast the technique of 'history by example' which established the 'Mingay Depression' with the history by scattered statistical sample which has constructed the rent index. In the broad reaches of the period from the late eighteenth century onwards the rent index may certainly be accepted as definitive in the sense that the addition of further rent data would be unlikely to alter significantly the trends established here — though they might affect the nominal figures of rent expressed as shillings per acre. For instance, the authors dither about whether or not to include Northumberland in their index, on the grounds that Northumberland, and in particular the duke's estate, embraced a large area of rough grazing with a small rental value, apparently because inclusion would 'artificially' deflate their figures of rents per acre. There is, however, no evidence that the rents of rough grazing were not subject to trends upwards or downwards like other agricultural rents, and plenty of evidence that rough grazings formed a significant part of farm economies in upland regions and more than ten per cent of the total 'cultivated' area of England as a whole, so that inclusion of information from such areas ought to enhance rather than depreciate the value of a general rent index. At times the authors seem to attach considerable importance to the figures of rents per acre yielded by their sample, for example when comparing their findings with contemporary estimates of rent by Arthur Young, J R McCulloch, or James Caird, or with other rent series such as those of R J Thompson, R C Allen, or J T Ward (Greg Clark, who has an egregious rent index for *c* 1500 to 1850, is consigned to a footnote without ceremony). But since the authors acknowledge that 'there was no such thing as a national average rent, or at least that any figure purporting to represent this would be a fiction', nominal figures of shillings per acre do not signify; what matters is the internal consistency of each separate series, and the trends revealed by changes in rents per acre.

The reasonably close correspondence between the rent index and indices constructed from earlier sources for the nineteenth century by R J Thompson, J R Bellerby, and J T Ward, or from the Schedule A returns (which in theory recorded 100 per cent of incomes from land), and by Chambers and Mingay for the period 1700–1880, can be taken as validating the new index or as retrospective validation for the others. There are differences, and for the specialist concerned with short-term changes they may be highly significant; but in an overview of the long period they amount to fine tuning rather than radical change in the received picture of changes in rent. It is helpful to be shown that no countrywide post-Napoleonic War depression shows up on the new rent index, although this is not exactly a novel argument, and while the prosperity of the Golden Age has been seriously questioned the rent index rises as steeply between 1850 and 1870 as in the 20-year period after 1790. The discussion of the significance of figures for arrears of rent, collected as a by-product of the enterprise, shows convincingly that fresh annual arrears are a more reliable indicator of distress and depression than figures of accumulated arrears, but this is hardly news. At this point an analysis of the meaning of rent, of rent actually negotiated, agreed, and paid in discreet historical contexts, as distinct from Ricardian abstract rent, would illuminate the entire scene. The authors are fully aware that rent forms one of the three shares into which the net agricultural product is conventionally divided, but it was not part of their concern to address the other two, the wage bill and the farmer's income, except in passing, and unless it is assumed that the relationship between the three remained constant over time, as in the traditional valuer's adage that the land produces three rents, it cannot be taken for granted that reliable information on rents is equivalent to reliable information on the

state of agriculture. Students should perhaps ignore the implication that the rent book has solved all questions of agricultural revolutions, depressions, and the like, and instead welcome it as a businesslike aid to a better understanding of the course of modern agricultural history.

F M L THOMPSON

PETER MATHIAS and JOHN A DAVIS, eds, *International Trade and Economic Growth: From the Eighteenth Century to the Present Day*, Blackwell, 1996. 169 pp. £40.

This short book of seven essays on international trade and British economic growth is volume 5 in a series on the *Nature of Industrialisation* edited by Mathias and Davis. Aside from their general editorial control they have added a short guide to the simple aim of the series, the specific aim of this volume, and a succinct summary of each of the essays. The aim of the series is to contextualize the uniquely British path to industrialization in relation to the most important themes with which it was involved.

The theme of greatest interest to agricultural historians is of course the relationship between agriculture and industrialization, and this was the subject matter of volume four. Fellow agricultural historians might therefore wonder what direct value this latest volume has for them. As it turns out, the essays are all interesting in their own right and broadly attempt to distinguish two opposing views in economic history – whether trade was an engine of growth, or a child of industry. Yet beyond this question, which should interest all economic historians of whatever subtle hues, because the products of agriculture were often traded goods, there are indeed specific issues which agricultural historians will appreciate, especially coming from historians who take a different view of the historic world they observe. This does not apply to all of the chapters, but, for example, whilst Morgan in chapter one has the difficult task of unravelling the relationship between the Atlantic trades and British economic growth, we should not forget the nature of the goods involved in those trades. The imports from the New World consisted of 'farmed' products from plantations – sugar, tobacco, rice and coffee, to name but a few – and then increasingly that all-important raw material, cotton, which was no less an agricultural product even if it had eventually a direct industrial use. In particular, Morgan explores his subject matter in the context of the Eric Williams thesis of the slave/sugar nexus, embodied in his *Capitalism and Slavery*, and the extent to which the Atlantic slave trade and its profits was inextricably linked to British economic growth. Of course it was, but the size of, and the eventual use to which those profits were put have been under considerable scrutiny by scholars in recent years, and therefore the direct links with British economic growth have similarly been under review. Yet whatever the solution to these questions, what their constant exploration reveals, often out of sight of the camera, behind the lens, or lurking in the shadows, is agriculture. Everyone sees those trans-Atlantic agricultural products as imports (and sometimes re-exports) in the great balance of payments game of economic history. But whilst ever specific parts of the New World remained British colonial territories much of that agriculture was directly British – first or near generation plantation owners of British families and goodness knows how much British capital sunk into developing the system over the eighteenth century. The fact that the Caribbean islands are 3–4000 miles south west of the Scillies makes them more foreign than perhaps they really were. Morgan only briefly touches on this particular issue, but it is the kind of supplementary question which we, as agricultural historians might raise.

In chapter two Pollard explores the relationship between British trade and economic development on the European mainland in which the increasing trail of manufactured goods leaving Britain was counter-balanced to a large degree by the products of the European agrarian classes. There was a direct link between the first industrial nation and the economic development of our nearest neighbours. We cannot turn all of the essays inside out in this way, to extract that which most appeals to us as agricultural historians, and perhaps these two examples are the limits to which we can go with this volume, but with careful reading the different questions which they address can sometimes reveal snippets of a scenery which is familiar to us.

MICHAEL TURNER

DENNIS MILLS and KEVIN SCHURER, eds, *Local Communities in the Victorian Census Enumerators' Books*, Local Population Studies Supplement, University of Essex, Colchester, 1996. xii + 450 pp. Pbk £12.50

This volume comprises 21 papers drawn from the journal *Local Population Studies* all of which had originally appeared at dates from 1972. The papers are arranged thematically by the editors into six sections which deal with all major aspects of the census: the enumeration process, population and demography, employment and occupations, migration and population turnover, family and household structure, and residential patterns.

The result is a most useful compilation, not only because it brings together and makes available material from a wide scatter of *LPS* volumes, but because of the editorial policy which has been adopted. The policy has resulted in added value by

means of an introductory chapter by the editors themselves who usefully summarise the information contained in the various census documents 1841–1891, and who also provide an extremely helpful analysis of each of the six themes dealt with throughout the volume by means of an introductory section at the beginning of each such theme. These are solid contributions to our knowledge about the census and deliver both empirical and conceptual material in compact writing. The Appendix to the introduction to Section II (Population and Demography) very usefully incorporates an appendix listing the published census reports 1801–1901, itemizing this valuable yet underused source.

These editorial contributions which update and contextualize the articles are in many ways the key features of the book. After all, the articles can, if sought, be found already published, but these linking introductory passages are new and provide the reader, both experienced and novice, with a great deal of thought-provoking information (although the Devon parish of Woodleigh is mistakenly referred to as Woodland on p 224). However, finding the articles will require a search, since there is no ready reference allowing the inquisitive reader to find the original in an old *LPS* volume, as is normally the case in such collections. Perhaps this should not matter, but we are told by the editors that the original articles have been modified by the authors subsequently, or by the editors themselves to avoid anachronisms, and also that new footnotes have been added, and new illustrative material inserted. We cannot always tell therefore, which footnotes have been inserted by the editors and which were the originals. This apart, the editors are to be congratulated on achieving as much uniformity in style of presentation as they have across a wide spectrum of articles. They have not only made the material accessible, but in so doing they have taken the opportunity to render a fuller service to demographers, local historians and others by their diligent additions. The 'accumulated bibliography' at the rear of the book, for example, also has a 'supplementary bibliography' of other articles from *LPS* which have made use of the Census Enumerators' Books between 1968 and 1995, although such a listing should itself be seen as a partial updating of previous bibliographic work such as that published by Mills and Pearce in 1989.

This *LPS* supplement, as with previous supplements (eg that edited by Drake on parish registers) can only be partial and cannot claim necessarily to be presenting the most influential papers in this wide research area. After all, there must have been at least a dozen other journals containing material of similar significance. But the concentrated blend of empiricism and methodology, or amateur and professional researcher, does signal the continuing health of local historical population work, and the particularity of the genre with its roots in the locality, in empiricism and in social scientific analysis are most amply demonstrated.

BRIAN SHORT

IAN CARTER, *Farm Life in Northeast Scotland, 1840–1914*, John Donald, 1979, reprinted 1997. xiv+258 pp. £14.95

This book first appeared in hardback and it is heartening to see it is still in sufficient demand for the publishers to reprint it in paperback. As a committed Marxist the author refers to 'capitalist' and 'peasant' farmers, instead of the more conventional 'large' and 'small'. The Marxist framework was often commented upon by reviewers at the time, and some regarded it as the main fault in what was otherwise seen as a soundly researched and pioneering regional monograph. But in the light of almost twenty years that have passed since then it should be remembered that many of the themes raised by Carter have endured and borne fruit in a number of ways. The topic of the nineteenth-century British peasant farmer has figured in studies by Reed, Howkins, Winter, and Winstanley. Carter argued that Scottish rural historians had concentrated on the Highlands and had neglected the study of the Lowlands, but since then Devine, Campbell, and Anthony – the last of whom is reviewed below – have done much to counter this. In his choice of source material Carter used not only the written records of large estates commenting upon landowners and substantial tenants, but also items taken from the oral tradition such as bothy ballads which serve to illuminate the views of farm servants, and oral sources have been taken up in the new journal *Rural History*. The only change this paperback makes to the original is an additional three page preface. This contains references to a selection of the comments and the most favourable reviews the book provoked after it appeared. As the author freely notes how 'many appreciated its detailed evidence but deprecated the Marxist machinery organising that material', it is a pity there is not a full list of reviews.

RICHARD PERREN

RICHARD ANTHONY, *Herds and Hinds: Farm Labour in Lowland Scotland, 1900–1939*, Tuckwell Press, 1997. 290 pp. £20.

This book is divided into two parts. Chapters 1–3 provide a general picture of Scottish agriculture from 1900 to 1939 with changes in production

patterns, general labour market conditions and the role of institutions. The institutions involved are the Board (later the Department) of Agriculture for Scotland, the National Farmers' Union of Scotland, and the Scottish Farm Servants' Union, which together covered government, management, and labour. It is symptomatic of the change from the previous century that these three can be represented by formal institutions, whereas in the nineteenth century they would have been more loosely categorized under the headings of capital (landlords), labour (farmworkers) and management (farmers). But by the twentieth century landlord power and influence had faded, though not entirely disappeared under the advance of owner occupancy, and government did the best it could under worsening conditions in the 1930s to fill the spot left vacant. This section of the book covers 156 pages and the essential statistical background of production, income and prices has been soundly constructed from a variety of series of official data supplemented by material from contemporary journal articles. As a result this book currently provides the best general survey of Scottish agriculture in the first half of the twentieth century, replacing Symon's now out-dated *Scottish Farming Past and Present*.

The second section, comprising chapters 4–8, is made up of local case studies of Scottish labour markets, and employs in its analysis the techniques of modern labour economics and rural sociology. The economics involves implicit contract theory and the study of labour mobility, whilst the sociology is centred around Newby's work on employer–employee relationships and the deferential worker. The case studies are based on two localities, East Lothian and Dumfries. There are a number of reasons for this particular choice. One important consideration was that the author did not want to present possibly misleading generalisations based on a single area so he chose two rather different localities. On the east coast East Lothian was dominated by large farms relying on the sale of farm crops, and Dumfries in the south-west had smaller farms, close to the Scottish Lowland average, with a greater emphasis on mixed farming and where before the Second World War production of milk was of growing importance. Also the work of Carter on the north-east of Scotland provides a third area which already has a scholarly literature on this topic that is used as a point of reference and comparison, at least for the years before 1914 when Carter's study ends. The author nevertheless warns the reader that his conclusions about the labour market are necessarily limited by the absence of other local studies within the modern Lowland regions of the Borders, Central and Fife, and Tayside.

This section leads to a number of interesting conclusions. The author finds that workers were more likely than employers to resort to the courts when contracts were broken, and that the most common cause of complaint was unjustifiable dismissal. The place where the employment contract was struck in the nineteenth century was at the hiring fair, while in the twentieth century these declined in importance as newspaper advertisements came to dominate the recruitment of farm labour by the 1930s. Economic theory might lead one to believe farm servants were more mobile during times when the general economy and farming were prosperous and became less mobile during times of depression. But local studies lead the author to conclude reasons behind worker mobility were much more complex than can be explained by any simple link between the amount of movement and the general state of the labour market. Although subject to annual contracts, the average length of stay on individual farms varied from 22 months to eight years. However, when it comes to explaining this wide variation, the author is forced to conclude that the answer lies in qualitative, unquantifiable factors like worker preferences, quality of employers, and therefore cannot be statistically proved. But workers tended not to move great distances in search of work, the maximum being seldom more than 20 miles; and of the various groups within the hierarchy of farmworkers the longest moves were undertaken by shepherds.

In addition to the light thrown on the twentieth century Scottish agricultural labour market, there are two other areas where this study makes notable contributions. The first is as an addition to the growing body of Scottish agricultural history that is serving to counter-balance the past preoccupation — some might even say the obsession – with the Highlands and the neglect of the Lowlands. It also ensures more notice will be taken of Scottish Lowland agricultural history which, as the author points out, is far less well served by regional studies than the English Lowlands, in particular the south and east of England. Of course England has had the advantage of greater numbers of local agricultural historians, and has been helped in particular by the *Agrarian History of England and Wales*, which is now almost complete. However, as a contributor to two of these volumes, I am inclined to conclude that it is solo authors such Anthony, working on local topics who have the freedom to make the really exciting advances in knowledge and demonstrate the use of new techniques.

RICHARD PERREN

WILLIAM H BROCK, *Justus von Liebig: The Chemical Gatekeeper*, CUP, 1997, xv+374 pp. £50.

In 1996 United Kingdom farmers used nearly 4.5 million tonnes of artificial fertilizer, the bulk of it being a source of nitrogen. Without it yields would be lower, perhaps by as much as 40 per cent. In 1840, when Liebig was beginning to examine plant nutrition, they used less than 100,000 tonnes, most of it a source of phosphate. While Liebig cannot be said to be responsible for the difference (although it might not have been beyond him to claim otherwise), he was nevertheless an important influence in opening up the discussion on the merits and demerits of fertilizers, and of the wider question of how plants obtain their nutrients, in this country.

Liebig was born in Darmstadt in 1803, the son of a hardware merchant (the *von* came later, in 1845, after some assiduous lobbying, and was temporarily dropped in the turbulent times around 1848, when 'it began to look like a liability'). Family poverty curtailed both his schooling and his apprenticeship to an apothecary, but by the time he was seventeen he was at the new University of Bonn, as an assistant to the professor of chemistry, Kastner. Three years later, following a short spell in prison, a homosexual affair, and a period of study in Paris, he had a doctorate from the University of Erlangen in Bavaria (apparently obtained by purchase, rather than thesis); shortly after his twenty-first birthday, in 1824, he was made professor of chemistry at the University of Giessen. There he stayed until 1852, when, having established both his own reputation and that of the Giessen chemistry laboratory, he moved to the chair of chemistry at Munich. He died in Munich in 1873.

These are the very bare outlines of a life stuffed full of incident. It was his role in the debate on plant nutrition which first generated and continues to maintain his interest to agricultural historians. The outlines of the story are well known. Liebig addressed the 1837 meeting of the British Association for the Advancement of Science, advocating the study of organic chemistry, and was in turn requested by the Association to prepare a report on the current state of the subject. In the event, he failed to do so, but instead produced, in 1840, *Organic Chemistry in its Application to Agriculture and Physiology* (which, as Brock demonstrates, was actually written as the introduction to a larger work on organic chemistry in general), wherein he argued that plants obtained nitrogen from the ammonia in the air. This resulted in a long-running argument with Sir John Lawes, who, with his colleague Dr Gilbert (whose doctorate came from Liebig's own laboratory at Giessen) demonstrated that there was insufficient ammonia in the air to provide the nitrogen required by crops. Nevertheless, Liebig had successfully disposed of the idea that plants required humus for growth, and had opened up the question of inorganic fertilizers and their function in agriculture. The consequences of that were enormous.

This is the well-known outline of the story. Professor Brock's book fills in the details, and in so doing examines the whole question of how science contributes to society and its development. Perhaps only the naive would now cling to the idea of the scientist as disinterested seeker after the truths of the natural world, but Brock's Liebig is the scientist as salesman, of both ideas and the commercial products that derived from them. Following on from his work on plant nutrition came Liebig's patent manure, produced by his friends the Muspratt family, alkali manufacturers of Liverpool. Since the nutrients in it were made insoluble to prevent them being washed away by rainwater, they were unavailable to the roots of plants. The product failed commercially, Liebig cursed the whole business, and both he and the Muspratts lost money. Liebig was a laboratory chemist; had he exposed the product to the sort of field trials used by Lawes and Gilbert on Broad*balk* (not Broadmack, as Brock has it on p 174) Field, the problems would presumably have been revealed. There were to be several other examples of fingers burned in the fires of commerce, and his involvement in a scheme to produce a substitute for quinine might now seem dangerously close to the criminal.

As a purveyor of ideas Liebig was more successful. Brock's appendix, listing the pupils who passed through the Giessen laboratory, contains several of the leading scientific names in Europe and America in the late nineteenth century, and even the immigration official to whom Liebig presented his passport in London in 1842 had read his work. He was clearly a great asker of the right questions, if not always a producer of the correct answers. Leaving aside its obvious merits as a readable account of a complex and contradictory figure, Professor Brock's biography will be essential for historians of nineteenth century agricultural science.

PAUL BRASSLEY

Notes

B A (JIM) HOLDERNESS

Members of the Society will be saddened to hear of the death of Jim Holderness, a distinguished contributor to agricultural history and to the *Agricultural History Review*. Jim, who was latterly Reader in History in the University of East Anglia, died in April. It has been suggested that, especially for those who were acquainted personally with him, an appropriate way of showing their appreciation of Jim's life and work would be to make a donation to the charity nominated by his family for this purpose. It is the Papworth Hospital Charity Account, and donations should be sent to it, c/o Brown's Funeral Services, 102, North Walsham Road, Norwich NR6 7QQ.

EDITING AND REFEREEING THE *REVIEW*

The present volume sees a change in the editorship of the *Review*. At part 1 of volume 46, David Hey retired as Book Reviews Editor and was replaced by John Walton. With this issue Tony Phillips steps down as Senior Editor, his place to be taken by Richard Hoyle. The two retiring editors take this opportunity to thank all those who have acted as referees (many acting more than once) from 1994 to 1998, and without whom the production of the *Review* would not have been possible.

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THE AGRICULTURAL HISTORY REVIEW

EDITORS: A D M PHILLIPS AND J R WALTON

EDITOR ELECT: R W HOYLE

DEPARTMENT OF HISTORICAL AND CRITICAL STUDIES,

UNIVERSITY OF CENTRAL LANCASHIRE, PRESTON, PR1 2HE

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Contributions and letters on any aspect of the history of agriculture and rural society and economy should be sent to the Editors. Articles are normally expected to be about 8000 words in length, but manuscripts of up to 15,000 words are also welcomed. Proposals for supplements of length intermediate between the long article and the book, normally not exceeding 30,000 words should also be sent to the Editors. Intending contributors are advised first to obtain a copy of the *Review's* 'Notes for Authors and Reviewers' from the Editors. The Society does not accept responsibility for the opinions expressed by contributors, or for the accidental loss of manuscripts, or for their return if they are not accompanied by a stamped addressed envelope.

Correspondence about conferences and meetings of the Society, and about more general matters, should be sent to Dr P E Dewey, Secretary, BAHS, Department of History, Royal Holloway, University of London, Egham, Surrey, TW20 0EX.

Correspondence on matters relating to membership, subscriptions, details of change of address, sale of publications, and exchange publications should be addressed to Professor Mark Overton, Treasurer, BAHS, c/o Department of Economic and Social History, University of Exeter, Exeter EX4 4RJ.

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