Swine - Cost of production



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The survey was begun by L. B. Wishart who left the department before it was completed. The survey was then continued by R. F. Ridgeon who is in charge of the Cambridge Pig Management Scheme and completed with the collaboration of the present writer. The authors are indebted to Mr G. B. Aneuryn Evans and Dr R. C. Campbell for comments on the statistical aspects of this study.

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# Contents

CHAPTER 1

# Introduction

## THE PURPOSE OF THE INVESTIGATION

For many years Danish and Dutch farmers have been praised by writers in this country for their technical efficiency, and the British farmer has been advised to follow their example. The success of the Danish farmer in capturing the English bacon market certainly seems to confirm the impression of his efficiency. But even if the Danes and the Dutch are more efficient, could the British farmer follow their lead? And if he did so, would his costs necessarily be as low as those of the Dutch and the Danes? These are the questions which will be considered in this report.

There are in fact three different questions to answer. The first is a purely factual one and is to ascertain whether the costs of production are lower in these countries than here. If so, the second question is to ascertain the reasons for these lower costs. It should also be possible to estimate the contribution that each factor is likely to make to the total. The third question is to consider the extent to which it is feasible or desirable to try to copy the Danish or Dutch methods here. The last question is in some ways the most important of all, because there is no point in scolding the British farmer and telling him that in future "he must do better". One must go a stage further and suggest which factors can be improved in this country and if so, by what means.

There is a further point that if Danish or Dutch costs are lower than our own, this is not necessarily the fault of the individual farmer. Indeed, some of the causes may be beyond his control. If food costs per score deadweight are too high, it may, for example, be due to poor stockmanship, to poorly insulated buildings, to expensive food ingredients or to the use of inferior breeding stock. The first of these could be remedied by the farmer, the second by the landlord (if the farmer is a tenant), the third by the government in its price policy, and the fourth jointly by the farmer, the breeder and the testing station.

The need to show the relative importance of the different causes of high costs is thus worth emphasis. There has sometimes been a tendency in the past to advocate one remedy such as progeny testing and to expect that it alone will prove a panacea. In fact, as will be seen, the differences in costs between England and Denmark are attributable not to one but to six or seven quite separate causes. It thus follows that unless all or most of these are remedied, the gap in efficiency will remain and the British pig industry will continue to compete inadequately and unsuccessfully against imports.

It should also be realised that some differences in cost may be due to natural advantages possessed by one country and not by the other. The availability of by-products such as skim milk or of cheap family labour with no other outlet are good examples. Indeed, it is such natural advantages that give rise to regional specialisation in the production of agricultural commodities. It is thus of interest to consider whether such advantages are large and permanent or small and transitory. In the former case, it might be in the national interest to relinquish part of the market to imports from favoured regions and concentrate on other products for which we have an advantage. In the latter case it should, on the contrary, be possible to tighten efficiency and build up competitive production in this country.

Few attempts have been made in the past to compare costs of production in different countries and when this is attempted there are a number of difficulties to be overcome. Apart from the obvious one of different currencies and price levels, the conventions used in collecting data and compiling costs are not the same in other countries. Every effort has been made, however, to make the information comparable.

## THE BACKGROUND

The aim of this report is to compare pig production in England, Denmark and Holland. Before doing so, it is of interest to consider briefly the size of the British market for pigs and the way in which it is supplied. The consumption of pork and bacon is shown in Table 1.

**Table 1. Consumption of Pigmeat in the United Kingdom (lb per head per year)**

| | *Pork* | *Bacon* |
|---|---|---|
| 1934–8 .. .. .. | 10·6 | 28·1 |
| 1957 .. .. .. | 17·3 | 24·7 |
| 1960 .. .. .. | 19·4 | 25·0 |
| 1963 .. .. .. | 21·9 | 25·2 |
| 1964 .. .. .. | 22·9 | 25·3 |
| 1965 .. .. .. | 25·8 | 25·9 |

*Source: Commonwealth Economic Committee (C.E.C.) Meat Review*

Before the war, the British public consumed 28·1 lb of bacon per head per year. Since the war, consumption has been running at about 25 lb—slightly below the pre-war level—and showing little sign of increase. The consumption of pork on the other hand has increased to two-and-a-half times the pre-war level (from 10·6 lb to 25·8 lb in 1965) and is now almost the same as for bacon.

It is of interest to note that the total consumption of pigmeat in this country (47 lb in 1963) is less than in Denmark (65 lb), Western Germany (69 lb), United States (65 lb), Sweden (57 lb), the Irish Republic (53 lb), or Canada (51 lb). It is about the same as in France (48 lb) and Belgium (47 lb). If we adopted the food habits of the Americans or the Scandinavians there would be scope for increased consumption of pigmeat in Britain—probably as pork. It should, however, be noted that the chief pork-consuming countries consume much less lamb and mutton than we do in Britain.

The amount of pigmeat imported and home-produced is shown in Table 2. It will be seen that the pork market is almost entirely supplied by home production which has expanded steadily to fulfil a growing demand. Before the war, home production accounted for 35 per cent of our bacon supplies, and this proportion has not greatly changed for many years. By 1960, the

**Table 2. Supplies of Pigmeat in the United Kingdom (thousand tons)**

| | Pork | | | Bacon | | |
|---|---|---|---|---|---|---|
| | *Home-Produced* | *Imported* | *Total* | *Home-Produced* | *Imported* | *Total* |
| 1934–8.. .. | 178 | 38 | 216 | 196 | 371 | 567 |
| 1957 .. .. | 385 | 22 | 407 | 212 | 331 | 543 |
| 1960 .. .. | 441 | 22 | 463 | 180 | 404 | 584 |
| 1963 .. .. | 522 | 6 | 528 | 217 | 383 | 600 |
| 1964 .. .. | 557 | 1 | 558 | 219 | 390 | 609 |
| 1965 .. .. | 628 | 17 | 645 | 232 | 395 | 627 |

*Source: CEC Meat Review*

proportion had fallen to only 31 per cent. Since then the figure has risen to 37 per cent but the home market producer shows little sign of capturing a major share of this market.

**Table 3. Imports of Bacon into the United Kingdom (thousand tons)**

| | *Denmark* | *Holland* | *Poland* | *Others* | *Total* |
|---|---|---|---|---|---|
| 1938 .. .. | 169·5 | 25·7 | 22·8 | 125·4 | 343·4 |
| 1954 .. .. | 212·9 | 26·3 | 43·4 | 17·2 | 299·8 |
| 1960 .. .. | 282·1 | 34·7 | 47·1 | 41·5 | 405·4 |
| 1963 .. .. | 286·5 | 8·6 | 50·6 | 39·2 | 384·9 |
| 1965 .. .. | 299·6 | 6·2 | 50·9 | 40·5 | 397·2 |

*Source: CEC Meat Review*

The chief sources of imports are shown in Table 3. It will be seen that over the years quite large changes have taken place in the amounts received from different countries. To stabilise the situation, therefore, the U.K. Government agreed with supplying countries to apportion the bacon market as from 1964–5 (Table 4). It will be seen that Denmark dominates the bacon market and has been given a larger share than the British producer. Of other suppliers, only

**Table 4. Supply Quotas of Bacon Production and Imports (thousand tons)**

| | 1964–5 | 1966–7 |
|---|---|---|
| United Kingdom .. | 222·4 | 233·2 |
| Denmark .. .. | 286·5 | 300·5 |
| Poland .. .. | 48·5 | 50·9 |
| Irish Republic .. .. | 27·0 | 27·0 |
| Netherlands .. .. | 13·0 | 5·0 |
| Sweden .. .. | 10·3 | 11·0 |
| Yugoslavia .. .. | 5·0 | 1·5 |
| Hungary .. .. | 2·3 | 2·4 |
| | 615·0 | 631·5 |

Poland, the Irish Republic and Sweden are now of any significance. Holland is losing the small share of the market she formerly possessed as her exports become increasingly channelled towards other Common Market countries. If Britain joined the E.E.C., however, Holland could again become an important supplier.

The success of the Danish producers in capturing the British market lies in the fact that they have taken pains to supply bacon with a flavour that the housewife has come to like and in a form that the retailer finds easy to handle. This is reflected in the fact that Danish bacon commands top prices in the British market (Table 5).

**Table 5. Bacon Prices (London Provision Exchange) (average annual price per cwt)**

| | *British No. 1* | | *Danish 'A' selection* | | *Dutch 'A' selection* | | *Polish 'A' selection* | |
|---|---|---|---|---|---|---|---|---|
| | *s* | *d* | *s* | *d* | *s* | *d* | *s* | *d* |
| 1961 .. .. | 251 | 1 | 262 | 4 | 250 | 3 | 247 | 2 |
| 1962 .. .. | 249 | 10 | 259 | 2 | 232 | 0 | 230 | 11 |
| 1963 .. .. | 274 | 7 | 278 | 5 | 263 | 7 | 259 | 3 |
| 1964 .. .. | 292 | 10 | 298 | 0 | 275 | 0 | 275 | 0 |
| 1965 .. .. | 278 | 3 | 282 | 8 | 257 | 4 | 259 | 8 |

British prices are delivered, foreign bacon prices are ex-quay.
*Source: CEC Meat Review*

The number of pigs kept in the three countries covered by this report is shown in Table 6.

**Table 6. Pig Population ('000s)**

| | *U.K.* | *Denmark* | *Holland* |
|---|---|---|---|
| 1957 | 5,974 | 5,409 | 2,529 |
| 1960 | 5,724 | 6,147 | 2,955 |
| 1963 | 6,859 | 7,353 | 2,923 |
| 1964 | 7,379 | 8,021 | 3,268 |
| 1965 | 7,979 | 8,624 | 3,752 |
| Increase 1957–65 | 34% | 59% | 48% |

The pig population in Denmark is about the same as in the United Kingdom. The numbers in Holland are rather less than half. In all three countries, the pig herd has been expanding in recent years, but rather more rapidly in Denmark and Holland than in the United Kingdom.

## THE METHODS USED

Costs of production in agriculture are often difficult to ascertain with any degree of precision. Different crops, for example, share the same implements and the same labour force and the allocation of costs between them may at best be somewhat arbitrary. In the case of the pig enterprise, however, the problem is somewhat simpler because it can be isolated from the rest of the farm without undue difficulty. By far the largest cost is for feeding stuffs, and these are not difficult to value. If they are purchased, the price paid is the cost. If they are home grown, they are usually cereals which could be sold and this sale price is the one that should be charged to the pigs. When this is done, the profit shown by the pigs represents the value that the pigs have added to the grain they have consumed. In fact the pigs become an alternative method of marketing grain.

Pigs also differ from most other farm enterprises in using hardly any land. They can therefore be added as a supplementary enterprise to a farm without necessarily displacing any other crop or livestock. It is thus possible to calculate the added profit due to the presence of this enterprise on a mixed farm without undue difficulty.

There are, however, some minor difficulties in costing pigs. Labour may have to be shared with other enterprises when the pig enterprise is not large enough to provide a full-time occupation for a pigman. There is also the question of valuing family labour. In all three countries, it was valued at current wage rates for hired labour. It is also customary to allocate a share of overhead costs or a nominal rental value for buildings already in existence when a pig herd is started. Such values may be arbitrary but as they contribute only a minor share of the total this item is not usually of much significance.

The main source of data used in this report has been the costing schemes operated in the countries concerned. For England, the Cambridge Pig Management Scheme has been used. This scheme, which has been in operation since 1936 and includes 70 herds, provides more data over a longer continuous period than is available elsewhere in Britain.

For Denmark, information was obtained from the Landøkonomiske Driftsbureau which assembles farm records from the bookkeeping societies. A proportion of these contain extra information to permit the preparation of pig enterprise costings. Data was obtained from 133 farms.

For Holland, information was obtained from the Landbouw Economisch Instituut about 122 farms carrying pig herds.

There were unfortunately a number of differences in the methods of recording and presenting the results. To measure the efficiency of breeding and fattening separately, food consumed by the sows and litters should be recorded separately from the fattening herd. This is done in the Cambridge Scheme and also in Holland, where gilts are also separated from the sows. No such division was made in the Danish scheme. Because of these differences in recording, it was necessary to visit Copenhagen and The Hague to re-analyse and adapt the original records. Overall results were obtained for each of these schemes for most of the post-war period. In addition, the individual results for 1961–2 were analysed in detail to discover the range of results. This is important when comparing the competitive position of two countries. If Danish costs are on average less than ours, it is of interest to see what proportion of English producers already have costs as low as theirs. This extra analysis was a time-consuming task but was accomplished reasonably satisfactorily.

It is also customary in Denmark and Holland (but not in England) to make allowances for management and interest, but not unfortunately on the same basis. To make the results comparable therefore these items were discarded.

It will be seen from Table 7 that most of the English and Danish herds included both breeding

**Table 7. Number of Pig Herds included in this survey**

| | *England* | *Denmark* | *Holland* |
|---|---|---|---|
| Breeding and fattening .. | 58 | 104 | 56 |
| Breeding only .. .. .. | 1 | 6 | 33 |
| Fattening only.. .. .. | 11 | 23 | 33 |
| | 70 | 133 | 122 |

and fattening. In Holland, where herds are smaller, a larger proportion specialised either in breeding or fattening. The herd sizes are shown in Table 8. The English herds (averaging 47 sows) were much larger—indeed nearly 40 per cent had 50 or more sows. The sample did, however, include a range from 5 to 210 sows. The Danish herds averaged 14 sows (ranging from 2 to 62): nearly 60 per cent of them had less than 10 sows and only 3 per cent had more than 50 sows. The Dutch herds that averaged only 6 sows (ranging from 1 to 21 sows) were the smallest: nearly 90 per cent had fewer than 10 sows.

**Table 8. Number of Sows in Herd**

| | *England* | | *Denmark* | | *Holland* | |
|---|---|---|---|---|---|---|
| Average .. .. .. | 47 | | 14 | | 6 | |
| Maximum .. .. .. | 210 | | 62 | | 21 | |
| Minimum .. .. .. | 5 | | 2 | | 1 | |
| Range: | No. | % | No. | % | No. | % |
| 0– 9 .. .. .. | 4 | 7 | 59 | 53 | 79 | 89 |
| 10–19 .. .. .. | 5 | 8 | 24 | 22 | 9 | 10 |
| 20–29 .. .. .. | 9 | 15 | 19 | 17 | 1 | 1 |
| 30–39 .. .. .. | 10 | 17 | 4 | 4 | – | – |
| 40–49 .. .. .. | 8 | 14 | 1 | 1 | – | – |
| 50–59 .. .. .. | 11 | 19 | 2 | 2 | – | – |
| 60–69 .. .. .. | 4 | 7 | 1 | 1 | – | – |
| 70–79 .. .. .. | 2 | 3 | – | – | – | – |
| 80–89 .. .. .. | 2 | 3 | – | – | – | – |
| 90–99 .. .. .. | 1 | 2 | – | – | – | – |
| 100 and over .. .. | 3 | 5 | – | – | – | – |
| | 59 | 100 | 110 | 100 | 89 | 100 |

It is thus obvious that in Denmark and Holland the pig herd is usually a part-time occupation for family labour. In the Cambridge scheme, two-thirds of the herds contained 30 or more sows, which is generally a full-time occupation for one pigman.

Ideally, such a survey should be based on a random sample. Membership of a costings scheme does, however, entail the keeping of fairly detailed records over long periods. Many farmers are not prepared to do this, particularly those that "dabble" in pig keeping from time to time. For this reason it has not yet been possible to obtain a large enough response to a random sample to make this method workable. It follows therefore that the members of costings schemes are farmers that take pigs seriously and are prepared to keep records.

This raises the question as to whether members of costings schemes can be used to represent pig production in these three countries. So far as England and Denmark are concerned the use of such data in this report can be justified as follows:

(*a*) As described in the next chapter, one key efficiency factor (weaners produced per sow) was calculated independently from census data and compared with the results of the costings schemes. The two estimates were closely similar in each country. If the farms costed are "average" in one important factor, it seems plausible to believe that they are reasonably typical in other factors.

(*b*) Some efficiency standards, such as food conversion rate, can be derived only from fairly accurate records—an error of 5 per cent (or 0·2 in the conversion rate) would be too large. It is thus difficult to obtain such information except from experimental farms (which are unrepresentative in other ways) or from the records of a costings scheme of the type used here.

(*c*) The two costings schemes are very similarly organised and present as representative a cross section of commercial producers as can be induced to keep records. In this respect, therefore, one is comparing like with like in the two countries.

In Holland, it is stated that the pig herds included are "operating efficiently". It is difficult to know how much weight to put on this phrase. If they wish to compile slightly above average standards with which producers can compare their results, this is a reasonable aim. This does, however, to some extent detract from the value of the comparison with the other two countries that have no such aim. As will be shown later, the average technical efficiency of the Dutch herds is high. Nevertheless, the range in results from best to worst is quite as great as in Denmark or England—a fact that does not suggest that the organisers have in practice been able to eliminate the "inefficient tail" that one expects in any normally distributed sample. This point will, however, be referred to again.

CHAPTER 2

# Denmark

## LONG TERM TRENDS 1953 TO 1965

The costs of production per score (20 lb) deadweight in England and Denmark are shown in Table 9 and Figure 1. The results in the table are given for 1953 and for 3-year averages up to 1965. It will be seen that in England costs per score have fallen from 45*s* 11*d* in 1953 to 37*s* 7*d* for 1963–5. By far the largest item of cost is that of food which per score fell from 38*s* 6*d* to 30*s* 4*d*. Such a change in costs could be due to one of two factors: a fall in the cost per cwt

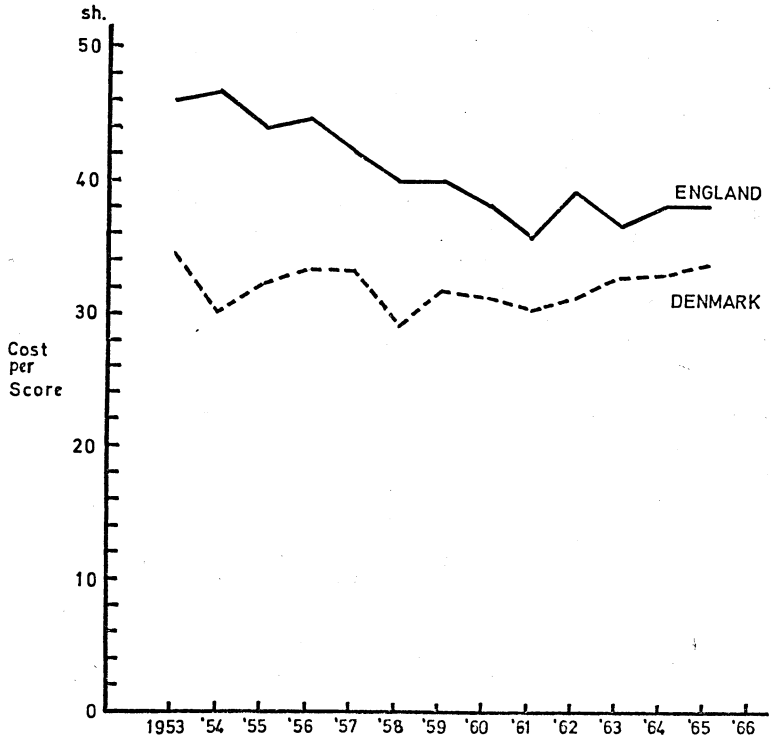


**Figure 1. Costs of production per score (20 lb): England v. Denmark**
(*Cambridge and Danish Costings Schemes*)

or an improvement in the utilisation of food. As can be seen from the foot of the table, both factors have contributed. Food costs have dropped from 33*s* 7*d* to 27*s* 10*d* per cwt, and the food conversion rate (including both breeding and fattening stock) has fallen from 5·13 in 1953 to 4·42 in 1963–5. It will also be seen that the cost of labour has declined from 4*s* 5*d* to 3*s* 10*d*. Other costs have not greatly changed.

Receipts during this period declined even more steeply than costs (from 56*s* 11*d* to 42*s* 10*d* per score) and in consequence the profit margin has shrunk from 11*s* to 5*s* 3*d* per score.

**Table 9. Costs and Returns per Score (20 lb) 1953 to 1965**

| | England | | | | | Denmark | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1953 | 1954–6 | 1957–9 | 1960–2 | 1963–5 | 1953 | 1954–6 | 1957–9 | 1960–2 | 1963–5 |
| | *s d* | *s d* | *s d* | *s d* | *s d* | *s d* | *s d* | *s d* | *s d* | *s d* |
| Food .. .. .. | 38 6 | 36 10 | 33 0 | 30 2 | 30 4 | 30 2 | 27 4 | 26 1 | 25 8 | 26 11 |
| Labour .. .. .. | 4 5 | 4 7 | 4 5 | 4 0 | 3 10 | 2 7 | 2 7 | 2 11 | 2 10 | 3 6 |
| Other costs .. .. .. | 3 0 | 3 8 | 3 4 | 3 6 | 3 5 | 1 11 | 1 11 | 2 3 | 2 5 | 2 10 |
| Total costs .. .. .. | 45 11 | 45 1 | 40 9 | 37 8 | 37 7 | 34 8 | 31 10 | 31 3 | 30 11 | 33 3 |
| Profit.. .. .. .. | 11 0 | 7 3 | 6 1 | 6 10 | 5 3 | 5 3 | 6 0 | 5 9 | 4 7 | 5 11 |
| Receipts .. .. .. | 56 11 | 52 4 | 46 10 | 44 6 | 42 10 | 39 11 | 37 10 | 37 0 | 35 6 | 39 2 |
| Weaners per litter .. .. | 7·92 | 7·90 | 7·93 | 8·02 | 8·27 | 8·34 | 8·24 | 8·24 | 8·27 | 8·32 |
| Weaners per sow per year .. | 13·30 | 13·87 | 13·83 | 13·90 | 14·73 | 15·80 | 15·90 | 15·50 | 15·70 | 15·93 |
| Food conversion rate (breeding and fattening).. | 5·13 | 4·85 | 4·63 | 4·59 | 4·42 | 4·63 | 4·64 | 4·53 | 4·31 | 4·15 |
| Food costs per cwt .. .. | 33*s* 7*d* | 31*s* 1*d* | 28*s* 6*d* | 27*s* 4*d* | 27*s* 10*d* | 27*s* 3*d* | 24*s* 8*d* | 24*s* 1*d* | 24*s* 9*d* | 27*s* 1*d* |

In Denmark the picture is somewhat different. Total costs per score have not altered greatly —from 34*s* 8*d* in 1953 to 33*s* 3*d* in 1963–5. During this period there has been some decline in food costs (from 30*s* 2*d* to 26*s* 11*d* per score) due to an improvement in the food conversion rate, but this saving has been absorbed by higher costs for labour and "other costs". Receipts declined from 39*s* 11*d* per score in 1953 to 35*s* 6*d* in 1960–2, and in consequence profit fell from 5*s* 3*d* to only 4*s* 7*d*. This very low profit led to discontent amongst Danish farmers and in 1961 a subsidy was introduced. This, together with better market prices, has raised the farmers' price to 39*s* 2*d* and the profit to 5*s* 11*d* in 1963–5.

It now remains to compare the difference in costs between the two countries (Table 10).

**Table 10. Differences in cost of production between England and Denmark**

| Per score: | 1953 | 1954–6 | 1957–9 | 1960–2 | 1963–5 |
|---|---|---|---|---|---|
| | *s d* | *s d* | *s d* | *s d* | *s d* |
| Food .. .. .. .. | 8 4 | 9 6 | 6 11 | 4 6 | 3 5 |
| Labour .. .. .. .. | 1 10 | 2 0 | 1 6 | 1 2 | 4 |
| Other costs .. .. .. | 1 1 | 1 9 | 1 1 | 1 1 | 7 |
| Total costs .. .. .. | 11 3 | 13 3 | 9 6 | 6 9 | 4 4 |
| Profit .. .. .. .. | 5 9 | 1 3 | 4 | 2 3 | — 8 |
| Receipts .. .. .. | 17 0 | 14 6 | 9 10 | 9 0 | 3 8 |
| Weaners per litter .. .. | 0·42 | 0·34 | 0·31 | 0·25 | 0·05 |
| Weaners per sow per year .. | 2·50 | 2·03 | 1·67 | 1·80 | 1·20 |
| Food conversion rate .. .. | 0·50 | 0·21 | 0·10 | 0·28 | 0·27 |
| Food cost per cwt .. .. | 6*s* 4*d* | 6*s* 5*d* | 4*s* 5*d* | 2*s* 7*d* | 9*d* |

In 1953 costs per score in England (45*s* 11*d*) were 11*s* 3*d* or 32 per cent above those of Denmark. Since then, the difference has fallen to 4*s* 4*d* per score. The farmers' receipts in 1953 (56*s* 11*d*) were 17*s* or 42·5 per cent above those of Denmark; since then the difference has fallen to 3*s* 8*d*. As a result, the difference in profits has also declined. In 1953 the British farmer had more than twice the profit of his Danish counterpart (11*s* compared with 5*s* 3*d*). By 1963–5 his profit had fallen below that of the Danish farmer (5*s* 3*d* compared with 5*s* 11*d*).

It is evident therefore that the difference in costs between the two countries has declined substantially in the past twelve years. There is, however, still a gap and costs in England appear to be 4*s* 4*d* per score or 13 per cent above those of Denmark. This is still an important difference,

for without guaranteed prices and deficiency payments provided by the Exchequer the British bacon producer could not compete against the Dane. It is thus worth examining this difference in costs in detail to find the causes and the prospects for reducing its size.

## THE COSTS COMPARED: ENGLAND v. DENMARK

An attempt has been made in Table 11 to allocate the 4*s* 4*d* to the underlying causes.

**Table 11. Causes of Higher Costs in England compared with Denmark (3 years 1963-5)**

| | *Per score pence* | % |
|---|---|---|
| Breeding stage: | | |
| (*a*) Less pigs per litter .. .. .. | 1 | 2 |
| (*b*) Less litters per sow per year .. .. | 8 | 15 |
| (*c*) More food used by breeding stock .. | 15 | 29 |
| | 24 | 46 |
| Fattening stage: | | |
| (*d*) Higher food conversion rate .. .. | 7 | 14 |
| Overall: | | |
| (*e*) Higher food cost per cwt .. .. | 10 | 19 |
| (*f*) Higher labour costs .. .. .. | 4 | 8 |
| (*g*) Higher overhead costs .. .. .. | 7 | 13 |
| | 52 | 100 |

It will be appreciated that such an allocation is to some extent a matter of judgment.* The factors quoted, moreover, are not entirely independent and a change in one factor can sometimes influence another. Nonetheless, Table 11 does indicate the order of magnitude of the factors influencing cost of production. Of the 46 per cent due to breeding efficiency, 17 per cent is due to the number of young pigs produced and 29 per cent to food rationing. Of the other factors, 14 per cent is due to food conversion at the fattening stage and 19 per cent to higher food costs. These first five items, accounting for 79 per cent, all influence the cost of food per 1 lb of pigmeat produced. Two items, labour and overheads, account for the remaining 21 per cent of the total.

To put the matter in another form, the first four items, (*a*) to (*d*), which represent the technical efficiency of breeding and fattening, account for 60 per cent of the difference in costs between England and Denmark. The remaining 40 per cent are mainly economic—food purchase, labour and overhead costs.

## EFFICIENCY IN BREEDING

The breeding stage of pig production comprises the sows, the boar and the young pigs until they are transferred to the fattening herd at about eight weeks of age. Most of the cost at this stage is the upkeep of the sow, which consumes about 26 cwt. of food a year, and most of it is necessary whether the sow produces ten or twenty pigs a year. As can be seen from Table 12, fixed costs per sow amount to £60 with a variable cost of 20*s* per weaner. Thus the more young pigs a sow produces, the less the cost of sow upkeep per weaner. As can be seen, the cost per

**Table 12. Cost of producing a weaner**

| | | | | |
|---|---|---|---|---|
| Number of pigs per sow per year .. .. | 12 | 14 | 16 | 18 |
| Fixed cost per sow* .. .. .. .. | £60 | £60 | £60 | £60 |
| Costs per weaner: | | | | |
| Share of sow costs.. .. .. .. | 100*s* | 86*s* | 75*s* | 67*s* |
| Creep feed, extra food per sow, vet, etc. .. | 20*s* | 20*s* | 20*s* | 20*s* |
| Total cost per weaner .. .. .. | 120*s* | 106*s* | 95*s* | 87*s* |

* Includes food for sows and boars, stock depreciation, labour and other costs.

* See Appendix for details.

weaner falls from 120*s* when the sow produces 12 weaners down to 87*s* when she produces 18. This factor has an important bearing on profitability. If the profit per fat pig is £2 then quite a modest increase from 14 to 16 pigs per sow would increase the profit by more than 25 per cent.

It is thus of interest to compare the number of weaners per sow per year in the two countries. In Denmark it was possible to estimate this factor from the agricultural census.* Rather surprisingly, this factor is not published as part of their costings scheme. It was, however, calculated for the year 1962 as part of this investigation. The number of pigs per sow was 15·5—the same figure as that obtained from the census. For England, two sources of information are available, the Cambridge costings scheme and the agricultural census. Details are given in Figure 2. It

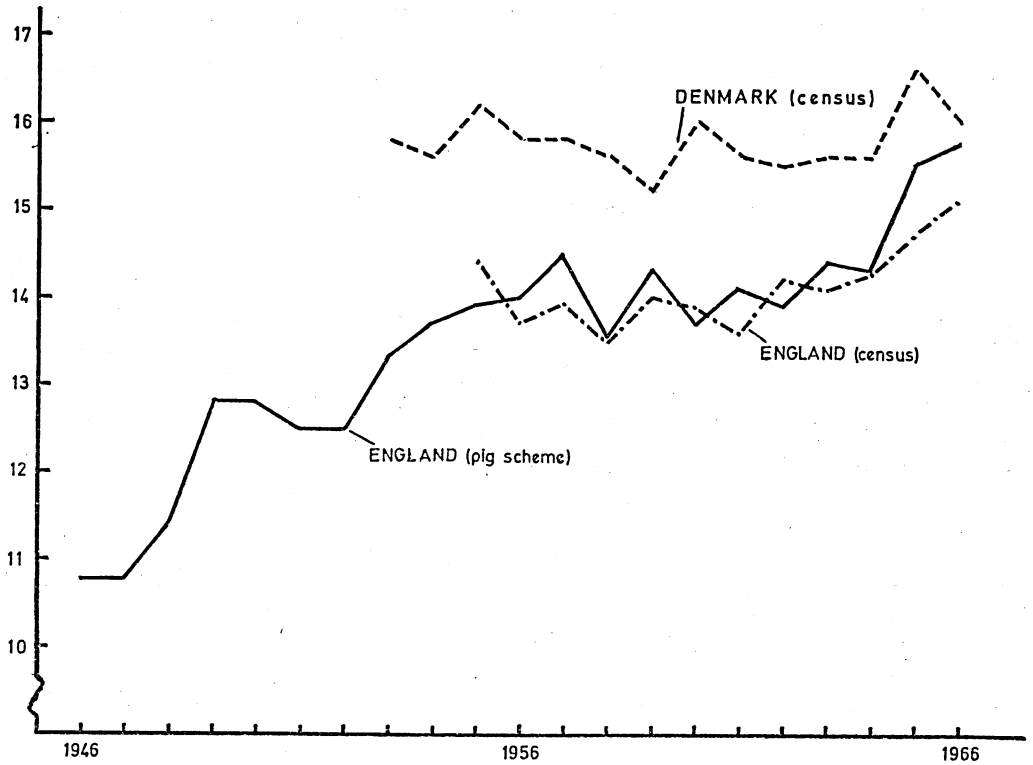


**Figure 2. Weaners per sow per year**

will be seen that the Cambridge scheme and the census give closely similar results. Indeed, for the ten years 1955 to 1964, the average difference is 0·1, which is negligible. It seems reasonable therefore to accept the Cambridge scheme as representative of English conditions for this factor at least.

It will be seen that the Danish results have been consistently high (at about 15·8 weaners per sow) but have shown little change over the past 14 years. In England the number of weaners per sow has been substantially lower. Numbers improved from the rather low level of 10·8 in

* For details see Appendix.

1946 to 14·5 in 1957. There was then little change until 1965. There are, however, signs that a further improvement is on the way. The reasons for this can be seen in Table 13, which shows the two components of this factor—weaners per litter and litters per sow per year. (See also

**Table 13. Breeding Efficiency: England and Denmark**

| | Pigs weaned per litter | | × | Litters per sow per year | | = | Weaners per sow per year | |
|---|---|---|---|---|---|---|---|---|
| | *England* | *Denmark* | | *England* | *Denmark* | | *England* | *Denmark* |
| 1946–52 .. | 7·6 | n.a. | | 1·57 | n.a. | | 11·9 | n.a. |
| 1953–8 .. | 7·9 | 8·2 | | 1·75 | 1·91 | | 13·8 | 15·8 |
| 1959–64 .. | 8·1 | 8·2 | | 1·74 | 1·88 | | 14·1 | 15·6 |
| 1965 .. .. | 8·4 | 8·4 | | 1·85 | 1·99 | | 15·5 | 16·6 |
| 1966 .. .. | 8·4 | 8·4 | | 1·87 | 1·90 | | 15·7 | 16·0 |

Figures 3 and 4.) There is evidence of an improvement in weaners per litter in England from 7·6 in 1946–52 to 8·1 in 1959–64 and to 8·4 in 1965. Part of the improvement is due to the elimination of deaths in the early stages after birth by the use of heat lamps, under-floor heating and improved sow pens, but most of it is due to an increase in the number born.

The other factor affecting sow productivity is the number of litters per sow per year. This is almost entirely a matter of management. The traditional method was to wean young pigs at 8 weeks and as the period of gestation is 16 weeks this gives a total of 24 weeks. As the sow normally comes in season about four days after her pigs are weaned, it is theoretically possible to obtain a litter within 26 weeks, and thus two litters per year. In fact, the number of litters

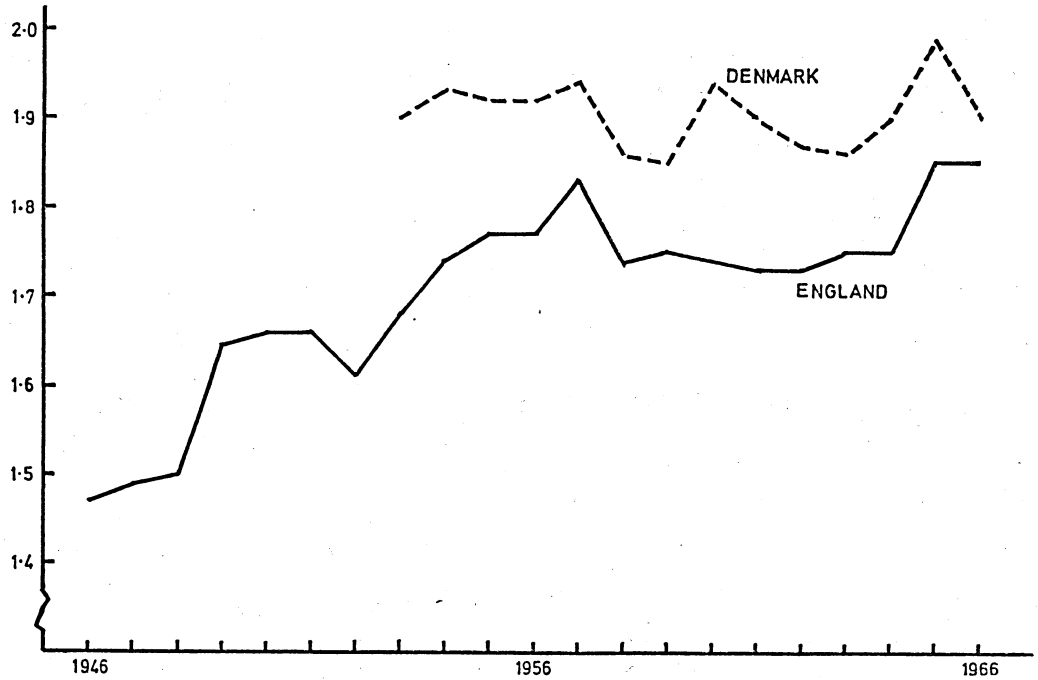


**Figure 3. Litters per sow per year**
(*Cambridge Costings Scheme and Danish Census*)

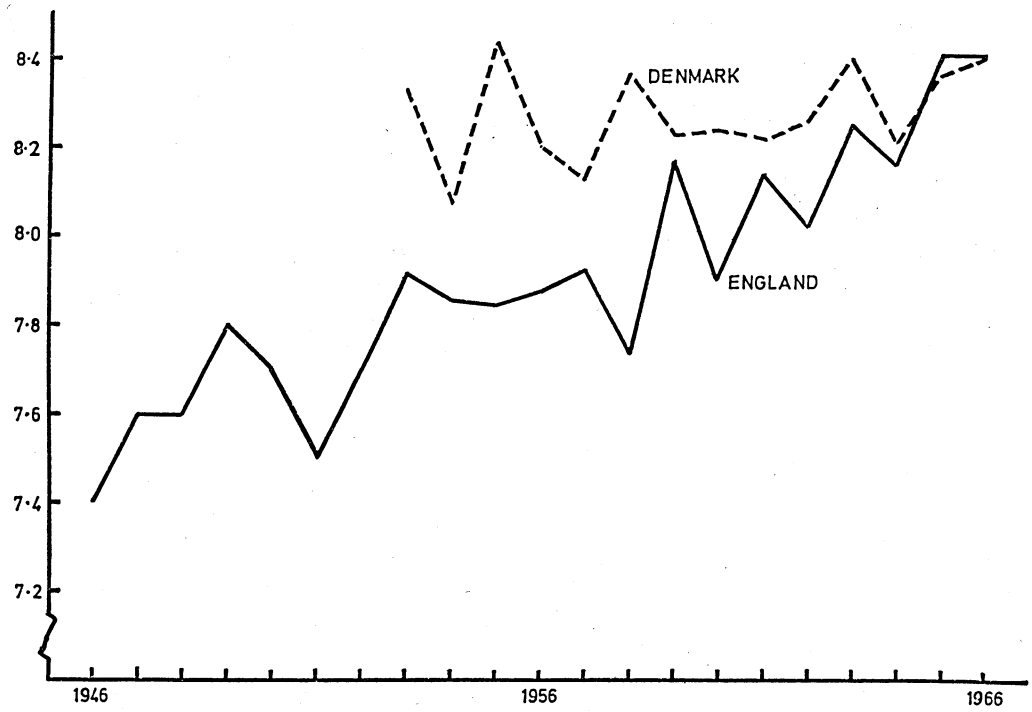


**Figure 4. Weaners per litter**
(*Cambridge Costings Scheme and Danish Census*)

always fall short of this target, because sows in season are missed or fail to conceive at the first service. In Denmark, the number of litters has fluctuated around 1·9 for many years. In England, the figure improved from 1·5 to 1·75 between 1946 and 1953. It then remained at a steady 1·75 for the next twelve years.

It will be noted, however, that the English figure for 1965 is 1·85. This higher figure is no chance variation but indicates a change in technique. For a number of years attempts have been made to increase the numbers of litters by early weaning. Techniques for weaning at three weeks were developed and a number of producers attempted to adopt them. Unfortunately, the method required extra attention, expensive creep foods to substitute for the sow's milk and a high standard of hygiene. Although theoretically more efficient, the extra time and cost of early weaning largely nullified the gain in number of litters and the technique has not made much headway.

The weaning of pigs at 6 or 7 weeks, is by comparison, a simple matter which has proved much more popular, and this accounts for the rise in the average number of litters per year from 1·75 to 1·85 in 1965. At the present time, 28 per cent of the English sample now wean at 3 to 5 weeks, 37 per cent at 6 or 7 weeks and only 35 per cent at the orthodox 8 weeks. As producers using the 5-week weaning technique commonly average 2·0 litters per sow, a further spread of this technique might well raise the average to 1·9 or 2·0. The gap in results from the two countries is thus closing. So far, the Danish farmers have shown little interest in early weaning but if they do, the Danish results might again pull ahead of the English.

It will be seen in Figure 2 that the estimate based on the English census has also begun to improve—but one year behind the Cambridge Pig Scheme. It would seem that members of this scheme, being more advanced in their ideas, are the trend setters but other producers soon follow suit.

The other factor in breeding efficiency is the consumption of food per sow. On average the Danish sows in 1961–2 used 28·4* cwt and produced 15·5 weaners. The English sows used 32·2* cwt and produced 13·9 weaners. The latter thus used 4 cwt more food to produce 1½ fewer pigs. This is an average, but as can be seen from Table 14, there are wide variations from herd to herd. It will be seen that in individual herds food consumption varies from 20·2 to 44·5 cwt per sow. As an extra pig adds only about ⅓ cwt (for extra sow meal and creep feed), differences of two or three pigs weaned per sow should make very little difference to the total food intake by the sow. The wide range in food consumption shown in Table 14 is thus due to other causes, of which the most important is a failure to ration sows adequately. There can be little doubt

**Table 14. Range in food consumption per sow (England)**

| | |
|---|---|
| Average .. .. .. .. | 32·2 cwt |
| Maximum .. .. .. | 44·5 ,, |
| Minimum .. .. .. | 20·2 ,, |
| 20 to 24·9 cwt .. .. .. | 5 herds |
| 25 to 29·9 ,, .. .. .. | 13 ,, |
| 30 to 34·9 ,, .. .. .. | 23 ,, |
| 35 to 39·9 ,, .. .. .. | 14 ,, |
| 40 to 44·9 ,, .. .. .. | 2 ,, |
| | 57 herds |

that sows are often overfed. A sow with young usually has a pen to itself and is individually rationed. Dry sows, however, are often grouped in batches of a dozen or more and if fed together greedy sows eat more than their share at the expense of others who get too little. The installation of individual feeding stalls for dry sows is beginning to become popular. There can be little doubt that these feeders are well worth while and savings in food will soon pay for their cost.

## EFFICIENCY IN FATTENING

Unlike the breeding stage which has large fixed costs for the upkeep of the breeding stock, costs at the fattening stage are almost entirely variable, i.e. they are broadly proportional to the throughput of pigs. By far the chief cost is food, which accounts for 85 per cent of the total.

The vital factor is thus the cost of food per 1 lb liveweight increase. This in turn contains two elements—the *weight* of food per 1 lb liveweight increase (i.e. the food conversion rate) and the *cost* of food per cwt.

### Food Conversion Rate

This is a most important factor and accounts for a major part of the differences in profit between pig fattening herds. The point is illustrated in Table 15. It will be seen that as the conversion rate rises, the profit falls by about 4*s* 3*d* per pig for each 0·1 change in the food conversion rate.

The food conversion rate commonly quoted in England usually includes only the fattening stage from weaning to slaugher. The Danes, however, publish an overall one covering both the breeding and the fattening stages. Changes in this factor from 1946 to the present day are

* Includes creep feed and share of boar's ration.

**Table 15. Effect of food conversion on profit**

| | | | | | |
|---|---|---|---|---|---|
| Food conversion rate .. .. | 3·0 | 3·4 | 3·8 | 4·2 | 4·6 |
| Food cost per cwt.. .. .. | 29*s* | 29*s* | 29*s* | 29*s* | 29*s* |
| Per bacon pig: | | | | | |
| Food .. .. .. .. | 128*s* | 145*s* | 162*s* | 179*s* | 196*s* |
| Remainder of costs* .. .. | 145*s* | 145*s* | 145*s* | 145*s* | 145*s* |
| Total costs .. .. .. | 273*s* | 290*s* | 307*s* | 324*s* | 341*s* |
| Sale price .. .. .. | 335*s* | 335*s* | 335*s* | 335*s* | 335*s* |
| Profit .. .. .. .. | 62*s* | 45*s* | 28*s* | 11*s* | −6*s* |

* Includes weaner costs, labour and other costs, and mortality.

shown in Figure 5. The English data have been recalculated in the same form for comparison. The long-term changes are shown in Table 16 and Figure 5. In both countries, the food conversion rate has improved steadily since 1946. At the beginning of this period, feeding stuffs were still

**Table 16. Food conversion rates: England and Denmark (both breeding and fattening stage)**

| | *England* | *Denmark* |
|---|---|---|
| 1946–52 (7 years) .. .. | 5·4 | 5·0 |
| 1953–8 (6 years) .. .. | 4·8 | 4·6 |
| 1959–64 (6 years) .. .. | 4·5 | 4·3 |
| 1965 .. .. .. .. | 4·3 | 4·1 |

in short supply, due to the war, and pigs had often to be fed on whatever by-products or damaged grain the farmer could spare. This was followed by a period of rapid expansion intended by the Government to bring meat rationing to an end. Farmers who had never kept pigs, or who had given them up during the war, began to build up pigs herds, and the high margin of profit helped to compensate them for the poor standards of efficiency that they often had. Within a

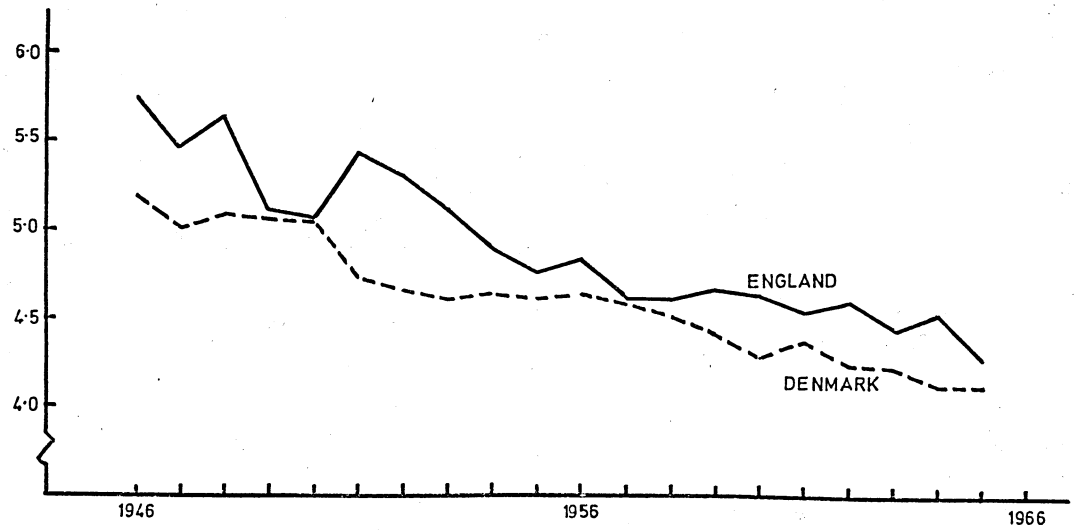


**Figure 5. Food conversion rate (both breeding and fattening)**
(*Cambridge and Danish Costings Schemes*)

few years, however, prices were trimmed and profit margins became tighter. Those who could not improve their standards then gave up and were replaced by others who could. Technical efficiency thus improved steadily. Throughout the period, however, the Danish producers have kept about 0·2 ahead of the English producers in the food conversion rate.

A more precise comparison for the fattening period alone is available for the year 1961–2 for which individual costings are available. As the Danes do not record food for breeding stock as a separate item, it has been necessary to confine the Danish figures to the 23 herds which specialised on fattening.*

**Table 17. Food conversion rate: England and Denmark (fattening stock only—1961-2)**

**(lb meal per 1 lb liveweight gain)**

| | England | | | | Denmark | |
|---|---|---|---|---|---|---|
| | *All herds* | | *Bacon herds* | | | |
| Average conversion rate .. | 3·96 | | 3·72 | | 3·80 | |
| Average weight at slaughter | 190 lb | | 204 lb | | 180 lb | |
| Range: | No. | % | No. | % | No. | % |
| 3·0 to 3·49 .. .. .. | 16 | 23 | 3 | 15 | 1 | 4 |
| 3·5 to 3·99 .. .. .. | 35 | 52 | 14 | 70 | 17 | 74 |
| 4·0 to 4·49 .. .. .. | 12 | 18 | 3 | 15 | 2 | 9 |
| 4·5 to 4·99 .. .. .. | 2 | 3 | – | – | 3 | 13 |
| 5·0 to 5·49 .. .. .. | 3 | 4 | – | – | – | – |
| | 68 | 100 | 20 | 100 | 23 | 100 |

Overall, the food conversion rate was 3·96 in England and 3·80 in Denmark. The difference of 0·16 is equivalent to an extra ¼ cwt food, or 7*s*, per bacon pig. It will be noted, however, that the English herds have a much greater range than the Danish. The age of slaughter has an effect on the food conversion rate—the larger the pig the more meal consumed per 1 lb liveweight gain. Most Danish pigs, whether for bacon or pork, are slaughtered at around bacon weight. In England, by contrast, the slaughter weight varies from light porkers weighing 130 lb to heavy hogs weighing 260 lb liveweight. It is hardly surprising that the English herds show a correspondingly wide range of conversion rates. It is of interest, therefore, to compare the 20 English producers who concentrated on bacon production with the Danish producers. In many ways the bacon producers are the elite of the English herds. They are in more direct competition with the Danes and have to meet much more exacting factory requirements than do producers for the pork or manufacturing market. It will be seen that the conversion rate for the bacon herds is 3·72, which is fractionally better than the Danish average of 3·80. This is particularly creditable when allowance is made for the fact that the English baconers are killed at 24 lb greater liveweight. As might be expected, the range of conversion rates for bacon herds is much narrower than for all pigs, and closely resembles the Danish herds. On the whole, therefore, these bacon producers appear to be very similar in feeding efficiency to their Danish counterparts.

## Cost of Feeding Stuffs

Attention has so far been concentrated on the food conversion rate—the weight of meal per 1 lb liveweight gain. From the economic point of view, however, the important point is the *cost* of food per 1 lb liveweight gain. This brings in the other component—the cost of the ration per hundredweight. In practice, this latter factor is often neglected and farmers who scrutinise the food conversion rate with the utmost care often accept much too readily an expensive ration. The relative importance of these two factors can be illustrated from Table 18.

* It is estimated, however, that the food conversion rate for fattening stock in the other mixed herds is closely similar.

**Table 18. Conversion rate v. Cost of the ration***

| Conversion rate | Cost of ration per cwt 24*s* d | 26*s* d | 28*s* d | 30*s* d | 32*s* d |
|---|---|---|---|---|---|
| 3·2 | 8·2 | 8·9 | 9·6 | 10·3 | 11·0 |
| 3·4 | 8·7 | 9·5 | 10·2 | 10·9 | 11·6 |
| 3·6 | 9·3 | 10·0 | **10·8** | 11·6 | 12·3 |
| 3·8 | 9·8 | 10·6 | 11·4 | 12·2 | 13·0 |
| 4·0 | 10·3 | 11·1 | 12·0 | 12·9 | 13·7 |
| 4·2 | **10·8** | 11·7 | **12·6** | 13·5 | 14·4 |
| 4·4 | 11·3 | 12·3 | 13·2 | 14·1 | 15·1 |
| 4·6 | 11·8 | 12·8 | 13·8 | 14·8 | 15·8 |
| 4·8 | 12·3 | 13·4 | 14·4 | 15·4 | 16·5 |
| 5·0 | 12·9 | 13·9 | 15·0 | 16·1 | 17·1 |

* Quoted from "Economics of Pig Production". R. F. Ridgeon, F.E.B. Report No. 52.

It will be seen that if a farmer had a ration costing 28*s* per cwt and a conversion rate of 4·2, the cost of food per 1 lb liveweight gain would be 12·6*d*. If by breeding a better strain of pig or erecting new buildings with better insulation, he could improve the conversion rate from 4·2 to 3·6, he would undoubtedly regard this as a major improvement. As can be seen, the effect would be to reduce the cost of food by 1·8*d* per 1 lb liveweight gain from 12·6*d* to 10·8*d*. If, on the other hand, by forward buying at harvest time, by joining a buying group or by devising a more economic ration he could reduce the cost of the ration by 4*s* per cwt, the fall in cost per 1 lb liveweight gain would be precisely the same. The first of these alternatives might, however, require many years of stock selection or heavy capital expenditure on buildings. The second alternative, if it could be arranged, might cost very little.

The range in costs of meal per cwt is shown in Table 19. The difference in costs between the two countries was 3*s* 1*d* in 1961–2. This gap has since diminished and was only 9*d* per cwt for the three years 1963–5. Nonetheless, as can be seen from Table 19, there is a wide range in food

**Table 19. Cost of meal per cwt (1961-2)**

| | England *s* | England *d* | Denmark *s* | Denmark *d* |
|---|---|---|---|---|
| Average .. .. .. | 28 | 2 | 25 | 1 |
| Maximum .. .. .. | 34 | 10 | 30 | 1 |
| Minimum .. .. .. | 23 | 10 | 20 | 2 |
| Range: | No. | % | No. | % |
| 20*s* to 21*s* 11*d* .. .. | – | – | 11 | 8 |
| 22*s* to 23*s* 11*d* .. .. | 1 | 1 | 32 | 24 |
| 24*s* to 25*s* 11*d* .. .. | 4 | 6 | 54 | 41 |
| 26*s* to 27*s* 11*d* .. .. | 17 | 24 | 26 | 19 |
| 28*s* to 29*s* 11*d* .. .. | 27 | 39 | 9 | 7 |
| 30*s* to 31*s* 11*d* .. .. | 11 | 16 | 1 | 1 |
| 32*s* to 33*s* 11*d* .. .. | 7 | 10 | – | – |
| 34*s* to 35*s* 11*d* .. .. | 3 | 4 | – | – |
| | 70 | 100 | 133 | 100 |

costs per cwt from the highest to the lowest in both countries. Many of the English herds seem, moreover, to have unnecessarily high food costs. It is thus worth examining the matter in more detail. If a ration is expensive, this must be either because the ingredients are unnecessarily dear or because the ration includes an undue proportion of expensive foods. It can be seen from Table 20 that the price of ingredients in the two countries was closely similar,* both in 1961–2 and in 1964–5. It follows that if the components are sold for much the same price in both countries,

* The one difference is in the soya bean meals which appear to differ in composition.

**Table 20. Cost of feeding stuffs (per cwt)**

| | 1961–2 | | | | 1964–5 | | | |
|---|---|---|---|---|---|---|---|---|
| | *England* | | *Denmark* | | *England* | | *Denmark* | |
| | *s* | *d* | *s* | *d* | *s* | *d* | *s* | *d* |
| Barley .. .. .. | 23 | 9 | 24 | 0 | 22 | 9 | 23 | 0 |
| Oats .. .. .. | 22 | 3 | 21 | 6 | 20 | 9 | 22 | 0 |
| Wheat .. .. .. | 23 | 9 | – | | 23 | 3 | – | |
| Middlings .. .. | 24 | 6 | – | | 25 | 0 | – | |
| Sorghum.. .. .. | 23 | 6(*a*) | 22 | 6 | – | | 22 | 6 |
| Soya bean (*b*) .. .. | 39 | 0 | 33 | 6 | 43 | 9 | 38 | 0 |
| Meat and bone .. .. | 40 | 0(*a*) | 40 | 6 | 44 | 3(*a*) | 44 | 9 |
| Fish meal .. .. | 61 | 6 | – | | 70 | 0 | – | |

Danish prices from "Undersøgelser over landbrugets driftsforhold" det Landøkonomiske Driftsbureau, Copenhagen.

English prices from M.A.F.F. quotations.

(*a*) Cambridge Pig Management Scheme.

(*b*) Denmark Soya bean bruise; England—Extracted soya bean meal.

any difference in the cost of ration must lie in the mixtures used or the methods of compounding them. There is one outstanding difference in pig feeding between the two countries—the use of skim milk. Most Danish pig producers have dairy cows and deliver milk to the local co-operative creamery. The milk is separated and the skim milk is returned to the farmer who feeds it to his pigs. The advantage of this system is not that skim milk is a cheap food—it is claimed indeed that the farmer pays a full economic price ($5\frac{3}{4}d$ per gallon in 1961–2); the advantage is that skim milk provides a good quality protein supplement that enables the farmer to use a simple and cheap meal ration, often largely barley.

A typical ration recommended in Denmark for use with skim milk is the following:

| | |
|---|---|
| 61·7% | barley |
| 10·7 | oats |
| 18·0 | sorghum |
| 5·5 | soya bean bruise |
| 2·5 | meat and bone meal |
| 1·6 | minerals and vitamins |
| 100·0 | |

(fed 1 cwt to an average of 16 gallons of skim milk)

In 1961–2 this ration (including skim milk at meal equivalent) cost 25*s* 11*d* at official Danish prices. If allowance is made for small additions of bulky food and other simple rations, this agrees closely with the average from the Danish costings scheme, namely 25*s* 1*d* per cwt.

The number of pigs in Denmark has, however, doubled since 1953, whereas the amount of skim milk has remained largely unchanged. In consequence, there is now less skim milk available per pig and many pigs are reared without any. Indeed, as can be seen from Table 21, the proportion of skim milk in the ration used by members of the Danish costings scheme has fallen from 31 per cent in 1946 to only 7 per cent in 1965. Other supplements, such as fodder roots, once

**Table 21. Composition of Danish Pig Ration (% by value, Danish Costing Scheme)**

| | *Meal* % | *Milk* % | *Other** % | *Total* % |
|---|---|---|---|---|
| 1946 .. .. | 62 | 31 | 7 | 100 |
| 1955 .. .. | 76 | 16 | 8 | 100 |
| 1960 .. .. | 85 | 12 | 3 | 100 |
| 1965 .. .. | 91 | 7 | 2 | 100 |

* Fodder roots, potatoes, etc.

so popular, are also declining in importance, largely due to the amount of labour required to grow and feed these crops. The Danish pig farmer, like his English counterpart, is thus coming to depend mainly on meal. In the absence of skim milk, a supplement is added. A recommended one for the typical Danish ration given above ($2\frac{1}{2}$ cwt added to 1 ton) is as follows:

| | |
|---|---|
| 60% | soya bean bruise |
| 30 | meat and bone meal |
| 2 | dried yeast |
| 8 | minerals and vitamins |
| 100 | |

By contrast, the typical English producer has no skim milk and relies on fish meal to provide a high-quality protein. The following is a ration recommended by the N.A.A.S.*; minerals and vitamins are incorporated.

| *Weight of pig* | *No. 1* *40 to 120 lb* | *No. 2* *120 to 200 lb* |
|---|---|---|
| Barley .. .. .. | 55% | 60% |
| Wheat .. .. .. | 20 | 30 |
| Middlings .. .. | 10 | – |
| Fish meal .. .. | $7\frac{1}{2}$ | 5 |
| Soya bean meal .. | $7\frac{1}{2}$ | 5 |
| | 100 | 100 |
| Cost at 1964–5 prices .. | 30*s* 6*d* | 28*s* 4*d* |

(including 2*s* for transport, milling and mixing)

Allowing for the amount required at each stage of growth, a weighted average price is 29*s* 4*d*.

The average cost of meal per cwt in the Cambridge scheme in 1964–5 was 29*s* 6*d*. This, however, included proprietary meals averaging 32*s* 4*d* and home-mixed meals averaging 28*s* 2*d*. If allowance is made for the inclusion of home-grown barley and some poorer quality meals, this agrees closely with the figure of 29*s* 4*d* for the N.A.A.S. ration.

We are now in a position to compare the competitive position of the Danish farmer operating under Danish conditions with the English farmer operating under English conditions. The prices used are those in operation in 1964–5.

| | *Price per cwt* *1964–5* |
|---|---|
| *Cost of pig rations in Denmark:* | |
| (*a*) Typical Danish ration (with skim milk) .. .. | 27*s* 9*d* |
| (*b*) Danish ration (no skim) .. .. .. .. | 28*s* 5*d* |
| *Cost of pig rations in England:* | |
| (*c*) Typical English ration (no skim) .. .. .. | 29*s* 4*d* |
| (*d*) Danish type ration (with skim) .. .. .. | 26*s* 11*d* |
| (*e*) Same as (*c*) but home-grown barley .. .. | 28*s* 0*d* |

(prices include 2*s* for transport, milling and mixing)

The Danish farmer with skim milk thus has an advantage of 1*s* 7*d* per cwt (or 12*s* per bacon pig) over his English competitor without skim milk (*a* compared with *c*). This is the situation that confronts most producers in the two countries.

The Danish farmers without enough skim milk (and their number is increasing) lose this advantage. Their ration (28*s* 5*d*) is slightly less expensive than the English (29*s* 4*d*) but the quality is somewhat lower.

* Recommended by Dr A. Eden, Nutrition Chemist, N.A.A.S. Eastern Region.

The few English farmers who can get a regular supply of skim milk and who use a cheap and simple ration (e.g. ration D costing 26*s* 11*d*) are on a par with the Danish competitors (ration A costing 27*s* 9*d*).

Ration E represents the situation of the barley grower. If he feeds barley, the pigs should be charged with the sale price of barley. If we assume that this is 2*s* less than the price at which feeding barley could be purchased, then the ration C should fall in value by 1*s* 4*d* to 28*s* 0*d*. At this level, the cost is on a par with the Danish farmer using skim milk.

It now remains to consider whether the English farmer should attempt to follow the example of the Danish farmer. The two Danish rations (with and without skim milk) have been repriced at English prices and set alongside the typical English home-mixed ration (with purchased and with home-grown barley) and purchased proprietary meals (price based on the Cambridge Pig

| *Ration* | *Price per cwt** (*1964–5, English price*) |
|---|---|
| (D) Danish type, with skim milk .. .. .. | 26*s* 11*d* |
| (F) ,, ,, no skim milk .. .. .. .. | 28*s* 9*d* |
| (C) Typical English ration, no skim milk .. .. | 29*s* 4*d* |
| (E) ,, ,, ,, home-grown barley .. | 28*s* 0*d* |
| (G) Purchased compounds (Cambridge scheme) .. | 32*s* 4*d* |

* Including 2*s* for transport, milling and mixing to place home-mixed meals on a par with purchased compounds.

Management Scheme). Of these rations, D (Danish type with skim milk) is the cheapest. Unfortunately, skim milk is available in only a few places for part of the year. The supply, moreover, is not dependable because the manufacture of milk products is cut whenever the liquid market is short of supplies. F (Danish type without skim milk) depends on soya bean and meat and bone meal for protein. This ration costs 1*s* 10*d* more than the skim milk ration and it is doubtful whether it is as satisfactory. Ration C is 7*d* per cwt more than F—mainly because fish meal is the source of protein. With a slightly higher content of better protein, it is worth the difference. The most expensive are the purchased compounds. At 32*s* 4*d* they cost 3*s* more than ration C. This, of course, is only an average, and individual compounds vary greatly in price and composition. They are convenient to use and many of them are most effective. An extra 3*s* per cwt is, however, hard to justify. Even if the compound produced a better food conversion rate than the N.A.A.S. ration, the first 0·35 of any improvement would be required to pay for the extra 3*s* per cwt and only the excess over this large amount would bring any net benefit to the farmer. It seems unlikely that the N.A.A.S. ration quoted could be bettered to that extent.

The verdict is, therefore, that some Danish farmers have a natural advantage in the use of skim milk, but as the number of pigs in Denmark grows this advantage diminishes. When the Danish farmer has to depend on a balanced ration made from purchased feeding stuffs, he enjoys no natural advantage over his English rival—apart from discounts from his co-operative society. This is confirmed by the fact that the gap in food cost per cwt between the English and Danish costings schemes has shrunk to 9*d*. The English barley grower, however, has an advantage that is not open to most Danish farmers whose holdings are too small to grow enough barley to feed more than a few pigs.

## THE USE OF LABOUR

Of the total costs of pig production, labour accounts for 11 per cent in England compared with 80 per cent for feeding stuffs. It is thus easy to dismiss labour as a minor element compared with food costs. In fact, labour costs are far more variable than food costs. Very few farmers use 20 per cent. more than the normal amount of feeding stuffs, whereas many have badly-designed

piggeries that need 200 per cent more than the normal amount of labour for feeding and cleaning. For this reason economy in the use of labour has quite an important effect on the profit from pigs.

As shown in Table 10, the difference in the cost of labour per score between the two countries has shrunk from around 2*s* in the early 1950's to 4*d* in 1963–5. This remaining 4*d* per score accounts for 8 per cent of the total difference in costs between the two countries. In one sense this difference is an understatement. A large proportion of English pig producers employ farm workers that must be paid in cash whether the pigs show a profit or not. Most Danish farmers use family labour that is nominally valued at current wage rates. But if profits fall, they would continue to work for a time at least for no more than the cost of subsistence. So long as family labour remains plentiful the Danish farmer will be able to work on tighter margins than the English farmer with paid labour. Family workers in Denmark are, however, drifting steadily to the town and this asset will diminish in time.

If, as appears, the English farmer spends 10 per cent more on labour per unit of pig meat, he must either pay higher wages per hour or use more man hours per pig. Current wage rates are shown in Table 22. It will be seen that in 1958–9 wage rates in England were 30 per cent higher than in Denmark. Since then, wage rates in Denmark have been rising more quickly than in England and now appear to be higher than in this country. It follows, therefore, that if the Danish labour costs per score are below the English, this must be due to the use of fewer man hours per pig produced.

**Table 22. Labour Costs per Hour of a Stockman**

*(including lodging, food, and paid holiday)*

| | 1958–9 | | 1961–2 | | 1964–5 | |
|---|---|---|---|---|---|---|
| | *s* | *d* | *s* | *d* | *s* | *d* |
| England .. .. .. | 4 | 4 | 5 | 0 | 5 | 11 |
| Denmark .. .. | 3 | 4 | 5 | 0 | 6 | 8 |

*Source: Prices of Agricultural Products and Fertilisers in Europe, F.A.O.*

It is not, however, possible to be precise about this point because labour use on these Danish farms has been recorded as a cost but not as man hours. There can be little doubt, however, that most of their housing has been designed to save labour. Indeed, the Danes pioneered the indoor fattening house with feeding and dunging passages that is still known in England as the "Danish piggery". Danish farmers are mostly owner-occupiers and easy credit facilities have encouraged them to invest heavily in modern housing. By contrast, a large proportion of English piggeries —especially on small farms—are poorly designed and time-wasting adaptations of buildings erected originally for some other purpose.

On the other hand, better piggeries are now being erected in England and some of the larger units are more labour saving than Danish buildings erected twenty or thirty years ago. The full-time pigman in England is a skilled craftsman and an expensive one. The tendency among the more progressive farmers is thus to construct an efficient one-man or two-man unit that will utilise this skilled labour to the full. The convenient size of a one-man unit is, however, growing steadily in size. A few years ago 20 to 25 sows (with progeny reared to slaughter) was accepted as a full-time job for one man. Now, the pigman is expected to look after 40 to 50 sows, or even more.

There is indeed ample evidence from this investigation that the productivity of labour in pig production has improved substantially. It can be seen from Table 9 that the cost of labour per score has fallen in England from 4*s* 5*d* in 1953 to 3*s* 10*d* in 1963–5. As the statutory minimum wage for a farm worker increased during this period from £5 13*s* to £10 2*s*, this means that output per man has been increasing faster than the rise in the wage rate. This is a most creditable

achievement and indicates a fall in man-hours per pig of about one half. There is, however, still room for improvement.

## OTHER COSTS

Other costs, or overhead costs, were 3*s* 5*d* in England and 2*s* 10*d* in Denmark in 1963–5, a difference of 7*d* or 13 per cent of the total difference between the two countries. This heading includes many small items and it is hardly feasible to compare them in detail. A number of English farmers have spent heavily on new buildings for which a rent has been allowed. Many of the Danish farmers erected their piggeries twenty or thirty years ago when costs were much lower. A number of English farmers, in the period concerned, spent quite large sums on swine fever vaccination. This has now been replaced by an eradication scheme. English farmers with larger open farm steadings, with the food and grain stores often at a distance from the piggery, use more tractor hours to move materials than do Danish farmers in their small compact buildings. Apart from these items, there was little to choose in the costs under this heading.

## A PREVIOUS COMPARISON

In 1954 a comparison of the costs of pig production in Denmark and England was produced jointly by the agricultural economists in the Ministry of Agriculture, Fisheries and Food and by Mr Rasmussen, the head of the agricultural economics department at Nottingham.* These results are shown in Table 23.

**Table 23. Costs and Returns per Score Deadweight (1953)**

| | Rasmussen Report | | | This Report |
|---|---|---|---|---|
| | *England* | *Denmark* | *Difference* | *Difference* |
| | *s d* | *s d* | *s d* | *s d* |
| Food .. .. .. | 36 6 | 22 1 | 14 5 | 8 4 |
| Labour .. .. .. | 4 8 | 2 9 | 1 11 | 1 10 |
| Other costs.. .. .. | 3 0 | 2 9 | 3 | 1 1 |
| Total costs .. .. .. | 44 2 | 27 7 | 16 7 | 11 3 |
| Profit .. .. .. | 12 9 | 10 11 | 1 10 | 5 9 |
| Receipts .. .. .. | 56 11 | 38 6 | 18 5 | 17 0 |
| Pigs per litter .. .. | 7·3 | 8·3 | 1·0 | 0·4 |
| Pigs per sow per year* .. | 11·1 | 14·3 | 3·2 | 2·5 |
| Food conversion rate .. | 5·30 | 4·54 | 0·76 | 0·50 |
| Cost of food per cwt .. | 28*s* 11*d* | 20*s* 5*d* | 8*s* 6*d* | 6*s* 4*d* |

* Average 5 years 1949–53 (number slaughtered)

The position so far as English production was concerned was a depressing one. Costs of production appeared to be 60 per cent higher than in Denmark and in spite of a price to the farmer nearly 50 per cent above that of Denmark, the English profits were very little more than those obtained by the Danish farmer. In all the efficiency standards the English producer lagged far behind the Danish farmer.

The general conclusion—that Danish producers were more efficient than the English—was sound enough. In the opinion of the present authors, however, the difference in costs given in the Rasmussen report for 1953 is somewhat overstated. The estimate of 5·3 for food conversion rate was derived from the Cambridge scheme but included in the average were some poor results in the immediate post-war period when proper pig meals were severely rationed. Much the same

* Costs and Efficiency of Pig Production: a comparison between England and Denmark, M.A.F.F. 1954.

consideration applies to the estimate of pigs produced per sow, which was derived from the census. By 1953, however, the results as shown by the Cambridge scheme were already better than those shown in Table 23.

The cost of food per cwt in Table 23, 20*s* 5*d* in Denmark and 28*s* 11*d* in England, moreover, seems unlikely. The cost of barley (in the same report) is given as 24*s* 2*d* and 29*s* 4*d* respectively in the two countries. As barley is usually one of the cheap ingredients in a mixture which normally includes fish or meat and bone meal at a much higher price, a mixed ration is unlikely to cost less than barley alone. The figures in this report were obtained by dividing costs from the recording schemes by a calculated quantity from a different source. The actual costs of food per cwt in the English and Danish costings schemes in 1953 were 33*s* 7*d* and 27*s* 3*d* respectively.

The Rasmussen report did nevertheless perform a useful function at the time by drawing attention to ways in which efficiency in pig production could be improved in this country. It also drew attention to the need for progeny testing stations which have since been established.

CHAPTER 3

# Holland

The comparative costs of production of pigmeat in England and Holland are shown in Table 24.

**Table 24. Costs and Returns per Score Deadweight**

| | *England* | | *Holland* | | *Difference* | |
|---|---|---|---|---|---|---|
| | 1960–2 | 1963–5 | 1960–2 | 1963–5 | 1960–2 | 1963–5 |
| | *s d* | *s d* | *s d* | *s d* | *s d* | *s d* |
| Food .. .. | 30 2 | 30 4 | 26 6 | 29 5 | 3 8 | 11 |
| Labour .. .. | 4 0 | 3 10 | 4 0 | 3 10 | – | – |
| Other costs.. .. | 3 6 | 3 5 | 3 6 | 3 5 | – | – |
| Total costs .. .. | 37 8 | 37 7 | 34 0 | 36 8 | 3 8 | 11 |
| Profit .. .. | 6 10 | 5 3 | 4 7 | 7 5 | 2 3 | –2 2 |
| Receipts .. .. | 44 6 | 42 10 | 38 7 | 44 1 | 5 11 | –1 3 |

The labour charged in the Dutch costings for the three years 1963–5 was 6*s* per score. This is, however, a nominal charge because no attempt is made to record the work on individual holdings. The estimate used is in fact based on records collected from experimental stations. The figure of 6*s* 0*d* per score for Holland is far above the sum of 3*s* 6*d* charged for Denmark and 3*s* 10*d* for England. The Dutch farmer, however, depends on family labour, as does the Danish farmer, and one might expect similar labour inputs. On the other hand, the Dutch herds are smaller and wage rates are somewhat higher. It seems reasonable therefore to insert 4*s* and 3*s* 10*d* (10 per cent more than the Danish figure and the same as the English cost) in Table 24 as a more realistic estimate of labour costs per score for Holland.

On this basis the cost of production in 1960–2 was 37*s* 8*d* per score in England and 34*s* 0*d* in Holland—a difference of 3*s* 8*d* per score. As receipts, however, were 5*s* 11*d* higher in England than in Holland, this left a profit of 6*s* 10*d* in England and 4*s* 7*d* in Holland. More recently, 1963–5, costs per score between the two countries have narrowed to a difference of only 11*d* per score. Dutch pig prices have risen substantially and exceed English receipts by 1*s* 3*d* per score. As a result the profit is 7*s* 5*d* in Holland compared with 5*s* 3*d* in England.

It will be noted that 'other costs' appear to be the same in both countries. The main point of interest is thus to compare the remaining item—food costs. The Dutch figure was 3*s* 8*d* per score or 12 per cent below the English average for 1960–2 but only 11*d* or 2 per cent below for 1963–5.

The evidence from this survey showed that the Dutch producers had a high level of technical efficiency. So far as breeding was concerned, the average number weaned per litter was 8·5 in Holland for the eight years 1958–65 compared with 8·1 in England. There is some evidence that litter size has been increasing in both countries but with the English results lagging all the time a little behind those of the Dutch.

Unfortunately, no estimate was available in Holland of the number of pigs produced per sow. An alternative standard is the consumption of meal per weaner produced—a good overall test of breeding efficiency. This was assessed in 1961–2 as 2·0 cwt in Holland compared with 2·33 cwt in England.

As the Dutch farmers recorded the feeding stuffs used for fattening separately, it was possible to estimate the food conversion rate at that stage. It can be seen from Table 26 that the average was 3·70 in Holland compared with 3·96 in England and 3·8 in Denmark. The Dutch figure thus

**Table 25. Pigs weaned per litter**

| 1961–2 | *England* | | *Holland* | |
|---|---|---|---|---|
| Average .. .. | 8·0 | | 8·6 | |
| Range: | No. | % | No. | % |
| 3 to 4·9 .. | – | – | 3 | 3 |
| 5 to 6·9 .. | 5 | 9 | 10 | 11 |
| 7 to 8·9 .. | 48 | 81 | 38 | 43 |
| 9 to 10·9 .. | 6 | 10 | 34 | 38 |
| 11 to 12·9 .. | – | – | 4 | 5 |
| | 59 | 100 | 89 | 100 |
| 1958 | 7·7 | | 8·2 | |
| 1959 | 8·2 | | 8·3 | |
| 1960 | 7·9 | | 8·3 | |
| 1961 | 8·1 | | 8·6 | |
| 1962 | 8·0 | | 8·6 | |
| 1963 | 8·2 | | 8·6 | |
| 1964 | 8·2 | | 8·6 | |
| 1965 | 8·4 | | 9·0 | |
| Average .. .. | 8·1 | | 8·5 | |

shows an advantage of 0·26 over the English. This is a very high standard—particularly if credit is given for the fact that Dutch pigs are 32 lb heavier at slaughter than the English. It will, however, be noted that the English *bacon* producers are as efficient as the Dutch. The food conversion rate (3·72) is only slightly higher than the Dutch figure but for a somewhat smaller pig.

**Table 26. Food conversion rate (fattening pigs only) 1961-2**

| | ENGLAND | | | | HOLLAND | |
|---|---|---|---|---|---|---|
| | *All herds* | | *Bacon herds* | | | |
| Average conversion rate .. | 3·96 | | 3·72 | | 3·70 | |
| Average liveweight at slaughter | 190 lb | | 204 lb | | 222 lb | |
| Range: | No. | % | No. | % | No. | % |
| 2·5 to 2·99.. .. .. | – | – | – | – | 1 | 1 |
| 3·0 to 3·49.. .. .. | 16 | 23 | 3 | 15 | 19 | 21 |
| 3·5 to 3·99.. .. .. | 35 | 52 | 14 | 70 | 62 | 70 |
| 4·0 to 4·49.. .. .. | 12 | 18 | 3 | 15 | 7 | 8 |
| 4·5 to 4·99.. .. .. | 2 | 3 | – | – | – | – |
| 5·0 to 5·49.. .. .. | 3 | 4 | – | – | – | – |
| | 68 | 100 | 20 | 100 | 89 | 100 |
| 1958 | 3·99 | | — | | 3·94 | |
| 1959 | 4·10 | | — | | 3·84 | |
| 1960 | 3·96 | | — | | 3·66 | |
| 1961 | 3·89 | | — | | 3·71 | |
| 1962 | 3·96 | | — | | 3·70 | |
| 1963 | 3·92 | | — | | 3·66 | |
| 1964 | 3·95 | | — | | 3·62 | |
| 1965 | 3·79 | | — | | 3·58 | |
| Average .. .. .. | 3·94 | | — | | 3·71 | |

The advantages of efficient food conversion in Holland are, however, dissipated to some extent by the high cost of the food used. It will be seen in Table 27 that the average cost per cwt was 30*s* 7*d* or 2*s* 5*d* more than the English cost. This more than negatived the excellent conversion

rate and the cost of meal per 1 lb liveweight gain was 12·1*d* in Holland compared with 11·6*d* in England. The main reason for the high cost of meal appears to be the extensive use of ready-made compounds. The average farmer in the Dutch costings scheme produces only 80 fat pigs a year compared with 180 in Denmark and 700 in England. For this small number the purchase of a mill-and-mixing unit is not worth while.

**Table 27. Cost of meal per cwt (1961-2)**

| | *England* | | *Holland* | |
|---|---|---|---|---|
| Cost of meal per cwt .. .. .. | 28*s* 2*d* | | 30*s* 7*d* | |
| Conversion rate .. .. .. .. | 3·96 | | 3·70 | |
| Cost of meal per 1 lb liveweight gain .. | 11·6*d* | | 12·1*d* | |
| Range in cost of meal: | No. | % | No. | % |
| 22*s* to 23*s* 11*d* .. .. .. .. | 1 | 1 | – | – |
| 24*s* to 25*s* 11*d* .. .. .. .. | 4 | 6 | – | – |
| 26*s* to 27*s* 11*d* .. .. .. .. | 17 | 24 | 5 | 5 |
| 28*s* to 29*s* 11*d* .. .. .. .. | 27 | 39 | 21 | 24 |
| 30*s* to 31*s* 11*d* .. .. .. .. | 11 | 16 | 47 | 53 |
| 32*s* to 33*s* 11*d* .. .. .. .. | 7 | 10 | 16 | 18 |
| 34*s* to 35*s* 11*d* .. .. .. .. | 3 | 4 | – | – |
| | 70 | 100 | 89 | 100 |

Having dealt with breeding and fattening separately, it now remains to assess the herd as a whole. A good overall test is the food conversion rate for the whole herd. As food for the breeding stock is included in this case, the figure is naturally greater than that already quoted for the fattening herd alone.

The two standards are as follows:

| | *England* | *Holland* | % *Advantage* (*Holland over England*) |
|---|---|---|---|
| Food conversion rate: | | | |
| Fattening pigs only.. .. .. | 3·96 | 3·70 | 7 |
| Fattening and breeding stock .. | 4·56 | 3·97 | 13 |

Fattening stock in the Dutch sample thus use 7 per cent less food per 1 lb liveweight increase. The herd as a whole, however, uses 13 per cent less food. The extra superiority of the herd as a whole is due to two causes. The first is the efficiency of the breeding stock, already commented on. The second reason is the large size of pig produced—32 lb more than the average English pig. This means that the cost of feeding the sow is spread over a larger volume of meat produced. (This indeed is one of the reasons for the present popularity of the heavy hog in England.) Thus in spite of the higher cost of meal per 1 lb liveweight increase at the *fattening* stage (already mentioned) the *overall* cost of food per score deadweight is lower in Holland than in England.

The general picture of Dutch production as revealed by the costings scheme is thus one of small herds with a very high level of technical efficiency (higher indeed than the Danish herds) somewhat marred by expensive food rations. Overall costs per score deadweight are lower than in England but higher than in Denmark.

CHAPTER 4

# Conclusions

It now remains to discuss the practical implications of this study. It has been show that on the whole the costs of pig production are less in Holland and Denmark than in England. This does not necessarily mean that English farmers are inefficient. The Dutch and Danish farmers are amongst the best educated, hard working and efficient in the world. They live in small countries where agriculture is a major industry and with fewer distractions, and the government can give farming more attention than is possible in England. The farming community is willing to co-operate to carry out tasks beyond the capacity of the individual and the government is prepared to give them strong backing. Pig production, moreover, is an export industry and to capture and hold foreign markets, farmers must submit to the discipline of grading and keep costs low enough to leave a profit after paying transport and import dues. In comparing the English pig producer with his counterparts in Holland and Denmark, we are thus comparing him with the highest standards anywhere.

It is, however, relevant to do so because pig production in these countries is, or may be, in competition with our own. The Danes in particular have always aimed at the British market and will almost certainly continue to do so indefinitely. Denmark is now a member of EFTA and if Britain should ever join the Common Market, she, no doubt, would follow suit to maintain access to our market. Holland has been a competitor but on a lesser scale. As a member of the Common Market, her exports now tend to go to her fellow members rather than Britain. Nonetheless, if we ever joined the Common Market, Holland would again no doubt become a serious competitor in the British market.

As already mentioned, the gaps in costs between England on the one hand and Denmark and Holland on the other are closing. The difference in costs is nevertheless appreciable and British production could not compete without the backing of guaranteed prices. The factors responsible can be explained more conveniently in terms of Denmark than of Holland. This for a variety of reasons. Danish costs are the lowest of the three and therefore provide a better target. The Danish producer has the same aim as our own—to please the British housewife. Danish costings data are more closely comparable with our own.

To repeat the list given in Table 11, the reasons for lower Danish costs are the following:

| | % |
|---|---|
| Breeding stage: | |
| Less pigs per litter .. .. .. .. .. | 2 |
| Less litters per sow per year .. .. .. | 15 |
| More food used by breeding stock .. .. | 29 |
| Fattening stage: | |
| Higher food conversion rate .. .. .. | 14 |
| Overall: | |
| Higher food costs per cwt .. .. .. | 19 |
| Higher labour costs .. .. .. .. | 8 |
| Higher overhead costs .. .. .. .. | 13 |
| | 100 |

Estimates of the contribution made by each factor are also given. They indicate in general terms the importance to be attached to each and the effect that might be expected if each fault were remedied. The reasons for the difference in costs have already been given in Chapter 2. It now remains to consider measures that might be taken to remedy these faults.

**Expensive rations** (*19 per cent of total difference in costs*)

This is obviously an item of major importance. As already shown, there is a wide range in the prices paid for feeding stuffs. Some farmers are much too complacent about food costs and spend four or five shillings a cwt more than others without obtaining any noticeable advantage. It is therefore worth repeating that 4*s* per cwt produces as much effect on profit as a fall of 0·6 in the food conversion rate or four extra weaners per sow. Ready-made feeding stuffs are handy to use but this convenience can be dearly bought. Before buying an expensive compound, a farmer should prepare a budget to see whether it would not be worth while to acquire a mill and mixer and mix the ingredients himself.

So far as could be ascertained, the basic cost of feeding stuffs is similar in Denmark and England. Most Danish farmers do, however, make use of co-operative societies that distribute feeding stuffs with great efficiency. British pig keepers who have larger herds should be able to buy on a bigger scale and on better terms than the Danish farmer. Some British farmers have formed buying groups in this country to secure discounts for bulk purchase. Others with storage space buy grain on advantageous terms at harvest time.

As already mentioned, the Danish farmer has an advantage in skim milk which allows him to use a cheaper meal. This advantage is, however, diminishing, mainly because an increase in pig numbers means that there is less skim milk available per pig. In addition, skim milk is beginning to lose its popularity because of the time and trouble required to feed it. Apart from the use of skim milk, however, there seems no reason why the English farmer should have to pay more per cwt for feeding stuffs than the Dane.

**More food required by the feeding herd** (*29 per cent*)

There is a wide range in the quantity of food consumed per sow. Very little of this is due to variation in the number of pigs reared. Stricter rationing and individual feeders for dry sows would appear to be worth while.

**Less pigs per sow per year** (*17 per cent*)

This depends partly on the size of litter but mainly on the number of litters per sow per year. With eight-week weaning, a sow should produce two litters a year. In practice the average is 1·75. This figure can be improved by early weaning. The size of litter is largely a matter of management —well designed sow pens or farrowing crates, and the use of heating lamps. It is to a slight extent dependent on breeding.

**Higher food conversion rate** (*14 per cent*)

Food conversion by the feeding stock is influenced by many factors. It depends on well-insulated housing and a comfortable environment for the pigs. It depends on a low death rate and the avoidance of diseases such as virus pneumonia that produce unthriftiness. It depends on a suitable ration. It depends in part on the right strain of pig.

**High cost of labour** (*8 per cent*)

This depends partly on design of buildings and partly on the work routine. Far too many piggeries are inconvenient and time wasting. This is not the place to go into this matter in detail. It is obvious, however, that a good design should provide for feeding stuffs to be delivered and stored as close as possible to the point of feeding. Manure disposal should be simplified with the use of slats and a minimum of litter. Labour costs also depend on fitting the right size of unit to the capacity of the pigman.

**High overhead costs** (*13 per cent*)

It is difficult to generalise about this heading, which includes so many small items, many of which are largely unavoidable. The avoidance of extravagantly expensive buildings is obviously desirable. The most effective way to reduce overhead costs per pig produced is, however, to tighten up efficiency and increase output per sow, per building and per man employed.

To summarise, it is obvious that of the total difference in costs between England and Denmark, or Holland, possibly half could be remedied on the individual farm by good stockmanship. This could influence strongly the numbers of weaners produced per sow and the food conversion rate. Of the remainder, quite an appreciable amount could be remedied by good overall management —in the selection of rations to minimise cost, in the organisation of labour and in the wise selection and culling of stock. The remainder could be influenced in a variety of ways:

(*a*) By the advisory services in showing the farmer how to improve stockmanship and management;

(*b*) By the government in giving improvement grants and facilitating the granting of credit to allow efficient producers to expand;

(*c*) By the veterinary services in the elimination of disease;

(*d*) By research into better building design and the dissemination of results;

(*e*) By the economist in providing standards of performance and criteria for capital investment;

(*f*) By the breeder in improving stock.

It may seem anomalous to place the breeder last on the list. The breeding of better stock can certainly influence food conversion rate and size of litter. These two factors, however, account for only 16 per cent of the difference in costs and only part of this is due to inheritance. The breeder can, however, help to tailor the pig to fit the requirements of the curer, the manufacturer and the housewife. If good conformation is reflected in the price offered to the farmer, then such improvements will benefit him as much as would a reduction in costs. In practice, however, this is by no means always the case. Indeed the pork and manufacturing markets have no systematic form of grading.

The same considerations apply to progeny testing. This contains useful information on the food conversion rates that influence costs but the conformation tests are directed mainly at the bacon market.

It is apparent that most of the gap in costs between England and Denmark and Holland could be closed. Both these countries have an advantage over England in the possession of family labour on small farms for which pig keeping provides a useful occupation. It is of interest to note, therefore, that Ulster, which also possesses numerous small family farms, is the only area of the United Kingdom where bacon production is increasing in spite of Danish competition.

Denmark also has the advantage of skim milk, although as mentioned above earlier, this is becoming of less importance as the pig population increases.

England, however, possesses some advantages. With larger pig herds it ought to be possible to buy feeding stuffs in bulk on better terms than in Denmark or Holland. In large and well-designed buildings it should be possible to employ skilled stockmen and to manage pigs with fewer man-hours per head than is possible on a family farm. On large arable farms there is a plentiful supply of home-grown barley to cheapen the ration. There are also two markets for pigs—for pork and manufacturing—for which there is little foreign competition. Indeed, in the long run the English farmer may prefer to concentrate on these markets and leave much of the

Wiltshire bacon market to Denmark. He may even prefer to turn to other enterprises than pigs.

On the other hand, if he wishes to compete, the English pig producer can do so and with assistance of the kind indicated, he can succeed. Indeed, a proportion of producers in this country are already as efficient as any in Denmark and Holland and with encouragement and guidance others could follow suit.

# APPENDIX I

## Allocation of difference in cost per score deadweight

### England v. Denmark (3 years 1963-5)

| | *England* | *Denmark* |
|---|---|---|
| Weight per pig (score deadweight) .. .. | 7·0 | 6·6 |
| Pigs weaned per litter .. .. .. .. | 8·27 | 8·32 |
| Litters per sow per year .. .. .. .. | 1·78 | 1·92 |
| Pigs weaned per sow per year .. .. .. | 14·73 | 15·93 |
| Food per weaner (cwt) .. .. .. .. | 2·2 | 1·75 |
| ,, ,, ,, (cost) .. .. .. .. | 67*s* 8*d* | — |
| Food conversion rate (fattening) .. .. .. | 3·9 | 3·8 |
| Food cost per cwt (breeding and fattening) .. | 27*s* 10*d* | 27*s* 1*d* |
| ,, ,, ,, ,, (breeding only) .. .. | 31*s* 1*d* | n.a. |
| ,, ,, ,, ,, (fattening only) .. .. | 26*s* 9*d* | n.a. |

**1. Weaners per sow per year***

If 1·2 more weaners were produced per sow, costs per weaner would be reduced by

$$67s\ 8d \times \frac{1{\cdot}2}{15{\cdot}93} = 5s\ 1d \text{ per pig} \div 7 \text{ score} = 9d \text{ per score}$$

This improvement can be split as follows:

| | |
|---|---|
| English production per sow | 8·27 × 1·78 = 14·73 |
| Improve litter size | 8·32 × 1·78 = 14·81 |
| Increase number of litters | 8·32 × 1·92 = 15·93 |

| Allocate 9*d* per score in proportion, say | *Per score* |
|---|---|
| Larger litter size .. .. .. .. .. .. .. .. .. | 1*d* |
| More litters .. .. .. .. .. .. .. .. .. | 8*d* |

**2. Food used by breeding stock**

Consumption 2·2 cwt per weaner in England. Assume numbers were increased to Danish level (already allowed for), consumption per weaner would be

$$2{\cdot}2 \times \frac{14{\cdot}73}{15{\cdot}93} = 2{\cdot}03$$

Actual consumption 1·75 cwt, a difference of 0·28 cwt @ 31*s* 1*d* = 8*s* 9*d* per pig ÷ 7 = 1*s* 3*d*

**3. Food conversion rate (fattening)**

3·9 − 3·8 = 0·1 × 152 lb liveweight gain @ 26*s* 9*d* per cwt = 3*s* 8*d* per pig ÷ 7 = 7*d*

**4. Higher food cost per cwt**

1 score deadweight = 27 lb liveweight × 4·42 conversion rate = 1·1 cwt @ 9*d* per cwt difference .. .. .. .. .. .. .. .. .. = 10*d*

| | |
|---|---|
| **5. Higher labour cost (see Table 11)** .. .. .. .. .. .. .. .. .. | 4*d* |
| **6. Higher other costs ( ,, )** .. .. .. .. .. .. .. .. .. | 7*d* |
| Total difference per score .. | 4*s* 4*d* |

* This is strictly the effect on food cost. Any consequential effects of increasing output on labour and other costs have been retained under the latter headings.

## APPENDIX II

### Statistical Notes

**1. Significance of difference in costs between England and Denmark:**

| *Cost per score* (1962) | *England* | *Denmark* |
|---|---|---|
| Average | 39*s.* 2*d.* | 31*s.* 2*d.* |
| 95% confidence limit | ±1*s.* 4*d.* | ±9*d.* |

A difference of more than 1*s.* 6*d.* between the two countries would be significant. As the actual difference was 8*s.*, it is very highly significant.

For the period 1963/5, with virtually no change in sample size, the gap had narrowed to 4*s.* 4*d.* The variance for Denmark is available only for 1962, but on the reasonable assumption that it is unchanged, the confidence limit is:

| | *England* | *Denmark* |
|---|---|---|
| Cost per score | 37*s.* 7*d.*±1*s.* 3*d.* | 33*s.* 3*d.*±10*d.* |

The difference of 4*s.* 4*d.* is thus very highly significant.

**2. Weaners per sow per year**

The difference between the English Census estimate and the Cambridge Pig Management Scheme is not significant—in fact, as can be seen from figure 2, they are closely similar. It seems reasonable therefore to accept the estimate derived from the costings scheme as representative of the national herd. The difference between the Danish Census and the Cambridge Pig Scheme (1963/65) is closing at a gradual but highly significant rate. As can be seen from figure 2, the rate of improvement was not uniform—it was more rapid from 1946 to 1957, then slowed down. There are, however, signs of further improvement in 1965, due to early weaning, which seem likely to continue. The Danish results have shown little change over the period for which records are available.

**3. The other two breeding factors**—litters per sow and weaners per litter—show a gradual but highly significant improvement from 1946 to 1965. Again the Danish results show little change.

**4. Food conversion rate**

There is a significant and steady fall in the costings schemes for both Denmark and England of approximately 0·05 per year between 1953 and 1965. Thus, although the gap for this factor is not narrowing, results in both countries are improving.

# APPENDIX III

## Pig Population ('000s)

| | 1953 | 1954 | 1955 | 1956 | 1957 | 1958 | 1959 | 1960 | 1961 | 1962 | 1963 | 1964 | 1965 | 1966 (*a*) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **GT BRITAIN** | | | | | | | | | | | | | | |
| Sows in pig .. .. .. .. | 291 | 366 | 333 | 319 | 340 | 385 | 337 | 318 | 343 | 391 | 415 | 407 | 452 | 410 |
| Gilts in pig .. .. .. .. | 150 | 149 | 83 | 123 | 141 | 126 | 95 | 124 | 133 | 131 | 129 | 148 | 129 | 96 |
| Other sows for breeding .. .. | 172 | 210 | 200 | 174 | 180 | 210 | 175 | 172 | 189 | 213 | 211 | 223 | 239 | 217 |
| Total breeding sows and gilts .. | 613 | 726 | 616 | 617 | 662 | 720 | 607 | 615 | 665 | 735 | 755 | 778 | 820 | 723 |
| Sows for fattening .. .. .. | 17 | (*b*) | (*b*) | 15 | 20 | 25 | 21 | 16 | 17 | 17 | 17 | 15 | 20 | 19 |
| Boars for service .. .. .. | 34 | 43 | 40 | 39 | 41 | 45 | 38 | 37 | 39 | 42 | 43 | 44 | 45 | 40 |
| Other pigs under 2 months .. .. | 1097 | 1363 | 1306 | 1220 | 1335 | 1499 | 1264 | 1241 | 1339 | 1510 | 1477 | 1663 | 1857 | 1672 |
| ,, ,, 2 to 5 months .. .. | 1708 | 2280 | 2188 | 2012 | 2219 | 2437 | 2280 | 2025 | 2132 | 2377 | 2502 | 2756 | 3014 | 2923 |
| ,, ,, 5 months and over .. | 937 | 1020 | 1007 | 919 | 956 | 969 | 925 | 806 | 816 | 858 | 876 | 970 | 1017 | 930 |
| Total pigs .. .. .. .. | 4406 | 5431 | 5157 | 4821 | 5232 | 5695 | 5135 | 4739 | 5009 | 5540 | 5670 | 6227 | 6773 | 6305 |

(*a*) Provisional. (*b*) Included with "Other pigs".

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **DENMARK** | | | | | | | | | | | | | | |
| Sows to farrow for first time .. | 115 | 123 | 83 | 122 | 136 | 121 | 166 | 152 | 215 | 179 | 153 | 211 | 185 | 171 |
| ,, ,, ,, ,, second ,, .. | (*a*) | (*a*) | (*a*) | (*a*) | (*a*) | (*a*) | (*a*) | (*a*) | (*a*) | 115 | 114 | 133 | 128 | 119 |
| ,, other to farrow .. .. | 199 | 217 | 196 | 210 | 234 | 245 | 275 | 285 | 304 | 235 | 268 | 278 | 314 | 311 |
| ,, with litters .. .. .. | 130 | 144 | 130 | 127 | 157 | 147 | 175 | 186 | 215 | 214 | 215 | 257 | 278 | 249 |
| Total breeding sows .. .. | 444 | 484 | 409 | 459 | 527 | 513 | 616 | 623 | 734 | 743 | 750 | 879 | 905 | 850 |
| Sows for slaughter .. .. .. | 41 | 55 | 44 | 44 | 55 | 49 | 54 | 58 | 65 | 58 | 57 | 62 | 66 | 56 |
| Boars for service .. .. .. | 14 | 15 | 12 | 13 | 14 | 14 | 16 | 17 | 19 | 21 | 21 | 24 | 26 | 25 |
| Suckling pigs .. .. .. .. | 1142 | 1224 | 1155 | 1097 | 1343 | 1296 | 1516 | 1614 | 1861 | 1861 | 1902 | 2222 | 2445 | 2201 |
| Weaned pigs under 35 kg .. .. | 1014 | 1219 | 1098 | 1105 | 1346 | 1319 | 1542 | 1474 | 1767 | 1837 | 1819 | 1903 | 2056 | 1934 |
| Pigs 35 to 60 kg .. .. | 948 | 1122 | 1105 | 1110 | 1282 | 1304 | 1457 | 1401 | 1666 | 1654 | 1703 | 1774 | 1908 | 1868 |
| ,, 60 and over .. .. | 707 | 733 | 775 | 802 | 842 | 852 | 873 | 960 | 983 | 1007 | 1082 | 1147 | 1218 | 1193 |
| Total pigs .. .. .. .. | 4310 | 4852 | 4598 | 4630 | 5409 | 5347 | 6074 | 6147 | 7095 | 7181 | 7334 | 8011 | 8624 | 8127 |

(*a*) Included with other sows to farrow.

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **HOLLAND** | | | | | | | | | | | | | | |
| Young sows and boars .. .. | 46 | 52 | 69 | 66 | 64 | 58 | 84 | 77 | 87 | 113 | 87 | 133 | 126 | 121 |
| Breeding sows .. .. .. | 248 | 254 | 313 | 286 | 311 | 298 | 334 | 379 | 352 | 384 | 347 | 398 | 442 | 450 |
| Boars for service .. .. .. | 4 | 4 | 4 | 5 | 5 | 5 | 5 | 6 | 6 | 7 | 8 | 9 | 10 | 12 |
| Suckling pigs .. .. .. .. | (*c*) | (*c*) | 720 | 737 | 797 | 737 | 785 | 957 | 832 | 738 | 887 | 969 | 1151 | 1064 |
| Weaners under 25 kg .. .. | 781 | 806 | 256 | 259 | 275 | 274 | 292 | 332 | 295 | 321 | (*d*) | 288 | 324 | 269 |
| Pigs 25 to 60 kg.. .. .. | 539 | 487 | 574 | 555 | 589 | 593 | 594 | 724 | 720 | 719 | 975 | 850 | 986 | 1095 |
| ,, 60 to 90 kg (*a*) .. .. | 288 | 290 | 344 | 336 | 385 | 430 | 405 | 422 | 494 | 455 | 547 | 554 | 651 | 784 |
| ,, 90 kg and over (*b*) .. | 62 | 81 | 98 | 87 | 102 | 77 | 91 | 59 | 75 | 62 | 72 | 67 | 61 | 92 |
| | 1968 | 1975 | 2378 | 2332 | 2529 | 2472 | 2590 | 2955 | 2860 | 2800 | 2923 | 3268 | 3752 | 3886 |

(*a*) 60 to 90 kg to 1962.
(*b*) 95 kg and over to 1962.
(*c*) Included with weaners, 25 kg.
(*d*) Included with pigs, 25 to 60 kg.

# APPENDIX IV

## Estimated number of pigs produced per sow per year in Great Britain

| | Mortality all'ce | 1954–5 I* | 1954–5 C* | 1955–6 I | 1955–6 C | 1956–7 I | 1956–7 C | 1957–8 I | 1957–8 C | 1958–9 I | 1958–9 C | 1959–60 I | 1959–60 C | 1960–1 I | 1960–1 C | 1961–2 I | 1961–2 C | 1962–3 I | 1962–3 C | 1963–4 I | 1963–4 C | 1964–5 I | 1964–5 C | 1965–6 I | 1965–6 C |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total breeding pigs | Nil | −113 | −113 | – | – | 52 | 52 | 67 | 67 | −124 | −124 | 2 | 2 | 53 | 53 | 73 | 73 | 21 | 21 | 22 | 22 | 47 | 47 | −102 | −102 |
| Suckling pigs | 10% | −56 | −62 | −86 | −95 | 115 | 104 | 164 | 148 | −235 | −258 | −23 | −25 | 98 | 88 | 171 | 154 | −33 | −36 | 186 | 167 | 175 | 158 | −166 | −183 |
| Feeders | 2% | −105 | −107 | −249 | −254 | 244 | 239 | 231 | 226 | −201 | −205 | −374 | −381 | 117 | 115 | 287 | 282 | 143 | 140 | 348 | 341 | 283 | 277 | −156 | −159 |
| "Corrected" increase .. | | −282 | | −349 | | 395 | | 441 | | −587 | | −404 | | 256 | | 509 | | 125 | | 530 | | 482 | | −444 | |
| Pigs certified June–June .. | | 9703 | | 8318 | | 8098 | | 8761 | | 9387 | | 8412 | | 7996 | | 8981 | | 9856 | | 9794 | | 10,825 | | 11,672 | |
| Est. marketings not certified | | 190 | | 190 | | 190 | | 190 | | 190 | | 190 | | 190 | | 190 | | 190 | | 190 | | 190 | | 190 | |
| Sow and boar slaughterings | | 357 | | 308 | | 301 | | 294 | | 382 | | 32 | | 310 | | 294 | | 314 | | 354 | | 329 | | 389 (Est.) | |
| Replacement for sow and boar mortality .. .. | | 18 | | 16 | | 17 | | 18 | | 17 | | 16 | | 17 | | 18 | | 20 | | 20 | | 21 | | 20 | |
| Total production .. | | 9986 | | 8483 | | 9001 | | 9704 | | 9389 | | 8536 | | 8769 | | 9992 | | 10,505 | | 10,888 | | 11,847 | | 11,827 | |
| Average sows (June–Dec.–June Census) .. .. | | 679 | | 611 | | 634 | | 704 | | 662 | | 602 | | 636 | | 700 | | 745 | | 761 | | 800 | | 774 | |
| Est. average sows on under 1 acre holdings.. .. | | 28 | | 28 | | 28 | | 28 | | 28 | | 28 | | 28 | | 28 | | 28 | | 28 | | 28 | | 28 | |
| Total .. .. .. | | 707 | | 639 | | 662 | | 732 | | 690 | | 630 | | 664 | | 728 | | 773 | | 789 | | 828 | | 802 | |
| Number of pigs produced per sow .. .. .. | | 14·1 | | 13·3 | | 13·6 | | 13·2 | | 13·6 | | 13·5 | | 13·2 | | 13·7 | | 13·6 | | 13·8 | | 14·3 | | 14·7 | |
| Number of weaners produced per sow (*a*) .. .. | | 14·4 | | 13·7 | | 13·9 | | 13·5 | | 14·0 | | 13·9 | | 13·6 | | 14·2 | | 14·1 | | 14·3 | | 14·7 | | 15·1 | |

* I = Increase during year; C = Correction for pre-slaughter deaths

(*a*) The number of pigs produced per sow per year has been increased by the feeding stock mortality rate from the Cambridge Pig Scheme to give the number of *weaners* per sow per year.

# APPENDIX V

## Estimated production per sow—Denmark

| Year | *Col.* 1 *Number of suckling pigs per suckling sow* | *Col.* 2 *Number of pigs weaned per litter* (95% *of Col.* 1) | *Col.* 3 *Number of litters per sow per year* (*a*) | *Col.* 4 *Number of weaners per sow per year* (*Col.* 2 × *Col.* 3) |
|---|---|---|---|---|
| 1953 | 8·78 | 8·34 | 1·90 | 15·8 |
| 1954 | 8·50 | 8·08 | 1·93 | 15·6 |
| 1955 | 8·88 | 8·44 | 1·92 } (*b*) | 16·2 |
| 1956 | 8·64 | 8·21 | 1·92 } (*b*) | 15·8 |
| 1957 | 8·55 | 8·13 | 1·94 | 15·8 |
| 1958 | 8·82 | 8·37 | 1·86 | 15·6 |
| 1959 | 8·66 | 8·23 | 1·85 | 15·2 |
| 1960 | 8·68 | 8·24 | 1·94 | 16·0 |
| 1961 | 8·66 | 8·22 | 1·90 | 15·6 |
| 1962 | 8·70 | 8·26 | 1·87 | 15·5 |
| 1963 | 8·85 | 8·40 | 1·86 | 15·6 |
| 1964 | 8·65 | 8·21 | 1·90 | 15·6 |
| 1965 | 8·80 | 8·36 | 1·99 | 16·6 |
| 1966 | 8·84 | 8·40 | 1·90 | 16·0 |

(*a*) The number of suckling sows multiplied by 6½ (number of 8-week weanings a year) and divided by the total number of breeding sows.

(*b*) Average of two years.

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