Agricultural Efficiency in Britain and France, 1815-1914

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1. Labour Productivity

Between the late XVIIIth century and the Great War labour productivity in British agriculture remained appreciably and consistently higher than productivity per worker employed in French agriculture.

In a taxonomic sense French retardation might be attributed or imputed entirely to the relative inefficiency of French agriculture. If French farms had produced an output per worker similar in value to that produced on British farms then, ceteris paribus, the gap in labour productivity would disappear; commodity flow per capita in France would have been between 21% and 41% higher (that is to say, the consumption per head of agricultural and industrial *commodities* would have been above British levels throughout the XIXth century) and historians would now engage in a discussion of British not French retardation, despite the technological superiority of British industry.[1]

[1] To give arithmetical backing to these statements we completed an exercise in counterfactual history which generated estimates for hypothetical commodity output and commodity flow per capita with agricultural productivity in France assumed to be at British levels. Commodity flow is equivalent to industrial output + agricultural output

TABLE 1

THE PRODUCTIVITY OF LABOUR EMPLOYED IN BRITISH AND FRENCH AGRICULTURE 1815-1913 (in current prices)

Periods	Great Britain £'s per worker employed	France £'s per worker employed
1815-24	46	32
1825-34	44	33
1835-44	50	29
1845-54	53	29
1855-64	58	36
1865-74	67	42
1875-84	67	34
1885-94	69	31
1895-1904	65	27
1905-13	64	43

Notes and Sources

These estimates were obtained by dividing estimates of value added at current prices in agriculture by the total labour force employed in that sector. The figures are averages for the decade specified. The French estimates were then converted into sterling equivalents at a rate of exchange calculated to reflect the parities of sterling and francs for each sub-period in terms of their purchasing power for agricultural commodities. In other words we converted francs into sterling at an exchange rate that reflected the power of the franc to purchase a basket of agricultural commodities in Britain and France. The procedures and sources used to construct these exchange rates are fully described in P. K. O'Brien and C. Keyder, *Two Paths to the XXth Century: Economic Growth in Britain and France* 1780-1914 (to be published by Allen & Unwin in 1978).

The estimates of value added in agriculture and for the total numbers employed in agriculture are also fully reviewed and specified in the book cited above. They are basically derived from the research of Marczewski and his associates Markovitch and Toutain into the long run growth of the French economy published as Cahiers de l'ISEA between 1961 and 1966 and a similar investigation by Deane, Cole and Mitchell into the long run growth of Britain, see P. Deane and W.A. Cole, *British Economic Growth* 1688-1959 (Cambridge, 1962) and B.R. Mitchell and P. Deane, *Abstract of British Historical Statistics* (Cambridge, 1962).

Of course statements of this kind, based upon imputed changes in agricultural productivities, ignore the fact that France retained a relatively high share of its work force in a sector of low productivity. Such statements also beg the question of whether French agriculture possessed the capacity to employ the extra 2.8 million workers it did absorb between the 1780's and 1913 and at the same time sustain the kind of increases in marginal and average product per worker that characterized agricultural development in Britain.

— commodity exports + commodity imports. Services were excluded from the exercise. In other words we assumed that the French labour force in agriculture, at each period, had the same average productivity (in current prices) as British labour in agriculture. Agricultural output was calculated by multiplying the number of agricultural labourers by British productivity levels. It was then added to actual industrial output in sterling — converted at French weights — and finally divided by French population. The data for these exercises are from O'Brien and Keyder, Two Paths, cited under Table 1.

Over the XIXth century (1815-24 to 1905-13) productivity per worker employed in French agriculture grew at 0.25% per annum, compared to a British rate over the same period of around 1% a year. This marked difference in rates of change in labour productivity occurred partly (but only in small part) because total output grew more slowly. (The rates are close to 1.3% per annum for France and 1.8% for Britain).[2] The main reason was that the French economy retained a far higher share of its labour supply in the countryside despite the potential advantage that could have been derived from the reallocation of labour to industry. In Britain the work force engaged in agriculture seems to have remained roughly stable for over a century while real output just about doubled.

But the wide and widening gap in the productivity of labour employed in the two agricultural systems does not imply that French peasants simply ignored or failed to take advantage of the new crops and new rotations which raised yields on British farmland.[3] Nor does it mean that British agriculture was more efficient in all its branches or that the institutional framework adhered to in France after the Revolution can be blamed out of hand for the backwardness of agriculture. Simplicistic diffusion models are particularly inappropriate devices for understanding the relative efficiency of agricultural systems. Furthermore, and as usual, a comparison of rates of change fails to take account of the "potential" for development in France. It could be the case that by the end of the XVIIIth century productivity in French arable and animal farming was, as Arthur Young thought, well below not only British but potential levels and that the rate of growth in total output achieved by French farmers over the XIXth century might

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[2] In order to calculate *changes* in real productivity for France we deflated average product figures in current prices by Marczewski's agricultural price index (J. MARCZEWSKI, *Le produit physique de l'economie Française de 1789 a 1913*, in « Cahiers de l'I.S.E.A. », A.F., July 1965, p. XXXV. For Britain we deflated by the Rousseau index in B. R. MITCHELL, *Abstract*, *op. cit.*, pp. 471-472.

[3] As recent research makes clear - see W. H. NEWELL, *The Agricultural Revolution in Nineeteenth Century, France*, in « Journal of Economic History », December 1973, pp. 697-703 and P. HOHENBERG, *Change in Rural France in the Period of industrialization, 1830-1914*, in « Journal of Economic History », March, 1972, pp. 219-240.

be criticised for being sub-optimal.[4] But that case still needs to be substantiated.

This paper will analyse the major factors affecting the productivity of labour employed in French agriculture in order to explain and evaluate the relative backwardness of that sector compared with Britain. The gap in value added per worker is related: first to the area of land cultivated per worker (the land-labour ratio) and secondly to the yields per hectare of land used to grow crops and to rear animals. Such yields, expressed in value terms, are a compound of physical productivity (measured as bushels per acre, hectolitres per hectare and the weight of animal produce per unit of land devoted to animal feedstuffs) and the product mix. Variations in the latter are relevant because if British farmers and labourers produced a more valuable range of crops and animal produce than agricultural workers in France, then differences in the allocation of land between animal and arable farming and in the mix of crops grown on the arable might be sufficient to account for the gap in labour productivity.

Physical yields per hectare depend upon the quantity and quality of capital available per worker and per hectare, techniques of cultivation, tenurial institutions (organization) and human capital. Human capital includes the education, skill, knowledge and capacity for work embodied in the agricultural work forces of Britain and France. Techniques of production refer to the organization and methods employed by farmers for the cultivation of crops and the rearing of livestock. Since so much contemporary writing on British and French agriculture tends to assign primary importance to institutional obstacles for the slow diffusion of more efficient techniques of production among French farmers, it seemed appropriate to approach the problem through an analysis of the quantity and quality of land and capital available per worker employed in British and French agriculture from 1780 to 1914.

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[4] A. YOUNG, *Travels in France, 1787-89*, ed. by C. Maxwell, Cambridge University Press, 1950. Young's views on French agriculture have been analysed and given quantitative expression by B. SEXAUER, *English and French Agriculture in the late XVIIIth Century*, in « Agricultural History », July 1976.

Institutions can then be discussed in their proper place as affecting the rates of capital accumulation in the two agricultural systems.

In formal terms this essay is organized as a discussion of factors affecting value added per worker employed in British and French agriculture from 1780 to 1914 where:

1. O/L (labour productivity) depends upon H/L (the land-labour ratio or hectares per worker) and O/H (yields per hectare in value terms).

2. Where O/H depends upon C (crop mix) and K/H (capital per hectare) and R (a residual which includes the institutions affecting the stock and productivity of capital and labour employed per hectare as well as the quality of labour engaged in agriculture.[5]

2. The Quantity and Quality of Land.

Among factors affecting the productivity of agricultural labour traditional emphasis was placed upon the quantity and quality of land cultivated per worker. But the preoccupations of Physiocrats and Classical Economists with land and diminishing returns have almost disappeared from modern literature on agrarian development largely because relatively cheap substitutes for land have been developed in this century including chemical fertilizers, improved seeds and mechanical power for farm operations and transport. Chemicals restore and can radically improve the nutrient qualities of soil. They allow farmers to cultivate land continuously without recourse to the traditional practice of fallow and rigid rotation of crops and also to produce a given output from a smaller area of cropped land. Selected seeds have similar effects. Mechanized forms of power provided substitutes for draught animals and thus "save" on land devoted in the past to the production of animal feedstuffs or used as pastures for cattle, oxen and horses.

Between 1780 and 1913 alternatives for land also developed but cheap substitutes such as chemical fertilizers, electric power and

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[5] Z. Griliches, *Specification and Estimation of Agricultural Production Functions*, in « Journal of Farm Economics », May 1963.

the internal combustion engine only became widely available after the end of the XIXth century. For most of that century, agricultural production continued to be constrained by the quantity, quality and accessibility of cultivable land. In these technological conditions the preoccupations of classical economists seem well conceived. Even if some of their gloomy prognostications about the effects of the agricultural bottleneck on the overall rate of growth failed to take sufficient account of technical progress and possibilities for international trade in farm produce, they « knew one big thing » namely that agriculture was strongly conditioned by soil, climate and topography (included here under the generic term of land). Thus any investigation into the gap in labour productivity in British and French agriculture needs to give primary emphasis to supplies of cultivable land in the two countries.

There are, however, serious problems involved in the definition and measurement of the total area of land utilized for agricultural production. Our definition relies upon Toutain's broad or gross definition of « territoire agricole cultivé » for France.[6] This concept was formulated by Government officials employed to conduct the agricultural census for France, taken almost every decade from 1840 onwards.[7] It includes land under crops, grass and trees and excludes land left fallow, uncultivable land and land used for non-agricultural purposes. Since possibilities for adjusting the French estimates were limited we decided to use the French definition of *land input* for comparative purposes and to adjust British data to bring them into line with the French concept of cultivated land.

Unfortunately, figures for the area cultivated in Britain do not exist before 1866 and we fell back upon contemporary estimates for the first half of the XIXth century. There is no need to remark on the crudeness of some of the estimates for cultivated area in the two countries. Nevertheless, British farmers and their labourers had significantly more land available to them than farm

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[6] J.C. Toutain, *Le Produit de l'agriculture française*, in « Cahiers de l'ISEA AFI », July, 1961, pp. 26-29.

[7] There is a good description of French agricultural statistics in Institut National de la Statistique et des Etudes Economiques, Les Statistiques Agricoles en France (n.d.).

TABLE 2

ESTIMATES OF LAND CULTIVATED IN BRITAIN AND FRANCE 1815 TO 1913

	France Cultivated Area (m's of hectares)	Great Britain Cultivated Area (m's of hectares)	Hectares per Worker Employed In Agriculture	
			France	G.B.
(1)	(2)	(3)	(4)	(5)
1815-24	43.0	14.7	6.7	8.2
1825-34	—	14.6	—	8.1
1835-44	42.8	—	6.1	—
1845-54	43.7	15.7	5.9	7.9
1855-64	44.8	—	5.9	—
1865-74	—	14.4	—	7.6
1875-84	44.6	14.9	5.7	8.8
1885-94	44.5	15.4	6.2	9.6
1895-1904	—	15.5	—	9.7
1905-13	46.6	15.6	5.4	9.8

Notes and Sources

Column (2): the figures are from Toutain, *Le Produit de l'agriculture Française*, II, *op. cit.*, p. 214. His definition of « territoire agricole cultivé » is set out in his Vol. I, pp. 26-27.

Column (3): British data have been adjusted to bring them into line with Toutain's definition of territoire agricole cultivé. The figures for 1865-74 to 1905-13 (inclusive) are official estimates published in Ministry of Agriculture, *A Century of Agricultural Statistics* (London, 1968, table 41) which gives the area under crops and grass in Great Britain from 1866 to 1966. We added an estimate for « rough grazing land » based upon official figures for 1892-1913 in table 39 of the same publication. We also added official estimates for woodland in Britain (woods, coppices and plantations) published for various years in *U.K. Statistical Abstract*. We deducted estimates for « bare fallow » taken from Mitchell, *Abstract of Historical Statistics, op. cit.*, pp. 78-79. The British data for cultivated land thus include crops, grassland, woodland and rough grazing. They exclude fallow and land not used for agricultural purposes and are comparable with Toutain's estimates for France.

For years before 1867 we used the following contemporary estimates — again adjusted to bring them into line with French definition: 1815-24: This estimate relates to 1812 and comes from J.R. McCulloch, *Statistical Account of the British Empire* (London, 1837), p. 528. McCulloch based his figures on estimates by Middleton, Comber and Stevenson and the *General Report of Scotland*, Vol. I, pp. 37 and 58. We checked his references and adjusted his figures to bring then into line with French concepts and used: Middleton, *General View of the Agriculture of Middlesex*, (London, 1804), p. 641. W.T. Comber, *An Inquiry into the State of National Subsistence* (London, 1808), p. 52. R. Stevenson, *A General View of the Agriculture of Surrey* (London, 1812), p. 64. H. Beeke, *Observations of the Produce of the Income Tax* (London, 1800), p. 30 for area of pasture in England and Wales which is an adjustment of Middleton's estimates. Middleton, Stevenson and Comber are frequently cited by most statisticians who tried to estimate the cultivated area of Britain before 1867. The first two wrote reports for the Board of Agriculture.

We added an estimate for woodland of 2,175,000 acres for 1871-72 based on official returns (cited above). Middleton, op. cit. p. 641 estimated the acreage of woodland for 1804 at 2 million acres. Comber op. cit. p. 52, estimated woodland at 1.6 million acres. Our estimate (the official figure for 1871-72) is in line with contemporary estimates. Bare fallow land is excluded from the estimate. 1825-34: Our estimates are based on Couling's figures for 1827 which he compiled for the Select Committee on Emigration, *British Parliamentary Papers* 1826-27 (V) p. 358. Couling was an engineer and surveyor and according to Porter based estimate on the « best authorities and a personal inspection during which he travelled over 50,000 miles ». G.R. Porter, *Progress of the Nation* (London, 1836), p. 171. Couling's figures seem to be regarded as the best available by XIXth century statisticians such as Porter, McQueen, Poole, Caird and Spackman and are in J.R. McCulloch, *Statistical Account of the British Empire* (London, 1837), pp. 528 and 537. Our estimate for woodland is described under 1815-24. Bare fallow land is excluded. 1845-54: The estimate relates to 1846 and is from J.R. McCulloch, *Statistical Account of the British Empire* (London, 1854), pp. 548 and 563. McCulloch surveys all available contemporary estimates but bases his own estimates on Couling's figures for arable adjusted to include additional wasteland brought into cultivation since 1827. We added the official estimate for woodland of just over 2 million acres for 1871-72. Rough grazing land seems to be included in these contemporary estimates. Bare fallow land is excluded from our figures.

Columns 4 and 5 are columns 2 and 3 divided by estimates for agricultural labour force set out in Table 1.

workers in France. Our table indicates that the addition per worker ranges from 21% in 1815-24 to 79% in 1905-13.

But the British not only farmed a larger area of land per worker, they also obtained higher yields per hectare cultivated than agricultural workers in France (see Table 3). It is unrealistic to be precise about the share of the differential in labour productivity that might be imputed to differences in crude land endowment per worker simply because the two factors are interconnected. For example, a more favourable land endowment allowed British farmers to retain more animals per hectare of arable land which raised crop yields via the application of organic fertilizer. Nevertheless, a *lower bound* estimate for the effects of variations in land endowment might be defined as equivalent to the gap that remained in labour productivity after British superiority in yields per hectare has been eliminated. What is involved here is an arithmetical exercise designed to separate out the relative importance of land endowment from crop mix and efficient use of land as causes of the gap in output per worker employed in British and French agriculture. The following calculations rest upon the simple assumption that French farmers obtained the same yield (again measured in value terms per hectare) as British farmers throughout the XIXth century.

This table exposes different facets of efficiency in British and French agriculture. It shows that differences in value added per hectare were not nearly as wide as the gap in labour productivities. Yields per hectare cultivated in France were around 75% of the British level for most of the XIXth century while the differential in labour productivity ranged downwards from that level at the beginning of the period to 42% in 1895-1904 (compare tables 1 and 3). On the basis of admittedly imperfect data, the superiority of British agriculture appears far less pronounced when yields per hectare are taken as the index for comparison.

Furthermore, our exercise suggests that even *if* the efficiency of French agriculture had been pushed to a level where yields per unit of cultivated land were the same in Britain and France, most of the gap in labour productivity would still remain. From the four observations (in column 5 of table 3) and the figures on labour

TABLE 3

Years	Actual Yields per Hectare		Output per Worker	
	Great Britain in £'s	France in £'s	Great Britain (actual output) in £'s	France (hypothetical output) in £'s
(1)	(2)	(3)	(4)	(5)
1815-24	5.6	4.0	45.6	37.6
1845-54	6.7	5.1	53.0	39.5
1875-84	7.6	6.0	67.0	43.3
1885-94	7.1	5.1	68.8	43.8

Notes and Sources

Columns 2 and 3 were calculated by dividing estimates for the value of agricultural output cited in table 1 by estimates of the hectares of cultivated land set out in table 2. Yields per hectare in francs at current prices were converted into sterling at an « agricultural » exchange rate based on the prices of two commodities (wheat and beef) weighted by the contribution of the arable and animal sectors to total agricultural production in Britain and France. This exchange rate is based upon the methods fully described in O'Brien and Keyder, op. cit. To simplify the data we presented column 3 as an average of output per hectare based upon two exchange rates, one which employed British weights and the second which used French weights. The conversion rates in francs per £ were: 24.81 for 1815-24; 25.14 for 1845-54; 28.3 for 1875-84 and 34.3 for 1885-94.

Column 4. Labour productivity for Great Britain is copied from table 1.

Column 5. Hypothetical output per worker in France was calculated as follows: The cultivated area for France (see table 2) was multiplied by yield per hectare (in £'s) cultivated in Britain. This is the hypothetical output for France *if* yields per hectare had been at British levels. The hypothetical output was then divided by the French agricultural work force to obtain hypothetical output per worker.

productivity it is possible to calculate that the superior land endowment enjoyed by British farm workers explains somewhere between 58% and 71% of the differential in value added per worker in British and French agriculture. Perhaps not more than 40% of the gap is left to be accounted for by variations in physical yields and in the crop mix.[8]

Another, and perhaps more satisfactory way, of measuring the share of the gap in labour productivity that emanated from a superior endowment of land per worker would be to define that share as equivalent to the decrease in total output per worker that would follow from a hypothetical reduction of the area cultivated in Britain to the point which equalized land-labour ratios in the two agricultural sectors, while leaving the total amount of other inputs (capital and labour) employed by British and French farmers unchanged.

[8] Arithmetically these percentages are based upon estimates set out in tables 1 and 2. The calculations express the difference betwen the real and hypothetical labour output ratios for French agriculture as a percentage of the actual gap between labour productivity in British and French agriculture.

Empirically this exercise presupposes that historians could estimate the yield of land at the extensive margin — a margin equivalent to about one third of the cultivated area of Britain (one third is roughly the fraction required to equalise land-labour ratios in Britain and France). The exercise also presupposes that returns (marginal products) from the capital and labour used on such lands, and hypothetically reallocated onto intra-marginal land, could be calculated. There is, however, no way of specifying the shape of the production function for British agriculture over the XIXth century and we cannot calculate the elasticities of farm output with respect to changes in inputs of land, labour or capital, either over time or across countries.

All these estimates are possibly an over-elaborate way of making the point that the relative backwardness of French agriculture cannot be properly understood with reference to the lower productivity of labour employed in that sector, which is much more a reflection of lower rates of structural change and internal migration than inefficient farming per se. Nevertheless, the gap in yields (value added) per hectare is still wide enough to support the view that French farmers failed to fully exploit techniques available to them for raising agricultural output (table 3). But before that gap is taken as an indicator of French backwardness, it is necessary to look at the quality of land endowment in the two countries.

Our figures of land input are crude and refer to hectares of cultivable land that differed widely in potential for agricultural production. All too often comparison of yields per hectare between Britain and France assume that the land in both countries offered a roughly similar potential for agricultural production and that national averages of physical yields per hectare are a valid index for comparisons.[9] That assumption is more acceptable in the second half of the XXth century because science has steadily diminished the importance of differences in soil, climate and topography. (Bananas can now be grown at the North Pole). But for

[9] ARTHUR YOUNG and LAVERGNE thought the "natural fertility" of French soil was greater than British soil — a view apparently supported by SEXAUER, *English and French Agriculture*, *op. cit.*, pp. 492-93.

most of the period 1815-1914 even slight differences in natural endowment could be significant simply because the technology available to compensate for such variations had not emerged or remained too expensive.

But the problem is how to give proper weight to variations in natural endowment across countries because the injunction presupposes that land can be classified in terms of its natural or inherent capacity for primary production. That capacity is a compound of soil type, precipitation, temperature relief and elevation, etc.[10] We propose to use modern scientific evidence in an attempt to classify and measure possible variations in the quality of land available to British and French farmers over the previous century.

Physically Britain and France are alike. Both countries have a similar geological base, natural vegetation and climate. Since these interdependent factors determine the quality of soils, Britain and France share a comparable range of soils. But small differences in geology and location have generated differences in their endowments of cultivable land. Furthermore, France is a larger country and thus exhibits wider variations in geological formation and climate than Britain.

Our preliminary classification of land in Britain and France begins with soil. Soil fertility is often discussed in the context of crop production because varieties of plant life require differing types of soil. Nevertheless, all soils possess an inherent fertility as well as a potential for induced fertility. The productive capacities of soils are generally analysed with reference to seven qualities which include: root room and root hold, areation and drainage, oxygen and moisture, percolation and temperature, a thermal profile of 16 essential elements (pH), stable site and erosion.[11] In its soil map of Europe published in 1969, the Food and Agricultural Organization distinguished the land areas of Britain and France into

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[10] N. HILTON, *An approach to Agricultural Land Classification in Great Britain*, in « Land Use and Resources », Studies in Applied Geography (London 1968), p. 128.

[11] E. A. FITZPATRICK, *Introduction to Soil Science* (Edinburgh, 1974), p. 74.

22 soil types, overwhelmingly of the gray podzolic variety which are usually very good for agricultural purposes.[12] France possesses a greater diversity of soils with 19 different varieties while Britain has 13.

Our first task was to convert the Soil Map of Europe into arithmetical shares of the total area occupied by different soils. The areas were measured with a planimeter and calculated as percentages of each country's total area.[13] Our initial classification, based on soil alone, showed that compared to Britain the ground surface of France contained 4% more unproductive soil (located in large part on upland and mountainous regions) 4% less soil of a secondary potential and roughly the same share of prime soil. Thus estimates based upon the F.A.O. Soil Map did not lend much support to the traditional view that French agriculture had the advantage of better quality soils.[14]

But the quality of a country's natural endowment cannot be appreciated on the basis of soil alone. Climate relief and topography had also to be taken into account. In general terms, the climates of Britain and France are similar. France is somewhat wetter, in that a larger area of the country receives 750 to 1000 millimetres of rain a year and smaller proportion receives 500-750 millimetres per annum. The farming areas of both countries are, however, fed with water at an average rate of 24 to 30 inches a year and heavier rain tends to fall at higher elevations on soil with a low capacity for agriculture, such as Wales and the Scottish Highlands or the Morvan, Vosges and Alps in France.

Again in general, temperatures are somewhat more extreme in France where summers are warmer and winters colder. Southwards from Paris the July temperature averages 68 to 70 degrees whereas around London the average is only 64 degrees, while the East

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12 F.A.O., *The Soil Man of Europe* (Rome, 1967).

13 The method used was to weigh areas classified on the maps associated with a given soil type and to use the weight of the entire map as the denominator. The FAO have not apparently published this data in statistical form - letter from A. Pecrot of FAO dated 11-9-75.

14 L. DE LAVERGNE, *Rural Economy of England, Scotland and Ireland*, (London, 1895), p. 6.

and mountain regions of France remain under snow for months every winter.[15]

Topography not only conditions the process and costs of cultivation but modifies the climate. Thus height alters the length of the growing season, while the slope and aspect of land are important both for the ease of ploughing and other operations and also for the incidence of frost. Land may also lie at a level that renders it too wet for the plough or susceptible to flooding. Thus there are upper and lower limits to cultivation, but farming takes place at a variety of elevations above and below sea level and upon slopes that differ enormously in steepness and aspect.[16]

There is no need to belabour points described in standard geographical texts. We used maps and other geographical evidence on climate and topography to amend the preliminary distribution of land in the two countries based on soil alone. Essentially we divided land into 7 subgroups, classified in terms of capacity (soil, climate and relief) to support different types of primary production.

Thus land is used as a technical term defined by its constituent properties of soil, relief, aspect, drainage, and climate. Land quality was determined by juxtaposing the soil profiles of Britain and France against other relevant profiles related to climate, relief, etc. There are numerous systems for the classification of land but we tried to make the system presented here « as objective and uncomplicated as possible ».[17] We preferred a seven category system cross cut by reference to elevation in order to produce information on the agricultural potential of land located in Britain and France. The categories used depend heavily on Dudley Stamp's land classification system for Britain.[18]

At the end of a lengthy investigation it remains difficult to arrive at a precise classification of the quality of land available to

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15 P. THRAN and S. BROCKHUIZEN, *Agro-Climatic Atlas of Europe* (Amsterdam, 1965).

16 *Atlas Economique et Social pour l'Amenagement du Territoire*, II *Agriculture* (Paris) Geographique National, 1969.

17 Ministry of Agriculture, *Agricultural Land Classification*, Technical Report II (London, 1966), p. 2.

18 L. DUDLEY STAMP, *The Land of Britain* (London, 1962), pp. 363-381.

TABLE 4

THE QUALITY OF LAND IN BRITAIN AND FRANCE
(% of total area)

Britain						Soil Type	France					
P	S^1	S^2	S^3	R.G.	U	*Low Plateaux, Hills, Plains*	P	S^1	S^2	S^3	R.G.	U
2.0		6.4	8.5			Acid brown forest		1.0		4.4		0.3
	1.0	6.96		3.7		Podzolized				1.4		1.4
	1.0	3.0	3.0			Podzolized/organic						
3.42		3.43				Organic						
	1.0		2.0	2.0		Organic/podzolized						
23.86			1.6			Gray brown podzolic	22.2					
0.6						Gray brown podzolic/podzolized			3.0	3.1	1.2	
						Gray brown podzolic/pseudogley				2.0		
12.39						Gray brown podzolic/brown forest				0.16		
					0.17	Regosols						1.5
						Regosols/rendzinas		0.5		6.0		
						Brown forest/regosol		1.0		9.0		
						Alluvial	2.5			1.5		0.5
4.5						Red mediterranean		0.4			0.4	
46.77	3.0	19.79	15.1	5.7	0.17		42.20	1.90	3.0	21.76	1.6	2.0
	6.87					*Subdued Mountains, High Plateaus*		0.4			4.2	
						Brown Forest/rendzings						
						Acid brown forest/rankers			0.9	1.8		
						Brown mediterranean/lithosols		0.2			1.0	0.8
						Red mediterranean/lithosols		0.15			0.63	0.62
	6.87							0.75	0.9	1.8	5.83	1.42
						Mountains						
				1.1		Lithosols					0.1	0.5
			0.8			Lithosols/podzolic					0.3	
						Lithosols/rendzinas		0.2			1.7	
						Lithosol/ranker/podzolic		0.3			1.8	1.8
			0.8	1.1				0.5			3.9	2.3
46.77	9.87	19.79	15.9	6.8	0.17		42.2	3.15	3.9	29.36	11.33	7.42

Notes and Sources

P = Prime land suitable for intensive farming, horticulture.
S = Land of Secondary Quality, Best suited for:
S^1 = Arable
S^2 = Mixed Farming
S^3 = Forest and Low Grade Polyculture.
R.G. = Rough Grazing.
U = Unproductive Land.
The sources and methods have been cited in the text.

British and French farmers. Our percentages suggest that the French farmed within a physical environment which (hectare for hectare) was inferior to the natural endowment available to British agricultural workers.

For example it seems that only 42% of the land surface of France could be classified as land of prime quality, compared with 47% of Great Britain. Nearly 19% of the land of France seems to have been unfit for agriculture or fit only for rough grazing but only 7% of Britain falls into that group (R.G. and U.). Turning to the large residual category (land of secondary potential S^{1-3}) a larger proportion of land of that type in France (29% for S^3) appears to be best suited to forest and low grade polyculture. In Britain a larger share of such land (some 30% in all for S^{1-2}) seems to possess adequate capacity for arable, mixed farming and good pasture.

In terms of elevation: the sub totals indicate that France has more of its land at higher levels than Britain. Thus 91% of Britain is located on low plateaux, hills and plains but only 83% of France. Roughly 7% of France is mountainous compared to just under 2% of Britain. There is no necessary relationship between elevation and soil quality but France does contain less lowland and less productive soils and more mountainous and more unproductive soils.

Our investigation into land-labour ratios in Britain and France cannot offer "measured" conclusions but the data does indicate that the land endowment available to British agricultural workers exceeded the endowment available to farmers across the channel by a large margin. Furthermore, the « quality of land » available to British farmers was hectare for hectare definitely superior to the quality of French farmland.

3. Product Mix and Value Added per Hectare.

While differences in the quantity and quality of land account for most of the gap in the productivity of labour employed in British and French agriculture something like 40% was still due

to the superior yields per hectare achieved by British farmers and their labourers. Some part of that advantage came from contrasts in the product mix, especially from the higher British share of net value added in agriculture derived from animal husbandry. Our estimates suggest that animal produce (meat, milk, eggs, poultry, fibres, skins, etc.) provided 42% of net output in 1815-24 and that this share rose to 68% by 1905-13.[19] In France that share rose from about 30% at the beginning of the century to around 43% just before the Great War.[20]

Unfortunately, we cannot present a detailed breakdown of the commodity composition of agricultural output in Britain and France. For Britain relevant data are not available before 1867 and the estimates after that date, for both countries, relate to gross output — that is to the gross value of sales plus farm consumption for 10 sub-sectors of agriculture.

TABLE 5

THE COMPOSITION OF AGRICULTURAL OUTPUT/SALES IN BRITAIN AND FRANCE

Commodity	1865-74		1905-14	
	G.B. %	France %	G.B. %	France %
1. Cereals	24	26	11	20
2. Potatoes	6	3	5	5
3. Fruit and Vegetables	5	4	5	8
4. Industrial Crops	2	3	1	2
5. Hay, Straw, Animal Feed	4	25	3	28
6. Vines and Cider	—	14	—	8
7. Meat	37	12	44	14
8. Milk	15	8	23	10
9. Wool and Silk	4	1	2	—
10. Eggs and Poultry	3	4	6	6

Notes and Sources

The percentages refer to the gross value of output (produit global) in each sub sector of agriculture in current prices. The French data are from Toutain, *Le Produit de l'agriculture Française, op. cit.*, pp. 7-9. The British estimates are from E.M. Ojala, *Agriculture and Economic Progress* (London, 1952), table 12. Ojala's figures refer to the U.K. and to 1867-76 and 1904-13. The figures are not strictly comparable. Ojala's figures refer to gross output but Toutain seems to be working with a concept of gross sales.

[19] These proportions are based upon the weights used to calculate the purchasing power parity exchange rates and are fully described in O'BRIEN and KEYDLER, *Two Paths, op. cit.*, ch. 2.

[20] TOUTAIN, *Le Produit, op. cit.*, p. 171.

Ideally, we required estimates for net value added in various branches of agriculture, but some contrasts are obvious enough. Looking first at the mix of crops produced within the arable sector, we observe there is no British equivalent to the cultivation of vines and that French farmers continued to grow more wheat and other cereals at a time when Britain became steadily more dependant upon imported grains. If we complement the information contained in table 5 with some estimates related to the allocation of arable land for 1892, we observe that British farmers allocated higher percentages of their land to root crops and oats than French farmers, who favoured the cultivation of wheat.[21] This does not imply that the latter could have increased the value added per hectare by reallocating arable land along British lines. On the contrary if French farmers had adopted a British crop mix, output per hectare of arable land in France would have gone down.[22]

British superiority was not due to a more efficient allocation of arable land among different crops and the really significant difference is found in the different proportions of output derived from animal farming. Britain was far more orientated towards animal husbandry than France and higher returns per hectare could usually be obtained from the allocation of land to stock rearing. In the 1860's and 1870's value added per hectare in British agriculture may have been 15% higher in animal than arable husbandry. With the influx of American wheat and the depression of grain prices after 1870 the return may have been as much as 65%

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21 The percentage of *arable* land allocated to various crops in 1892: Wheat: 54% in France and 20% in Great Britain; Barley 6% and 18%; oats 17% and 26%; potatoes 6% and 5% respectively. In Great Britain 17% of arable land grew turnips and swedes and in France 8% grew vines. The figures for Great Britain are from MITCHELL, *Abstract, op. cit.*, p. 78-79. For France we calculated these proportions from the Census of Agricultural Production for 1892 which published estimates for gross output per hectare in francs for several crops. We also used Toutain's figures for produit global to measure the area under these crops. The French ratios relate to grains, potatoes and vines.

22 Given the information in the Census for 1892 on gross output per hectare for various crops and the shares of arable land devoted to different crops in Great Britain. MITCHELL, *Abstract, op. cit.*, p. 78, we calculated what French output per hectare of arable land *would have been* if French farmers allocated land in British proportions. Note our figures refer to arable land under grain, potatoes, vines and root crops only.

higher by 1905-13.[23] Although we hesitate to cite figures, returns in animal husbandry seem to have been even higher in France.[24] Thus if French farmers had found it possible to devote something like the British proportion of their farmland to animal husbandry the observed differential in value added per hectare would have been smaller.

We knew this would have been the case but unfortunately cannot measure the effects that flowed from the different allocation of land because no estimates for the *total* area of land devoted to the production of grass, hay, straw, artificial grasses and other fodder crops (including grains) are available. The unknown figures are the acres and hectares of land used to grow fodder crops, such as oats fed to animals, clover, lucerne, sanfoin, root crops, etc.[25] All we have on the input side are estimates for the area of land given over to grass, pasture and rough grazing in the two countries, but striking contrasts again emerge. Thus between 1815 and 1914 about 54% of the cultivable land of Britain was used as pasture for

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[23] We calculated these returns by dividing net value added in the cultivation of cereals by the number of acres devoted to cereals and net value added in animal production by the land under rotation grasses and permanent pasture. Net value added in grain production was assumed to be equal to its gross value. Net value added in animal husbandry was derived from sources cited in footnote 19. Land input for the two sectors are from MITCHELL, *Abstract, op. cit.*, pp. 78-79. Since these figures neglect imported animal feed as well as grains and root crops fed to animals they are very crude estimates that undoubtedly overstate the relative profitability of animal farming.

[24] We do not offer figures because although we have cited estimates of output (value added in animal farming) we do not have figures for the relevant input of land required to calculate yields per hectare. The figures available relate to a large proportion of that input, namely land devoted to grass, pasture and artificial meadows. If we divide value added in animal husbandry by that *partial input* of land and compare in with returns per hectare in arable farming then it certainly looks as if animal husbandry in France was relatively speaking even more profitable than Britain. The relevant output and input figures are cited under tables 1 and 5. But see footnote 23.

[25] Given data on the total area of land devoted to the cultivation of animal fodder, of all kinds, the exercise would proceed to multiply the *hypothetical* hectares of farmland in France allocated to fodder crops by net value added per hectare of land actually used in animal farming. (These hypothetical hectares would represent the British percentage of the cultivable area devoted to animal husbandry). The residual arable hectares would then be multiplied by the actual yield achieved in arable farming. The sum of hypothetical animal and hypothetical arable output would be the hypothetical agricultural output for France, *if* French farmers had allocated land along British lines. It is then simple to calculate the difference this hypothetical allocation of land could have made to yields per hectare and output per worker in French agriculture.

cattle, sheep, pigs, horses and goats, compared to only 23% of France.[26] Already at mid century from a far smaller area of farmland British farmers used some 8 million hectares for pasture while French farmers left only 9 million hectares of land as pasture.

Farmers in Britain and France used meadows along waterways and better pasture to raise cattle while poorer grazing land tended to support sheep. The capacity of land used as grass, pasture and rough grazing to support animals seems to have been roughly similar in Britain and France. In 1852 the number of sheep per hundred hectares of pasture was 350 in France and 320 in Britain and the ratios for cattle come to 120 for France and 70 for Britain.[27] Furthermore, the animal stock of France contained a far higher proportion of cattle and pigs than Britain where sheep accounted for roughly three quarters of the stock. During the period 1862-1914 cattle formed 18% of the British animal stock and 29% of the French stock, pigs 7% and 15% respectively and sheep 75% of the animal population in Britain compared to 56% for France.[28] In 1862 French cattle cost ten times as much as sheep and a mature pig sold at twice the price of a sheep.[29]

From these figures it looks as if French agriculture sustained more animals and more valuable animals per unit of grass and pasture than animal husbandry in Britain. We do not know the proportions of arable land farmers allocated to grow fodder crops for their animals either in Britain or France. But unless British farmers obtained significantly higher physical yields per hectare in animal husbandry (physical yields measured as meat per live animal, litres of milk per cow, eggs per hen, kilogrammes of wool per sheep, etc.) these figures lead to the conclusion that the yield or value added per hectare of *all* land allocated to animal farming in Britain was probabily not greater than land similarly deployed in France.

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[26] See notes and sources to table 2.

[27] These ratios were calculated by dividing the sheep and cattle populations of Great Britain and France by the hectares of land devoted to grass, pasture and rough grazing. The relevant estimates can be found under tables 2, 6 and 7.

[28] See footnotes to table 8.

[29] *Statistique de la France*, Resultats généraux de l'enquête decennale de 1862 (Strasbourg, 1870).

Of course the information available did not permit us to conduct an adequate investigation into the efficiency of animal husbandry in Britain and France. Nevertheless that information does not dispose us to expect that much if anything of the differential in value added per hectare stemmed from more efficient stock rearing in Britain. It was not the higher yields or greater efficiency of the animal sector of British agriculture that stands in marked contrast to France. Nor can it be maintained that French farmers allocated arable land inefficiently among different crops. It was rather the allocation of a far greater share of farmland and other resources to the rearing of stock, especially sheep, that distinguished British farming in the XIXth century. This contrast between an animal intensive agriculture in England and a far greater emphasis on arable farming in France is, however, central to the explanation of differences achieved in value added per hectare in the two countries because animal products are not only more valuable but the density of animals per hectare of arable land was a critical determinant of the level physical yields achieved in the cultivation of grains, vegetables and other crops.

4. Farm Animals as Capital Goods.

Differences in labour productivity should be related to differences in the ratios of land to labour (hectares per worker employed in British and French agriculture) and to ratios of capital to labour in the two agricultural systems. Capital refers to reproducible capital such as buildings, machinery and equipment, implements, hedges, trees, drains, roads, tracks and to animals used in the production of farm output.

During the XIXth century capital in agriculture was, to a considerable extent, formed with inputs produced within the sector. Capital purchased from industry, such as machinery, implements and chemicals formed a small, if growing, proportion of the capital stock. Capital formation in both British and French agriculture might be described as a labour-intensive process, designed to make each hectare of cultivable land into a hectare of comparable quality

and accessibility. Gestation periods were long and the productivity of investment at the margin depended on the size and quality of the stock of capital already in place. There could be jumps in the capital output ratio as capital per unit of labour and land approached some critical minimum level. Although the process of capital formation can be described, useable estimates of the quantity of capital available per worker in British and French agriculture have not been compiled.[30] We intend to concentrate upon a single but critical component of the capital stock, namely farm animals.

Over the XIXth century the employment of steam engines in European agriculture increased but remained on a fairly limited scale. Power in agriculture continued to be provided by people, the elements (wind and water) and above all by animals, particularly horses and draught cattle which supplied most of the energy required for cartage, transport, ploughing, harvesting and other operations on the farm. Obviously some index of the availability of animal power to British and French farmers is relevant if we are to understand variations in output per worker employed in the two agricultures.

TABLE 6

ANIMAL POWER IN BRITISH AND FRENCH AGRICULTURE IN 1892

	Draught Horses 000's (1)	Draught Cattle 000's (2)	Ratio of Animal Power Per Hectare of « Arable » Land (3)	Animal Power Per Worker Employed in Agriculture (4)
Great Britain	1,027	—	1: 6.4	1:1.6
France	1,322	1,387	1:11.4	1:2.6

Notes and Sources

Draught animal totals for Great Britain are from Ministry of Agriculture, *Agricultural Statistics*, London, 1893, p. 64.

For France they are from *Statistique Agricole de la France*, Enquête decennale 1892 (Paris, 1892), pp. 120 and 124. Our figures are horses and boeufs travail.

The sources for hectares of arable land and workers employed in the two agricultural systems are cited under tables 1 and 2.

30 But see C. H. Feinstein's paper in the *Cambridge Economic History of Europe* (unpublished) on « Capital Accumulation and Economic Growth in Great Britain 1760-1860 ». Toutain has some estimates for capital in Chapter IV of *Le Produit de l'agriculture française, op. cit.*

Our estimates suggest that the animal power available to the agricultural workforce for the cultivation of arable land in Britain, exceeded the amount used by French workers by a considerable margin. This margin is, moreover, understated by the figures cited above because the horse was considered to be a more efficient animal than the ox and other *boeufs travail* which constituted the majority of animals used on French farms.[31]

For the kind of pre-chemical agriculture that operated over most of Western Europe during the period 1780-1914, animals also supplied most of the organic fertilizer utilized in arable farming. Historically, farm animals functioned as capital goods for transport and for the production of organic fertilizer vital for higher yields per hectare deployed in the cultivation of grain, vegetables and other crops.

There are figures available for the stocks of live animals (cows, sheep, pigs, horses) in Britain and France and it is possible to produce rough estimates of the annual *flows* of manure produced by these animals. Such flows can, in turn, serve as a proxy for the volume of organic fertilizer potentially available for application onto the arable land of Britain and France.

An exercise along these lines generated estimates for the volume (measured in chemical equivalents) of domestically produced organic fertilizer *available* per hectare of arable farmland in the two countries for the 1830's, 1850's and 1890's.

The sources and methods used to construct these figures have been outlined below the table where the steps involved in converting figures related to the animal populations of Britain and France into flows of manure and finally into nitrogen, phosphorous and potassium equivalents have been fully specified. We have *not* measured the actual amount of organic fertilizer *applied* to the arable land of Britain and France. Manure was not all gathered. Its properties were vulnerable to leaching and imperfect storage. Dung could be improved by the addition of straw and its quality varied with the food intake of the animals excreting it. Furthermore our

[31] See J. A. Perkins, *The Ox, the Horse and English Farming, 1750-1850*, Department of Economic History Working Paper, University of New South Wales.

TABLE 7

PRODUCTION OF DOMESTIC ORGANIC FERTILISER IN GREAT BRITAIN AND FRANCE, 1837-1892

Year	Total Availability in millions of metric tons		Arable Land (millions of hectares)		Volume of Fertilizers available in kilogrammes per hectare of arable land	
	Great Britain	France	Great Britain	France	Great Britain	France
1830's	1,034	1,787	5.5	25.4	188	70
1850's	1,148	1,964	6.6	26.1	174	75
1890's	1,644	2,070	6.6	23.7	249	87

Notes and Sources

The methods and sources used to calculate the volume of organic fertilizer per hectare for Great Britain and France were as follows:

1. Figures for the animal population of France are from: l'Archive Nationale F20/724 Tableau des recensements des animaux, 1839 - for 1839; *Statistique de la France*, Statistique Agricole (Paris, 1858) vols. 1 and 2 - for 1852; *Statistique Agricole de la France*, Resultats Generaux de l'enquête décennale de 1892 (Paris 1897) - for 1892.

2. Figures for the animal population of Great Britain are from: J.R. McCULLOCH, *Statistical account of the British Empire* (London, 1837) p. 530 and *Edimburgh Encyclopaedia*, (Edimburgh, 1830) pp. 730-732, and DEANE and COLE, *British Economic Growth, op. cit.*, p. 195 - for 1837. J.R. McCULLOCH, *Statistical account of the British Empire* (London, 1854) pp. 489, 495 and 500 and B. POOLE, *Statistics of Commerce* (London, 1852) p. 69, and M. BLOCK, *Statistique de la France* (Paris, 1860), p. 93 - for 1854. Ministry of Agriculture, *Agricultural Statistics* (London, 1892) - for 1892. We next attempted to group the animal populations by age and weight.

The age distribution for British animal population for 1892 was derived from age profiles for the animal population of 1916-20 (Ministry of Agriculture, *A Century of Agricultural Statistics*, London, 1968, p. 123) and from the French data for 1892 from the source cited above. For 1854 and 1837 the age profile was based on French data for 1862 (*Statistique de la France*, Resultats Generaux de l'enquête decennale de 1862, Paris, 1868).

For France the age profiles are given in the enquête decennale for 1862 and 1892. For 1839 we used the source cited above for animal population.

For the *live* weights of cattle, pigs, sheep and horses we used the figures from the *Statistique de la France*, Statistique Agricole (Paris, 1858) Vols. 1 and 2. In other words we used a constant average weight for each animal at each age throughout the century.

To estimate the weight of manure produced per animal per year we deployed coefficients for the average volume of dung produced by modern animals of the same weight and age per year. Finally the estimates for manure produced were converted into nitrogen, phosphorus pentoxide and potassium-oxide equivalents - again using modern conversion coefficients. Both sets of coefficients came from: S.L. TISDALE and W.L. NELSON, *Soil Fertility and Fertilizers* (New York, 1956) p. 231 and K. PAISLEY, *Fertilizers and Manures* (London, 1960), p. 116.

Sources for the estimates of hectares of arable land are cited under Table 2.

figures take no account of imports of organic or chemical fertilizers but the British advantage over France could only appear more marked if import figures were taken into the comparison. Between 1871-80 Britain imported about 365,000 metric tons of fertilizer a year compared to a French import of around 116,000 metric tons.[32]

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32 Ministry of Agriculture, *Agricultural Statistics* (London, 1879), et seq. and « Journal of the Royal Statistical Society », December 1882, p. 605. For France we used « Annales du Commerce Exterieurs », 1884-86, pp. 128-129 and « Statistique Agricole Annuelle and Enquête Agricole » 1868-72, Rapport, p. 95.

Inevitably the estimates are no more than guesses at rough magnitude but they help to bring out one very significant difference between the two farming systems, namely that supplies of domestically produced fertilizer *available* for application onto the arable land of France was around 45% of the amount available per hectare in Britain. Organic fertilizers are produced mainly by farm animals and the stock of such animals depends on the allocation of land between arable and pasture. Thus the relatively high availability of fertilizer in Britain reflects the fact that a far greater proportion of the land utilized consisted of pasture and rough grazing.

To reiterate, it is the allocation of so much land to pasture that seems peculiar to Britain. The accumulation of a stock of animals which provided British cultivators with more draught power and far greater quantitites of organic fertilizer per hectare of arable land gave them superiority not only over French farmers but over farmers in other regions of Europe as well. Just how far back in history these advantages can be traced is difficult to ascertain. They seem to have been obvious to some agronomists as early as the XVIIth century and became really significant when European population growth accelerated in the second half of the XVIIIth century. But there is no mistaking the benefits that accrued to agriculture and the British economy from the accumulation of farm animals. Value added per worker went up as the product mix shifted in favour of higher value outputs associated with animal farming. At the same time increased supplies of animal power saved labour per unit of arable output. There is no way of measuring the amount of labour time saved through the substitution of animal power in British agriculture, but farm animals must be considered in any discussion of variations in labour productivity and land-labour ratios observed for British and French agriculture. Agriculture's capacity to release labour for industrial employment is, of course, related to availability of substitute forms of draught power for ploughing, cartage and transport of all kinds. More important, animal husbandry in most of its branches is a less labour intensive and seasonal activity than arable farming. Certainly it

would be interesting to know the proportion of the French labour force retained in the countryside in order to cope with the more cyclical work rhythms of cultivating arable land, as compared to a move regular work cycle of labour engaged in rearing livestock.

5. Output per Hectare in Physical Terms.

We propose to conclude the attempt to explain variations in the productivity of labour engaged in British and French agriculture by comparing physical yields per hectare employed in the cultivation of crops, particularly cereals and potatoes. These ratios have been deliberately considered last because too many commentaries on French retardation assume that Britain's superiority in agriculture emanated from higher yields in animal and arable husbandry. That was not the case. In agriculture French backwardness stemmed mainly from a lower endowment of farmland per worker and an allocation of land that gave far less emphasis to animals than Britain. Differences in the land-labour ratio probably accounted for well over half of the gap in labour productivity and variations in product mix accounted for substantial share of the remainder. We are not disposed to think that the gap in physical yields per hectare could account for more than a third of the marked superiority of British agricultural workers.

There is, moreover, little evidence that the animal sector of British agriculture was more efficient than its counterpart in France. On the contrary in terms of animal produce obtained per hectare of land allocated to grass and pasture it appeared that French farmers obtained slightly better yields already by mid century. Our selection of partial productivity indicators for the 1900's also suggests that French farmers did as well and often better than their British rivals in the production of meat, milk, eggs and wool and their superiority went back at least to 1852 and possibly earlier.[33]

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[33] We compared British yields for the late XIXth Century with French yields for 1852 and 1862 in *Statistique de la France*, Resultats généraux de l'enquête decennale de 1852 et 1862, *op. cit.*, and C. Dutens, *Essai comparatif sur les formation et le distribution du revenu de la France* (Paris, 1842).

TABLE 8

PRODUCTIVITY RATIOS FOR ANIMAL HUSBANDRY

	Great Britain			France		
	Weight		Years	Weight		Years
1. Meat Produced per head of cattle slaughtered	306	kg.	1907-08	421	kg.	1909-11
2. Veal Produced per calf slaughtered	44	kg.	1907-08	96	kg.	1909-11
3. Meat Produced per sheep slaughtered	30	kg.	1898-1903	26	kg.	1909-11
4. Lamb Produced per animal slaughtered	18	kg.	1898-1903		—	—
5. Pork Produced per pig slaughtered	71	kg.	1907-08	114	kg.	1909-11
6. Milk Produced per cow and heifer in milk or calf.	1,375	ltrs.	1907-08	1,600	ltrs.	1885-94
7. Wool produced per sheep.	2.2	kg.	1892	2.4	kg.	1892
8. Eggs produced per fowl.	48		1907-08	46		1892

Notes and Sources

The French figures for 1909-11 relate to the abbattoir for Paris (La Villette) published in Ministère de l'Agriculture *Statistique Agricole Annuelle*.

The figures for eggs and wool which refer to 1892 are from *Statistique de la France*, Agriculture, Resultats Generaux de l'Enquête Decennale de 1892 (Paris 1897).

Milk yields per cow in milk are from J.C. TOUTAIN, *La Consommation alimentaire en France de 1789 a 1964* (Paris, 1971), p. 1951.

The British ratios were calculated from estimates published by Board of Agriculture and Fisheries, *The Agricultural Output of Great Britain* (London, H.M.S.O. 1912) and Journal of the Royal Statistical Society, 1904.

No, it was on arable land that British farmers obtained results way ahead of those achieved by farmers in France. By the end of the XIXth century their superiority was patently obvious to officials of the Ministère de l'Agriculture who regularly published comparisons with British grain yields in Statistiques Agricoles and Enquêtes decennale.

Physical yields which are averages for the whole of Britain and France conceal regional disparities. And the figures cited above refer to only a sample of crops grown on arable land. Nevertheless, such averages are frequently used as the basis for condemning French farmers for their failure to adopt techniques of cultivation, larger units of production and modern systems of tenure, perceived as "preconditions" for higher yields and held to be at the back

TABLE 9

PHYSICAL YIELDS ON ARABLE LAND IN BRITAIN AND FRANCE IN 1862, 1892 AND 1902 (in kg. per sown hectare)

Crop	1862		1892		1902	
	Ireland	France	Great Britain	France	Great Britain	France
Wheat	1,399	1,201	1,840	1,267	2,293	1,359
Barley	1,802	1,207	2,092	1,186	2,105	1,366
Oats	1,487	1,122	1,739	1,084	1,903	1,211
Potatoes	6,783	11,555	14,618	10,500	14,114	7,671

Notes and Sources

1862 France: *Statistique de la France*, Agriculture, Resultats Generaux de l'enquête decennale de 1862 (Strasbourg, 1870).

1892 France l'enquête decennale de 1892, *op. cit.*

1902 France Ministère de l'Agriculture, *Statistique Agricole Annuelle*, 1902.

Yields expressed in quintals and hectolitres per hectare were converted into kilogrammes per hectare by using the conversion coefficients published by Ministère de l'Agriculture in *Statistique Agricole* for 1902.

1862 Ireland from Mitchell Abstract op. cit., p. 92. To compensate for the bad harvests of 1861 and 1862 we took average yields 1860-65. The figures are in tons and cwts and converted at 220.46 lb. = 100 kg. We know from Craigie's estimates for 1882 that Irish yields were slightly below British yields for wheat; above British for barley and below British yields for oats - Craigie, « On Statistics of Agricultural Production », *Journal of the Royal Statistical Society*, March 1883, p. 19. It is clear, however, that Irish potato yields were well below yields in Britain - compare Mitchell, *Abstract, op. cit.* with Ministry of Agriculture, *A Century of Agricultural Statistics, op. cit.*, table 59. 1892 and 1902 Great Britain: from *ibid* tables 56-59.

Converted to hectares and kilogrammes at 2.471 acres = 1 hectare and 2.3046 lbs. = 1 kg.

of the outstanding performance by British farmers. The differentials are very wide. By 1902 average wheat yields in Britain were 69% above the yield obtained in France; for barley the differential amounted to 54%; for oats 57% and potatoes as much as 84%. There seems, moreover, to be no tendency for the gap in output per hectare to diminish over time. Whether we take comparisons back to 1862 or forward to 1912 British superiority seems to rise steadily in almost all grains and potatoes.[34]

Before such "facts" are taken as proof of gross inefficiency and placed high on the list of factors retarding the development of France the analysis must be taken further. Within the wider context of French backwardness, we have already argued that even *if* French farmers had raised yields on arable land to British levels, most of the differential in output and income per worker

[34] *Statistique Agricole de 1912, op. cit.*, published yield figures for Great Britain in hectolitres per hectare.

employed in agriculture would remain. This comes about mainly because cereals and potatoes formed only a part of French agriculture — 30% of gross output in 1905-13 and there is no evidence that yields in other sectors fell substantially below British levels. In the cultivation of hay and other fodder crops and in sugar beet French yields seem to have been up to and above British levels.[35] We know that French farmers were not "backward" in animal husbandry — that is in the production of meat, milk, eggs, wool, butter and cheese. No data are available for fruit and horticulture. Industrial crops grown in France (such as vines, olives, tobacco, hemp, flax and linseed) have no British counterpart. But there are no reasons to expect lower yields from French farmers engaged in market gardening or in the cultivation of industrial crops.

Thus their presumed incompetence seems to have been based on low yields in the cultivation of grains and potatoes — not an insignificant part of agriculture, but not large enough to have made all that much difference. Because it can be easily shown that even if French yields in the cultivation of cereals equalled the levels obtained in Britain, total output and output per worker would have been not more than 20% higher.[36] In other words an upper bound estimate of the share of the gap in labour productivity that

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[35] In 1925 the British yield in sugar beet was 20,314 kg. per hectare compared to a French yield of 24,501 kgs. already in 1904-13. But for root crops British yields for turnips and sweeds, at 35,789 kg. per hectare, was a bit above French yields for betteraves de fourrage, at 30,326 kg. per hectare. French yields of 3,424 kgs. per hectare from prés naturels and 3,313 kgs. for herbage were above British yields for hay (3,214 kgs. per hectare). The sources are *Statistique Agricole de 1913, op. cit.*, and *A Century of Agricultural Statistics, op. cit.*

[36] We conducted the following arithmetical exercise to arrive at 20%. First we assumed that French yields per hectare in the cultivation of cereals and potatoes equalled average British yields over the period 1904-13. This involved increasing the number of quintals per hectare by approximately 60% in most cases. These hypothetical physical yields were then multiplied by the value of each quintal produced. This gave us hypothetical gross output in francs for the cultivation of 8 cereals and potatoes, which was roughly 60% above the real gross output for these 9 crops. In 1904-14 the share of these 9 crops in the gross value of agricultural output came to approximately 30% and we assumed that their share to net value added would be the same (see Table 5). We then adjusted total net output by 60% of 30% in order to estimate hypothetical net value added. Dividing by the agricultural labour force produced net value added per worker just 18% above the real level for 1905-14. The sources for this exercise were *Statistique Agricole de 1913, op. cit.* and *A Century of Agricultural Statistics, op. cit.*

could a priori be attributed to some sort of entrepreneurial failure by French farmers comes to about one third.

Although this estimate relates to the very end of the period, we are disposed to regard it as a representative average for the whole of the XIXth century because the gap in output per hectare sown with cereals was definitely wider in 1904-13 that it had been 50 years before (see table 9). It probably narrowed during the Agricultural Revolution in France from the 1820's to the 1870's.[37] Furthermore, we also favour explanations for the gap in physical yields that emphasise two things: firstly, the long run relocation of cereal crops onto land with natural advantages for the cultivation of wheat, barley, oats and rye; and secondly the long term rise in the volume of fertilizer applied to arable land, with chemicals assuming greater importance in the XXth century. These trends are well documented in the histories of agricultural development in the two countries. Thus although the absolute numbers of hectares sown with cereals seem to have remained about constant between 1800 and 1900, those hectares became steadily more concentrated in Britain, whereas in France most farms and every department continued to produce grain throughout the century.[38] The growing disparity in the application of organic fertilizer to arable land can be seen from the data in table 7 and those facts can be complemented by Dovring's estimates of chemical fertilizer applied per hectare of arable land in the two countries.[39]

While higher yields could certainly have increased labour productivity in France, the potential loss from the failure of French farmers to obtain British levels of output per hectare in cereal cultivation was never very large. Nevertheless, the rather wide

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37 NEWELL, *The Agricultural Revolution, op. cit.*

38 See TOUTAIN, *Le Produit, op. cit.*, p. 56 and *Statistique Agricole de 1913, op. cit.* for France. See DEANE and COLE, *British Economic Growth*, p. 66 for an estimate of 6 million acres sown with cereals in 1800 compared with 6.8 million acres in 1900 from *Agricultural Statistics, op. cit.*, pp. 98-100. In France the percentage of land sown with grain in all departments throughout the century, remained about constant R. REMOND, *Atlas Historique de la France Contemporaire, 1800-1965*, (Paris, 1965), p. 55 and M. AUGE-LARIBÉ, *La Politique Agricole de la France, 1800-1940* (Paris, 1950) pp. 51-52.

39 HABAKKUK and POSTAN, ed., *Cambridge Economic History of Europe, op. cit.*, Vol. VI, p. 656.

differentials in the average quantity of wheat, oats, barley and potatoes harvested per unit of land in Britain and France needs to be considered further, basically because the backwardness of French agriculture is usually analysed in terms of physical output per hectare. At the centre of most explanations for the gap in yields are arguments which emphasise differences in farm size, tenure and the quality of farm workers in the two countries. This thesis of "entrepreneurial failure" finds graphic expression in a book published in 1852. "The French", writes the author of "Claret and Olives", « are undoubtedly at least a century behind us in agricultural science and skill... When I say this I mean that the immense majority of the cultivators are unlettered peasants — hinds — who till the land in the unvarying mechanical routine handed down to them from their forefathers. Of agriculture, in any other sense than the rule of thumb practice of ploughing, sowing, reaping and threshing, they literally know nothing. Of the rational management of land... they think no more than honest La Balafre, whose only notion of a final cause was the command of his superior officer. I do not mean to say that here and there, all over France, there may not be found active and intelligent resident landlords, nor that in the north of France, there may not be discovered intelligent and clear headed tenant farmers; but the rule is as I have stated. Utterly ignorant boors are allowed to plod on from generation to generation wrapped in the most dismal mists of agricultural superstition... The infinitesimal patches of land are cultivated in the most rude and uneconomical fashion. Not a franc of capital further than that sunk in the purchase of spades, picks and hoes is expended on them. They are undrained, ill-manured, expensively worked, etc. etc. ».[40]

There is no need to chronicle further a tradition of castigation which comes right up into modern literature. We are as a first reaction extremely sceptical about the weight placed upon human factors in explanations offered for the backwardness of French agri-

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40 A. B. REACH, *Claret and Olives* (London, 1852) cited by S. Pollard and C. Holmes, ed. Documents of European Economic History (London, 1968) pp. 199-201.

culture before 1914.[41] Lavergne, a contemporary of Caird's who had studied both French and British agriculture regarded French peasants as « the most laborious, intelligent and economical, perhaps that exists.[42] His views certainly deserve more attention than the random impressions of English travellers. But some reference to the human factor is called for because even if the capacities and skills embodied in the agricultural work forces of Britain and France cannot be measured with any degree of accuracy, it would be myopic to ignore some rather obvious difference in their composition.

For example, French agriculture employed a higher proportion of female labour. Between 1851 and 1911 that proportion amounted on average to about 33% of the labour force, compared to a British ratio of 7½%.[43] Estimates of literacy suggested that differences in the educational levels attained by workers in the two societies could not be regarded as a significant source for overall differences in labour productivity. But for the agricultural sector which employed a relatively high proportion of female labour, education could be more important simply because women were on average less well educated than men.

Such facts should be mentioned but they do not permit us to "measure" possible differences in the quality of agricultural workers in Britain and France. We could adopt the kind of assumptions now common in the estimation of production functions across countries and assign weights to the number of female workers employed on British and French farms in order to standardise statistics for the labour input in agriculture.[44] Such weights are imputed on the basis of wage differentials between male and female labour. But we see no reason to assume that wage rates paid by French farmers were proportional to the marginal productivities of their male and female workers. Particularly as a fairly high proportion of female workers in the agricultural sector of France consisted of

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41 For example in H. HEATON, *Economic History of Europe* (New York, 1948), pp. 435-437.

42 LAVERGNE, *Rural Economy*, *op. cit.*, p. 12.

43 BAIROCH, *La Population Active*, *op. cit.*, pp. 96-99.

44 GRILICHES, *Specification and Estimation*, *op. cit.*, p. 423.

relatives and there is no institution quite so efficacious for extracting optimal work loads as the family.

Male agricultural workers probably worked longer hours and were perhaps endowed with a greater skill and physical capacity for farm work than their female partners but, a priori, there is still no basis for the argument that variations in the sex composition of the two work forces may have been significant because even if we define each unit of female labour engaged in agriculture as equivalent to half the input supplied by each male employed the overall gap in the productivity of labour would still remain very wide. For example, between 1855 and 1913 labour productivity in French agriculture fell 33% to 58% below British productivity when measured with an unweighted index for labour input (see table 1). With labour input figures revised in the way suggested to take account of the higher proportion of women employed in French agriculture the gap in productivity continued to range from 25% to 56%.[45] Other factors such as education, health and motivation which affect the *relative* quality of agricultural labour are not likely to have exerted any significant influence on yields per hectare in the two countries. We must, however, admit that there is almost no historical writing on British or French farmers that would allow us to evaluate the managerial abilities of the two groups. The same is, of course, true for British and French industrialists but the poverty of evidence does not seem to have inhibited controversy about the supposed entrepreneurial failure in French industry.[46] But turning again to the hypothesis of entrepreneurial failure we reiterate that low yields were confined to arable farming. Even within that sub-sector of agriculture, estimates that refer to

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[45] For this exercise we used the ratio of females in the agricultural work forces of France and Great Britain cited by BAIROCH, *La Population Active*, *op. cit.*, pp. 96-99 and recalculated labour productivities in the two agricultures using the data cited in table 1 but weighting each female worker as equivalent to 0.5 per male worker. We compared differences in productivity with weighted and unweighted input figures for the agricultural work forces. The differences amounted to an average of 16% for 5 observations over the period 1855-64 to 1905-13. The Malinvaud study used 0.8 — see E. MALINVAUD et al., *La Croissance Française*, *op. cit.*, p. 81.

[46] That controversy is reviewed in A. GERSCHENKRON, *Economic Backwardness in Historical Perspective* (Cambridge, Harvard University Press, 1966), pp. 61-66.

Britain and France conceal regional and local deviations from national averages. The dispersion about the mean may have been far wider in France than Britain, where grain production had become concentrated in the "right" locations, while across the Channel cereals and potatoes continued to be grown on soils, elevations and in climatic conditions long since abandoned in England to animal husbandry or to more suitable crops. We have already shown that the quality of land available to British farmers tended, hectare for hectare, to be superior to French farmland and a recent text on wheat found « taking everything into consideration England is probably the best country in the world from the wheat producer's point of view ».[47] Since a comparable French study on cereals held that variations in the quality of soil had a great deal to do with higher wheat yields obtained in Britain in the late XIXth century, we decided to compare yields per hectare *on land of prime quality* sown with wheat between 1815 and 1892.[48]

Unfortunately, the data available do not refer to farms, per se, but consists of estimates of yields per hectare on land sown with wheat in various departments of France and counties of England and Wales. These figures are still useful because it is possible to select samples of administrative units which are in large part (80% was the proportion used) located on land of the best quality (see table 4). The samples include such counties as Norfolk, Lincolnshire and Worcester and such departments as Nord, Pas de Calais and Seine, long recognized as the best endowed farming regions in both countries.

While these figures are far from ideal (particularly for 1815) they are accurate enough to make one large point, namely that over the XIXth century on land of comparable quality French farmers could achieve yields in grain production not very far below British levels. They will also help to place in better perspective the precise degree of inefficiency that might be associated with farm

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[47] R. H. Biffen and F. L. Engledon, *Wheat breeding investigations at the Plant Breeding Institute, Cambridge*, Ministry of Agriculture Research Monograph, no. 4 (London 1926).

[48] E. Serand, *Etude agronomique, statistique, et commerciale sur les céreals* (Paris, 1891) pp. 333-339.

TABLE 10

AVERAGE WHEAT YIELDS (Hectolitre per Hectare)
ON PRIME QUALITY LAND IN BRITAIN AND FRANCE

Year	Great Britain	France	France/ Great Britain
circa 1815	18.7	14.3	76%
circa 1850	23.0	18.5	80%
1892	23.8	20.5	86%

Notes and Sources

The wheat yield for Britain relates to Herts, Beds., Norfolk, Lincs., Essex, Leicester, Warwick, Middlesex, Worcs., Hunts., and Northants. In 1892 the total number of hectares sown was 329,212 hectares producing 7,903,069 hectolitres of wheat. The official data are from Ministry of Agriculture, *Agricultural Produce Statistics of Great Britain for* 1892 (London, 1893) Volume C, p. 6904. 1892 for France from: *Statistique Agricole de la France*, 1892, pp. 2-4. The departments in our sample are: Aisne, Eure, Eure-et-Loire, Manche, Mayenne, Nord, Oise, Pas de Calais, Seine, Seine-Inferieur, Seine-et-Marne, Seine-et-Oise. The total hectares sown with wheat are 1,282,743 producing 26, 266, 792 hectolitres. 1892 was a year of below average harvest in both countries.

1815 for Britain: we began with J.R. McCULLOCH, *Statistical Account of the British Empire* (London, CAIRD, *English Agriculture in 1850-51* (London, 1852), p. 480. The land sown with wheat in each county is from Ministry of Agriculture, *Agricultural Statistics for* 1866 (London, 1867). The figures are in the Journal of Royal Statistical Society, vol. 30, 1867, pp. 196-199.

1852 for France: official data from the Agricultutal Census contained in Statistique de France, Statistique Agricole (Paris, 1858) vol. 1, pp. 4-19 and vol. 2, pp. 4-17.

1815 for Britain: we began with J.R. McCULLOCH, *Statistical Account of the British Empire* (London, 1837) p. 482. We cross checked McCulloch's data against original reports of the Board of Agriculture, county by county. The data relate to a span of years 1800-1816. Wheat acreage data came from Board of Agriculture's *General Report on Enclosures* (London, 1808), p. 229.

1816 for France is from Les Archives Statistique de la France (Paris, 1837). This same data is also contained in MINISTÈRE DE L'AGRICULTURE, *Récolte des Céreals et des Pommes de Terre* (Paris, 1878).

management, small - scale holdings, and tenurial institutions that characterized French agriculture. But that perspective is still questionable unless we can also show that the sample of departments included on the basis of land endowment alone were also characterized by a system of tenure and a scale of production that did not differ significantly from the rest of France. Otherwise the wheat yields obtained in those 13 departments might be strongly influenced by the very factors we tend to underplay.

Fortunately the Enquête of 1892 reported on the percentage of land in each department farmed under « Biens Cultivé Par Le Propriétaire », "Métayage" et "Fermage".[49] The profile of land tenure for France and for our sample appears as follows:

	Owner Occupied	Share Cropped	Tenant Farmed
All France	53%	11%	36%
The Sample	48%	2%	50%

[49] Enquête decennale de 1892, *op. cit.*, pp. 230-237.

Our sample does contain departments with a higher than average percentage of land cultivated by tenant farmers, the system of tenure preferred by critics of métayage and peasant proprietorship. It is in this respect a bit more like Britain than the rest of France. These departments were also characterised by size of farms slightly above the national average (9.2 hectares compared to an average for all France of 8.7 hectares). But in scale and tenure the sample does not differ widely from the rest of France. At least the difference is not significant enough to invalidate our basic point that even in the late XIXth century the quality of land was still a more important determinant of physical yields per hectare. On the basis of fairly accurate data for 1892 it is possible to show that in the cultivation of wheat the *average* yield achieved in Britain was 45% above the average for France. But on prime soils French farmers managed to push their yields up to 86% of British levels. Yet in the 1890's 85% of the land of England and Wales was farmed by tenants on holdings that were on average double the size of holdings in France. Only 6% of the land was cultivated in units below 20 acres in extent and twenty acres was roughly equivalent to the average size of a French farm.[50] Yet despite the handicaps associated with farms far smaller in scale than those that characterized British agriculture and a system of tenure dominated by peasant proprietorship, on land of comparable quality French farmers obtained yields that turn out to be surprisingly close to British levels.

6. The Systems of Tenure.

Between the Revolution and the Great War French agriculture seemed to most observers to be extremely inefficient. Certainly there can be no doubt that the productivity of labour employed on French farms fell well below the average level achieved in neighbouring countries such as Britain, Holland and Belgium. This fact stimulated a widespread condemnation of the agricultural insti-

[50] *Agricultural Statistics*, *op. cit.*, tables 6, 7 and 11.

tutions of France and of French farmers; a tradition of criticism which is not misplaced, but it is sometimes superficial and badly specified. In one sense the trouble with French agriculture was not peasant tenure and peasants slow to innovate. On the contrary there is every reason to expect owner occupiers to be as efficient as tenant Farmers. Even Young admitted that property in land is, of all others, the most active instigator to severe and incessant labour.[51] Eighty years later that great admirer of English agriculture Leonce de Lavergne observed the best cultivation in France on the whole is that of the peasant proprietors.[52] Furthermore, our own preliminary investigation into the relationship between wheat yields and tenure for 1892 found little correlation between the hectolitres of wheat obtained per hectare and the share of cultivated land under different forms of "tenure".[53]

We would not pretend that every farm in France operated near optimum levels of efficiency between 1780 and 1914. No doubt the diffusion of best practice from region to region and from farm to farm took too long a time. Agricultural innovation proceeded more slowly than it did in Britain, but we are *not* disposed to accept as self evident the proposition that French institutions and French farmers were peculiarly and perversely resistant to new techniques of cultivation or that they allocated their resources in an inefficient manner. No, we prefer to argue that those who tilled the soil of France probably achieved a level of production not far short of the optimum, given the supplies of land, capital and other inputs available to them.

Thus our analysis of land showed that essential differences between British and French agriculture went back a long way and were geographical as well as institutional in origin. In Britain, where the terrain (hectare for hectare) was of higher quality and by nature better suited to pastoral than to arable farming, agri-

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51 MAXWELL, ed., *Young's Travels in France, op. cit.*, p. 299.

52 POLLARD and HOLMES, *Documents in European Economic History, op. cit.*, p. 205.

53 For our sample of 13 departments located on prime soils we correlated wheat yields with the percentage of land cultivated under different forms of tenure (see table 10) and found r = 0.31.

culture employed far fewer workers per acre of cultivable land, devoted a greater proportion of land and other resources to animal husbandry and obtained significantly higher levels of labour productivity.

By way of contrast, France retained more of its work force in the countryside, concentrated on the cultivation of cereals and obtained lower output per worker employed in agriculture. Retardation in French agriculture stemmed far less from incompetent farming and far more from unfavourable land-labour ratios, which reflect the fact that the majority of Frenchmen preferred to remain on farms. This in turn led to a pressure of population on the land and to the cultivation of soils of declining fertility. Thus British superiority in grain production can be explained in large part in terms of lower pressure to cultivate soils of inferior quality. The gap in yields per hectare achieved on the *best* arable land in Britain and France was far narrower than the differential in average yields over each country considered as a whole.

Through British eyes, there was simply too much agriculture in France. Too many families cultivated land which yielded a low return for all their skill and effort. Only heavier investment in fertilizers, draught power, drainage and traction could really make up for the relative scarcity and low quality of the basic endowment of land. The intensification of labour input (noticed by the more acute observers of the French agricultural scene) or the sheer toil captured so vividly by Millet in his paintings were not enough to make up for British advantages in the form of higher amounts of capital per acre and per worker.

Given the state of agrarian technology that persisted until the XXth century, a critical component of the capital stock in "pre-modern" agriculture consisted of animals. Farm animals saved labour, provided cultivators with draught power and the bulk of their supplies of organic fertilizers. Animal power for traction rendered heavy soils more friable and the application of manure to arable land constituted the main way of raising yields per hectare. Over the XIXth century the stock of cattle, horses, sheep and pigs was large enough to supply British farms with organic fertilizer at a rate per hectare or arable land that was 2.63 times

the French rate (table 1). That alone made a considerable difference to yields of grain, potatoes and other crops. Modern coefficients for chemical fertilizers indicate an elasticity of response falling within a range from 0.1 to 0.3. If the response to the application or organic fertilizers onto the soil in the XVIIIth and XIX centuries fell within a similar range then the larger stock of farm animals in Britain could have raised average yields on the arable by anything from 16% to 48% above French yields.[54]

Caird spotted this critical difference in the middle of the XIXth century and wrote « In 1855 while travelling in France my attention was drawn to the very low yield of wheat as compared to ours and after publishing my own views on the question I had an opportunity of discussing them with the very eminent French statistician M. Leonce de Lavergne who agreed with me that apart from the difference in soil and climate it is probably to be accounted for by the fact that while our grass and green crops... are as 2 to 1 to our corn, France is exactly reversed, her corn or exhaustive crops being as 2 to 1 of her grass and green crops ».[55]

Clearly something that might be called the "grass-corn" or better still the "land-beast" ratio should be at the centre of explanations for French backwardness in agriculture. But how and why British farmers had accumulated larger stocks of animals per unit of cultivated land demands historical investigation that would take us back centuries before the Industrial Revolution of the late XVIIIth century, perhaps back to a comparison of the feudal systems of France and Britain because, while land and climate are important, over the long run contrasts in the system of property rights established in the French and British countryside may have been more significant.

But geography should not be ignored. Even our cursory examination reveals that British agriculture was better endowed with pasture of all kinds. For example, where rain is excessive the soil becomes acid and produces only rough pasture

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54 Y. HAYAMI and V. RUTTAN, *Agricultural Development*, Baltimore, 1971, pp. 94-95 for the coefficients and table 7 for the fertilizer supplies per hectare.

55 J. CAIRD, *Our Daily Bread* (London, 1868), p. 27.

and areas of low rainfall are too dry for grass to grow well. Large areas of southern France suffered in comparison with Britain from inadequate rainfall. Thus while fields in the Vendee and Normandy produced up to thirty quintals of hay per hectare, pastures in the Alps and Pyrenees produced less than 10 quintals. The Atlas Historique de la France revealed the persistence for more than a century of cattle densities and the share of land used as meadows, pasture and rough grazing department by department.[56] Large parts of the British Isles seem naturally suited to pasture while large parts of France do not. As long ago as the XIVth century Britain's special advantages for rearing sheep were recognized and the sheep population of these islands grew from around 8 million at that time to 26 million by 1800, when perhaps half the cultivable acreage of England was under grass — a proportion never yet reached in modern France.[57]

But geography does not explain enough. In the 1780's Arthur Young in his travels across France noticed « the management of cattle in France is a blank. On an average of the kingdom, there is not, perhaps, a tenth of what there ought to be: and of this any one must be convinced who reflects, that the courses of crops throughout the kingdom are calculated for corn only; generally bread corn; and that no attention whatever is paid to the equally important object of supporting great herds of cattle, for raising manure, by introducing the culture of plants that make cattle the preparative for corn, instead of those barren fallows which are a disgrace to the kingdom. This system of interweaving the crops which support cattle, amongst those of corn, is the pillar of English husbandry; without which our agriculture would be as miserable and as unproductive as that of France ».[58] Young's *Travels* contain what is the classic critique of the tenurial institutions of France as well as his astringent disagreement with Mirabeau and other members of the Revolutionary Assembly who sought to maintain

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[56] H. C. Darby ed., *A New Historical Geography of England* (Cambridge University Press, 1973), pp. 94 and 457. Rémond, *Atlas Historique*, *op. cit.*, p. 63, maps these densities from 1842 to 1962.

[57] Darby, *A Historical Geography*, *op. cit.*, pp. 157, 168 and 421.

[58] *A. Young's Travel in France*, Vol. 2 (Bury St. Edmunds), pp. 52-53.

and extend peasant proprietorship in France. Young begins the polemic « by asserting with confidence that I never saw a single instance of good husbandry on a small farm ».[59] The words « on a small farm » goes to the heart of the matter because Young does not disparage peasant cultivators per se. He is, however, vehemently opposed to peasant tenure because it leads to the subdivision and more widespread ownership of land, which in turn lead to units of production (farms) too small to accumulate capital at anything but a slow rate. In his words « The profit of a large farm supports the farmer and his family and leaves a surplus which may be laid out in improvements; that of a small tract of land will do no more than support the farmer and leaves nothing for improvements... The farms I should prefer in France would be 250 to 350 acres upon rich soils and 400 to 600 upon poorer ones ».[60] We know from his tour of the North of England that Young preferred larger farms because they employed advanced technology, minimized the input of labour per unit of cultivated land and sustained more livestock per acre than smaller farms.[61]

Young is quoted so often because his trenchant views capture what is essential to a critical comparison of the French and British systems of land tenure as they operated over the long run. In France the prevalence of peasant proprietorship, partible inheritance, the wider diffusion of land-ownership and above all smaller scale farm units are facets of a system of property rights that proved incapable century after century of generating an investible surplus and a rate of investment per hectare to match the rate of capital formation achieved by British landowners and their tenants. Location, climate and soil apart, the lower productivity of workers employed in French agriculture over the XIXth century can be explained in institutional terms; as the product of a system of land tenure that encouraged labour to remain on farms badly endowed with capital per hectare and at the same time depressed the rate of investment required to compensate for the lower endowment

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59 Cited in J. KAPLOW, ed., *France on the Eve of Revolution* (New York, 1971), p. 126.

60 *Ibid.*, p. 129.

61 A. YOUNG, *Six Months Tour of the North of England* (London, 1771), p. 267.

of cultivable land per worker, itself a reflection of lower rates of structural change.

As a system of agriculture, peasant proprietorship with family labour is not necessarily inferior to a system managed by a combination of large aristocratic landowners and their tenants. Modern evidence suggests that peasants are normally price responsive, profit maximizers, open to new crops and techniques for the cultivation of their land. Larger farmers and landlords simply possessed greater capacity to save and invest. In agriculture, where gestation periods are often long and risks high, this placed smaller farmers at a disadvantage. Their investible surplus was too small and their capacity to borrow funds too limited in relation to the lumpy and indivisible investment required to move from one level of production or one mix of crops to another.

Young cogently asked the advocates of small farms « where is the little farmer to be found who will cover his whole farm with marl, at the rate of 100 to 150 tons per acre? Who will drain all his land at the expense of two or three pounds an acre? Who will float his meadows at the expense of 51 pounds an acre? »[62] Of course Young brought a British perspective to bear on the small farms of France but his critique not only echoes advocacy of larger units by the Encyclopaedia but anticipates a tradition of writing within France on the disadvanges of *les petits entreprises agricoles*. Even today, when provided with the far greater infrastructual resources of modern transport, power supplies and credit, « techniquement et économiquement, la petite entreprise est moins bien placée pour reussir que la grande ou la moyenne ».[63]

How and why France first evolved and persisted with a system of land tenure that appeared to many observers to possess such manifold disadvantages, compared both to Britain and to variants of British tenure (fermage), found within well defined regions of France is a very large question beyond the scope of this study.

But there is no derogating the importance of that question. Indeed Lavoisier affirmed in 1787, « it is in our institutions and

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62 KAPLOW, *France on the Eve of Revolution*, *op. cit.*, p. 129.

63 J. CHOMBART DE LAUWE, *Les Possibilités de la Petite Entreprise dans l'agriculture française* (Paris, S.A.D.E.P., 1954), p. 110.

laws that agriculture finds its most palpable obstacles ».[64] Contrasts with Britain had probably persisted for centuries. Already in the late XVIIth century perhaps not more than a quarter of the land of England and Wales (some 7 million acres in all) remained in the hands of small peasants. Two centuries later that proportion had fallen to 11%; at a time when the small peasants of France continued to control up to 40% of its territoire cultivé.[65]

Marc Bloch offers persuasive explanations for the origins of these differences which run in terms of the weaker juridical and political control over tenure exercised by the seigneurs, compared to the Lords of English manors.[66] Since the Middle Ages royal power was used in France (not consistently but certainly more consistently than in Britain) to protect peasant and communal lands from encroachment by powerful landed magnates and to preserve traditional forms of tenure and collective rights of access to land, while in Britain the State and the law steadily transferred land under indeterminate or collective forms of tenure into private ownership. Tudors apart, British Kings made few and ineffectual attempts to resist the efforts of larger and powerful landowners to extend their properties, often at the expense of smaller men. By and large monarchs and Parliaments alike did everything required to facilitate the enclosure and consolidation of cultivable land into larger units of ownership and production.[67] No doubt royal policy in France was basically concerned to protect the King's fiscal base among the peasantry. Whereas the British government had less

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64 Quoted by A. Soboul, *The French Rural Community in the XVIIIth and XIXth centuries*, in « Past and Present », No. 10, 1956, p. 88.

65 The British ratios are derived from F. M. L. Thompson, *Landownership and Economic Growth in England in the XVIIIth century*, in E. L. Jones and S. J. Woolf, ed., « Agrarian Change and Economic Development » (London, 1969) p. 44. The total cultivated land relates to 1815-24 and the sources are cited under table 2. The French ratio refers to units of cultivation under 20 hectares and is thus comparable with Thompson's figure of up to 50 acres farmed by small peasants in England. French statistics are from Enquête decennale, *op. cit.*, 1892, p. 232, and Augé-Labribé, *La Politique Agricole*, *op. cit.*, p. 36.

66 Marc Bloch, *Les caractères originaux de l'Histoire Rurale Française* (Paris, 1952), p. 133-40.

67 Marc Bloch, *Seigneurie Française et Manoir Anglais* (Paris, 1967), pp. 69-90 and 113-143.

need to tax land because it found other and more lucrative sources of revenue in trade and industry.[68] We simply remark the difference.

What also seems striking about the rural history of France in contrast to Britain is the tenacity and violence displayed by French peasants to maintain rights of access and control over land. Bloch described their long history of agrarian revolt as « apparaît aussi inséparable du régime seigneurial que, par example, de la grande entreprise capitaliste, la grève ».[69] Lefébvre also remarked that « the history of France abounds in jacqueries » and the struggles of French peasants appear to have been collective not atomized, organized rather than spontaneous.[70] Dare we accept Meuvret's and Soboul's descriptions of the rural communities of France as far more cohesive and capable of joint action to defend their interests than English villages? [71] Their defence of communal land and rights of access to land against seigneurial encroachments during the second half of the XVIIIth century (encroachment backed on this occasion by the State) certainly supports such a hypothesis. Moreover, even when the commons and wastes of France passed into private ownership, compared to England, the powers of owners seem abridged and the criteria applied for the distribution of land among the residents of a village appear more egalitarian. Thus paradoxically the laws and customs of Bourbon France may have been more tender towards the interests of the landless than acts of enclosures passed by English parliaments to define and reassert the rights of ownership over the commons and wastes of England.

Seigneurs found it more difficult to add to their estates by means other than purchase. Tenancy also appears more permanent in France, where the equation of ownership with control was far less secure than in England. For example, even when a lease to

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68 P. MATHIAS and P. K. O'BRIEN, *Taxation in Britain and France, 1715-1810*, in « The European Journal of Economic History », Winter 1976.

69 BLOCH, *Les caractères originaux*, *op. cit.*, p. 175.

70 Our views have been strongly influenced by Bloch; also by E. le Roy Ladurie's essay, « La civilization rurale » in his Le territoire de l'historien (Paris, 1973) pp. 141-168.

71 SOBOUL, *The French Rural Community*, *op. cit.*, and J. MEUVRAT, *Etudes d'Histoire Economique* (Paris, 1971), pp. 176-178.

land expired a French proprietor was in trouble if he refused to renew it in favour of the former tenant and on almost the same conditions. Worse trouble was in store for the new tenant from the peasant community because leaseholders in situ also claimed the first refusal when their farms were being sold.[72]

Even a cursory examination of secondary sources will reveal real contrasts between the British and French systems of land tenure as they evolved and operated between the later Middle Ages and the French Revolution. Nevertheless, historians should not lose sight of long run trends which in both societies proceeded towards the transformation of property rights in land into full private ownership and (as far as we can tell) towards a greater inequality in the distribution of landownership. For Britain the second trend was perhaps less obvious because modern research now suggests there may have been no fundamental shift in the distribution of land by estate size between 1500 and 1800. Whereas in France, according to Bloch, « the three centuries between 1480 and 1789 saw the rehabilitation of the large estate ».[73] That rehabilitation was certainly checked by the French Revolution, while in Britain the distribution of landownership almost certainly grew more unequal over the century after 1789 and the New Domesday Survey of 1873 revealed a country where 80% of the land was owned by a mere 7,000 individuals.[74]

Nothing like that degree of concentration in land ownership had developed in France over the XIXth century when « the overall trend » to quote Labrousse, « was clearly a slow but substantial advance of peasant property. To be sure the land remained unequally distributed. Large noble and bourgeois property holdings remained and there persisted from the top to the bottom of the scale, great disparities among the different peasant groups. But

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72 Marc Bloch, *Les caractères, op. cit.*, pp. 172-194 and 202-216 and P. Goubert's chapter in F. Braudel and E. Labrousse, ed. *Histoire économique et sociale de France*, p. 10.

73 Bloch, *Les Caractères*, op. cit., p. 154.

74 Thompson, *English Landed Society*, op. cit., p. 27.

in the general peasant advance the advantage lay with the small landholders ».[75]

What happened to land-ownership in Britain since the XVIth century is still controversial, but there should be no mistaking the contrast with France at various points in time from 1500 to 1789. Nor can there be doubt that the French Revolution checked a long term movement towards the concentration of landownership — a movement that seems to have gathered momentum during the seigneurial reaction of the XVIIIth century. We are not concerned here with the origins or character of the French Revolution, but simply wish to agree with observations made by several of its scholars, that in broad terms the agrarian laws of the Revolutionary era operated to strengthen and consolidate peasant proprietorship. In other words, the penumbra of measures related to seigneurial dues to tenancy and landownership, to the layout of fields, to grazing rights and to common and waste lands that emerged during the Revolution, and continued in force after the fall of Napoleon, effectively precluded any fundamental or rapid transformation of the traditional system of land tenure in France.

For example, the Revolution led to the redistribution of land expropriated from the King, from emigré nobles, considered to be enemies of the Revolution, and, most important of all, from the Church. Perhaps not more than 10% of the cultivable land of France changed hands between 1789 and the Consulate of 1799 and the absence of relevant statistics on the distribution of landownership by estate size makes it impossible to discover which categories of landowners increased their relative shares of le territoire cultivé.[76] Controversy surrounds the topic, but the procedures adopted by the Treasury for the sale of expropriated land (biens nationaux) seem to rule out the possibility that the landless or very small landowners obtained much of this land. As a group

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[75] E. LABROUSSE, "The Evolution of Peasant Society in France" in E. M. ACOMB and M. L. BROWN, ed., *French Society and Culture Since the Old Regime*, (Holt, Rinehart and Winston, New York, 1966), p. 51, and compare with AUGÉ-LARIBÉ, *La Politique Agricole*, op. cit., p. 36.

[76] LABROUSSE, "The Evolution of Peasant Society", op. cit., p. 46.

the peasantry gained and in the Nord their share went up from 30% to 62%.[77] Middling proprietors seem to have enlarged their estates and according to some historians the urban bourgeoisie gained a "disproportionate" share of *biens nationaux*. Whatever may have happened to the share of land in the hands of urban or absentee proprietors, it is clear that the very large estates lost land to owners further down the scale. In a technical sense the overall distribution became more equal.

Roughly the same outcome transpired with respect to the enclosure and partition of common and waste land. Under Louis XVI the transposition of communal land into private ownership favoured the seigneurs.[78] In 1790 the Constituent Assembly abolished their right to *triage*, under which a seigneur could take one third of enclosed commons. The Convention went further and allowed « communes to recover any property in rights of usage of which they had been despoiled unless the lord were able to show he had acquired them by legal purchase », while « bourgeois governments of the last years of the Revolution, the Directory and Consulate put an end to forms of partition which favoured poorer villagers ».[79] Basically what the Revolution did about communal property (a problem that had preoccupied agrarian reformers of the old regime) was to pass laws enabling communes to enclose and distribute such land, but left the form and timing of repartition to local initiative, freed obviously from the constraints formerly imposed by seigneurs and the King. Communal property survived the Revolution, and as late as 1863, 33 departments of France had at least 10% of their surface occupied by communal holdings.[80] Egalitarian criteria for the repartition of common and waste land were explicitly abandoned and the long process of selling common

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77 J. Loutchisky, Quelque rémarques sur la Vente des Biens Nationaux (Champion, Paris, 1913) and the excellent summary in Milward and Saul, *The Economic Development of Continental Europe*, op. cit., p. 264.

78 M. Bloch, "Le lutte pour l'individualisme agraire dans la France du XVIII[e] siècle" in *Mélanges Historiques*, Vol. II (Paris, 1960).

79 Bloch, *Les caractères originaux*, op. cit., p. 247 and S. Herbert, *The Fall of Feudalism in France* (New York, n.d.), pp. 191-196.

80 F. O. Sargent, "The Persistence of Communal Tenure in French Agriculture", *Agricultural History*, July 1958, p. 212.

land over the XIXth century implied that the poor and landless in French villages remained dependent for their subsistence upon farmers who employed hired hands. In other words the agrarian policy of the Revolution favoured medium proprietors and larger tenant farmers over seigneurs who lost the power to "appropriate" a disproportionate share of common land. At the same time proletarian and landless families were also prevented from acquiring land except by purchase and thus the supply of labour available for hire was not reduced as it might have been under Jacobin policies for a more egalitarian repartition of communal land.[81]

Finally, and most important, the Revolution abolished seigneurial dues and thus transferred income back to those who owned and farmed the land of France. Lefébvre and others have shown how the Constituent Assembly and the Convention were pushed by the actual and incipient power of peasant revolt into the abolition without compensation of a wide range of property rights attached to land and the produce of land.[82] As Cobban puts it: « The abolition of seigneurial dues was the work of the peasantry unwillingly accepted by the men who drew up the town and bailliage cahiers and forced on the National Assembly through the fear inspired by a peasant revolt ».[83]

Historians still debate the precise amount of agricultural income involved in this transfer of property rights. Overall it must have been substantial. Economically its significance lies in the fact that it gave the peasantry a far greater share of produce from their lands. Their burdens were lightened at a stroke and their capacity to survive and even prosper on relatively small plots enhanced. Marginal properties became intra-marginal, medium proprietors more viable and the economic strength of the peasantry improved.

While the Revolution checked the rehabilitation of large estates, we would not wish to argue that all the preconditions for a British

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81 F. O. SARGENT, *From Feudalism to Family in France, Agricultural History*, July 1961.

82 C. LEFEBVRE, *Études sur la Revolution Française* (Presses Universitaires de France, Paris, 1954).

83 A. COBBAN, *The Social Interpretation of the French Revolution* (Cambridge University Press, 1964), p. 53.

system of tenure were developing in France before its outbreak in 1789. For example, seigneurs did not apparently invest anything like the British proportions of their incomes in improving their estates. Most had detached themselves from day to day management of land or from such problems as field layout or farm size. Their preoccupations seem to have been more with the collection of rent and other dues attached to the land and far less with the business of farming. Partnership between landlord and tenant, common in Britain, hardly existed across the channel, where « the land was but a means to be sucked dry to provide the cream of society the resources to consume, to buy, to pay dowries and to consume again ».[84] In the literature, which lacks the kind of empirical base available in monographs on Britain's landed estates, the magnates of France appear as an unproductive class of rentiers who employed chains of parasitic middlemen to squeeze the maximum amount of revenue from their estates.

Yet over the long run only a consistent agrarian policy designed to strengthen and increase the estates of such magnates and to consolidate fields into larger scale enclosed farms might eventually have generated the rates of investment in agriculture comparable to those achieved in England. By the second half of the XVIIIth century the Bourbon state seem to have realised the need for change and took steps in that direction.[85] But the steps were tentative because the Bourbons and their ministers feared to provoke disorder among those « inevitable victims of progress » the landless and *manouvriers* of rural France, millions of whom already tottered on the brink between poverty and indigence.[86] No doubt the ancien régime also cared deeply to preserve its fiscal base long (but by the XVIIIth century more precariously) established on the backs of the peasantry.

Opportunities for reform came with the Revolution, but, once again, the militant actions of the peasantry ensured that no agrarian

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[84] R. Forster, *Obstacles to Agricultural Growth in XVIIIth Century France*, « American Historical Review », 1970, p. 1613.

[85] Bloch, *Les caractères originaux, op. cit.*, pp. 233-237, and A. Davies, *The New Agriculture in Lower Normandy, Transactions of the Royal Historical Society*, vol. 8, 1958, pp. 129-146.

[86] O. Hufton, *The poor of XVIIIth Century France* (Oxford, 1974), p. 23.

laws were implemented which adversely affected their interests or interfered in any real way with their control of the land. Only the Jacobin, Marat, seriously contemplated anything like a radical reform of French agrarian institutions. Symbolically perhaps, he was assassinated by a peasant girl — Charlotte Corday. By their actions during a decade of revolution French peasants checked attempts at reform from above that had gathered some momentum during the second half of the XVIIIth century and ensured that solutions to the problems of inefficiency associated with peasant proprietorship, traditional field layout and the small scale of farms would not be political. From the Revolution to the Great War the State left them alone to till the land and to exhange their property rights in the light of incentives and constraints imposed only by the market.

The whole system proved to be extremely resilient to market forces and significant changes in the distribution of landownership and the concentration of holdings did not occur until after the 1914 War.[87] As Bloch observed « . . . the economic position of the small and medium peasant was in many respects unstable. All the same it must be admitted that none of the essential features of small peasant farming have disappeared in the course of the XIXth and early XXth centuries. Peasant proprietorship . . . has been conspicuously successful in maintaining its ascendancy over much of the soil, and has even some noticeable conquests to its credit ».[88]

7. Conclusions.

In this paper we have measured and then analysed some of the salient differences between British and French agriculture. We began with the contrast in the productivity of labour employed in the two agricultural systems and observed how British superiority became steadily more pronounced over the XIXth century.

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[87] Labrousse, *The Evolution of Peasant Society, op. cit.*, p. 61.
[88] Bloch, *Les caractères originaux*, p. 250.

Most of that superiority can, however, be explained by the significantly larger and higher quality endowment of land cultivated by those who tilled the soil of England. At the outside no more than 40% of the gap in labour productivity between Britain and France can be accounted for in terms of higher yields per hectare. Moreover, even if average yields had been similar in the two countries the marked contrast in the productivity of labour would have persisted because it reflected, above all, the slower pace of structural transformation in France. For perfectly good reasons the majority of the French labour force preferred to remain in agriculture.

Nevertheless the lower yields achieved per unit of land cultivated in France required explanation and we shifted the focus of discussion to differences in value added per hectare. Perhaps most of that gap would have disappeared if French farmers had allocated as much land as farmers in Britain to the rearing of livestock. Not only was value added per acre higher in animal than in arable agriculture but the availability of organic fertilizer exercised a decisive influence on the level of physical yields achieved in the cultivation of cereals, potatoes and other crops.

Thus British superiority in agriculture can be pinned down to the persistence of higher yields on arable land. In the livestock sector or the cultivation of industrial crops there is no evidence of French backwardness. Furthermore the overall importance of British superiority or the relative incompetence of French farmers on arable land should be kept in mind because even *if* the latter had obtained British yields in the cultivation of grain, potatoes and other vegetables about three quarters of the gap in labour productivity would still remain.

In our discussion of the determinants of observed differences in physical yields on arable land we attempted to bring geography back into the picture and to allay the superficial impression left by a generation of British travellers to France who saw little in the countryside but a backward and conservative peasantry. On soils of comparable quality and in animal husbandry the yields achieved by French farmers do not seem to have been unimpressive. French retardation had less to do with the national or psychological

attributes of those who tilled the soil and stemmed far more from the limited capacity of small units of ownership and cultivation to generate an investible surplus. Over the long run the French agricultural sector had failed to accumulate a stock of productive assets to match the capital-labour and capital-land ratios attained in Britain.

By the late XVIIIth century this "central" and persistent obstacle to progress was at the root of the relative backwardness of agriculture in France. In contrast with Britain, the land was short of capital, particularly animals. On each farm, output remained more diversified because smaller units of production devoted resources to meeting their own demands for food and failed to take full advantage of opportunities for specialization associated with production for the market. Family farms also retained underemployed labour. While in Britain "capitalist" agriculture was compelled by market forces (and the New Poor Law of 1834) to release or to expel redundant labour. In France the retention of labour in the countryside implied extensive cultivation of submarginal land of a quality that in Britain had long since been abandoned to rough pasture.

With higher densities of people on the land and a plethora of smallholdings the competition to buy and rent land must also have been keener than in Britain, where landed magnates were not faced with the same sort of inelastic demand curve for the larger farms that required more capital to stock and greater expertise to manage. In such conditions economists expect the shares of output extracted as rent on land leased to tenants to be lower in Britain. In any case England's large and aristocratic landowners had less need than the bourgeois proprietors of France to extract every last penny or sou of rent from their properties. Of course a smaller proportion of lands was under the control of tenant farmers (*fermiers*) over there but the pressure remained. Furthermore, in agricultural systems characterized by high rents, insecure forms of tenure and small owner-occupiers, the overall propensity to deploy investible funds to buy land almost invariably intensifies. Thus we were not surprised to find examples of French farmers

and landowners heavily engaged in transactions for the purchase of land. In Britain less of the agricultural surplus was dissipated in such transactions and a greater share ploughed back both by tenants and proprietors into capital accumulation, particularly animals, which over time raised agricultural output and yields from the land.

Only to a small extent should the backwardness of agriculture in France be conceived as a problem of small peasants slow to innovate or to copy the superior techniques deployed by farmers across the channel. Backwardness should be associated far more with high labour densities generated in large part by a system of property rights for the ownership and management of cultivable land that, compared to Britain, held labour in the countryside and depressed the rate of capital accumulation in agriculture. While we are not Panglossian, our comparison of the British and French agricultural systems leads us to conclude that French farmers probably did as well as can be expected given the demographic pressure to extend the margin of cultivation onto soils of lower quality and the constraints on investment exercised by smaller units of ownership and production.

Marc Bloch found the origins of contrast between the British and French systems of property rights in developments that occurred basically between the XIth and XIIIth centuries.[89] Whatever the origins there is no mistaking the dominance of large estates in England and the tenacious strength of peasant agriculture in France, where even the great political revolution of 1789 did little to upset the established layout of fields, communal techniques of cultivation or the distribution of land ownership. Most of those who farmed and worked the land in France displayed little desire for a fundamental transformation in the established system of property rights which might at one and the same time raise the productivity of labour and carry the often reluctant beneficiaries of progress to new industrial towns. They, it seems, remained blissfully unaware of their relative deprivation or the backwardness of their

[89] BLOCH, *Seigneurie Française et Manoir Anglaise, op. cit.*, part 2.

agriculture, compared to Britain. But then even Tocqueville who found so much to admire in England expressed serious reservations about the distribution of landownership over here. « In England », he observed in his journey of 1833, « the number of people who possess land is tending to decrease rather than increase, and the number of proletarians grows ceaselessly with the population . . . The thought of even a gradual sharing of the land has not in the least occurred to the public imagination . . . The English are still imbued with that doctrine, which is at least debatable, that great properties are necessary for the improvement of agriculture.[90] French society showed itself consistently reluctant to bear the economic costs and social dislocation associated with that kind of "improvement".

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[90] J.P. MAYER, ed., A. DE TOCQUEVILLE, *Journeys to England and Ireland* (Yale University Press, 1958), p. 72.