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FACULTY OF ECONOMIC AND SOCIAL STUDIES

~~DEPARTMENT~~ OF AGRICULTURAL ECONOMICS

# INCOME AND EFFICIENCY IN AGRICULTURE

## A comparison between Belgium, Denmark, the Netherlands and the United Kingdom

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by

T. Kempinski.

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Note. Numbers in brackets refer to list of references at the end of the bulletin.

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## 1. Introduction

It is always instructive to see one's country's performance compared with others for it helps us to see where our weaknesses lie and shows how others deal with similar difficulties. In the present report a comparison is made between British agriculture and that of two Common Market countries - Belgium and the Netherlands - and of Denmark, which is one of the chief food exporters in Europe. The climate of these three countries is fairly similar to that of Britain and so are their farm products; to this extent, at least, comparative results should be meaningful.

The Common Market's and Denmark's farm price and production policies are important to Britain because of her reliance on certain food imports from these countries.[1] The British farmer's income and cost position in relation to the other countries' farmers is also of vital importance to the nation. Unless production costs are competitive British farmers' incomes will suffer or will have to go on being protected by subsidies and tariffs. If British farm incomes are to fall, one wants to know whether this is likely to make our farmers poorer than their continental neighbours who - on the average - are thought to have a relatively modest standard of living.

Of the various existing data on farm costs and incomes the most comprehensive are those relating to the aggregate results of all farms in the country. Data on the different size groups, regions, and commodities are based on sample surveys and, as such, are subject to error

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1. See, e.g., (1), Table 3, p. 31.

the extent of which cannot be determined by an outsider; whereas the aggregate results have at least the advantage of being consistent with the country's national income accounts. Furthermore, most farms produce several commodities, and the aggregate results are perhaps more meaningful as a picture of the farmers' position than the product-by-product analysis, with its artificial and arbitrary allocation of certain inputs to the different commodities.

For these reasons, and because of the greater ease of comparison, the present study is based mainly on the aggregate farm revenue and expenditure accounts in each of the four countries. These data will enable us to derive some measures of comparative farm incomes and production costs. It will then be necessary to examine the possible reasons for any differences in costs and incomes between the four countries.

The main body of the present report presents the most important findings of this enquiry. A description of the methods used and more detailed results are contained in the Appendices. Research of this kind is relatively time-consuming and actual numerical results are bound to be rather out of date when they are published. However, by taking two periods of two years each (1953-54 and 1957-58[2]) it can be shown that certain distinctive features persisted in each country's agriculture for a period of six years and are, therefore, likely to be of a more than temporary nature.

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2. In the U.K. the majority of the relevant statistics apply to agricultural, not calendar, years; the periods considered in the present study are 1953/4 - 1954/5 and 1957/8 - 1958/9.

## PART I. FINANCIAL RESULTS

### 2. Net Farm Income per Farm

As in other branches of economic activity, incomes in agriculture are derived from work, ownership (of land or capital) or entrepreneurship. Farmers' incomes combine all these three elements in varying proportions, depending mainly on the size of the farm business and on whether the farm is rented or owner-occupied. For purposes of comparison, this last difference can be eliminated by charging a notional rent to owner-occupied farms. It is then possible to arrive at an estimate of the "net farm income", which is basically the reward for the farmer's labour and enterprise. (Appendix 3 shows that the data for this calculation, especially estimates of family labour, are far from satisfactory). Since it has been impossible to estimate the amount of interest on the farmer's own and borrowed capital for all the four countries studied, such interest is also included in our net farm income figures.

Table 1 shows the estimated average net farm income per farm in the four countries. This, however, is only a very rough indicator of the actual incomes met on the individual farms, since an identical average figure may be derived from an aggregate including relatively few very large and many small incomes, or from one consisting exclusively of near-average incomes. In the absence of data on the proportion of farms within various ranges of income, some idea of the incomes for the different sizes of farms can be obtained by looking at the average incomes per 100

adjusted acres[3], in conjunction with the information given in Table 2 about the farm sizes in the four countries.

It should also be noted that the number of "farms" includes holdings whose occupiers derive most of their income from other sources (compare Ref. 45) but lack of information on this point for the three continental countries makes any adjustment a matter for guesswork; I have, therefore, used the unadjusted totals.

As elsewhere in this report, the financial data are presented mainly in pounds sterling at current exchange rates. Here, as in some of the following pages, an alternative series is also shown, giving the results in £ adjusted for the purchasing power of the four currencies. These alternative figures must be regarded as very tentative, since no year-by-year estimates of the purchasing power of the various currencies are available. The 1955 results of an O.E.E.C. enquiry (2) have been applied to our 1957-58 data merely to illustrate the probable difference between results calculated at current exchange rates and those based on the "real" value of the currencies in terms of their internal purchasing power.[4] For example, the average net income per farm in 1957-58 in the

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3. The method of calculating "adjusted acres" is explained in Appendix 1.

4. Reference (2), p.30, Table 5 gives the units of domestic currency per dollar both at the official exchange rates and at each country's quantity weights. E.g. 100 U.S. dollars in 1955 exchanged for £35.8, but the basket of goods, representative of the British expenditure pattern, which cost 100 dollars in the U.S. cost only £27.2 in Britain. The ratio between the "exchange rate equivalent" and the "purchasing power equivalent", i.e. 35.8/27.2, represents the internal purchasing power of one dollar in Britain. These ratios for several countries are shown in Reference (2), p. 31, Table 6. Taking the U.K. ratio as 100, the other countries' ratios can be expressed as the following indices: Belgium 91, Denmark 102, Netherlands 119. In the present report the results in £ at current exchange rates have been multiplied by these indices to obtain "£ adjusted to purchasing power".

Netherlands at current exchange rates was fourteen per cent lower than in the U.K., but - assuming that the adjusted figures are accurate - the "average" Dutch farmer's annual income would actually have bought a slightly larger "basket of goods" than a British farmer's income.

Table 1 also shows the percentage changes in income per farm between the two periods.

TABLE 1

Net Farm Income (2-year averages)

| | | Belgium | Denmark | Netherlands | U.K. |
|---|---|---|---|---|---|
| | | £ at current exchange rates | | | |
| Average net farm income per farm: | 1953-54 | 518 | 831 | 412 | 559 |
| | 1957-58 | 637 | 855 | 572 | 667 |
| Average net farm income per 100 adjusted acres: | 1953-54 | 3162 | 2219 | 2033 | 963 |
| | 1957-58 | 3529 | 2205 | 2780 | 1076 |
| | | £ adjusted to purchasing power[4] | | | |
| Average net farm income per farm: 1957-58 | | 580 | 872 | 681 | 667 |
| | | Per cent | | | |
| Percentage increase in net farm income per farm, 1953-54 to 1957-58 (at current exchange rates) | | 23 | 3 | 39 | 19 |

TABLE 2

Farm Acreage

| | Belgium | Denmark | Netherlands | U.K. |
|---|---|---|---|---|
| | Adjusted Acres per Farm | | | |
| Average size of farms: | | | | |
| Year 1953 | 16.5 | 37.5 | 20.2 | 58.1 |
| 1958 | 18.3 | 38.5 | 20.6 | 62.8 |
| | Per cent | | | |
| Estimated number of farms below average size, as percentage of all farms of 1 hectare (2.47 acres) or over.[5] | 61 | 58 | 56 | 66 |
| Percentage of agricultural area occupied by farms of 50 hectares (123.5 acres) or less (8) | 90 | 80 | 90 | 40 |

It would seem from Table 1 that in both periods the average income per farm was highest in Denmark. The relative position of the other three countries differs according to whether, in valuing their farm incomes, we use the exchange rates or the relative purchasing power of the currencies. However, firm conclusions about the comparative levels of farmers' incomes cannot be drawn because of the lack of complete information on labour cost (see Appendix 3) and on the number of farms.

5. Derived from References (3, 4, 5, 6, 7). The data refer to the following years : Belgium, 1959; Denmark, 1956; Netherlands, 1959; U.K., 1958.

The comparison of incomes per 100 adjusted acres is very much less favourable to the U.K. than the "per farm" results because of the considerably larger average size of farms in Britain than in the other countries. (see Table 2). The results per 100 acres are averages weighted by the acreage. In the U.K. a relatively high percentage of the agricultural area is occupied by farms of 50 hectares or over; hence the U.K. results are more representative of such farms than are the other countries' results. It has often been found that, within a country, net incomes per 100 acres tend to fall as the farm size rises,[6] and the same trend can be seen in our inter-country comparison, especially for 1957-8. This negative association between net income per 100 acres and farm acreage is probably due mainly to the fact that the average "amount" of a farmer's labour and entrepreneurship is fairly similar in the different size groups, and can be considered a fixed factor of production; hence there are diminishing returns to other factors, including additional acres of land.

However, unless the small farmer's income per acre is high enough to offset the limitations of his acreage, his total net income is likely to be below his country's average. This is probably the position in Britain, or so it appears from the sample surveys of farm management.[7]

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6. Compare Reference (9), Table 13, for England and Wales. A similar trend for Denmark can be seen in Reference (10), 1960, p. 113, assuming that net farm income = net profit + total labour - hired labour.

7. See Ref. (9), 1954-55, Table 12.

Since the percentage of smaller-than-average farms is higher in Britain than in the other countries (see Table 2), it seems likely that a particularly high proportion of British farmers earn an income below the national average. Even in the other three countries well over half of the farms are under the average size and hence probably earn a lower-than-average income.

3. Net Farm Income per 100 acres

Table 1 shows that there is a very large difference between the average net income per 100 acres in Britain and the other countries. In both periods the other countries' net income per 100 acres was more than double the U.K. figure. Even allowing for the possible errors of estimation and for the tendency of income per acre to vary inversely with farm size (see section 2), the impression remains that of any four farms of similar size, each situated respectively in one of the four countries and representative of its country's farming, the British farm would probably have by far the lowest net income. (This, of course, is an over-simplification, but it is the nearest that aggregate data allow us to get to the true position at the farm level.) Such a situation seems disquieting from the British point of view, and it is important to look for the causes of Britain's relatively low ratio of farm income to acreage; at the same time some light may be thrown on the differences between all the four countries' income/acreage ratios.

Net farm income per 100 acres is the difference between total output and total cost per 100 acres. Table 3 shows the relative influence of costs and output on income in the four countries.

TABLE 3

Total Output, Total Cost and Net Farm Income per 100 adjusted acres.

(2-year averages)

| | Belgium | | Denmark | | Netherlands | | U.K. | |
|---|---|---|---|---|---|---|---|---|
| | 1953-4 | 1957-8 | 1953-4 | 1957-8 | 1953-4 | 1957-8 | 1953-4 | 1957-8 |
| | £ at current exchange rates | | | | | | | |
| Total Output | 7464 | 8479 | 4636 | 4884 | 6982 | 9235 | 4101 | 4732 |
| Total Cost | 4302 | 4950 | 2417 | 2679 | 4949 | 6455 | 3138 | 3656 |
| Net Farm Income | 3162 | 3529 | 2219 | 2205 | 2033 | 2780 | 963 | 1076 |

(N.B. Cost excludes farmers' labour)

Taking each country separately, a comparison between the two periods shows that, with the exception of Denmark, increases in income were associated with increases in both cost and output. In Denmark, the cost increased by a greater amount than output, resulting in a diminished income. An inter-country comparison, however, does not show such a strong positive association between cost, output and income. Thus Belgium's relatively high income was achieved in the first period through high output but moderate cost; in the second period her output fell behind the Netherlands', but the cost was sufficiently low to ensure the highest income of the four countries. In both periods Denmark had a higher output than the U.K., but a lower cost, with the result that her income, though lower than Belgium's, was considerably higher than Britain's.

Obviously income depends on the relation between cost and output, as well as on their size, but since an identical cost/output ratio must result in a higher income per acre at a higher than at a lower level of cost

and output, high costs and outputs are often associated with high incomes. The importance of a high output can be seen, for example, by comparing the Belgian and Danish results: the cost per £100 output is fairly similar (see Table 4), but the much higher Belgian output per 100 acres results in a much higher income. On the other hand, Denmark's output per 100 acres is only slightly higher than Britain's, and it is the large difference in the two countries' cost per £100 output (Table 4) that causes the large difference in income per 100 acres.

TABLE 4

Total Cost per £100 Total Output (2-year averages)
(Cost excluding farmers' own labour)

| | Belgium | Denmark | Netherlands | U.K. |
|---|---|---|---|---|
| Period: | £ at current exchange rates | | | |
| 1953-4 | 58 | 52 | 71 | 77 |
| 1957-8 | 58 | 55 | 70 | 77 |

Output per 100 acres depends on the physical yields of agricultural products, on the prices received for those products and on the proportions between the different products. The same factors affect the cost/output ratio which, in addition, is influenced by the productivity of labour, materials and equipment used, by the composition of these resources and by their prices. We shall attempt to probe into these complex relationships as far as possible, but before doing so it is worth looking at a few other results which emerge from a comparative study of farm costs and revenue.

4. Net Product of Agriculture

The concept of net farm income has several disadvantages for any international comparison. Firstly, that proportion of income which is a reward for the farmer's labour varies according to the size and type of farm: at the one extreme there is a small family farm with no hired labour, typical of Belgium, Denmark and Holland, at the other - a businessman's "hobby" farm with a manager in complete charge, or a large farm on which the farmer performs no manual but only managerial work - both types often met with in the U.K. Secondly, it is difficult, if not impossible, to judge how appropriate the values of "notional" rent are, yet these values (based mainly on the average rent of tenanted farms) must be used in arriving at the net income. Lastly, only very approximate estimates can be made of the amount of farm work done by unpaid family members; yet this work must be valued and included in wages in arriving at the farmers' net income in order to make the results comparable.

All these difficulties are eliminated by using net product as the yardstick for comparisons, since net product, in the United Nations terminology (11), is the difference between (a) total output and (b) external inputs, i.e. total cost other than land and labour cost and interest. Net product is thus essentially the return to the land, labour, capital and management employed in farming, and is equal to that part of national income which is derived from agriculture. Since farmers often

own the farm land and perform much of the farm work, it seems meaningful to incorporate their income with the income from agriculture of those landlords and labourers who are not farmers, and to use this aggregate figure for international comparisons. In Table 5 net product is related to the acreage, manpower and total external inputs of each country's agriculture.

TABLE 5

Net Product of Agriculture (2-year averages)

| | Belgium | | Denmark | | Netherlands | | U.K. | |
|---|---|---|---|---|---|---|---|---|
| | 1953-4 | 1957-8 | 1953-4 | 1957-8 | 1953-4 | 1957-8 | 1953-4 | 1957-8 |
| | £ at current exchange rates | | | | | | | |
| Per 100 adj. acres | 4831 | 5417 | 3314 | 3309 | 4275 | 5698 | 2042 | 2282 |
| Per £100 External Inputs | 184 | 177 | 251 | 210 | 158 | 161 | 99 | 93 |
| Per Man-Year[8] | 854 | 982 | 688 | 778 | 497 | 707 | 586 | 723 |
| Per person in agricultural occupations | 599 | 684 | 547 | 608 | 342 | 486 | 586 | 734 |
| | £ adjusted to purchasing power | | | | | | | |
| Per Man-Year | | 894 | | 794 | | 841 | | 723 |

Net product per 100 acres depends on costs ("external inputs") and output per 100 acres, and on the input/output ratio; thus much of what was said in section 3 about the reasons for the differences in net income between periods and between countries is applicable here as well.

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8. See Appendix 4. Data relating to labour are probably more subject to errors of estimation than other data used in this paper.

Britain's input/output ratio (i.e. total external inputs per £100 output) is particularly high (Table 6), causing her net product per 100 acres to be much lower than Denmark's despite the relatively small difference in the two countries' output per 100 acres (Table 3).

TABLE 6

External Inputs per £100 Total Output (2-year averages).

| | Belgium | | Denmark | | Netherlands | | U.K. | |
|---|---|---|---|---|---|---|---|---|
| | 1953-4 | 1957-8 | 1953-4 | 1957-8 | 1953-4 | 1957-8 | 1953-4 | 1957-8 |
| | £ at current exchange rates | | | | | | | |
| Imported Feed & Seed | 15.4 | 16.9 | 10.7 | 10.9 | 19.1 | 20.1 | 22.1 | 20.9 |
| Imported Animals | (a) | (a) | (a) | (a) | (a) | (a) | 3.2 | 4.2 |
| Fertilisers | 7.0 | 6.3 | 5.1 | 5.7 | 6.9 | 5.6 | 5.1 | 6.3 |
| Equipment: | | | | | | | | |
| Maintenance & Fuel | 2.3 | 2.2 | 12.8 | 15.7 | 3.8 | 4.4 | 8.7 | 7.9 |
| Depreciation | 5.1 | 5.0 | | | 3.9 | 3.6 | 5.0 | 5.1 |
| Miscellaneous | 5.5 | 5.7 | | | 5.1 | 4.6 | 6.1 | 7.3 |
| Total External Inputs | 35.3 | 36.1 | 28.6 | 32.3 | 38.8 | 38.3 | 50.2 | 51.7 |

NOTE: (a) deducted in calculating output.

Relating financial results to acreage has the disadvantage of the uncertainty as to whether we are comparing like with like; despite our attempts at making an adjusted acre comparable between countries, no adjustment can fully account for the differences in soil fertility and climate. Expressing results "per £100 External Inputs" or "per Man-Year" does not overcome this objection completely, for those natural differences

must contribute to the variation in the productivity of the materials, equipment and manpower. However, if the inherent fertility of land in one country is lower, on the average, than in another, one would expect the difference to show itself to a greater extent in the net product per acre of land than in the ratios of net product to external inputs or to manpower. These ratios are also of interest from the point of view of the allocation of human and capital resources between agriculture and industry, and between the different countries of a European community.

In fact, Table 5 shows that Britain's net product/external inputs ratio is not so far below Belgium's and the Netherlands' as her net product/acreage ratio. However, the most striking difference between these two measures occurs in the case of Denmark which, though only third in order of net product per 100 acres, is first in order of net product per £100 external inputs. This is primarily due to Denmark's relative self-sufficiency in animal feedingstuffs.[9] Denmark's comparatively low expenditure on imported feed, seen in Table 6, contrasts with the high proportion of livestock products in her total agricultural output, shown later in this paper (Table 13).

Table 5 also shows that the four countries' relative positions differ according to whether we are concerned with net product per 100 acres or per man-year. Britain, which has by far the lowest net product per 100 acres, moves up to the third place in the ranking for net product per

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9. Compare Reference (12), Table 1.

man-year (at current exchange rates). On the other hand, the Netherlands move down from their first (1957-8) or second (1953-4) position in land productivity to the bottom in productivity of labour (at current exchange rates). This is because U.K. and the Netherlands are at the two extremes of the labour/land ratio, as shown in Table 7.

TABLE 7

Man-Years per 1000 adjusted acres

(2-year averages)

| | 1953-4 | 1957-8 |
|---|---|---|
| U.K. | 35 | 32 |
| Denmark | 48 | 44 |
| Belgium | 57 | 55 |
| Netherlands | 86 | 81 |

Since the British farmers and farm workers have so much more land at their disposal, in relation to their number, than their Dutch counterparts, it is not surprising that their net product per man is larger. It might indeed be considered disappointing that the difference is not greater, and that the average purchasing power of the net product per man-year in British agriculture seems to be the lowest of the four countries (Table 5, last row).

The data on agricultural labour are so imprecise that too much realiance must not be placed on the results per man-year. Results per person engaged in agriculture are included in Table 5 as a check. It would appear from these figures that British agriculture has a comparatively

high net product in relation to the total number of persons employed. Since, however, the number of persons does not include casual workers and those part-time workers whose main occupation is outside agriculture, net product per person seems to me less meaningful than net product per man-year.

Ideally, the differences between the ratios of net product to movable resources, i.e. labour and capital, such as those illustrated in Table 5 should be minimised in a European community aiming at the greatest possible economic efficiency. However, the results considered so far in this paper have been calculated on the basis of the existing money prices of factors and products; these prices differ widely between the four countries. If Britain and Denmark join the European Economic Community, and if the E.E.C. continues its policy of economic harmonization, these price differences are likely to become very much less and the ratio of net product to the resources used should reflect more closely the physical productivity of these resources. The physical-productivity aspect of the problem will be considered later in the present paper.

5. Rents, Wages and Profits

I have drawn the reader's attention to the lack of exact information about the appropriate values of notional rent on owner-occupied farms, the amount of agricultural work done by farmers and their unpaid relatives and the amount of capital invested in farming. It seems desirable, however, to make some estimate of the proportion of the net product attributable to the broad categories of factors of production, i.e., to land, labour, capital and entrepreneurship. In Table 8 rent includes notional rent and charges for depreciation and maintenance of

buildings and fixtures, so that all farms, whether tenanted or not, are put on the same footing; wages include an estimate of the value of unpaid family labour (see Appendix 4); and "profit and interest" are a residual (called "Profit" in the text for brevity).

TABLE 8

Rent, Labour Cost, Profit and Interest (2-year averages)

| | Belgium | | Denmark | | Netherlands | | U.K. | |
|---|---|---|---|---|---|---|---|---|
| | 1953-4 | 1957-8 | 1953-4 | 1957-8 | 1953-4 | 1957-8 | 1953-4 | 1957-8 |
| A. Percentage Distribution of Net Product | | | | Per cent | | | | |
| Rent | 16.5 | 16.4 | 5.4 | 6.5 | 11.0 | 10.2 | 9.5 | 9.1 |
| Wages | 18.0 | 18.4 | 27.7 | 26.9 | 41.4 | 41.0 | 43.4 | 43.8 |
| Farmer's labour | 26.5 | 27.1 | 17.4 | 17.3 | 24.1 | 23.9 | 24.0 | 25.9 |
| Total labour | 44.5 | 45.5 | 45.1 | 44.2 | 65.5 | 64.9 | 67.4 | 69.7 |
| Profit and Interest | 39.0 | 38.1 | 49.5 | 49.3 | 23.5 | 24.9 | 23.1 | 21.2 |
| Total | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| B. Rent per 100 adjusted acres | | | £ at current exchange rates | | | | | |
| | 799 | 891 | 178 | 213 | 470 | 582 | 194 | 207 |
| C. Wages per Man-Year | | | £ at current exchange rates | | | | | |
| | 380 | 447 | 310 | 344 | 326 | 459 | 395 | 504 |
| | | | £ adjusted to purchasing power | | | | | |
| | | 407 | | 351 | | 546 | | 504 |
| D. Profit and Interest | | | £ at current exchange rates | | | | | |
| (1) per £100 output | 25 | 24 | 36 | 34 | 12 | 15 | 12 | 10 |
| (2) per 100 adjusted acres | 1881 | 2064 | 1644 | 1633 | 1004 | 1418 | 472 | 483 |
| (3) per farm | 308 | 373 | 617 | 626 | 163 | 292 | 274 | 300 |

Rent The share of net product attributed to rent depends to some extent on the average rent per 100 acres. Thus it can be seen in Table 8 that Belgium's relatively high share of rent in the net product corresponds to that country's high rent per 100 acres, and that the Netherlands are in the second place in both respects. However, Britain shows a considerably higher share of rent than Denmark in both periods, although in 1957-8 the average British rent per 100 acres was actually lower than my estimated figure for Denmark. This is a result of Britain's relatively low productivity of land, as shown by net product per 100 acres (Table 5): the U.K. requires, on the average, more land than Denmark to produce the same value of net product, and this tends to boost the proportion of net product attributed to rent.

A comparison of rent per 100 acres (Table 8) with output and net product per 100 acres (Tables 3 and 5) shows that both rent and productivity of land are relatively high in Belgium and the Netherlands, and relatively low in Denmark and the U.K. (though the ranking of each country for rent is not the same in all cases as for productivity of land). This evidence is naturally insufficient for us to conclude that a general rent increase in Britain would lead to an increase in the productivity of land. Indeed, the cause-and-effect relationship may conceivably be in the reverse direction: the high land rents in Belgium, for example, may be a result, rather than a cause, of the high productivity of land.

Labour Although the share of labour in the net product must depend partly on each country's wages per man-year, it is obvious from Table 8 that the inter-country differences in the wage level are not very strongly associated with the relative share of labour. Thus, looking at the share of labour, the U.K. and the Netherlands on the one hand, and Belgium and Denmark on the other, form two distinct pairs, with approximately 65 - 70% of the net product attributed to labour in the former and approximately 45% in the latter pair in both periods; whereas no consistent and striking pairing-off is possible with regard to wage levels. In fact, Britain and Holland find themselves with a similar, comparatively large share of net product going to labour for different reasons: Britain mainly because of its high wage level and Holland mainly because of its labour-intensive system of farming (see Table 7).

Profit and Interest Since this is a residual, its share depends to a large extent on the shares of the other types of income, and especially the most important of those, i.e. labour. Hence in Table 8 we see again the wide discrepancy between the relatively low share of profit in the U.K. and the Netherlands and the relatively high one in Denmark and Belgium. Although in Belgium profits seem to suffer from the high rents, it should be remembered that this is of no practical importance to owner-occupiers whose "rent" is only notional.

A high share of profit in the net product does not necessarily mean that farming is highly profitable: if net product is very low, so is the profit. The usual measure of profitability - profit as percentage of capital - cannot be calculated from the existing data, but Table 8 enables

us to compare profitability in terms of profit per £100 output, per 100 acres and per farm. The figures show that in the case of our four countries a relatively high share of profit in net product does seem to be associated with a relatively high profitability (i.e. Belgium's and Denmark's agriculture are relatively high in both respects). In most cases profit per £100 output fell but profit per 100 acres and per farm increased between the two periods. In Holland the rise in profits was remarkably large, thanks mainly to the comparatively large increase in the physical productivity which will be seen in a later section (section 9, Table 12). Britain shows a particularly low profit per 100 acres; this follows from the already emphasised relatively low output and net product per 100 acres.

## 6. An Overall Picture of Financial Results

The preceding sections have presented an analysis of some financial results of farming in Belgium, Denmark, the Netherlands and the U.K. They have not, however, supplied an answer to the question which the reader may have in mind, namely, which of the countries studied has the most efficient agriculture? We have not the data for assessing their overall agricultural efficiency in the strict economic sense of equal marginal returns, etc., (see e.g. Ref. 13). Yet the data presented so far do afford some indications on the different aspects of economic efficiency. These indications are summarised in Table 9.

TABLE 9

Ranking of Financial Results (2-year averages at current exchange rates)

(in descending order, unless otherwise stated)

| | Period (A = 1953-4) (B = 1957-8) | Belgium | Denmark | Netherlands | U.K. |
|---|---|---|---|---|---|
| 1. Net Farm Income per farm | A | 3 | 1 | 4 | 2 |
| | B | 3 | 1 | 4 | 2 |
| 2. Net farm Income per 100 adjusted acres | A | 1 | 2 | 3 | 4 |
| | B | 1 | 3 | 2 | 4 |
| 3. Output per 100 adjusted acres | A | 1 | 3 | 2 | 4 |
| | B | 2 | 3 | 1 | 4 |
| 4. Cost per £100 output (ascending order) | A | 2 | 1 | 3 | 4 |
| | B | 2 | 1 | 3 | 4 |
| 5. Net Product per 100 adjusted acres | A | 1 | 3 | 2 | 4 |
| | B | 2 | 3 | 1 | 4 |
| 6. Net Product per £100 external inputs | A | 2 | 1 | 3 | 4 |
| | B | 2 | 1 | 3 | 4 |
| 7. Net Product per Man-Year | A | 1 | 2 | 4 | 3 |
| | B | 1 | 2 | 4 | 3 |
| 8. Wages per Man-Year | A | 2 | 4 | 3 | 1 |
| | B | 3 | 4 | 2 | 1 |
| Profit and Interest | | | | | |
| 9. (a) per £100 output | A | 2 | 1 | 3-4 | 3-4 |
| | B | 2 | 1 | 3 | 4 |
| 10. (b) per 100 adjusted acres | A | 1 | 2 | 3 | 4 |
| | B | 1 | 2 | 3 | 4 |

The lower the ranking figure in the table, the higher is the country's comparative position. For example, Belgium has "1" for Net Income per 100 acres, meaning that she is highest with regard to that measure of efficiency. The table deals with ten different aspects of economic performance and no country is first or last in all of them. Even within the limitations of the selected aspects of performance, we may wonder whether the ranking might not be more meaningful if the results had been calculated according to the purchasing power of each currency rather than the current exchange rates. As already explained, I had no means of making reliable estimates on the basis of the purchasing power. Where such estimates were attempted for the purpose of illustration (Tables 1, 5 and 8), the relative position of the countries did change, with the Netherlands appearing higher and Belgium lower in the ranking for performance than in the "current exchange rate" results. However, sad as it may seem to the British reader, Britain's relative position is not improved by using the purchasing power instead of the exchange rate basis.

I mentioned in the Introduction that certain features of each of the four countries' agriculture have appeared in both two-year periods studied and are therefore of a more than temporary nature. This is well illustrated by the fact that the four countries' relative position (as shown in Table 9) changed very little between the two periods: where the ranking varies between the two periods the difference is never more than one point. However, bearing in mind the different results given by the "exchange rate" and "purchasing power" methods, the general conclusion must be restricted to the one fact

which emerges whichever method is used; namely, that in both periods the economic efficiency of British agriculture, so far as I have been able to measure it, was below that of Belgium, Denmark and the Netherlands with regard to six out of the ten yardsticks used in Table 9 (i.e. items 2, 3, 4, 5, 6 and 10). By way of contrast it is worth emphasising that the farm workers' annual earnings were relatively high in Britain, though in 1957 and 1958 the Dutch farm workers may have led in purchasing power (Table 8). The wage level, however, is a rather ambiguous measure of economic efficiency in agriculture. Even in the U.K., with its relatively high degree of dependence on hired labour, wages accounted for well under half of agriculture's net product; in the other countries the proportion was only between approximately eighteen and forty-one per cent (Table 8). The comparatively high wages per worker in British farming must be seen in conjunction with the comparatively low profits (Table 8); and we should not forget that, from the farmer's point of view, wages are an item of cost whose increase he may regard as an economic setback.

One weakness of the "aggregate" approach used in this paper is that the results for each country represent a very heterogeneous collection of farms and are therefore rather remote from anything encountered on any one farm or group of farms. It may, therefore be of interest to see some comparative results derived from actual surveys of farms which do not differ very greatly as to size, type and climate. A few such results from Denmark and the south of England are presented in Appendix 11. The comparison shows

that the Danish farms had, on the average, a higher net income per 100 acres. The differences are not so great as in the aggregate estimates, but it must be recognised that the farms surveyed give only a partial picture of the two countries' agriculture. In particular, the U.K. hill farms, which - because of climate and topography - specialise in sheep and cattle rearing, would probably tend to have a lower income per 100 acres than lowland farms even if acreage were adjusted to take account of the differences in natural fertility.

## PART II. PHYSICAL PRODUCTIVITY AND PRICES

Money incomes depend mainly on (a) the volume and unit cost of physical resources, (b) the composition of resources and the productivity of each component and (c) the unit prices of products and the composition of output. In this part of the paper I shall examine these factors and their influence on the income differences between the four countries.

### 7. Product Prices

Table 10 shows the indices of prices received by farmers in each country (U.K. prices = 100).

Table 10

Indices of Producers' Prices [a] at current exchange rates (2-year averages)(U.K. = 100)

| | 1953-4 | | | | 1957-8 | | | |
|---|---|---|---|---|---|---|---|---|
| | Belgium | Denmark | Netherlands | U.K. | Belgium | Denmark | Netherlands | U.K. |
| Grain | 95 | 81 | 76 | 100 | 106 | 89 | 86 | 100 |
| Sugar Beet | 84 | 64 | 73 | 100 | 88 | 79 | 82 | 100 |
| Potatoes | 76 | 77 | 72 | 100 | 44 | 40 | 36 | 100 |
| Total Field Crops [b] | 87 | 76 | 75 | 100 | 73 | 65 | 61 | 100 |
| Vegetables | 50 | 68 | 44 | 100 | 38 | 55 | 38 | 100 |
| Fruit | 37 | 56 | 32 | 100 | 46 | 63 | 46 | 100 |
| Total Horticult.Crops [b] | 45 | 65 | 40 | 100 | 40 | 54 | 40 | 100 |
| Cattle | 126 | 112 | 105 | 100 | 107 | 97 | 107 | 100 |
| Pigs | 89 | 85 | 77 | 100 | 90 | 86 | 84 | 100 |
| Poultry | 81 | 95 | 70 | 100 | 67 | 84 | 65 | 100 |
| Milk | 73 | 56 | 59 | 100 | 79 | 51 | 55 | 100 |
| Eggs | 94 | 64 | 72 | 100 | 74 | 66 | 74 | 100 |
| Total Livestock Products [b] | 92 | 77 | 77 | 100 | 87 | 72 | 74 | 100 |
| Total Agricultural Output [b] | 81 | 75 | 69 | 100 | 76 | 68 | 68 | 100 |

Notes : (a) Prices include subsidies.
(b) Each "Total" is an index of output valued at the relevant prices, when output at U.K. prices is taken as 100.

For most of the products, prices were higher in Britain than in any of the other countries studied. Consequently, all the aggregate price indices (i.e. The "Total" indices for field crops, horticultural crops, livestock products and agricultural output) for Belgium, Denmark and the Netherlands are below 100 in both periods. Thus, the better financial results of the three continental countries' agriculture compared with Britain's owe nothing to the level of product prices. One might conclude that the British farmers' financial results would have been worse, both absolutely and relatively to the other countries, under the Belgian, Danish or Dutch system of agricultural prices. However, if price levels had been different, other things might have been different as well. For example, lower prices might have encouraged higher output (in an attempt to maintain revenue) or more care in the use of resources; so that, had the British prices been lower, farm incomes need not necessarily have been correspondingly lower.

Apart from the inter-country price differences, there were, of course, year-to-year changes in product prices within each country. Increases in crop prices were accompanied by falls in the prices of livestock products, the net effect on the aggregate price level being an increase from 100 to 103 in the Netherlands, from 100 to 105 in the U.K. and a decline from 100 to 95 and 99 respectively for Denmark and Belgium between 1953-4 and 1957-8.

## 8. Input Prices

The published statistics provide only very incomplete data on the prices of the different inputs used in farming. Information on the quantities of individual inputs used, which would make possible an accurate weighting of the individual prices (e.g. of petrol, T.V.O. and diesel oil, to arrive at price indices of all tractor fuel), is often even more scanty. The estimates presented in Table 11 cannot, therefore, be regarded as highly accurate.

TABLE 11

Indices of Input Prices at current exchange rates. U.K. Price = 100

2-year averages

| | 1953 - 4 | | | | 1957 - 8 | | | |
|---|---|---|---|---|---|---|---|---|
| | Belgium | Denmark | Netherlands | U.K. | Belgium | Denmark | Netherlands | U.K. |
| Imported Feed | 81 | 80 | 87 | 100 | 107 | 75 | 113 | 100 |
| Fertilisers | 94 | 82 | 75 | 100 | 79 | 71 | 64 | 100 |
| Fuel and lubricants | 108 | 89 | 114 | 100 | 104 | 87 | 121 | 100 |
| Machinery | 174 | 118 | 154 | 100 | 165 | 121 | 155 | 100 |
| Total External Inputs | 112 | 92 | 109 | 100 | 119 | 89 | 117 | 100 |
| Rent | 412 | 92 | 242 | 100 | 429 | 102 | 280 | 100 |
| Labour | 96 | 78 | 83 | 100 | 89 | 68 | 91 | 100 |
| All Inputs | 118 | 86 | 100 | 100 | 150 | 83 | 114 | 100 |

However, the degree of error contained in these estimates is unlikely to alter the main conclusions which can be drawn from the table. These conclusions, based on the aggregate indices ("All Inputs") are :

(1) In Belgium, input prices were, on the whole, higher than in the other three countries - considerably higher in the second period.

(2) Danish input prices were, on the whole, the lowest.

(3) Dutch and British input prices were, in aggregate, similar in the first period; in 1957-8 Dutch input prices were higher than British.

These conclusions do not seem to indicate any strong association between input prices and profitability. Thus, for example, Britain's input prices were not unduly high, yet her profit per £100 output in 1957-8 was the lowest of the four countries (Table 8); and Belgium had a fairly high profit per £100 output (Table 8) despite her relatively expensive inputs.

The prices of inputs changed in varying proportions, some upwards and some downwards, between 1953-4 and 1957-8. However, unlike product price changes, the changes in input prices resulted in an overall increase in the index (taking 1953-4 as the base year) in all the four countries. The rise in Belgium was 36 points, in Denmark 3 points, in the Netherlands 23 points, and in the U.K. 7 points.

9. Aggregate Physical Productivity

Since price differences do not seem to explain the inter-country variation in income and other financial results of farming, the main reason for this variation must be the varying productivity of resources in physical terms. Due to the absence of sufficiently detailed and reliable information about the composition and quantity of resources used in producing each individual commodity, physical productivity must be assessed on the aggregate level. For this purpose all inputs and outputs have been converted to a single common denominator, i.e., their money value at standard prices, which are the same for all the four countries and for both periods. Since,

however, the standard price system adopted can affect not only each country's results but also the relationship between the four countries' comparative performance[10], three separate sets of calculations, using a different price system for each set, have been made, so that the results can be checked and those which are significantly affected by changes in the price system can be pinpointed. The three price systems used are:-

(1) Danish 1953 prices: These were chosen because during the period under review the farm product prices in Denmark were largely formed without state intervention and thus may be said to have approached a free-trade level of prices. The 1953 prices were used because they were available from an earlier investigation (12).

(2) U.K. 1958-59 prices: From the British point of view it seems interesting to see what the other countries' results would have been under British price conditions. 1958-59 was the most recent year for which complete price data were available when the calculations were carried out.

(3) Milk at actual prices in each country: other prices at U.K. 1958-59 level: Milk is the most important or the second most important single farm product in all the four countries, (see Table 13). In Britain the producers' price of milk has been considerably higher than in the other four countries, (Table 10) mainly because of the much higher proportion of milk consumed liquid (see Appendix 6). The use of resources in dairy farming is presumably influenced by the expected receipts which in turn depend on the proportion of the milk consumed liquid, made into cream, butter, etc; thus, it might

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10. See Reference (12), Part I, p. 22, for a discussion of this problem.

be claimed that deriving productivity measures from calculations in which milk is valued at the same price in each country does not give a fair comparison between the countries. In one set of calculations I have therefore valued milk at each country's price, on the assumption that this reflects the different patterns of milk utilisation.

In assessing the aggregate "quantity" of inputs we come up against the already mentioned uncertainty as to the correct estimate of unpaid family labour. One method of assessing the labour input is based on the estimated number of man-years (see Appendix 4) charged at a standard rate. This concept of assessing the manpower use is probably more relevant in the context of physical productivity than an estimate based on the unadjusted number of all farm personnel which includes part-time labour. However, to indicate the possible extent of error in the assessment of man-years, I have included some estimates in which all persons occupied in farming are charged at a standard rate.

Details of the methods and results of the calculation of inputs and outputs at standard prices are given in Appendices 7 and 8.

Table 12

Ratios of Output to Total Inputs [a] (2-year averages)

| Pricing System | Belgium 1953-4 | Belgium 1957-8 | Denmark 1953-4 | Denmark 1957-8 | Netherlands 1953-4 | Netherlands 1957-8 | U.K. 1953-4 | U.K. 1957-8 |
|---|---|---|---|---|---|---|---|---|
| I. Standard Prices | | | £ output per £100 inputs | | | | | |
| 1. Danish 1953 prices | | | | | | | | |
| (a) with labour input based on man-years | 180 | 194 | 165 | 174 | 157 | 177 | 101 | 101 |
| (b) with labour input based on the number of persons | 170 | 185 | 164 | 172 | 144 | 164 | 109 | 108 |
| 2. U.K. 1958-9 prices [b] | | 234 | | 182 | | 211 | | 118 |
| 3. Milk at actual prices, other at U.K. 1958-9 prices [b] | | 223 | | 152 | | 183 | | 117 |
| II. Actual prices [b] | 134 | 132 | 155 | 150 | 113 | 118 | 113 | 111 |
| I. Standard Prices | | | INDICES (1) U.K. ratio = 100 | | | | | |
| 1. Danish 1953 prices | | | | | | | | |
| (a) with labour input based on man-years | 179 | 192 | 163 | 172 | 155 | 175 | 100 | 100 |
| (b) with labour input based on the number of persons | 156 | 171 | 150 | 159 | 132 | 152 | 100 | 100 |
| 2. U.K. 1958-9 prices [b] | | 199 | | 154 | | 179 | | 100 |
| 3. Milk at actual prices, other at U.K. 1958-9 prices [b] | | 191 | | 130 | | 156 | | 100 |
| II. Actual prices [b] | 119 | 119 | 137 | 135 | 100 | 106 | 100 | 100 |
| | | | (2) 1953-4 ratio = 100 | | | | | |
| Danish 1953 prices (with labour input based on man-years) | 100 | 109 | 100 | 105 | 100 | 113 | 100 | 100 |
| Actual prices [b] | 100 | 99 | 100 | 97 | 100 | 104 | 100 | 98 |

Note a) Inputs include farmers' and other unpaid labour.
b) Labour input based on man-years.

Some estimates of overall physical productivity are shown in Table 12 in the form of output/input ratios at standard prices. Here the most striking result is the considerably higher physical productivity of resources in the three continental countries than in Britain. Belgium's physical productivity appears to be the highest of the four countries irrespective of the price system used. The choice of price system does, however, affect the relative as well as the absolute productivities. The most marked effect is in the case of Denmark whose superiority at Danish prices is considerably reduced when using British prices. This effect is largely due to the higher prices of inputs in Britain than in Denmark. Under pricing system 3 (actual prices for milk, otherwise British 1958/59 prices) Denmark's relative position compared with Britain naturally suffers a further deterioration even though productivity of resources is still 30 per cent higher in Denmark than in Britain. When any of the remaining standard price systems is used all the three continental countries' indices are considerably higher for physical productivity than for productivity at actual prices. This indicates that the actual price relationships between products and inputs were more favourable to farmers in Britain than in the other countries. The use of "standard" prices naturally removes this differential.

Britain seems to have been the only one of the four countries where overall physical productivity (measured at Danish 1953 prices) did not rise

during the six years, 1953 to 1958.[11] However, in Belgium and Denmark the rise in physical productivity was not sufficient to compensate for the unfavourable change in the farmers' terms of trade, i.e. the reduced product prices and increased input prices. Although the Dutch farmers' input prices rose much more than the prices of their products (by 23 per cent as against 3 per cent), the relatively large increase in physical productivity enabled them, alone among the four countries studied, to increase their output per £100 inputs at actual prices between the two periods.

10. Product-mix

Although in the present study productivity is assessed at the aggregate level only, the fact cannot be ignored that for a really satisfactory explanation of the inter-country differences in productivity it would be necessary to investigate resource use in the production of every commodity. There are, however, indications in many farm surveys that resources are not equally productive in all branches of agricultural production; hence the composition of output ("product-mix") may be expected to affect the overall productivity of resources. Table 13 shows each country's "product-mix".

Since the relationship between the productivities of resources in the different branches of farming is likely to vary from country to country,

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11. This conclusion from Table 12 is contrary to the estimates published by the Central Statistical Office (15) which show a rise in the index of productivity of British agriculture from 106.1 in 1953/4 and 108.1 in 1954/5 to 113.6 in 1957/8 and 115.3 in 1958/9 (1949/50 = 100). It has unfortunately not been practicable to investigate in detail the reasons for the divergence between those results and mine. This divergence is probably due mainly to the use of two different price systems (Danish 1953 and British 1949/50) in the two studies. Also, the C.S.O. estimates are based on output adjusted to normal weather, whereas I used the actual output. Apart from the uncertainty as to what "normal weather" is and how far output is affected by "abnormal weather", I was unable to make similar adjustments to the output of the continental countries, which do not appear to publish figures of "normal weather" output.

we could not expect any strong correlation between product-mix and aggregate productivity. A country's overall productivity should be the higher the more it concentrated on those commodities in whose production resource productivity is relatively high; but we cannot fully demonstrate the truth of this statement while there are insufficient data on these individual commodity results. A partial demonstration is, however, possible. In a previous paper I showed that more land was needed per unit of livestock output in Britain than in Belgium, Denmark or Holland (Ref. 12, Part I, p.15, Table 1), and that this difference was particularly great in the grazing enterprises (Ref. 12, Part I, p.16, Table 2). Yet Table 13 shows that a larger share of agricultural output was derived from the grazing livestock in the U.K. than in the other countries. This would naturally tend to depress the overall physical productivity of land in the U.K. This, however, might not lead to a low aggregate productivity of resources, for one might suppose that some non-land resources would be saved when more land was used. One method of testing this hypothesis is to plot on a diagram the quantities of land and of other resources used in each country and in each period to produce a unit of output. If less "other resources" were needed when more land was used, the points on the diagram would tend to be arranged about a curve descending from left to right.

In fact, no such general relationship emerges from the accompanying diagram.(p.37). This may be due to several reasons. In agriculture, land is by no means a perfect substitute for other resources; certain inputs, such as

Table 13

Percentage Composition of Agricultural Output at Danish 1953 Prices

(2 - year averages)

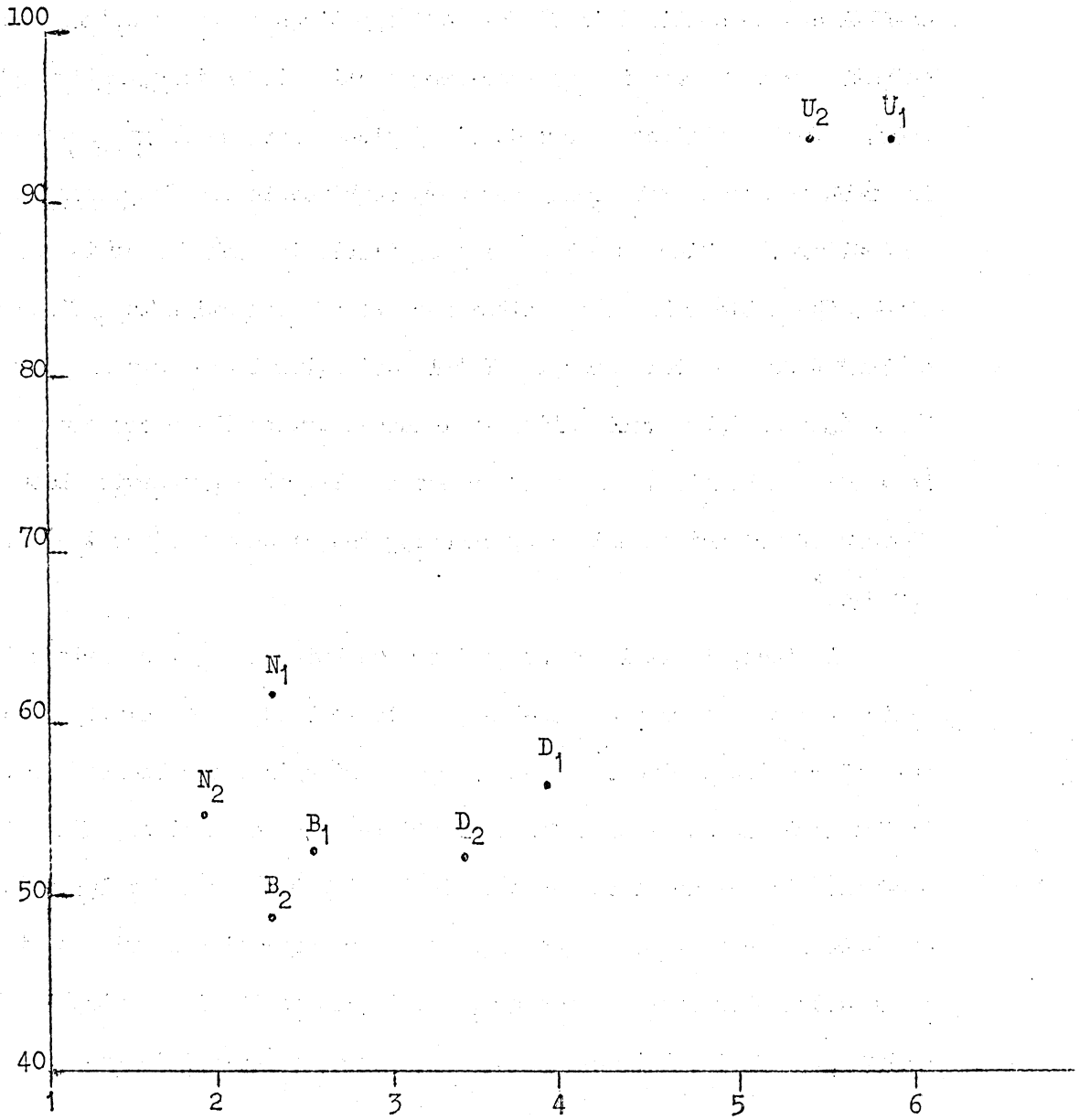
| | Belgium | | Denmark | | Netherlands | | U.K. | |
|---|---|---|---|---|---|---|---|---|
| | 1953-4 | 1957-8 | 1953-4 | 1957-8 | 1953-4 | 1957-8 | 1953-4 | 1957-8 |
| | Per cent | | | | | | | |
| Grain | 5.9 | 6.6 | 4.1 | 3.6 | 4.9 | 4.4 | 8.3 | 5.8 |
| Sugar Beet | 2.9 | 3.1 | 2.1 | 2.9 | 2.5 | 2.5 | 2.0 | 1.9 |
| Potatoes | 4.1 | 3.9 | 1.9 | 1.6 | 5.3 | 4.9 | 4.9 | 3.3 |
| Other Field Crops | 2.2 | 1.5 | 1.6 | 1.1 | 4.1 | 3.1 | 0.9 | 0.7 |
| TOTAL FIELD CROPS | 15.1 | 15.1 | 9.7 | 9.2 | 16.8 | 14.9 | 16.1 | 11.7 |
| Vegetables (excl.potatoes) | 13.3 | 15.3 | 2.1 | 2.2 | 8.0 | 8.4 | 4.5 | 3.5 |
| Fruit | 7.7 | 4.8 | 1.2 | 1.1 | 6.2 | 3.8 | 2.4 | 2.2 |
| Other Horticultural Crops (a) | 3.1 | 3.3 | 2.5 | 2.7 | 7.2 | 6.3 | 1.3 | 0.9 |
| TOTAL HORTICULTURE | 24.1 | 23.4 | 5.8 | 6.0 | 21.4 | 18.5 | 8.2 | 6.6 |
| Cattle | 14.0 | 13.6 | 12.9 | 17.4 | 10.7 | 9.6 | 19.8 | 19.8 |
| Sheep | 0.2 | 0.2 | 0.1 | (b) | 0.4 | 0.5 | 4.9 | 4.8 |
| Horses | 1.0 | 0.5 | 0.8 | 0.4 | 0.6 | 0.3 | (b) | (b) |
| Milk | 20.0 | 18.2 | 28.4 | 24.9 | 23.7 | 25.1 | 20.1 | 19.6 |
| Wool | 0.1 | 0.1 | (b) | (b) | (b) | (b) | 1.7 | 1.7 |
| Total Grazing Livestock Output | 35.3 | 32.6 | 42.2 | 42.7 | 35.4 | 35.5 | 46.5 | 45.9 |
| Pigs | 14.4 | 14.3 | 31.7 | 32.4 | 15.6 | 15.7 | 16.7 | 15.8 |
| Poultry | 1.6 | 3.9 | 2.0 | 2.1 | 1.8 | 3.5 | 3.3 | 5.9 |
| Eggs | 8.9 | 9.6 | 7.7 | 7.4 | 8.5 | 9.8 | 9.0 | 11.2 |
| Other Livestock Products | - | - | 0.1 | 0.1 | 0.3 | 0.6 | 0.1 | 0.2 |
| TOTAL LIVESTOCK PRODUCTS | 60.2 | 60.4 | 83.7 | 84.7 | 61.6 | 65.1 | 75.6 | 79.0 |
| Sundry Output | - | - | - | - | - | - | 0.9 | 1.8 |
| Valuation Change | +0.6 | +1.1 | +0.8 | +0.1 | +0.2 | +1.5 | -0.8 | +0.9 |
| TOTAL AGRICULTURAL OUTPUT | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |

Notes: (a) Mainly flowers, bulbs and seeds
(b) Included in Other Livestock Products.

fencing, drainage, and essential cultivation (with the necessary equipment) will normally increase with the area of land farmed and are therefore complements rather than substitutes for land. A low productivity in relation to land will then reflect itself in low productivity of some of the inputs. In a comparatively non-intensive grassland system, such as in the United Kingdom, the proportion of inputs which are complementary to land is likely to be higher than in the other three countries and the same causes which lead to low land productivity will also tend to be shown up in a relatively low productivity of other resources.

Inputs per £100 Output at 1953 Danish Prices

Non-land inputs (incl. labour). £ at 1953 Danish prices




Land = £ Rent (at 1953 Danish level per adjusted acre)

B = Belgium, D = Denmark, N = Netherlands, U = U.K.

Subscripts: 1 = 1953-4 (2-year average)
2 = 1957-8 (2-year average)

11. Factor Proportion

In farming, as in other branches of production, land, labour and capital can be combined in different proportions to produce the same output. The diagram in the preceding section is an illustration of this fact. Table 14 gives a more detailed picture of the varying proportions in which the productive resources were combined in the four countries' agriculture. Since the land area available to each farmer is usually fixed, the table relates the other factors of production to a fixed unit of land (100 adjusted acres). Total agricultural area may and does change, being increased by reclamation or reduced, e.g., by the encroachment of industry and housing. Farmers, however, alter the proportion between the factors of production mainly by changing the amounts used on the existing acreage.

In fact, Table 14 shows an increase between the two periods in the ratio of each category of non-land inputs to land, with only two exceptions, one major and one minor. The major exception is the well-known reduction in the agricultural labour force in all the four countries. The minor exception is the apparent decrease in the input of fuel and lubricants in the United Kingdom. This decrease may seem surprising in view of the increased number of farm tractors; it is due to the large rise in the popularity of diesel tractors which are more economical in fuel

Table 14

Main Inputs and Output (at Danish 1953 prices) per 100 adjusted acres (2 - year averages)

| | Belgium | | Denmark | | Netherlands | | U.K. | |
|---|---|---|---|---|---|---|---|---|
| | 1953-4 | 1957-8 | 1953-4 | 1957-8 | 1953-4 | 1957-8 | 1953-4 | 1957-8 |
| | £ | £ | £ | £ | £ | £ | £ | £ |
| Imported Feed | 868 | 990 | 380 | 529 | 944 | 1232 | 554 | 735 |
| Imported Animals | (deducted from output) | | | | | | 131 | 172 |
| Fertilisers (excl.lime) | 408 | 433 | 211 | 254 | 474 | 518 | 156 | 192 |
| Maintenance, Repairs, Depreciation | 321 | 333 | 270 | 338 | 319 | 392 | 445 | 480 |
| Fuel and Lubricants | 68 | 84 ) | 332 | 381 | 97 | 127 | 172 | 154 |
| Miscellaneous | 290 | 345 ) | | | 240 | 286 | 264 | 350 |
| Main External Inputs: Total | 1955 | 2185 | 1193 | 1502 | 2074 | 2555 | 1722 | 2083 |
| Labour (incl. farmers' labour) ("man-year"method) | 1695 | 1655 | 1442 | 1276 | 2577 | 2417 | 1043 | 947 |
| Main Inputs: Total [a] | 3650 | 3840 | 2635 | 2778 | 4651 | 4972 | 2765 | 3030 |
| Output | 6892 | 7858 | 4625 | 5118 | 7562 | 9085 | 2967 | 3237 |

[a]) Exclusive of Rent.

consumption than either petrol or T.V.O. tractors.[12]

12. In Britain, the increase in the total number of tractors was comparatively very small, and therefore did not counteract the effect of the rise in the proportion of diesel tractors. The comparative figures are given below (References 3, 14, 6, 7). (The 1953 diesel tractors' percentage in the Netherlands is my estimate).

| Percentage of diesel tractors: | Belgium | Denmark | Netherlands | U.K |
|---|---|---|---|---|
| | % | % | % | % |
| 1953 | 40 | no data | 23 | 16 |
| 1958 | 65 | no data | 47 | 39 |
| Percentage increase in tractor number, 1953 - 58 | 127 | 102 | 115 | 9 |

Although the percentage increases in the various inputs vary between the countries, an overall pattern emerges from the table. In both periods the Netherlands had the highest and Belgium the second highest quantity of labour, imported feed, fertilisers, total main external inputs and all main inputs per 100 acres. Britain and Denmark ranked third or fourth in these respects. This ranking may be thought of as a measure of the intensity of land use, but it does not afford any straightforward explanation of the varying productivity of resources seen in Table 12. It may perhaps be suggested that the highly intensive system of farming in the Netherlands does not result in a correspondingly high output/input ratio because of a strong "diminishing returns" effect when the quantity of land is fixed. Belgium, the second highest in order of intensity, has perhaps found the "golden mean" resulting in the highest average productivity of resources.

Britain's relatively low output/input ratio may be partly due to the high machinery and miscellaneous inputs in relation to the area. It can be seen in Table 14 that there is, in general, no association between these inputs and the output. Britain's high expenditure on these items is accompanied by a relatively low output, and this helps to make her "aggregate" productivity of resources (Table 12) relatively low.

It would be wrong, however, to conclude that British agriculture would be necessarily more efficient if it were less mechanised. It seems likely that the "drift" of farm workers to other, better-paid occupations would have occurred even if the rate of mechanisation had been much slower. In such circumstances British farmers might have been forced to derive

an even higher proportion of their output from grassland husbandry which - as suggested in section 10 - may have a particularly low output/input ratio in Britain. As it is, not only has a large number of workers been released from the farms, but the U.K.'s present agricultural output probably requires a much lower expenditure on labour and power than it would if the horse were the main source of power on the farm. (See Appendix 9).

It should be noted here that the costs of maintenance, fuel, etc. (Table 14), are only a very imperfect measure of mechanisation, as these items include the expenditure relating to horse-drawn implements. The picture can be supplemented by the data on the density of farm tractors and horses given in Table 15.

Table 15

Number of Agricultural Tractors and Horses[a] per 1000 Adjusted Acres

| Year | | Belgium | Denmark | Netherlands | U.K. |
|---|---|---|---|---|---|
| 1953 | Tractors | 4 | 5 | 5 | 13 |
| | Horses | 51 | 46 | 42 | 8 |
| 1958 | Tractors | 9 | 11 | 12 | 14 |
| | Horses | 40 | 27 | 34 | 3 |

a) Sources: Ref. (7) and (14).

As might be expected, Britain's large number of tractors in relation to its agricultural area enables her farming to be carried on with a relatively small labour force. (Table 14). At the other extreme, Holland's relatively

high labour input is probably an effect of the intensive use of land. The large amounts of fertilisers and imported feedingstuffs used require a correspondingly large number of men to handle them; and the resulting high output per acre needs a relatively large labour force to harvest the abundant crops, milk the high-yielding cows, and so on. However, the high yields and non-labour inputs do not seem to provide a sufficient explanation of Holland's high labour input. For example, in 1957-8 the Netherlands used almost 50 per cent more labour per acre than Belgium; yet her imported feed and fertiliser inputs per acre and her output per acre were only 24, 20 and 16 per cent, respectively, greater. Part of the difference in the manpower use is probably due to Holland's having a smaller share than Belgium of low-labour enterprises, such as cereal growing, and a larger share of products with relatively high labour requirements, e.g.,milk. (See Table 13).

To some extent the inter-country differences in the "input-mix" may reflect the differences in the relative prices of the various factors of production. Thus, in both periods under review machinery was, on the whole, cheaper, and labour and fertilisers dearer in Britain than in the other three countries (Table 11); and it is probably no coincidence that machinery use (as shown by "Maintenance, Repairs, Depreciation") was highest in Britain and labour and fertiliser use lowest (Table 14). The estimated rent per acre of farm land is considerably lower in Denmark and Britain than in Belgium and the Netherlands (Table 8). (The reason for this difference is probably the greater scarcity of farm land in relation to the agricultural population and the smaller average farm size in the latter countries - see Tables 2 and 7).

It is thus logical that farming is relatively "extensive" in Denmark and Britain, as shown by the comparatively low inputs and output per 100 acres (Table 14). In other words, the quantity of land tends to be high in relation to other resources where the rent (or price) of land is relatively low. Furthermore, different agricultural products require different combinations of productive factors, so that each country's "product-mix" must affect its "input-mix". Nevertheless, even within these limitations there is scope for modifications in the traditional pattern of inputs. For example, the often advocated increase in the use of fertilizer on British grassland may result in a substitution of home-grown for imported feed. This would almost certainly reduce the cost of production of cattle and sheep products without necessarily altering the "product-mix".[13]

It must be understood that a higher aggregate output/input ratio unambiguously indicates a higher technical efficiency only when the physical amounts of all factors per unit of output are lower. If the difference in aggregate cost is partly a result of a difference in input-mix (as in the present comparison), the cost difference is influenced by the relative prices used for valuing the inputs. Hence the comparison between the four countries' output/input ratios (Table 12) is not an entirely satisfactory indication of their relative technical efficiency.

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13. Compare Reference (12), Part II, p. 128 - 131, and Reference (16).

## 12. Productivity of Labour and Land

The differences in the four countries' aggregate productivity, illustrated in Table 12, are likely to be associated with differences in the productivity of the individual factors employed. If we knew the exact magnitude of productivity of each factor in the different countries (i.e., the marginal product of each factor) and were able to estimate the effects on these productivities of changing the ratio between the factors, we should be in a good position to advise farmers and governments on the steps necessary for bringing a country's agricultural productivity and incomes up to the level of the more efficient producers. For those farms in Denmark, Britain and Ireland whose accounts are analysed by agricultural economists this kind of study was carried out by Rasmussen (62,63). The aggregate data used in the present study do not lend themselves to this type of analysis. What can be measured from these data is not marginal product but an altogether different concept, namely, "productivity" in the sense of average output per unit of factor employed. Table 16 presents a comparison in index form of average output per unit of two of the most important factors of production: land and labour. The indices of output/labour ratios are given in two forms: (1) output per man-year and (2) output per person occupied in agriculture, to indicate the possible extent of error in the man-year calculation.

Table 16

Indices of output at standard prices (U.K. = 100)

(2 - year averages)

| Price System | | Belgium | | Denmark | | Netherlands | | U.K. | |
|---|---|---|---|---|---|---|---|---|---|
| | | 1953-4 | 1957-8 | 1953-4 | 1957-8 | 1953-4 | 1957-8 | 1953-4 | 1957-8 |
| Danish 1953 | Output per man-year | 143 | 139 | 113 | 117 | 103 | 110 | 100 | 100 |
| | " per person | 101 | 95 | 90 | 90 | 71 | 75 | 100 | 100 |
| | " per adj.acre | 232 | 243 | 156 | 158 | 255 | 281 | 100 | 100 |
| U.K. 1958-9 | Output per man-year | | 152 | | 115 | | 123 | | 100 |
| | " per person | | 104 | | 88 | | 83 | | 100 |
| | " per adj.acre | | 265 | | 155 | | 313 | | 100 |
| Milk at actual prices, other at U.K. 1958-9 | Output per man-year | | 145 | | 97 | | 107 | | 100 |
| | " per person | | 100 | | 74 | | 72 | | 100 |
| | " per adj.acre | | 254 | | 130 | | 273 | | 100 |

Note These results are given in £ in Appendix 10.

As regards output per man-year, the only striking conclusions from the table which survives under all three price systems is the comparatively high figure for Belgium. The fact that output per man-year in Belgium is higher

than in Holland may be partly due to the already mentioned difference in the product-mix. Also, Belgium's output per acre is so much higher than Denmark's or Britain's that it is bound to favour a greater economy of labour used in those operations which do not vary greatly with size of output (e.g. cultivations). This part of the labour input may be considered a fixed cost whose average amount per unit of output falls as output rises. Hence, the larger the total output, the larger will be the amount of output per unit of this "fixed" labour. With a fixed acreage, there will, therefore, be a tendency for average productivity of labour to increase as output per acre rises, though this tendency may be counteracted by diminishing returns to that labour which varies directly with output (e.g. harvesting labour).

The difference between the output per man-year in Britain on the one hand and Denmark and Holland on the other is relatively small, with Denmark's figure being actually lower than Britain's under one of the price systems used for the calculations. Yet this is a disappointing result for Britain when we consider the comparatively large amounts of other resources used in British farming in relation to manpower. (Table 17).

Table 17

Total Main Inputs at Standard Prices [a] per Man-year (2-year averages)

| Price System | Period | Belgium | Denmark | Netherlands | U.K. |
|---|---|---|---|---|---|
| | | £ | £ | £ | £ |
| Danish 1953 | 1953-4 | 376 | 284 | 261 | 506 |
| | 1957-8 | 427 | 393 | 338 | 660 |
| U.K. 1958-9 | 1957-8 | 397 | 375 | 305 | 618 |

a) Exclusive of labour.

It seems obvious that the main reason for Britain's relatively low output per man-year is her low output per acre, just as Belgium's high output per acre helps to raise that country's output per man-year.

These conclusions on productivity of labour must be taken with the proverbial grain of salt because of the very different relative position with regard to output per person occupied in agriculture. Here British figures are higher than Dutch and Danish in all cases and very close to the Belgian figures. Were the manpower data more complete, output per man-year would be the appropriate measure of the average productivity of labour. In the present unsatisfactory state of the labour data the discrepancy between the two sets of indices (i.e. output per man-year and output per person) may, however, be partly due to errors of estimation. It is therefore best to suspend judgment on the relative productivity of labour until more complete information is available.

As to the productivity of land, this can be measured in more detail than in Table 16 by crop yields per acre. Table 18 shows a long-term tendency for almost all crop yields in the three continental countries to be higher than in the U.K. While this may be partly due to natural advantages, such as climate, it seems likely that the relatively low fertiliser usage in Britain is one of the reasons for the comparatively low yields. It is probably not a coincidence that the order of the four countries with regard to output per acre (i.e. Netherlands, Belgium, Denmark, U.K., in descending order) is the same as their ranking for the amount of fertiliser per acre (Table 14).

Table 18

Indices of Yield per Acre (U.K. in each period = 100). Period Averages

Periods: 1 - 1920-4; 2 - 1948-52; 3 - 1957-8

| | Belgium | | Denmark | | | Netherlands | |
|---|---|---|---|---|---|---|---|
| Period: | 2 | 3 | 1 | 2 | 3 | 2 | 3 |
| Wheat | 118 | 113 | 130 | 134 | 125 | 134 | 121 |
| Rye | 125 | 121 | ---- | 114 | 108 | 125 | 122 |
| Barley | 118 | 118 | 126 | 137 | 125 | 133 | 138 |
| Oats | 122 | 131 | 105 | 139 | 138 | 129 | 136 |
| Sugar Beet | 135 | 123 | ---- | 123 | 119 | 156 | 153 |
| Potatoes | 124 | 142 | 92 | 101 | 113 | ---- | 162 |

Notes: ---- = no data available. The U.K. data for 1920-4 exclude Northern Ireland. Sources: (14, 17)

Before artificial fertilisers reached their present importance it was suggested that Denmark's relatively high crop yield was due to the large amounts of dung which the soil received from the dense livestock population (Ref. 17). It is therefore interesting to note that not only Denmark, but also - and to a greater extent - Belgium and Holland have had a greater number of livestock units per acre of agricultural area than Britain and that the relative figures have changed very little over the years. (Table 19).

Table 19

Indices of Livestock Density (Period Averages). U.K. = 100

| Description of Index | Years | Belgium | Denmark | Netherlands |
|---|---|---|---|---|
| Livestock Units per Acre of Crops and Grass | 1920-4[a] | b | 129 | b |
| " " per adjusted acre | 1953-4 | 149 | 129 | 141 |
| " " " " " | 1956-9 | 147[c] | 130 | 149 |

Notes: a England = 100 (No data for U.K.)
b No data
c Includes Luxemburg

Sources: (8,14,17,19)

Productivity of land used for livestock feeding cannot be measured as easily as crop yield per acre, but there are indications that Britain lags much further behind the three continental countries in this respect than in crop yields (12). This is, of course, a further reason for Britain's comparatively low total output per acre.

## PART III. AN OVERALL VIEW

### 13. Competitive Position and Farmers' Income Prospects

How far do the results presented in this paper help us to assess British agriculture's place in Europe? Let us first consider the competitive position and assume, for the sake of argument, that Britain becomes subject to the same level of factor and product prices as Belgium, Denmark and the Netherlands. It is evident from Table 12 that in such a situation the percentage profit on farmer's expenditure is likely to be lower, on the average, in Britain than in the other three countries. Indeed, a fall in product prices that would leave many British farmers without any profit might simply reduce the relatively high profit margin of the other.

Exact figures cannot be given for these hypothetical profit margins, because my calculation of inputs at standard prices leaves out certain items, e.g.,seeds, lime, etc., for which I had incomplete information. Some impression of the competitive position may, however, be gained when the ratios between total main inputs and total output (both at standard prices) are presented in index form, since the relation between the different countries' ratios is likely to be similar to the relation between their hypothetical costs of production under a unified price system. In Table 21 these indices are given together with indices of actual cost (i.e. total input at actual prices) per unit of output at standard prices. The second set of indices corresponds to a situation

in which there is a free market for farm products without any harmonisation of input prices; in other words, these are aggregate indices of unit costs of production actually prevailing in the four countries, with Britain's cost taken as 100.

TABLE 21

Indices of Cost of Producing £100 worth of output valued at Danish 1953 prices (U.K. = 100). 2-year averages

| Price system for valuing inputs | Years | Belgium | Denmark | Netherlands | U.K. |
|---|---|---|---|---|---|
| Danish 1953 prices | 1953-4 | 56 | 62 | 65 | 100 |
| | 1957-8 | 52 | 59 | 58 | 100 |
| Actual prices | 1953-4 | 66 | 53 | 65 | 100 |
| | 1957-8 | 62 | 48 | 65 | 100 |

N.B. "Cost" includes farmers' labour. The labour charge is based on the "man-year" method.

Assuming a unified price system for both inputs and output, Belgium would have been in the strongest competitive position in both periods, whilst Holland's improvement in physical productivity would have raised her from the third place in 1953-4 to the second in 1957-8. However, Denmark, with relatively low input prices (Table 11), had the lowest actual costs of production in both periods.

Britain comes badly out of both comparisons, with her production costs considerably higher than in any of the other countries, mainly because of

the relatively low productivity of resources. As a result, British agriculture is in a much weaker position than the agriculture of Belgium, Denmark or Holland to survive in its present form if prices received by farmers for their products fall significantly below their present level. Although the larger farms may continue in existence indefinitely with a low profit margin per acre, small farmers - of whom there are many in Britain despite the relatively large <u>average</u> size of farms - would find that the low profit per acre reduced their actual income to an intolerably low level. Furthermore, at price levels so low that receipts do not cover the cash expenditure necessary for production, no farmer, whether large or small, can carry on for long. As Table 22 shows, this would have been in fact the position of British agriculture in 1957 and 1958 if product prices had been at the Danish 1953 level, whereas the Belgian, Danish and Dutch farmers would have received a substantial surplus over and above that expenditure. (This assumes that factor prices, the quantities and composition of inputs and output, and physical productivity would have remained at their actual level.)

Table 22

Hypothetical Net Income of Agriculture under a system of standard product prices

| | | Belgium | | Denmark | | Netherlands | | U.K. | |
|---|---|---|---|---|---|---|---|---|---|
| | | 1957 | 1958 | 1957 | 1958 | 1957 | 1958 | 1957 | 1958 |
| | | £m | £m | £m | £m | £m | £m | £m | £m |
| (A) | Total Annual Cost at Actual Prices [a] (at current exchange rates) | 206 | 214 | 202 | 214 | 356 | 379 | 1108 | 1162 |
| (B) | Total Annual Output at Danish 1953 prices | 322 | 347 | 390 | 405 | 501 | 534 | 989 | 1020 |
| | Hypothetical Annual Net Income of Agriculture (B - A) | 116 | 133 | 188 | 191 | 145 | 155 | -119 | -142 |
| | | £ | £ | £ | £ | £ | £ | £ | £ |
| | Per Farm | 487 | 573 | 926 | 946 | 523 | 560 | -235 | -287 |

Note: a) Exclusive of interest and farmers' labour (see section 2).

In fact, of course, there is no immediate prospect of farm product prices in Britain falling to the low level envisaged in the table; and the physical productivity of British agriculture may well have increased since 1958, thus making a negative net income unlikely even if prices fell considerably. It should also be remembered that the relatively large home market for liquid milk is likely to make the British farmers' competitive position better than would appear from the table, because the average price of British milk is likely to be above the European average even in an entirely free market.

Despite these reservations, the fact remains that British agriculture has only been able to provide farmers with average incomes reasonably close to those prevailing in Belgium, Denmark and Holland (see Table 1) and farm workers - with comparatively high wages (Table 8), because of the relatively high level of product prices received by British farmers (Table 10). Closer integration of the economies of Western Europe does not necessarily mean that U.K. agricultural income would fall, provided the farm price level is set at or near the British level, but - because of their relatively high production costs (Table 21) - British farmers' incomes are likely to be well below those in the three other countries. A reduction in the present level of product prices, unless accompanied by a proportional fall in the prices of inputs, is likely to hit U.K. farmers more severely on the whole, than Belgian, Dutch or Danish farmers because of the higher average costs of production. However, a detailed study of the comparative unit costs of different agricultural products may well reveal that British costs are relatively low in certain branches of farming, and that in some sectors British producers may be better equipped to face falling prices than their continental counterparts.

## 14. Summary and Conclusions

As indicated at the beginning, and emphasised in the text and in the appendices to this report, the measurement of relative productivities between countries is a difficult and lengthy process. There is the general problem of ensuring that we are comparing like with like in terms of the quantities and qualities of products and inputs and the prices assigned to them. In this context, probably the two greatest weaknesses of these calculations are the absence of any satisfactory measure of the relative quality of land and uncertainty about the quantities of labour used.

Although the acreage of agricultural land in Britain has been adjusted to take account of the high proportion of hilly areas and rough grazings, the problem of comparability has not been satisfactorily overcome. The higher productivity per acre of land shown for the three continental countries may thus be, in part, merely a reflection of the better land in those countries. Calculations of land productivity in terms of output per £100 of rent would have shown a very different ranking between Belgium and the Netherlands but not between Britain and Denmark. Rent, however, is also an unsatisfactory measure, in that contract rents (either actual or notional), which are the only measures available, may bear little or no relationship to the economic worth of agricultural land, since they are affected by institutional and other influences and subject to long lags.

With regard to the labour productivity measurements, little can be done to improve them until better statistics are available of the use

of manpower in agriculture. In this respect, the British data are considerably better than in some of the continental countries, where family labour forms a higher proportion of total labour input. In all countries, however, there is a large measure of uncertainty about the amount of work done by farmers themselves outside their farms. In these circumstances the best that can be done is to offer calculations on more than one basis, as has been done in the present report.

Despite these difficulties and uncertainties, however, some of the findings of this analysis must stand. Whatever refinements may become possible as a result of better data, they are unlikely to invalidate the conclusions that between 1953 and 1958 the income and purchasing power of the 'average farmer' in Denmark were superior to those enjoyed by the average British, Belgian or Dutch farmer.

Income is closely related to productivity. The productivity of resources used depends in part upon the efficiency of the technical processes used in given lines of production and there are indications of a higher level of technology within the agriculture of the three continental countries than in Britain itself. This has been accepted for a long time with respect to Danish agriculture but it is obvious from this analysis that in many respects the agriculture of the Netherlands and Belgium is technically equally efficient. It would appear that British farmers have a good deal to learn from Belgian and Netherlands farmers on the efficiency of operating an intensive small-scale agriculture. A disquieting feature of the comparisons made is

the fact that, during the middle 1950's, British agriculture seems to have made little or no gain in efficiency (measured in terms of output per unit input at Danish 1953 prices; see Table 12) at a time when our continental neighbours were improving theirs at a fairly rapid rate. In terms of the future, and particularly in the event of close economic integration of Britain and Europe, any differential gains in efficiency in favour of the continental countries must seriously affect the competitive position of British farmers and, in consequence, their level of income.

One feature common to all the four countries during the period under review was the rapid expansion of agricultural output, which was particularly marked in the Netherlands. In an industry like agriculture, carrying a large proportion of fixed costs, expansion of output will usually lead to greater physical productivity of total resources used. But, since the expansion of output takes place against the background of a more slowly rising demand for agricultural products, the tendency is for prices to fall in real terms and for farm incomes to suffer. Intensification of agricultural production, while it may lead to greater physical productivity, is not therefore the answer to the agricultural problems of the four countries under review. However, if we could spread the overhead costs of each farm over a greater output without at the same time unduly increasing the aggregate output of agriculture, the pressures on prices and on farm incomes would be considerably alleviated. This could only be done by reducing the number of farms, thus allowing each to produce more without increasing aggregate output. In the light of what has been ascertained about the relative productivity of resources between the

four countries, the relative income of the average British farm would today be much more unfavourable than it is, were it not for the fact that the average British farmer has more land at his command than is the case in the three continental countries. This relative advantage may, however, be completely wiped out if British farmers' product prices fall to, say, the Danish level, without a corresponding reduction in costs. As shown in Table 22, British farmers' income might then fall far below that in the other countries. A faster rate of decrease in the number of holdings through amalgamation is, therefore, even more vital to the British farmers than to some of their continental neighbours. The problem is not easy but it is being seriously discussed on the Continent, and programmes of farm amalgamation are being actually put into effect in some countries (e.g., Sweden). (64). Action along these lines, together with a vigorous application of those cost-saving methods which do not depend on an increase in the country's agricultural output, seems to be urgently needed in Britain if the relative prosperity of farmers is to be maintained.

## APPENDICES

Note: Individual entries in the tables do not always add up to the totals entered because of rounding.

1. Adjusted Acreage

The data on the total agricultural area were obtained from References (7) and (14).

It was felt that U.K. hills and rough grazings are the only well-defined categories of agricultural land with an obviously lower productive potential than the rest; only an insignificant proportion of the other countries' farm land falls within these categories. Only the U.K. area has, therefore, been "adjusted". The following method was used.

Outputs per acre of hills and of lowlands were calculated from data published by Davidson and Wibberley (21). Nash's estimates (22) were considered inapplicable, as he included uplands in the "hill" area (23). It was assumed that an acre of rough grazings is equivalent to a quarter of an acre of "crops and grass". As a result, the following scale has been used:

| | | | |
|---|---|---|---|
| Crops and Grass: | 1 acre of lowlands | = | 1.00 adjusted acre |
| | 1 " " hills | = | 0.22 " " |
| Rough Grazings: | 1 " " lowlands | = | 0.25 " " |
| | 1 " " hills | = | 0.055 " " |

Davidson and Wibberley (21) estimate that hills occupy 7.61 per cent of Crops and Grass, and 71.80 per cent of Rough Grazings in Great Britain.

I applied these proportions to the U.K. as a whole. The resulting estimates are compared with total acreage (exclusive of land out of use because of flooding) in the following table, which also gives the other three countries' total agricultural area.

| Year: | 1953 | 1954 | 1957 | 1958 |
|---|---|---|---|---|
| U.K. | | | | |
| (1) Actual area: | | (1000 acres) | | |
| Crops & Grass: Hills | 2364 | 2364 | 2361 | 2359 |
| Lowlands | 28695 | 28713 | 28665 | 28642 |
| Rough Grazings: Hills | 12114 | 12114 | 12082 | 12115 |
| Lowlands | 4758 | 4758 | 4745 | 4758 |
| Total | 47931 | 47949 | 47853 | 47874 |
| (2) Adjusted area: | | (1000 adjusted acres) | | |
| Crops & Grass: Hills | 520 | 520 | 519 | 519 |
| Lowlands | 28695 | 28713 | 28665 | 28642 |
| Rough Grazings: Hills | 666 | 666 | 665 | 666 |
| Lowlands | 1190 | 1190 | 1186 | 1190 |
| U.K. Total | 31071 | 31089 | 31035 | 31017 |
| | | (1000 acres) | | |
| Belgium | 4337 | 4305 | 4245 | 4255 |
| Denmark | 7732 | 7695 | 7747 | 7781 |
| Netherlands | 5703 | 5730 | 5698 | 5693 |

2. Number of Farms

Basis of Estimates

(N.B. Where no information was available on year-to-year changes, the same figure was applied to two years).

Belgium: Number of agricultural and horticultural holdings of all sizes: Ref. (3).

Denmark: Number of agricultural holdings: Ref. (10). (It was assumed that these include holdings which are partly horticultural). Number of purely horticultural holdings: Ref. (4).

Netherlands:

Number of agricultural and horticultural holdings excluding field crop holdings under 1 hectare and livestock holdings producing for household consumption only. The figure from the 1950 World Census (Ref. 24) was applied to the years 1953 and 1954. The 1957-8 estimate was obtained by assuming that the total number of holdings had fallen in the same proportion as the number of farms of 1 hectare and over. (Ref. 6).

U.K.: Number of agricultural and horticultural holdings over 1 acre: Ref.(7).

Estimated Number of Farms

| Year | Belgium | Denmark | Netherlands | U.K. |
|---|---|---|---|---|
| 1953 | 263629 | 206186 | 282119 | 534924 |
| 1954 | 263629 | 205521 | 282119 | 534924 |
| 1957 | 238514 | 202935 | 276609 | 506269 |
| 1958 | 232152 | 201906 | 276609 | 495198 |

N.B. (1) In Northern Ireland holdings of 1 acre are included.

(2) The number of holdings in the U.K. in 1954 was, in fact, 525, 125, but this figure was not available when the results per farm were being calculated for the present bulletin.

3. Net Farm Income per 100 adjusted acres.

Sources: (3, 4, 6 - 11, 18, 25 - 39).

General Notes: Wherever possible, purchases by farmers of feed, seeds and plants produced by home agriculture are excluded from outputs and inputs. Output includes subsidies.

Denmark: Unlike most previously published statistics, Danish data here include horticulture.

U.K.: The total Net Income figures for the U.K. from which these results were calculated differ from the figures published in the U.K. Annual Abstract of Statistics (29) mainly because I did not include "other credits' in Output, or "interest" in cost. These items are not recorded in the other countries' available statistics; their exclusion, therefore, increases comparability. On the basis of the Annual Abstract figures, U.K. Net Income per 100 adjusted acres is:

| Year | 1953/4 | 1954/5 | 1957/8 | 1958/9 |
|---|---|---|---|---|
| £ | 1073 | 959 | 1154 | 1017 |

Net Farm Income per 100 adjusted acres (£ at current exchange rates)

| Years: | Belgium 1953 £ | Belgium 1954 £ | Denmark 1953 £ | Denmark 1954 £ | Netherlands 1953 £ | Netherlands 1954 £ | U.K. 1953/4 £ | U.K. 1954/5 £ |
|---|---|---|---|---|---|---|---|---|
| Imported Feed, Seeds & Plants[a] | 1075 | 1214 | 396[b] | 595[b] | 1260 | 1405 | 827 | 980 |
| Imported Animals | c | c | c | c | c | c | 123 | 139 |
| Fertilisers | 499 | 545 | 240 | 230 | 479 | 483 | 210 | 212 |
| Maintenance & Repairs (excl. buildings) | 96[d] | 95[d] | 264 | 279 | 147[d] | 151[d] | 169 | 176 |
| Depreciation (excl. buildings) | 365 | 395 | | | 270 | 273 | 206 | 207 |
| Fuel & Lubricants | 72[d] | 82[d] | 312 | 329 | 116 | 118 | 187 | 180 |
| Miscellaneous[e] | 421[d] | 407[d] | | | 344 | 368 | 245 | 256 |
| Total External Inputs | 2528 | 2738 | 1212 | 1433 | 2616 | 2798 | 1967 | 2150 |
| Rent[f] | 790 | 809 | 172 | 185 | 460 | 479 | 190 | 197 |
| Wages[g] | 863 | 877 | 913 | 920 | 1669 | 1874 | 885 | 886 |
| Total Cost | 4181 | 4424 | 2297 | 2538 | 4745 | 5151 | 3042 | 3233 |
| Total Output | 7348 | 7581 | 4652[b] | 4619[b] | 6699 | 7263 | 4078[h] | 4122[h] |
| Net Farm Income | 3167 | 3157 | 2355 | 2081 | 1954 | 2112 | 1036 | 889 |

| Years: | 1957 £ | 1958 £ | 1957 £ | 1958 £ | 1957 £ | 1958 £ | 1957/8 £ | 1958/9 £ |
|---|---|---|---|---|---|---|---|---|
| Imported Feed, Seeds & Plants[a] | 1337 | 1523 | 464[b] | 599[b] | 1839 | 1874 | 930 | 1042 |
| Imported Animals | c | c | c | c | c | c | 213 | 193 |
| Fertilisers | 577 | 497 | 284 | 276 | 511 | 526 | 301 | 297 |
| Maintenance & Repairs (excl. buildings) | 98[d] | 96[d] | 324 | 448 | 233[d] | 250[d] | 205 | 211 |
| Depreciation (excl. buildings) | 413 | 427 | | | 322 | 338 | 237 | 248 |
| Fuel and Lubricants | 98[d] | 87[d] | 409 | 345 | 165 | 166 | 163 | 166 |
| Miscellaneous[e] | 473[d] | 497[d] | | | 417 | 433 | 338 | 358 |
| Total External Inputs | 2996 | 3127 | 1481 | 1668 | 3487 | 3587 | 2387 | 2515 |
| Rent[f] | 882 | 900 | 216 | 211 | 579 | 586 | 203 | 211 |
| Wages[g] | 986 | 1007 | 900 | 880 | 2184 | 2489 | 980 | 1020 |
| Total Cost | 4864 | 5034 | 2597 | 2759 | 6250 | 6662 | 3570 | 3746 |
| Total Output | 8499 | 8459 | 4926[b] | 4841[b] | 9050 | 9421 | 4727[h] | 4741[h] |
| Net Farm Income | 3635 | 3425 | 2329 | 2082 | 2800 | 2759 | 1157 | 995 |

See notes on p. 64.

Footnotes to table on p. 63

a Includes the following feeds derived from home agriculture: industrial by-products, milling offals, and meat and bone meal. Also included are handling charges and merchants' margins on home-produced seed, feed and livestock. In the Netherlands, the value of home-grown ingredients of compound feeds is included. For the U.K., the author's estimate of the value of home-grown feed was deducted from the feed totals.

b Home-grown horticultural seeds, bulbs and plants purchased by Danish growers are included in the cost of seeds and in the output. In the Danish output, meat and milk are valued after processing in slaughter-houses and dairies.

c Deducted in calculating output.

d Author's estimates. For Belgium, the total of these items equals the official total of "general overhead expenses".

e In Belgium and the Netherlands, includes indirect taxes. In Denmark, includes materials used in dairies and slaughter-houses.

f Includes estimated costs of maintenance and depreciation of buildings, land taxes, rates and owner-occupiers' notional rent. For Denmark, "rent" was estimated on the basis of Danish land prices (Ref. 12 p.133, Appendix Table F) and of the other three countries' average ratio of rent to land price.

g The estimated number of persons engaged in agriculture (exclusive of farmers) (Ref. 3, 5, 6, 7, 10, 14, 42, 43, 44, 61) was multiplied by the estimated average earnings (Ref. 3, 25, 4, 10, 36, 41). The resulting estimates of total "wages" are compared below with the official estimates used by each country's authorities in the farm income computations.

| Total "Wages" | | (£ million) | | | |
|---|---|---|---|---|---|
| | Year: | 1953 | 1954 | 1957 | 1958 |
| Belgium | Estimated | 37 | 38 | 42 | 43 |
| | Official | 19 | 19 | 20 | 20 |
| Denmark | Estimated | 51 | 53 | 49 | 48 |
| | Official | 71 | 71 | 70 | 68 |
| Netherlands | Estimated | 95 | 107 | 124 | 142 |
| | Official | 49 | 51 | 60 | 66 |
| U.K. | Estimated | 175 | 180 | 194 | 196 |
| | Official | 275 | 276 | 304 | 316 |

Unless there had been a large expenditure on casual labour, one would have expected all the estimates to be higher than the official figures which are meant to exclude the wife's labour in the U.K. and all unpaid family labour in the other countries. Obviously my estimates for Denmark and the U.K. are too low; in the absence of any other relevant information I have therefore used the "official" figures for these two countries, although complete comparability might require the addition of an imputed charge for any unpaid labour in Denmark and for wives' labour in the U.K.

h Excludes the author's estimate of the value of home-grown feed.

4. Labour

General: One man-year is the equivalent of the annual labour of an adult male.

Belgium: (Ref. 3 and 25). Employees' total earnings = e. Other labour is assumed to be equivalent to all farmers' full-time farm work; thus unpaid family labour on the farm is assumed to compensate for the farm occupiers' absence from the farm when engaged in other work. Ratio of Number of Farmers to Total Number of persons engaged in agriculture, forestry and fishing = 0.543 (in 1947)

Total Number of persons engaged in agriculture etc. = n.
Therefore, the estimated number of farmers each year = 0.543n = f.
Average annual earnings of adult males = w.
Hence, estimated labour cost exclusive of employees = fw.
Number of man-years = $(e + fw) \div w$.

Denmark: Man-years ("helårbejdere") in Danish statistics are not adjusted for sex or age. My attempts at adjustment give mutually inconsistent figures. Results seem more reasonable if the official data are taken as estimates of adjusted man-years; this has been done in the present study, on the assumption that the downward adjustment for sex and age is

cancelled by an addition for overtime, special skills, etc.

The total number of man-years in agriculture is given in Ref. (10). The total number of man-years in horticulture in 1953 and 1954 has been calculated from Ref. (4); the 1957 and 1958 totals are estimates based on the 1954 man-year data and the indices of horticultural output (1954 = 100).

The average annual earnings of adult males have been estimated from Ref. (10); when multiplied by the total number of man-years they give the Total Labour Cost (including farmers' labour income).

Netherlands: Earnings per man year: Ref. (36). Man-years for the years 1953, 1957 and 1958: Ref. (6) and (40). Man-years for 1954: my estimate.

U.K.: Earnings per man-year (Ref. 41) = w. Number of man-years, excluding farmers and their wives = Total Wages (from Appendix 3) divided by w.

The number of man-years of farmers and their wives has been estimated in the following manner:

Ratios of the number of farmers to all employers and self-employed persons in agriculture, forestry and fishing were calculated from Ref.(42). These ratios were applied to data from Ref. (43) to estimate the number of farmers in Northern Ireland in 1951. This estimate was added to the number of farmers in Great Britain (Ref. 42 and 44) to obtain the 1951

estimate for the U.K. The ratio of this figure to the total number of agricultural holdings (from Ref. 7) is 0.728; this ratio has been used to estimate the number of farmers' and wives' man-years from the number of holdings in each year. The ratio (0.728) does not include the wives; hut it may be noted that the total amount of agricultural work done by farmers' wives in the U.K. is not likely to be greater than the total number of hours by which the annual farm labour of those farmers who have other part-time jobs (or who occupy very small holdings) falls short of full-time farm work. (Compare Ref. 45).

Estimated number of man-years in agriculture

| Year | Belgium | Denmark | Netherlands | U.K. |
|---|---|---|---|---|
| | | 1000 man-years | | |
| 1953 | 245 | 376 | 496 | 1110 |
| 1954 | 244 | 367 | 487 | 1055 |
| 1957 | 235 | 334 | 459 | 987 |
| 1958 | 234 | 327 | 459 | 973 |

Estimated number of persons in agricultural occupations (Ref. 3. 5-7.10.14.42-44.61) (excl. fisheries & forestry)

| Year | Belgium | Denmark | Netherlands | U.K. |
|---|---|---|---|---|
| | | 1000 persons | | |
| 1953 | 350 | 470 | 711 | 1102 |
| 1954 | 347 | 464 | 720 | 1065 |
| 1957 | 337 | 428 | 662 | 981 |
| 1958 | 336 | 418 | 673 | 950 |

5. Net Product

The Net Product calculation is a simple extension of the Net Income calculation which is described in Appendix 3; Net Product being the difference between Total Output and Total External Inputs.

Estimates of the distribution of the Net Product between the different types of income have been made by reference to the Net Income and Labour calculations (See Appendices 3 and 4). These estimates are given in the table which follows.

"Profit and Interest" is the name given to the residual income which is not further sub-divided in the table because of the lack of satisfactory data.

The other terms are defined in Appendices 3 and 4.

## Estimated Formation and Distribution of Total Net Product of Agriculture

(£ million at current exchange rates)

| | Years: | Belgium | | Denmark | | Netherlands | | U.K. | |
|---|---|---|---|---|---|---|---|---|---|
| | | 1953 £m | 1954 £m | 1953 £m | 1954 £m | 1953 £m | 1954 £m | 1953/4 £m | 1954/5 £m |
| Total Output | | 319 | 326 | 360 | 355 | 382 | 416 | 1267 | 1281 |
| Total External Inputs | | 110 | 118 | 94 | 110 | 149 | 160 | 611 | 668 |
| Net Product | | 209 | 208 | 266 | 245 | 233 | 256 | 656 | 613 |
| Rent | | 34 | 35 | 13 | 14 | 26 | 27 | 59 | 61 |
| Wages | | 37 | 38 | 71 | 71 | 95 | 107 | 275 | 275 |
| Farmers' labour | | 55 | 56 | 42 | 46 | 58 | 59 | 149 | 157 |
| Total Labour | | 93 | 93 | 113 | 117 | 154 | 167 | 424 | 432 |
| Profit and Interest | | 82 | 80 | 140 | 114 | 53 | 62 | 173 | 120 |
| | Years: | 1957 £m | 1958 £m | 1957 £m | 1958 £m | 1957 £m | 1958 £m | 1957/8 £m | 1958/9 £m |
| Total Output | | 361 | 360 | 382 | 377 | 516 | 536 | 1467 | 1470 |
| Total External Inputs | | 127 | 133 | 115 | 130 | 199 | 204 | 741 | 780 |
| Net Product | | 234 | 227 | 267 | 247 | 317 | 332 | 726 | 690 |
| Rent | | 38 | 38 | 17 | 16 | 33 | 33 | 63 | 65 |
| Wages | | 42 | 43 | 70 | 68 | 124 | 142 | 304 | 317 |
| Farmers' Labour | | 61 | 63 | 43 | 46 | 75 | 81 | 181 | 186 |
| Total Labour | | 103 | 106 | 113 | 114 | 200 | 222 | 485 | 503 |
| Profit and Interest | | 93 | 83 | 137 | 117 | 84 | 77 | 178 | 122 |

6. Milk Utilisation

| | Belgium | | Denmark | | Netherlands | | U.K. | |
|---|---|---|---|---|---|---|---|---|
| | 1954 galls. | 1958 galls. | 1954 galls. | 1958 galls. | 1954 galls. | 1958 galls. | 1954/5 galls. | 1958/ galls |
| Total Milk Production per person | 89 | 88 | 262 | 242 | 119 | 118 | 45 | 46 |
| Liquid Human Consumption per person | 22[a] | c | 26[b] | 28 | 41[b] | 36 | 32 | 31 |
| | % | % | % | % | % | % | % | % |
| Liquid Human Consumption as percentage of total production | 25[a] | c | 10[b] | 12 | 35[b] | 31 | 71 | 69 |

[a]Includes milk used in the production of cheese and of tinned and dried milk.

[b]Includes producers' use of farm-made milk products for human consumption.

[c]Not available.

Sources: (6, 10, 14, 25, 27, 31)

7. Inputs at Standard Prices

Method

(a) Inputs at Danish 1953 prices

Imported Feed 1. 1953 and 1954

The quantities of different feeds used in 1953 and 1954 had been estimated by the author for a previous paper (12) on the basis of Ref. (10, 14, 25, 27, 29, 36 and 46).

The 1953 import prices in the U.K. could be calculated in detail from Ref. (46). The few details of Danish prices available to the author (Ref. 10) pointed to the conclusion that, although there were small differences in the prices of

individual items, the total value of imported feed would be fairly similar whether calculated at Danish or British 1953 prices. British 1953 prices were therefore used for convenience in estimating the value of imported feed in 1953 and 1954.

2. 1957 and 1958

The 1957 and 1958 feed inputs at standard 1953 prices were estimated in the following manner:

(1) For Belgium, the quantities of the different feeds given in Ref. (3) were multiplied by the U.K. 1953 import prices.

(2) For Denmark, Netherlands and U.K. the quantitative data are not available in sufficient detail. Therefore imported feed at standard 1953 prices was estimated by the formula $\frac{100\ a\ c}{b\ d}$, where :

a is the total value at actual prices of "Imported Feed, Seeds, Bulbs and Plants" in 1957 or 1958 (see Appendix 3)

b is the corresponding item in 1953.

c is the 1953 total Imported Feed at standard prices;

and d is the aggregate index of feed prices in 1957 or 1958 (U.K. 1953 price = 100) estimated from individual prices given in Ref. (6, 10, 35, 46) weighted by the 1953 quantities (Ref. 12).

Imported Animals

This item was calculated by using a cattle price index (See Appendix 8).

Fertilisers

Quantities: Ref. (14).

Danish 1953 prices: Ref. (47).

Maintenance, Repairs and Depreciation (excluding buildings)

is estimated to equal $\frac{100e}{f}$, where e is the total of Maintenance, Repairs and Depreciation at actual prices (see Appendix 3); and f is a composite price index (Danish 1953 prices = 100) estimated from prices of different items of equipment weighted by the current numbers of each item. (Source: Ref. 3, 6, 7, 10, 35, 40, 48-54).

Fuel and Lubricants

Actual cost was converted to standard prices by the use of a price index (Danish 1953 prices = 100) estimated by the following method

Some of the sources just mentioned (under Maintenance etc.) give the prices of different types of tractor fuel and enable separate estimates to be made of the number of petrol, T.V.O. and diesel tractors in each country in the relevant years.

An estimate of the percentage quantities of the different fuels was made on the basis of these estimates of tractor numbers, and of the standard fuel requirements given in Ref. (55 & 56). The fuel prices were weighted by these percentages to obtain an "average" fuel price for each country in each year. Then price index, for example, for the U.K. in 1957 is: - $\frac{100 \times \text{U.K. 1957 average price}}{\text{Danish 1953 average price.}}$

Miscellaneous actual costs were converted to standard prices by the use of an index equal to the simple average of the "Maintenance etc." and "Fuel" price indices.

Labour cost at standard prices is the number of man-years multiplied by the Danish 1953 annual earnings per adult male. (See Appendix 4). The alternative estimates in Table 12 of the main text are based on the number of persons (Appendix 4) multiplied by the average Danish wage per person in 1953 (£240).

Rent is Danish 1953 estimated rent per acre (see Appendix 3) times number of acres (adjusted acres in U.K.; see Appendix 1).

(b) Inputs at U.K. 1958-59 Prices

These results were calculated from the inputs valued at Danish 1953 prices, using the various price indices described in section (a) above.

Estimated Inputs at Danish 1953 Prices (£ million at current exchange rates)

| | Belgium | | Denmark | | Netherlands | | U.K. | |
|---|---|---|---|---|---|---|---|---|
| | 1953 | 1954 | 1953 | 1954 | 1953 | 1954 | 1953/4 | 1954/5 |
| Imported Feed | 33 | 42 | 25 | 33 | 46 | 62 | 159 | 185 |
| Imported Animals | deducted from output | | | | | | 38 | 43 |
| Fertilisers | 18 | 17 | 17 | 16 | 27 | 27 | 49 | 48 |
| Fuel and Lubricants | 3 | 3 | incl.in Misc. | | 5 | 6 | 54 | 53 |
| Maintenance, Repairs and Depreciation (excl.buildings) | 13 | 14 | 20 | 21 | 18 | 19 | 140 | 137 |
| Miscellaneous | 13 | 13 | 24 | 27 | 13 | 14 | 80 | 84 |
| MAIN EXTERNAL INPUTS: TOTAL | 80 | 89 | 86 | 97 | 109 | 128 | 520 | 550 |
| Rent | 7 | 7 | 13 | 13 | 10 | 10 | 53 | 53 |
| Labour (incl. farmers' labour) | 73 | 73 | 113 | 110 | 149 | 146 | 333 | 316 |
| MAIN INPUTS: TOTAL | 160 | 169 | 212 | 220 | 268 | 284 | 906 | 919 |
| | 1957 | 1958 | 1957 | 1958 | 1957 | 1958 | 1957/8 | 1958/9 |
| Imported Feed | 41 | 43 | 33 | 50 | 67 | 74 | 203 | 253 |
| Imported Animals | deducted from output | | | | | | 56 | 50 |
| Fertilisers | 19 | 18 | 19 | 20 | 29 | 29 | 58 | 62 |
| Fuel and Lubricants | 3 | 4 | incl.in Misc. | | 7 | 8 | 45 | 52 |
| Maintenance, Repairs and Depreciation (excl.buildings) | 14 | 14 | 22 | 30 | 22 | 23 | 152 | 145 |
| Miscellaneous | 14 | 16 | 32 | 28 | 16 | 17 | 105 | 112 |
| MAIN EXTERNAL INPUTS: TOTAL | 91 | 95 | 106 | 128 | 141 | 151 | 619 | 674 |
| Rent | 7 | 7 | 13 | 13 | 10 | 10 | 53 | 53 |
| Labour (incl. farmers' labour) | 71 | 70 | 100 | 98 | 138 | 138 | 296 | 292 |
| MAIN INPUTS: TOTAL | 169 | 172 | 219 | 239 | 288 | 298 | 968 | 1019 |

N.B. The following items are excluded because of the difficulty of conversion to standard prices:
a) imported seeds, bulbs and plants
b) lime
c) handling charges and merchants' margins on seed and feed.

8. Output at Standard Prices

Method

(a) Output at Danish 1953 Prices

The prices received by farmers of each country for field crops and livestock products were ascertained or estimated from References (3, 6, 10, 18, 25-27, 31, 36). Indices (Danish 1953 price = 100) calculated from these prices were used to convert each country's output of these products to Danish 1953 prices.

Information is not available for estimating the price of each horticultural product in the four countries. Existing price data (References 6, 7, 10, 18, 25, 31) were used, however, to estimate aggregate indices (Danish 1953 price = 100) for the three broad groups of horticultural products, i.e. vegetables, fruit, and other (mainly flowers, bulbs and seeds). These indices were used to convert each country's horticultural output to Danish 1953 prices.

(b) Output at U.K. 1958-59 Prices

These results were calculated from the output valued at Danish 1953 prices, using the price indices described in section (a) above.

Estimated Output at Danish 1953 Prices (£ million at current exchange rates)

(N.B. .. = less than £500,000)

| | Belgium | | Denmark | | Netherlands | | U.K. | |
|---|---|---|---|---|---|---|---|---|
| | 1953 | 1954 | 1953 | 1954 | 1953 | 1954 | 1953/4 | 1954/5 |
| Grain | 17 | 18 | 20 | 9 | 20 | 22 | 83 | 71 |
| Sugar Beet | 9 | 8 | 9 | 6 | 11 | 11 | 19 | 17 |
| Potatoes | 12 | 13 | 8 | 5 | 16 | 29 | 46 | 44 |
| Other Field Crops | 5 | 7 | 6 | 6 | 15 | 21 | 9 | 8 |
| TOTAL FIELD CROPS | 44 | 46 | 43 | 26 | 62 | 83 | 157 | 140 |
| Vegetables (exc. potatoes) | 33 | 46 | 8 | 7 | 33 | 36 | 44 | 39 |
| Fruit | 21 | 24 | 4 | 5 | 27 | 27 | 21 | 23 |
| Other Horticultural Crops | 8 | 11 | 9 | 8 | 30 | 32 | 12 | 12 |
| TOTAL HORTICULTURE | 62 | 81 | 21 | 20 | 90 | 94 | 77 | 74 |
| Cattle | 39 | 44 | 45 | 48 | 45 | 48 | 163 | 203 |
| Sheep | 1 | 1 | .. | .. | 2 | 2 | 45 | 46 |
| Horses | 2 | 3 | 3 | 3 | 2 | 3 | incl.in other L'st. Prod. | |
| Milk | 60 | 60 | 101 | 101 | 105 | 101 | 186 | 185 |
| Wool | .. | .. | .. | .. | incl.in other L'st. Prod. | | 16 | 17 |
| Pigs | 43 | 42 | 108 | 118 | 66 | 69 | 135 | 172 |
| Poultry | 5 | 5 | 7 | 7 | 6 | 9 | 27 | 32 |
| Eggs | 25 | 29 | 27 | 28 | 32 | 41 | 83 | 84 |
| Other Livestock Products | .. | .. | .. | .. | 1 | 1 | 1 | 1 |
| TOTAL LIVESTOCK PRODUCTS | 175 | 184 | 291 | 306 | 259 | 274 | 655 | 740 |
| Sundry Output | - | - | - | - | - | - | 10 | 6 |
| Valuation change | 2 | 2 | 5 | 1 | - | 2 | 5 | -19 |
| TOTAL AGRICULTURAL OUTPUT | 283 | 312 | 360 | 354 | 411 | 454 | 904 | 941 |

Estimated Output at Danish 1953 Prices (£ million at current exchange rates) cont.

| | Belgium | | Denmark | | Netherlands | | U.K. | |
|---|---|---|---|---|---|---|---|---|
| | 1957 | 1958 | 1957 | 1958 | 1957 | 1958 | 1957/8 | 1958/9 |
| Grain | 23 | 22 | 11 | 17 | 22 | 23 | 61 | 55 |
| Sugar Beet | 9 | 11 | 11 | 12 | 11 | 16 | 17 | 21 |
| Potatoes | 12 | 14 | 6 | 7 | 24 | 27 | 32 | 34 |
| Other Field Crops | 6 | 5 | 4 | 4 | 17 | 15 | 7 | 8 |
| TOTAL FIELD CROPS | 50 | 52 | 32 | 40 | 74 | 81 | 117 | 118 |
| Vegetables (excl. potatoes) | 51 | 51 | 8 | 9 | 42 | 45 | 33 | 36 |
| Fruit | 12 | 20 | 4 | 5 | 14 | 24 | 21 | 22 |
| Other Horticultural Crops | 10 | 13 | 11 | 11 | 27 | 38 | 9 | 11 |
| TOTAL HORTICULTURE | 73 | 84 | 23 | 25 | 83 | 107 | 63 | 69 |
| Cattle | 42 | 48 | 67 | 71 | 50 | 50 | 206 | 191 |
| Sheep | 1 | 1 | incl.in other L'st. Prod. | | 2 | 3 | 48 | 48 |
| Horses | 2 | 2 | 2 | 2 | 2 | 1 | incl.in other L'st.Prod. | |
| Milk | 61 | 61 | 101 | 97 | 131 | 129 | 204 | 191 |
| Wool | .. | .. | incl.in other L'st. Prod. | | incl.in other L'st. Prod. | | 17 | 18 |
| Pigs | 48 | 48 | 128 | 130 | 84 | 78 | 152 | 165 |
| Poultry | 9 | 17 | 6 | 10 | 17 | 19 | 52 | 67 |
| Eggs | 32 | 32 | 28 | 31 | 48 | 54 | 106 | 119 |
| Other Livestock Products | .. | .. | 1 | .. | 3 | 3 | 2 | 2 |
| TOTAL LIVESTOCK PRODUCTS | 195 | 209 | 333 | 341 | 337 | 337 | 787 | 801 |
| Sundry Output | - | - | - | - | - | - | 17 | 18 |
| Valuation change | 4 | 3 | 2 | -1 | 7 | 9 | 4 | 14 |
| TOTAL AGRICULTURAL OUTPUT | 321 | 347 | 390 | 405 | 501 | 534 | 989 | 1020 |

9. An Estimate of Cost-saving by Mechanisation

One of the main differences between the British and continental farming methods is the relatively much greater number of tractors in the U.K. It is well known that farming requires less manpower when tractors replace horses. One may wonder, however, whether the saving on labour and on horse maintenance is larger than the additional expenditure, i.e. the depreciation of tractor-drawn implements and the costs of tractor maintenance and operation.

An investigation into the comparative cost of using tractors and horses on British farms was carried out by Dexter in 1953. His paper (57) gives data on annual fixed costs per horse and per tractor and hourly variable costs of horses and tractors. I used these data to estimate the total U.K. agricultural power cost at 1953 prices in two years, 1946/7 and 1953/4, between which the number of tractors rose from 181,000 to 460,000, while the number of horses fell from 585,000 to 212,000 (Reference 7). My method is as follows.

Two studies (58,59) provide data on the average annual number of hours per tractor on different types of farms. From these I estimated that in 1946/7 U.K. farm tractors worked, on the average, 861 hours each, and in 1953/4, 810 hours each - the reduction in the number of hours being due to the contraction in the arable acreage.

Between 1946/7 and 1953/4 there were, on the average, three tractors added to the total number for every four horses lost from the total. In absence of better data I assumed this to indicate that three tractors did, on the average, the same amount of work as four horses.

Assuming that it takes a horse, on the average, three hours to do the work which a tractor can do in an hour, the annual number of horse-hours per 4 horses is three times the annual number of tractor-hours per 3 tractors. These assumptions enable us, therefore, to estimate the total number of tractor-hours and horse-hours in the U.K. during the two years in question. Dexter's results can then be used to estimate the total annual cost of tractor and horse power in farming (at 1953 prices).

Total U.K. labour cost (excluding the labour of farmers and their wives) for 1953/4 is given in Reference (29). From this and from the ratio between the total number of farm workers in the two years (Reference 7) it is possible to estimate the labour cost in 1946/7 at 1953 prices.

The estimated total cost of labour and power in U.K. farming can thus be assessed as follows :

| Year : | 1946/7 | 1953/4 |
|---|---|---|
| | £ million (at 1953 prices) | |
| Cost of Tractor Power | 28.8 | 70.1 |
| Cost of Horse Power | 51.0 | 17.9 |
| Cost of Labour (excl.farmers and wives) | 324.8 | 275.0 |
| Power and Labour Total | 404.6 | 363.0 |

Thus, assuming constant prices, there was an estimated reduction of £41.6 million in the annual cost of labour and power during this period of rapid mechanisation. Yet this was also a period of rising output. From Reference (27) we can estimate that "net output" rose by £214.6 million

(at 1953 prices) from £711.8 million in 1946/7 to £926.4 million in 1953/4. These results indicate a reduction of £17.6 in the power and labour cost per £100 net output (all at 1953 prices) (from £56.8 to £39.2).

In other words, if the 1953/4 net output had been produced by the 1946/7 methods, it would have cost £163 million more than it actually did (i.e. $17.6 \times \frac{926.4}{100}$). Though part of this saving may be due to a shift towards enterprises requiring less labour and power in relation to output, and to increased crop yields per acre, it seems likely that most of the saving can be attributed to mechanisation.

10. Output at Standard Prices per Man-Year, per Person and per 100 Adjusted Acres. (Sources: see Appendices 1,4 and 8). (2-year averages)

| Price System | Description | Belgium | | Denmark | | Netherlands | | U.K. | |
|---|---|---|---|---|---|---|---|---|---|
| | | 1953/4 | 1957/8 | 1953/4 | 1957/8 | 1953/4 | 1957/8 | 1953/4 | 1957/8 |
| | | £ at current exchange rates | | | | | | | |
| Danish 1953 | Output per man-year | 1219 | 1425 | 961 | 1203 | 880 | 1127 | 852 | 1025 |
| | Output per person in agric. occup. | 855 | 992 | 764 | 939 | 604 | 775 | 851 | 1040 |
| | Output per 100 adj. acres | 6892 | 7858 | 4625 | 5118 | 7562 | 9085 | 2967 | 3237 |
| U.K. 1958-9 | Output per man-year | | 2142 | | 1621 | | 1732 | | 1410 |
| | Output per person in agric. occup. | | 1492 | | 1266 | | 1191 | | 1431 |
| | Output per 100 adj. acres | | 11815 | | 6896 | | 13956 | | 4454 |
| Milk at current prices, other at U.K. 1958-9 prices | Output per man-year | | 2040 | | 1355 | | 1501 | | 1404 |
| | Output per person in agric. occup. | | 1421 | | 1058 | | 1032 | | 1425 |
| | Output per 100 adj. acres | | 11248 | | 5765 | | 12098 | | 4435 |

11. Comparisons of Financial Results Based on Farm Surveys, 1958/9

(Estimated from References 9, 35 and 60 on the basis of current prices and exchange rates)

(N.B. No "farming-type" classification is used in the Danish reports).

A. Mainly medium-sized farms.

| Type of Farm | England<br>Mixed with mixed crops & livestock. | Denmark<br>Various |
|---|---|---|
| Region | South east | Various |
| | acres | acres |
| Size range | 150-250 | 123.6-247.1 |
| Average size | 190.5 | 164.1 |
| | No. | No. |
| No. of Farms | 13 | 89 |
| Composition of Output | % | % |
| Cattle | 11.8 | 14.6 |
| Sheep and Wool | 6.3 | incl.in"Other L'st.". |
| Pigs | 9.0 | 32.0 |
| Poultry and Eggs | 9.9 | 3.9 |
| Milk | 41.8 | 25.4 |
| Other Livestock | - | 0.3 |
| Total Livestock | 78.8 | 76.2 |
| Crops | 17.3 | 23.8 |
| Sundries | 3.9 | - |
| Total | 100.0 | 100.0 |
| | £ per 100 acres | |
| Output | 4561 | 4693 |
| Input | 4086 | 4242 |
| Interest and Profit | 475 | 451 |
| Add Farmer's and Wife's Labour | 153 | 504 |
| Net Farm Income | 628 | 955 |
| Other Family Labour | not avail. | 67 |

B. Small Farms

| | England | Denmark | |
|---|---|---|---|
| Type of Farm | Mixed with substantial dairying. | Various | |
| Region | Bucks., Oxfords., South Essex, Berks., Sussex. | Various | |
| | | Acres | Acres |
| Size range | 50-100 acres | 49.4-74.1 | 74.2-123.5 |
| Average size | 79 acres | 61.0 | 92.7 |
| No. of Farms | 26 | 169 | 159 |
| | £ | £ | £ |
| Net Farm Income per 100 acres (including farmer's and wife's labour income) | 809 | 1387 | 1185 |
| Other Family Labour | not available | 259 | 155 |

Note: In the English publications quoted, Net Farm Income includes the reward for any farm work done by the farmer's wife. The Danish sources include the wife's reward with the charge for family labour. For the sake of comparability I included half of this charge in Net Farm Income as representing the wife's estimated share.

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