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## *Irish Agricultural Output Before and After the Famine\**

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The main purpose of this study is to provide new estimates of Irish agricultural output before and after the Great Famine of 1845-49. The case for presenting such estimates is a strong one, because so far, if one excludes demographic data, the analysis of this cataclysm in Irish and European economic history and its aftermath has had to proceed largely with the aid of qualitative evidence, without reference to the size or complexion of the farm sector.<sup>1</sup> Censal and workhouse statistics are crucial for establishing the proximate causes of population loss and the regional incidence of the crisis. Without a broader data base, however, related issues such as the relative backwardness of pre-Famine farming, the relative size of the potato crop before the onset of the blight, and output and productivity change in the wake of the crisis, cannot

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\* Earlier versions of the results reported here appeared in my dissertation "Post-Famine Adjustment: Essays in Nineteenth-century Irish Economic History" (Columbia University, New York, 1973) and in a presentation to the Seventh International Economic Conference, Edinburgh, August 1978. For their help and advice, my special thanks to Michael Edelstein, John McManus, Joel Mokyr, F.M.L. Thompson, and Peter Solar. The usual disclaimer applies.

<sup>1</sup> The standard reference is still R.D. EDWARDS and T.D. WILLIAMS (eds.), *The Great Famine: Studies in Irish History* (Dublin, 1956), but see also S.H. COUSENS, "The Regional Variation in Mortality During the Great Irish Famine," *Proceedings of the Royal Irish Academy*, Section C, 63 (1963), 127-149, and J. MOKYR, "The Deadly Fungus: An Econometric Investigation into the Short-term Demographic Impact of the Irish Famine, 1846-1851," *Research in Population Economics*, 3 (1980), 237-277. Mokyr's study is the major exception to our claim.

be definitively resolved. The assessment of agricultural performance and the trend in living standards between the Famine and the Land War can also arguably benefit from a firmer statistical base.

The output data presented here thus have several potential uses. In this paper, however, we shall discuss only a few points which follow directly from the data; their implications for some of the 'big' questions of nineteenth-century Irish economic history are best left for other papers and other scholars to pursue.<sup>2</sup> The pre-Famine period is almost a "statistical dark age" insofar as agriculture is concerned. The situation improved dramatically in 1847, when data on livestock numbers, crop acreages, and yields began to be collected on an annual basis, producing a range of data unavailable in Great Britain until 1884.<sup>3</sup> The system of collection changed from time to time, as did the amount of detail sought; between 1854 and 1874 crop acreage and livestock statistics by farm size were given, and for a few years even weed statistics were published! There is general agreement on the reliability of the figures throughout, however, and they have already prompted historians to produce some estimates of agricultural output at various dates before 1908, when output was officially calculated for the first time.<sup>4</sup> No such estimate exists for the pre-Famine period, and contemporary estimates — though, as we shall see in a moment, sometimes not far off the mark — provide only aggregate numbers without supporting evidence. It is possible to do better than this, and we have pieced together a reasonably detailed estimate of farm output on the eve of the Famine and another for 1854. These estimates were constructed from sources such as the 1841 census, the Irish Poor Inquiry of the 1830s,

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<sup>2</sup> One indication of the need for output data is that some of the recent work which attempts to answer such "big" questions has used provisional versions of the numbers produced here. See e.g., P. BEW, *Land and the National Question in Ireland* (Dublin, 1978), pp. 27-28; S. CLARK, *The Social Origins of the Irish Land War* (Princeton, 1979), pp. 111-112; J.M. GOLDSTROM, "Irish Agriculture Before the Famine," in J.M. GOLDSTROM and L.A. CLARKSON (eds.), *Irish Population, Economy, and Society: Essays in Honour of the late K.H. Connell* (Oxford, 1981). In her important reinterpretation of the role of land tenure in post-Famine agriculture B.L. Solow has produced estimates of her own for 1876, 1881, and 1886. See her *The Land Question and the Irish Economy 1870-1903* (Cambridge, Mass., 1971), pp. 171, 213-7.

<sup>3</sup> The most important data are summarized in B.R. MITCHELL and P. DEANE, *Abstract of British Historical Statistics* (Cambridge, 1962), pp. 80-1, 84-5, 88-9, 92-3.

<sup>4</sup> Department of Agriculture and Technical Instruction for Ireland, *The Agricultural Output of Ireland 1908* (Dublin, 1912). See also B.L. SOLOW, *loc. cit.*; W.E. VAUGHAN, "Agricultural Output, Rent and Wages in Ireland 1850-1880," in L.M. CULLEN and F. FURET (eds.), *Ireland and France* (Paris, 1980). H. Staehle, "Statistical Notes on the Economic History of Irish Agriculture, 1847-1913," *Journal of the Statistical and Social Inquiry Society of Ireland*, 18 (1950-51); R.C. GEARY, "The Future Population of Saorstát Éireann and Some Observations on Population Statistics," *Journal of the Statistical and Social Inquiry Society of Ireland*, 15 (1935-36), 29-30.

contemporary farm accounts and manuals, the post-1847 agricultural statistics, and the pre-Famine acreage and yield totals proposed by Dr. Austin Bourke.<sup>5</sup> The results of the exercise are given in Table 1. Some straightforward implications of those results are discussed below. The calculations and reservations attached to them are explained in some detail in the Appendix.

In the early 1840s British agricultural output was worth about £120-130 million.<sup>6</sup> Table 1 implies, then, that Ireland's Poor Inquiry Commissioners

TABLE 1  
IRISH AGRICULTURAL OUTPUT (GROSS VALUE ADDED) IN  
CURRENT PRICES, 1840-45 AND 1854

Item	£m	
Crops:		
Wheat	4.9	4.1
Oats	8.1	5.7
Barley	1.8	1.6
Flax	1.3	2.3
Potatoes	8.8	6.7
Hay	1.2	1.0
Other	1.4	1.1
Sub Total	27.5	22.5
Livestock:		
Cattle	4.7	7.9
Butter and Milk	4.8	8.4
Pigs	3.4	3.9
Sheep	0.8	2.0
Wool	0.5	0.9
Eggs	0.9	1.1
Other	0.8	1.3
Sub Total	15.9	25.5
TOTAL	43.4	48.0

Source: See Text and Appendix.

<sup>5</sup> Since our pre-Famine sources draw on a period of several years, our output estimate is best interpreted as an average for a range of years on the eve of the crisis, such as 1843-45.

<sup>6</sup> P. DEANE and W.A. COLE, *British Economic Growth 1699-1959* (Cambridge, 1967), pp. 166-67, report income from agriculture, forestry, and fishing as £99.9 million in 1841 and £106.5 million in 1851. However, as F.M.L. Thompson has suggested to me in

did not grossly exaggerate in suggesting that "the agricultural produce of Great Britain (was) more than four times that of Ireland" in the 1830s, nor was Frenchman Léonce de Lavergne's guess of £40 million far off target either.<sup>7</sup> Reassuringly, our pre-Famine estimate also supports some themes highlighted in the recent professional literature. The importance of the potato (almost one-third of crop, and one-fifth of total output) and the preponderance of tillage over livestock (by a factor of about two to one) are confirmed. So is the generally high level of commercialization in farming: since the potato and oats were the sole mainly subsistence items, and two-fifths of even the latter were marketed on the eve of the Famine, as much as two-thirds of total output was being sold for cash.<sup>8</sup>

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correspondence, Deane and Cole underestimate British agricultural output by taking Schedule B farmers' income as a guide. We have assumed instead that output was worth £ 120-130 million in the early 1840s. On the difficulties of estimating British agricultural output before the 1860s, when partial official data become available, see C.H. FEINSTEIN, *National Income and Expenditure of the United Kingdom 1855-1965* (Cambridge, 1972), pp. 41-42.

<sup>7</sup> GREAT BRITAIN, *Parliamentary Papers*, "Third Report of the Commissioners for Inquiring into the Poorer Classes in Ireland," 1836, XXX, p. 3; L.L. de LAVERGNE, *Essai sur l'Economie Rurale de l'Angleterre, de l'Ecosse et de l'Irlande* (Paris, 3rd ed., 1858), pp. 372-80. Though Lavergne's estimate was not published until 1855, his primary focus was on the pre-Famine situation. Less trustworthy are the calculations of another Frenchman, Moreau de Jonnés, who assumed inter alia that annual meat consumption per head in Ireland during the 1830s was over 100 lbs.: A. MOREAU DE JONNÈS, *Statistique de la Grande Bretagne et de l'Irlande* (Paris, 1837), i, p. 221.

<sup>8</sup> Bourke's calculations (in "The Potato, Blight, Weather, and the Irish Famine" (Unpublished Ph. D. Dissertation, National University of Ireland, 1965), Appendix 4, and "The Irish Grain Trade, 1839-48," *Irish Historical Studies*, XX (1976), 156-69) imply that one-quarter of grain output was being exported. To assume in addition that half of livestock output was exported — hardly an extravagant claim — would mean that exports accounted for a quarter of all output. The figures given for the proportion of oats marketed is based on Bourke, "The Potato...", *loc. cit.* and Great Britain, *Parl. Papers*, "Third Report of the Select Committee on Agricultural Distress," 1836 (VIII), Part II, 507-545. The latter source reports the sale of oats in Irish markets at 410,000 tons. The marketed share given in the text assumes that this is somewhat of an underestimate, and allows for some increase in marketed production of oats between 1835 and the early 1840s. While pre-Famine Ireland supplied only a small proportion of Britain's total grain requirements — perhaps five to seven per cent — it was then perhaps its biggest single supplier of grain. Hence the kernel of truth in the Halls' claim (*Ireland: Its Scenery, Character, Etc.* (London, 1841-43), i, p. 406) that Ireland was the granary of Great Britain during this period. Compare B.R. MITCHELL and P. DEANE, *Abstract...*, pp. 93-102, and P.M.A. BOURKE, "The Irish Grain Trade..."

For some recent work on these topics see J.H. JOHNSON, "The Two 'Irelands' at the Beginning of the Nineteenth Century" in *Irish Geographical Studies* (Belfast, 1970), pp. 224-43; J. MOKYR, *Why Ireland Starved: A Quantitative and Analytical History of*

TABLE 2

AGRICULTURAL OUTPUT AND PRODUCTIVITY IN IRELAND  
AND GREAT BRITAIN C. 1845

	Ireland	Great Britain
1. Output (£m)	43	120-130
2. Acreage (£m)	15	30
3. Employment (£m)	1.7	2.0
4. (1)/(2)	2.9	4.0-4.3
5. (1)/(5)	25	60-65

Our estimates also throw some new light on the question of farm productivity before the Famine. British acreage and employment data prompt the comparison in Table 2.<sup>9</sup>

When due allowance is made for the lower prices obtained by Irish farmers, British superiority in terms of labour productivity turns out to have been of the order of 2.2 to 1.<sup>10</sup> Bearing in mind that British agriculture led the world at this time, the productivity gap is hardly striking: indeed, whether, a gap of this size can accommodate all the explanations proposed for Irish agricultural backwardness is doubtful! The gap compares favourably with that recently estimated for France in the 1840s, which puts Britain's advantage at 1.8 to 1.<sup>11</sup> Since the latter estimate probably exaggerates France's relative position,<sup>12</sup> it would be rash to assume that Irish worker productivity in farming was much below the European norm before the Famine. Given the "Great Hunger" and the prevailing contemporary view that Irish agriculture was generations or centuries behind British best practice before 1845<sup>13</sup> this

*the Irish Economy, 1800-1850* (London, 1983); P. SOLAR, "Pre-Famine Agriculture: Some Political Arithmetic," paper presented at Irish Economic and Social History Society Conference, Cork, September 1977.

<sup>9</sup> GREAT BRITAIN, *Parl. Papers*, "Report of the Commissioners Appointed to Take the Census of Ireland for the Year 1841," 1843, XXIV, p. 440; P. O'BRIEN and C. KEYDER, *Economic Growth in Britain and France 1780-1914: Two Paths to the Twentieth Century* (London, 1978), pp. 94, 105.

<sup>10</sup> Assuming that Irish prices were about ten per cent less than British prices.

<sup>11</sup> P. O'BRIEN and C. KEYDER, *Economic Growth...*, pp. 109-13.

<sup>12</sup> O'Brien and Keyder follow Deane and Coale, so their estimates are subject to the caveat noted above in n. 6.

<sup>13</sup> For a compendium of remarks about the backwardness of pre-Famine farming, see G. O'BRIEN, *The Economic History of Ireland from the Union to the Famine* (Dublin, 1921), pp. 27-41.

may seem hard to credit. But relative backwardness is not being denied, because output per head alone is fallible index of development. As some contemporaries were quick to point out,<sup>14</sup> Ireland may have been "over-producing" potatoes before 1845 in order to maintain its high agricultural output, making a catastrophe increasingly likely in the process. To the extent that this was so, Table 1 does indeed suggest "a ramshackle, ill-balanced agricultural system," in that the huge grain output was dependent on the Corn Laws and low cost labour, and therefore ultimately on the ill-fated potato.<sup>15</sup>

It remains to compare pre- and post-Famine output and productivity levels. Recent scholarship confirms the traditional view that death and emigration due to the Famine exceeded one million each.<sup>16</sup> The immediate impact on aggregate output may be gauged from the Marquis of Landsdowne's claim that the 1846 harvest failure alone had been "equivalent to the absolute destruction of 1,500,000 acres," or produce worth £ 15 million. The acreage under potatoes, which had exceeded two million in 1845, dropped to 1.2 million in 1847 and a mere 0.3 million in 1848.<sup>17</sup> Output recovered subsequently, but to new lower levels. We have selected the year 1854 for comparison purposes for three reasons. Output was on trend, data more plentiful, and 1854 is late enough to have allowed production to recover from the ravages of the crisis itself. Perhaps the most notable feature of the comparison is the drop in tillage's proportion of output from two-thirds to one-half. The shift, hardly surprising in view of the change in factor proportions, marks only the beginnings of a well-known and long-drawn out trend: half a century later the humble farmyard hen and duck were adding more to agricultural output than wheat, oats, and potatoes combined, crops which in the early 1840s accounted for more than half of output.<sup>18</sup>

Using the average of the two deflators implicit in Tables 2 and 3 as our adjustment for price change, the numbers imply that output dropped by about sixteen per cent in real terms between 1844-45 and 1854. Census data suggest that the male labour force fell by rather more — from 1.7 to 1.3 million, or twenty-four per cent.<sup>19</sup> It is tempting to view this result as further evidence

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<sup>14</sup> See O'BRIEN, *The Economic History...*, pp. 222-232, and the sources quoted therein.

<sup>15</sup> R.B. McDOWELL, "Ireland on the Eve of the Famine" in R.D. EDWARDS and T.D. WILLIAMS (eds.), *The Great Famine...*, p. 10. Whether pre-Famine potato yields were as variable as this implies is a moot point, however, on which hard evidence is lacking.

<sup>16</sup> J. MOKYR, "The Deadly Fungus...", pp. 244-51; J. Verrière, *La Population de l'Irlande* (Paris, 1977), p. 64.

<sup>17</sup> BOURKE, "The Potato..."; Mitchell and Deane, *Abstract...*, pp. 80-81.

<sup>18</sup> D.A.T.I., *The Agricultural Output of Ireland*, op. cit.

<sup>19</sup> In focusing on the male labour force and interpolation between census years, we follow J. HUTTMAN, "Institutional Factors in the Development of Irish Agriculture

against the once-popular belief that "a removal of 25 per cent of the land in poor countries will not reduce agricultural production,"<sup>20</sup> but the Irish case is not a "clear" test of the hypothesis, for the following reason. The Great Famine altered not just the labour supply, but also, in a certain sense, the land endowment. Farmers could no longer rely on the potato crop as before, since average yield was lower and variability greater than before the flight.<sup>21</sup> They therefore grew fewer despite higher prices. Nor should the substantial drop in output be seen as proof that redundant labour was not a serious problem in pre-Famine Ireland: earlier accounts may have exaggerated the extent of unemployment, due account being taken of seasonal peaks and lulls in the demand for agricultural workers, but much stronger evidence is needed.

Taken together, Tables 2 and 3 indicate that land productivity dropped and labour productivity rose in the wake of the Famine: they imply an increase in output per worker of almost fifteen per cent between 1845 and 1854. They also confirm the common view that average incomes from the land jumped dramatically in money terms; the numbers imply a rise from £26 to £37. The "cheerful" implication of this rise must be tempered by two considerations, though: (a) the likelihood that the rural cost of living also rose simultaneously, though by a lesser amount, and (b) the certainty that, since the poor constituted the Famine's main casualties, the average living standards of those who survived did not rise in proportion.<sup>22</sup>

What of total factor productivity change? A familiar approach to its measurement is to begin with the assumption of constant returns to scale in agriculture, and to take output, "measurable" inputs, and factor shares: the residual which emerges when output grows faster than the weighted sum of inputs is then equated with productivity change. Productivity growth can also be measured using price and factor income information instead, since if the price of output rises more slowly than the price of land, and other inputs used up in producing it, the same growth in productivity must have occurred. The residual is equated with productivity change, though strictly speaking it absorbs misspecification of inputs (the omission of human capital, for instance),

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1850-1915" (Unpublished Ph. D. Dissertation, London School of Economics, 1969), Appendix 4.

<sup>20</sup> T.W. SCHULTZ, *Transforming Traditional Agriculture* (New Haven, 1964), pp. 53-70.

<sup>21</sup> For the drop in mean yield compare P.M.A. BOURKE, "The Average Yield of Food Crops in Ireland on the Eve of the Great Famine," *Journal of the Department of Agriculture and Fisheries*, 66 (1969), pp. 3-16; MITCHELL and DEANE, *Abstract...*, pp. 84-85.

<sup>22</sup> To assume, not too unreasonably, that the average income from agriculture was £10 for the 400,000 households who disappeared means that survivors' average income rose from £30 to £37, barely enough to compensate for the ensuing rise in prices. But, of course, this ignores the marked shift from landlord to non-landlord caused by the crisis.

TABLE 3

## OUTPUT IN CONSTANT PRICE TERMS

Item	1840/5 Output at 1854 Prices	1854 Output at 1840/5 Prices
Crops:		
Wheat	6.04	3.32
Oats	10.69	4.34
Barley	2.08	1.33
Flax	1.96	1.52
Potatoes	12.60	4.20
Hay	1.56	0.80
Other	2.10	0.87
Sub Total	42.0	16.3
Livestock:		
Cattle	5.10	7.25
Butter	5.58	7.32
Pigs	4.50	3.00
Sheep	0.95	1.20
Wool	0.48	0.93
Eggs	1.00	1.00
Other	1.00	1.10
Sub Total	18.6	22.3
TOTAL	60.6	38.6

Source: See Appendix.

outputs (failure to adjust for product quality changes or external economies), and the production function (neglect of economies of scale and organizational technique). Nevertheless, the smaller the residual the less scope left for such factors, so that a sizeable residual may therefore be considered a "plus" in some broad sense.<sup>23</sup>

Using the usually accepted figures for aggregate head rents — £12 million on the eve of the famine and £10 million a decade later — and assuming away the problem of capital on the basis that changes in its share or

<sup>23</sup> For earlier uses of the method by economic historians see D.N. McCLOSKEY, *Economic Maturity and Industrial Decline* (Cambridge, Mass., 1973), pp. 85-86; R.W. FOGEL and S.L. ENGERMAN, "A Model for the Explanation of Industrial Expansion during the Nineteenth Century," *Journal of Political Economy*, 77 (1969), pp. 306-328.

return are unlikely to upset the overall results,<sup>24</sup> our data allow estimation of the productivity growth equation:

$$A = -p' + \gamma_L w' + \gamma_R r' + \gamma_K i'$$

where  $A$  is productivity growth,  $w'$ ,  $r'$ ,  $i'$  are the annual percentage rates of change in the return on labour, land, and capital, respectively,  $p'$  is price change, and the  $\gamma$ 's are factor shares. We have assumed  $\gamma_K = .07$ , and  $i' = 0$ .<sup>25</sup> Estimation is complicated by the fact that both the composition of output and factor shares changed substantially over the period. However, the use of end-year weights to some extent finesses a problem mentioned earlier, in that a price index based on 1854 weights reflects the unwillingness of farmers in the wake of the blight to grow as many potatoes as they would have earlier, given the higher prices. The result is:<sup>26</sup>

$p'$	— 2.46
$\gamma_L$	0.75
$w'$	4.80
$\gamma_R$	0.18
$r'$	— 1.84
$A$	<u>0.81</u>

A concluding assessment, then. Productivity growth of 0.8 per cent annually with a blight-constrained land endowment is not unimpressive, especially since the relatively high productivity of pre-Famine farming, reported

<sup>24</sup> The rent estimates follow B.L. SOLOW, *The Land Question...*, pp. 57-77; C. Ó Gráda, "Agricultural Head Rents, Pre-Famine and Post-Famine," *Economic and Social Review*, V (1974); W.E. VAUGHAN, "Agricultural Output, Rent and Wages in Ireland 1950-80," *loc. cit.* No reliable estimate of the capital employed in nineteenth-century Irish agriculture exists. We have assumed that crops and livestock accounted for the bulk of capital throughout the period surveyed, as they did in Great Britain. In that case a return on capital of three per cent suggests that capital's share was six or seven per cent at the time. For comparison see the papers by A.J. BOREHAM and J.R. BELLERBY in *Farm Economist*, VII (1953), n.o 6.

<sup>25</sup> To have assumed a higher  $\gamma_K$  would have produced a higher  $A$ , while  $\gamma_L = 0.6$  yields  $A = 0.79$ .  $i$  may well have dropped due to the fall in the labour-capital ratio but, again, the effect on  $A$  would have been trivially small.

<sup>26</sup> The calculations assume a ten-year period.

<sup>27</sup> For comparison see A.C. KELLEY and J.G. WILLIAMSON, *Lessons from Japanese Economic Development* (Chicago, 1974), p. 181; R. GALLMAN, "Changes in Total United States Agricultural Factor Productivity in the Nineteenth Century," *Agricultural History*, 46 (1972), pp. 191-210. Nor did total factor productivity growth increase between

earlier, was presumably due in part to farmers gradually, through a process of trial and error, arriving at "efficient" methods over time. On the other hand, the recorded productivity advance is not enormous by contemporary standards, and thus perhaps belies the most sanguine immediate hopes of some Malthusian commentators.<sup>28</sup>

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the 1850s and 1870s: our calculations (not reported here) suggest an annual rate of less than 0.5 per cent between the mid-1850s and mid-1870s.

<sup>28</sup> e.g., N.W. SENIOR, *Journals, Conversations and Essays Relating to Ireland* (2 vols., London, 1868); H. MARTINEAU, *Letters from Ireland* (London, 1854); C.E. TREVELYAN, *The Irish Crisis* (London, 1848).

APPENDIX

The Output Estimated

"We have already had it from Mr. Murrough O'Brien that instead of the £ 14,000,000 for milk, he would put about £ 8,000,000?" — "Yes, I think the great thing is to submit full data on these matters for discussion."

«Sir Robert Giffen in evidence to the Childers Commission (1896)».<sup>1</sup>

Our pre-Famine estimate owes much to the pioneering work of Dr. Austin Bourke, whose calculations of pre-Famine acreages and yields, and the disposal of various items, form the basis of the tillage output figures. The 1841 population census provides the basis for the livestock figures used, though some of these required adjustment for seasonality and under-enumeration, so as to ensure comparability with later data.<sup>2</sup> The published agricultural statistics provide a starting point for the 1854 calculations: farming manuals, farm accounts, and other contemporary sources were used as clues as to carcass weights, milk yields, and so on. The prices used are given in Table 1: they are largely based on sources such as the well-known series in the Cowper Commission report and Thom's Directory. In the event of a price range being given in the original source, the mean price was used.<sup>3</sup> The earlier calculations by Solow and Vaughan served as extremely useful guidelines, and have been adopted without amendment for some items.<sup>4</sup> Of the two estimates, the pre-Famine one is the less firmly based, and it is here that Feinstein's warning that "it is probably not now possible to make a really reliable estimate of Irish farm output" is most pertinent.<sup>5</sup> The same might be said of midnineteenth century British or French agricultural output. Yet the effort must be made. We shall discuss the assumptions behind the estimates of the major items in turn.

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<sup>1</sup> GREAT BRITAIN, *Parliamentary Papers*, "Royal Commission on the Financial Relations Between Great Britain and Ireland," 1895, XXXVI.

<sup>2</sup> BOURKE, "The Agricultural Statistics of the 1841 Census of Ireland, A Critical Review," *Economic History Review*, 18 (1965), pp. 376-91.

<sup>3</sup> *Thom's Irish Almanac and Official Directory* (Dublin, annually from 1844); *Report of the Royal Commission on Land Law (Ireland) Act...*, (Great Britain, 1887, XXVI).

<sup>4</sup> Solow, pp. 171, 213-7; Vaughan, "Agricultural Output..."

<sup>5</sup> C.H. FEINSTEIN, *National Income, Expenditure, and Output of the United Kingdom 1855-1965* (Cambridge, 1972), p. 213.

*Grain Crops:* The pre-Famine totals are derived from Burke's suggestions and contemporary market prices, as follows:

Crop	Acreage (1000s)	Yield	Proportion Counting as Output	Price (per cwt)	Value (£m)
Oats	2,500	13	.73	6 - 9-3/4	8.08
Wheat	700	12.5	.92	12 - 1-1/2	4.88
Barley	300	17	.92	7 - 6	1.76

For 1854 we have assumed that nine-tenths of wheat, four-fifth of barley, and two-fifths of the oats crop constituted output. The last proportion allows for off-farm consumption by horses at the rate of 1.4 ton a year, for exports as reported in the grain trade statistics, and for human consumption at the rate of 1 cwt. per head.<sup>6</sup>

Oats Production	(21.5 (million cwts.))
Of which:	
Human Consumption	6.2
Off-farm Horses	1.4
Exports	5.2

*Flax:* According to the Irish Flax Society the quantity of flax produced rose from 25,000 tons in 1841 to about 35,000 tons in 1843 and 1844, and then dropped to 28,000 tons in 1845. Taking 30,000 tons as an average for 1840/5 and a price of 43.75s. per cwt. yields an output estimate of £1.3 million.<sup>7</sup> For 1854, Vaughan's estimate — implying a price of 66s. is used.

*Potatoes:* Bourke's acreage, yield, and disposal estimates are internally consistent, and more thoroughly researched and supported than any other pre-Fa-

<sup>6</sup> When translated into oatmeal consumption, the human food share works out at about 4 oz. daily. For comparison see GREAT BRITAIN, *Parl. Papers*, "Dietaries in Certain Workhouses in Ireland..." (1864), LII, p. 260. For horse numbers and the grain trade see *Returns of Agricultural Produce in Ireland in the Year 1854* (Dublin, 1885), p. xlv; BOURKE, "The Grain Trade..." For oats consumption by horses we have followed F.M.L. THOMPSON, "Nineteenth Century Horse Sense," *Economic History Review*, XXI (1976), p. 78.

<sup>7</sup> Great Britain, *Parl. Papers*, "Such Part of the Fifth Annual Report of the Society for the Promotion and Improvement of the Growth of Flax in Ireland as Relates to the Quantity of the Flax Crop," 1856, XLII, p. 249; *Proceedings of the Third Annual General Meeting of the Society ... Ireland* (Belfast, 1843), p. 14.

mine agricultural data. These suggest an output of 7,350 tons, just less than half of total production. However, because there is some doubt about the acreage classification used in collecting Bourke's source data — Bourke assumes that, with rare exceptions, the Irish acre was meant — we have assumed that output was only ninety per cent of Bourke's total in 1840/5. Selecting a price for that part of the potato crop constituting output is somewhat of a problem, since most of the crop was not marketed. The average reported marketed price, used for other crops, may be too high for our purposes, since the law of demand predicts that the marketed portion of the crop may have been better than average.<sup>8</sup> But what is a plausible level? "I have known potatoes purchased at the rate of one shilling and fourpence for 21 lb. — it was in the spring of 1801 — the same quantity might have been purchased this year for one half-penny:" so reported the Rev. Horatio Townsend in 1828.<sup>9</sup> In November 1828 the Franciscan friars of Cork were paying 3½d per weight (21/lb.) for their potatoes, but in June and July 1830 they were paying 1s. 2d. However, a more detailed examination of the record shows that the ranges quoted are quite atypical, and that a rate of 2d per stone — at the lower end of the range of prices quoted in the parliamentary papers for 1840/5 — may be defended as reasonable. Prices of this order crop up again and again in the Poor Inquiry investigation into food consumption patterns, in 1835, and in farm account books, and are consistent with the price paid for conacre.<sup>10</sup> A more direct source for potato prices is the prices charged to Poor Law

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<sup>8</sup> See T.E. BORCHERDING and E. SILBERBERG, "Shipping the Good Apples Out: The Alchian and Allen Theorem Reconsidered," *Journal of Political Economy*, 86 (1978), pp. 131-38. In the case of Irish potatoes the theorem almost literally held: the coarse and turnip-like 'lumper' was grown mainly for the producer's table, the tastier and probably more nutritious "apple" and "cup" for the market. See for instance Great Britain, *Parliamentary Papers*, "Report of the Commissioners for Inquiry into the Condition of the Poorer Classes..." (1836), XXXIII, p. 227.

<sup>9</sup> H. TOWNSEND, "On the Improvement of Irish Agriculture," *Quarterly Journal of Agriculture*, I (1829), p. 313; W.D. O'CONNELL, *Cork Franciscan Records 1764-1831* (Cork, 1942), Appendix.

<sup>10</sup> W.H. CRAWFORD, *Domestic Industry in Ireland* (Dublin, 1972), p. 40 (£ 0.08-0.09) per cwt. in 1827/38); National Library of Ireland, Ms. 7909, farm account book of W.B. Smythe (3 d. to 3 d. per stone); N.L.I. Ms. 4882, Powers-court Estate demense accounts (3 d. to 4 d. per stone); (Anon.), "On the Agriculture of the Country of Cork, Part II," *Quarterly Journal of Agriculture*, X (183-), p. 521 (3 d. per weight, i.e., 2 d per stone); *Poor Inquiry...*, App. E, passim, H.D. INGLIS, *Ireland in 1834* (London, 1835), I, pp. 148, 246, 343, II, 34 (2 ¾ d., 2 ¼ d., 2 d., 3 ½ d.); E. BURROUGHS, *The Irish Farmer's Calendar* (Dublin, 1835), p. 300 (4 s. per barrel); *Clogher Record*, 1969, p. 81 (2 ½ d. to 5 d., Enniskillen 1825-45); B. TRAINOR (ed.), *Ordinance Survey Memoir for the Parish of Antrim* (Belfast, 1969), p. 39 (1 ½ d., 1834-45); R.M. BARRINGTON, "The Prices of Some Agricultural Produce and the Cost of Farm Labour for the Past Fifty Years," *Journal of the Statistical and Social Inquiry Society of Ireland*, IX (1887), p. 143.

Unions in potato contracts in the period up to 1845. The minute books of the Guardians show a regional and seasonal variation in potato prices. Generally potatoes were cheapest in the autumn and in the west and south, and contract prices could sometimes vary considerably across relatively short distances, though this may, in part, have reflected differences in quality. Calculating a weighted average of the contract prices charged to over one hundred Poor Law Unions in 1844 and 1845, using Bourke's county acreage data as weights, gives a price of 3.0 to 3.1 pence per stone. A more detailed parliamentary return of potato prices in over four hundred market towns for 1840-46 produces the following.<sup>11</sup>

	1841	1845
	(pence per stone)	
Mean	2.74	2.71
Coefficient of Variation	.14	.11

Allowing for the fact that these were "highest" prices, that the Poor Law Unions contracted for apples or "cups" rather than lumpers, and that the cost of transporting potatoes was considerable a figure of two pence per stone or £ 1.33 per ton was used. The value of 1840/5 output was thus estimated at:

$$7350 \times .90 \times 1.33 = \text{£}8.8\text{m.}$$

We have assumed that fifty per cent of production in 1854 was output, which we valued at 4d. per stone. This implies a reduction of over half in consumption per head over 1840/5.

*Hay:* Off-farm horses were allowed 2.4 tons per annum in 1840/5-1854. The number of off-farm horses in 1840/5 is not known, but was assumed to be the same as in 1854.

*Sheep:* In both 1908 and 1926/7 the number of sheep constituting output was about one-third of the annual enumeration. This proportion is also consistent with the year-to-year "disappearance" of sheep in the enumerations,

<sup>11</sup> Great Britain, *Parl. Papers*, "A Return of the Highest Price of ... in the Various Market Towns in Ireland, per Bushel and Stone..." (1846), XXXVII, p. 489; Great Britain, *Parl. Papers*, "Return of the Price of Potatoes Agreed for at the Last Contract Entered into by Each Board of Guardians, in Ireland, Previously to the 1st of May in the Years 1844, 1845, and 1846," (1846), XXXVI, p. 45.

so it has also been used for both 1840/5 and 1854. An average carcass weight of 50 lbs. was assumed for 1840/5 and 60 lbs. for 1854.<sup>12</sup>

*Butter and Milk:* In what has been aptly termed "a masterpiece of understatement," the English statistician Henry Ray in 1892 wrote that "in no branch of agricultural statistics has there been more uncertainty than in that which relates to the production of milk."<sup>13</sup> Of course this applies to Ireland too, and the estimates given in Tables 1, 5, and 6 are inevitably rather conjectural. The following procedure has been used. The conventional round figure of 1 cwt. of butter per cow — implying an annual milk yield of about 300 gallons — has been used for 1840/5, and yields of 350 and 385 gallons have been assumed for 1854 and 1876, respectively. For the latter years the deductions made for mortality, dry cows, and calf and pig feed were as in *Agricultural Output 1908*, while twenty per cent was deducted from the 1840/5 output to allow for these uses. Butter output in 1854 has been estimated on the assumption that three gallons of milk produced a pound of butter. Poor Law Union contract information has been used to put a value on the residual skim or buttermilk.<sup>14</sup>

*Pigs:* Because of shortfalls in the potato harvests in 1838/40 the pig population in June 1841 was probably below the pre-Famine norm. The extent of the shortfall is impossible to assess with confidence. However, given that in the post-Famine period bad potato harvests in successive years might easily reduce pig numbers by twenty per cent below trend, a pig population of 1.7 million for 1840/5 instead of the 1.4 million enumerated can hardly be an exaggeration. Professor Thomas Baldwin suggested in 1874 that "about as many pigs are annually sold in Ireland as the country contains at the time of taking

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<sup>12</sup> For evidence of a substantial increase in sheep carcass weights over this period see R. HERBERT, "State of Livestock and Dead Meat Consumption in the Metropolis," *Journal of the Royal Agricultural Society of England*, XX (1859), p. 476. See also the accounts of the Crofton estate (N.L.I. Ms. 3499) and the Powerscourt demesne (Ms. 4882).

<sup>13</sup> H. REW, quoted in D. Taylor, "The English Dairy Industry, 1860-1930," *Economic History Review*, XXIX (1976), 587-88.

<sup>14</sup> For estimates of milk consumption in Britain see TAYLOR, *op. cit.*, p. 590. Our milk yield for 1854, 350 gallons, is a rough interpolation between the assumed pre-Famine level of 336 gallons and the yield reported in 1908. No doubt milk yields throughout the nineteenth century were subject to wide variation between regions and farms. A model farm like William Talbot Crosbie's in north Kerry (N.L.I. Ms. 5041) might reach 600 gallons per cow in the 1850s, while in County Leitrim as late as the 1920s the average yield was reported as less than 330 gallons (*The Output ... 1926/27*, p. 25). Skim milk was valued at 2 d. per gallon in 1845 and 1854, levels deduced from Boards of Guardians' minute books deposited in the Public Record Office of Northern Ireland, Belfast, and the Public Library, Dingle, County Kerry.

the Government returns."<sup>15</sup> The implied output is perhaps too low, for in 1908 and 1926/7 output exceeded the annual enumeration by about one-third. The pre-Famine pig, however, though heavier than later varieties, was slower to mature, "steadily refusing," as one observer claimed, "for the first two years of its existence to snore and grow fat as a well-conditioned pig ought to do."<sup>16</sup> Accordingly, an average output of 1.2 cwt. per pig in 1840/5 and 1854 was allowed. Note too that, given Solar's recent estimates of Irish agricultural exports in the 1830s of c. 800,000 cwts. of bacon plus 376,000 live animals, about sixty to sixty-five per cent of pigs produced must have been exported at the time.

	1840/5	1854
Number	1.7	1.343
Price per cwt. (sh.)	27.5	48.5
Cwt. per Pig	1.2	1.2
Output (£m.)	3.83	3.91

	Number of Cattle (1,000s)		
	Two Years and Upward	One Year	Under One Year
1854	2,218	598	683
1855	2,315	570	679

*Eggs:* The pre-Famine and 1854 estimates are based on the assumption of sixty eggs per bird enumerated.

The "disappearance" of one year olds — (683-570) — is taken as output of young cattle, and the output of other cattle is taken as 598 — (2315-2218) = 501. Five per cent is allowed for mortality. The value of output is then = (501 × price of older cattle) + (112 × price of young cattle) × 0.95. For the pre-Famine period, no disaggregated data are available, so Bourke's adjusted total is used, and the same output proportions assumed. For both these estimates Ballinasloe third and fourth quality cattle prices were used for "other" and "young" cattle, respectively.

<sup>15</sup> H.S. THOMPSON, *Ireland in 1839 and 1869* (London, 1870), p. 27.

<sup>17</sup> The Ballinasloe prices were reported annually in *Thoms' Irish Almanac and Official Directory*.

*Irish Agricultural Output Before and After the Famine*

TABLE 1

PRICES USED IN THE OUTPUT CALCULATIONS  
(IN SHILLINGS AND PENCE PER UNIT)

	1840/5	1854
Wheat (cwt.)	12 - 1-1/2	15 - 0
Oats (cwt.)	6 - 9-3/4	9 - 0
Barley (cwt.)	7 - 6	8 - 10-1/2
Flax (cwt.)	43 - 9	66 - 0
Potatoes (stone)	2	4
Hay (cwt.)	3 - 10	5 - 0
Pork (cwt.)	51 - 4	60 - 6
Wool (lb.)	1 - 1-1/8	1 - 0
Eggs (per 12 doz.)	53 - 0	60 - 0
Butter (cwt.)	81 - 6	91 - 0
Cattle: 3rds	264 - 7	290 - 0
4ths	179 - 0	195 - 0

Source: See Text.

