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Sheep - Cost
of production

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HILL SHEEP - A STUDY OF COSTS AND RETURNS ON 48

WELSH FARMS DURING 1945-46.

by

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1948.

PRICE: ONE SHILLING.

Introduction.

Much has been written and spoken about the long-continued adversity of hill sheep farms, and, while it is generally recognised that financial conditions on these farms have been extremely poor, relatively little is known regarding the extent of the disparity in incomes and living standards between those who work them and those who work other types of farms. More than any other group, hill farms are organised on a family basis, and their resources are relatively immobile. Standards of living have been stabilised at low levels, and operators have become accustomed to what is really an insufficient level of income. Had it been otherwise, many more of the remoter holdings would have become derelict. A study of conditions on one Welsh hill farm between 1929-30 and 1937-8* showed that for five out of the nine years the farm income failed to meet the charges of minimum wage rates for the farmer and his wife and interest on capital invested. When it is remembered that about one-quarter of Welsh farmers are concerned with hill sheep flocks the aggregate extent of the depression in Welsh agriculture is seen to assume considerable proportions, and it becomes clear that the recent legislation to support hill farming was certainly not premature.

It is not always realised that the average size of hill sheep flocks in Wales is no more than 75-80 sheep (ewes and yearlings), and that 86 per cent of hill flocks have 200 sheep or less**. The organisation of these farms in such small units has meant that the productivity of labour engaged on them has been very low, and a recent study has indicated that there is considerable opportunity for amalgamation of holdings, particularly as labour has become a limiting factor in production.

Since the end of the last century there has been an appreciable change in the constitution of hill flocks. The main feature in the change has been the gradual disappearance of wethers. It is generally believed that this has resulted in deterioration of hill grazings. The change, however, is linked with the change in public demand and in the supply of imported lamb meat. It would appear, therefore, that the problem is beyond the control of the hill sheep farmer, and under normal conditions its solution may depend on official action to limit the supply of sheep meat, at any rate to the extent of ensuring that sufficient public demand exists to consume the maximum productivity of our hills. There is no doubt that wether mutton production involves comparatively low demands on the resources of feed and labour, and that, particularly in a period of food shortage, any argument in its favour merits some consideration. But it does follow that if hill sheep farming as such needs official support for its rehabilitation, any schemes involved should take into consideration the utilisation of wether flocks as an important factor in increasing the productivity of hill grazings.

* J. Pryse Howell: "A Hill Farm in Wales (Nine Years' Financial Results)" Welsh Journal of Agriculture, Vol. XV. 1939.

** Ashby and Phillips: "Some Aspects of Hill Sheep Farming in Wales". Welsh Journal of Agriculture, Vol. XVII. 1943.

♠ Phillips, J.R.E.: "Hill Sheep Farms in Wales: A Study in Economic Organisation." Dept. of Agricultural Economics, University College of Wales, Aberystwyth. 1946

The table below* gives some indication of the change in constitution of Welsh sheep flocks in the 40-50 years prior to the late War.

Constitution of Flocks (as percentages).

Year.	Ewes for Breeding.	Other Sheep.	
		Under 1 year old.	Over 1 year old.
1893	36.8	33.4	29.8
1933	47.0	40.2	12.8
1937	46.4	46.4	7.2

There was, of course, a similar trend in other hill farming areas of Britain, and the following extract from a recent Scottish report** sums up the consequences of this change:-

"Before the days of large imports of mutton, and when consumers required big joints, many of the exposed hills were stocked with wedder sheep. Many wedder flocks were replaced by ewe flocks when these conditions changed. But the harsh climatic conditions, which widders were able to stand, were sometimes too much for the ewes. As a result the standard of productivity persistently declined, until a stage was reached when it became so low that no financial improvement could be effected by any practicable increase in prices. Accounts received for some of these poor hill sheep farms in recent years show a level of production so low that the monetary value of the gross outputs would not be satisfactory if lamb and draft ewe prices were quadrupled".

The difference in productivity between winter and summer is probably more marked on rough highland grazings than on any other type of pasture. This is the core of the problem which confronts the hill sheep farmer: how to make fuller use of pastures during the summer grazing season and how to maintain the corresponding ewe flock on an adequate dietary during the hard winter months. It is generally believed that a wether sheep can lose half its weight during the winter months, and yet re-build itself during the summer into a sufficient weight for grading. The ewe, however, has to carry a lamb for the greater part of the hard weather and even, for some months, to keep her own body functioning besides producing milk for her lamb.

In many cases farmers could relieve the situation by improving their in-bye land and increasing its productivity, particularly for wintering of sheep. It was shown in the results of a survey by Ashby and Phillips, a few years ago,

* Ashby and Evans: "The Agriculture of Wales & Monmouthshire". Joint Publication of the Hon. Society of Cymmrodorion & Press Board, University of Wales. 1944.

** Scotland's Marginal Farms. General Report. H.M.S.O. 1947.

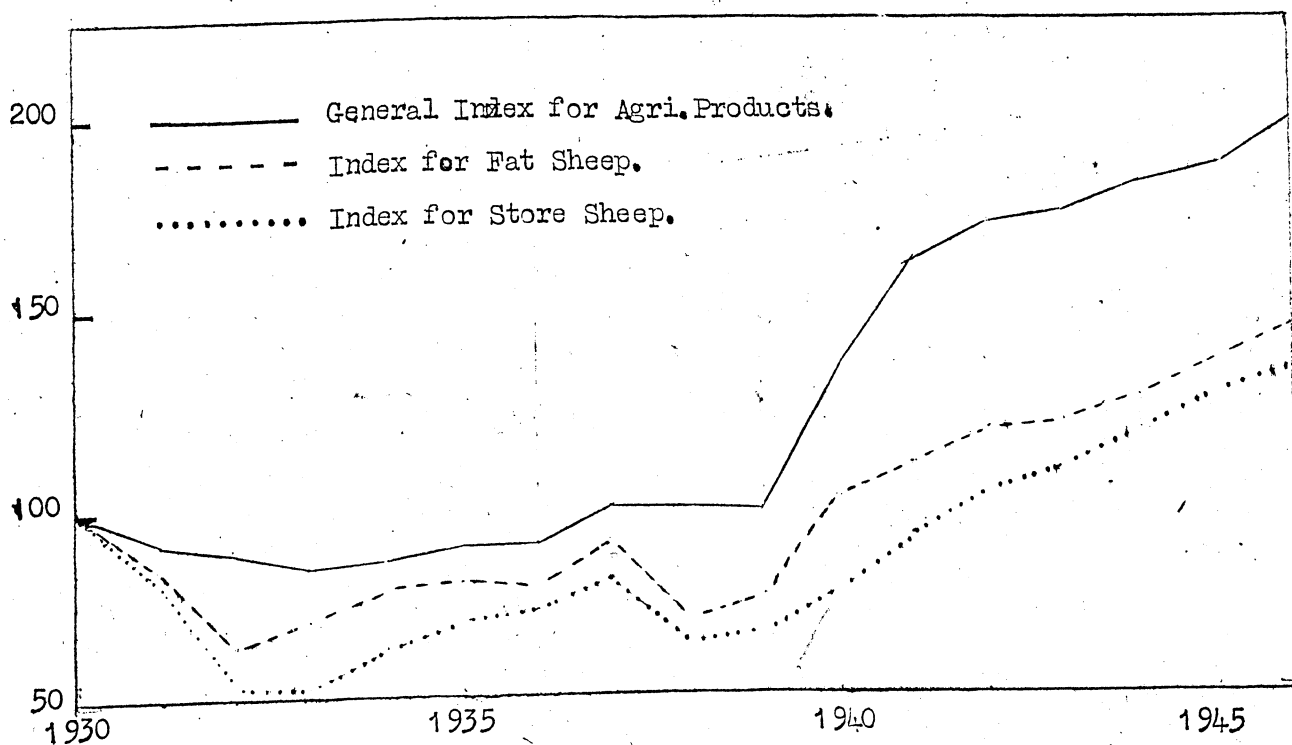
that farms without a sufficient area of low-lying ground suffered more than those where provision of lowland was better, and that costs incurred in tacking down sheep for the winter crippled a good many of them.

As was indicated by the Committee on Hill Sheep Farming, there is much evidence of decay owing to extraneous economic causes, and the application of science alone cannot bring about recovery. There will be little benefit from increasing the productivity of the hills if in the end the products are to suffer from relative disadvantages in the home market.

If, and when, pre-war conditions of demand and supply return, we shall be faced with the question of whether hill sheep farming is to survive or not. Will our lowlands be able to produce all the sheep-meat necessary to meet the nation's demand - and produce it economically - or can these same lowlands produce another commodity which gives them a better return for identical expenditure of their resources? The relative economy of land utilisation on lowland farms may influence the utilisation of poor upland grazings.

Although there was a general depression of prices in the early thirties, those of store sheep fell more steeply than those of agricultural products in general. It is little wonder, therefore, that hill sheep farmers were unable to reinvest capital in their farms, and that grazings deteriorated into a very low productive capacity.

Trends of Indices of Agricultural Prices 1930-46.
(1930 = 100).



(Source: Ministry of Agriculture Statements of Price Indices).

It will be seen from the graph that from 1930 onwards the disparity between prices of sheep and those of agricultural products in general grew wider, and that prices of store sheep, while following those of fat sheep fairly closely, had nevertheless fallen below them.

Results of 1945-6 Investigation.

The investigation undertaken by the Department during 1945-6 covered 48 flocks dispersed in the four counties of Merioneth, Caernarvon, Brecon and Montgomery. The average size of ewe flocks in the sample was 763, which of course is very much larger than that of the 'national' hill flock. The smallest flock in the sample had an average number of 94 ewes, while the largest flock included 2,581 ewes. The frequency distribution in ewe-flock size groups was as follows:-

Frequency Distribution of Ewe Flock Sizes.

<u>Size of Ewe Flock.</u>	<u>No. of Flocks.</u>
100 or less	1
101 - 250	2
251 - 400	9
401 - 550	10
551 - 700	8
701 - 850	5
851 - 1000	1
1001 - 1250	5
1251 - 1500	1
1501 - 1800	3
1801 - 2000	0
Over 2000	3
	<u>48</u>

Of the forty-eight flocks, eleven did not have accompanying wether sheep. Where wethers were kept, the average number per 100 breeding ewes was about 21, but there was considerable variation between individual farms; one farm had 107 wethers for every hundred ewes, but a dozen farms had 10 or less. All but nine of the farms had incurred "tacking" costs, and in some cases ewes were wintered on land in their possession, but at some distance from the home farm.

Some idea of the relative stocking of the farms by the various livestock can be derived from the grazing record. After converting stock into grazing units, and considering the duration of grazing periods by each group, it has been calculated that sheep utilised 88 per cent of the available grazing. The remaining 12 per cent was utilised by cattle. Cattle were very largely confined to grazing on the lower pastures and "ffriddocdd", and hardly utilised winter grazing on the hills at all.

On 28 of the farms some attempt had been made at providing for the sheep a supplementary feed of catch crop, such as rape or rape and turnips. Where a relatively large acreage was grown it was used to some extent for finishing off

lambs for grading. On the whole, however, the acreage grown was very small, and only averaged between 6 and 7 acres per farm which grow it. Two of the farms grew 29 and 24 acres respectively. In some cases also the crop was used as a 'nurse' for seeds.

Table I (Appendix 1) gives the average stocking and land utilisation on these farms. In one or two cases the area of rough grazing on mountain was not determinable, so that the actual area of rough grazing was in excess of the figure shown. There was, however, over one acre of land per sheep kept.

On the whole, cattle assumed relatively little importance on the farms in the sample, although in some individual cases they probably accounted for a greater part of the farm output than did sheep. Only three of the farms were without any cattle at all.

Weather conditions were particularly bad for the 1946 hay harvest on hill farms, and although those in the sample had, on average, prepared about 26 acres each for hay, very little of this was harvested as such. In many cases cattle were turned in to graze what was very poor and over-matured hay.

There was very little resort to hand-feeding of sheep during the winter of 1945-6. The purchased nuts and the bulk of the hay consumed were used on six of the farms where an appreciable number of lambs and wethers were graded.

In Table II (Appendix I) there is shown a general statement of account for the sheep enterprise of all the 48 flocks in the sample. It will be noticed that Hill Sheep Subsidy payments have been included as a receipt. It may be argued that this item should not appear in the sheep account at all, particularly as such payments are, to some extent, intended to promote improvements that would render the hill land more productive. On the other hand, no allowance has been made in grazing and other costs for such re-imburements.

The margin or gross profit shown is not necessarily the true net profit accruing to the farmers. No account has been taken of miscellaneous overhead expenses attributable to the farm organisation as a whole, nor has any interest been allowed on capital investment. It will be seen that over half this margin is attributable to Hill Sheep Subsidy payments. The highest individual farm margin was £1.516 - with an average ewe flock size of 258 - while the worst result was a loss of about £28 on a flock of 94 ewes. Incidentally these flocks were the largest and smallest, respectively, in the sample. With Hill Sheep Subsidy payments included as receipts, only the one farm shows a loss; if, however, the payments were excluded, nine farms would be showing an adverse margin, and another five would show a favourable margin of only a few pounds. An investigation carried out in the East of Scotland in 1945-6 on 26 hill sheep farms indicated that such farms were very largely dependent on direct subsidies, and that the Hill Sheep

N.B. Costings methods and principles adopted are described in Appendix II of this Report.

Subsidy alone accounted for 54 per cent of their net profits.*

Insufficient accommodation for wintering of ewes and ewe lambs has involved the hill farmers in heavy expenditure on agistment. Such expenditure for the group as whole has been almost as much as the costs incurred on all their own grazing lands, and has in many cases exceeded them. In terms of per 100 ewes this charge appears to be heavier with the larger flocks than with the smaller ones. This might be taken to indicate that it is among the larger hill sheep farms that reorganisation is needed - that is, reorganisation to adjust grazing resources so that the total sheep carried can be accommodated both in summer and winter without resort to "expensive" agisting ground. Although the smaller units, on the whole, appear to be more self-contained, the relative extensive nature of production does not allow them to provide a sufficient total return for the labour involved.

The factor of incomplete adjustment between summer and winter grazing to meet the needs of the permanent flock appears, in this sample of farms at least, to have offset some of the advantages of large-scale production. An analysis of the results according to ewe-flock sizes - shown in Table III of the Appendix - indicates relatively little improvement in profit margin per 100 ewes with increasing size of flock. It will be seen that, although the larger flocks involve a much reduced labour cost per ewe, they have in general a higher level of costs for wintering their ewes. One might have expected disease or casualties to have accounted for some of the poor results on larger flocks, but smaller flocks on the whole suffered more from these causes than the larger ones (See Table V). Deaths among sheep, however, were responsible for some low margins.

An analysis of flock results according to profit margin per 100 ewes reveals some factors which influence profitability. In Table IV the results of flocks have been arranged according to average profit per 100 ewes, and average figures are shown for four groups: (a) flocks with an average profit of under £25 (b) flocks with an average profit of between £25 and £50 (c) flocks with an average profit of between £50 and £70 and (d) flocks with an average profit of over £70. This analysis indicates decreasing labour and agistment costs as profits rise, and suggests that among the factors affecting profitability of hill sheep flocks are size of flock - with its distinct bearing on economy in the use of labour - and the provision of adequate grazing for wintering ewes and ewe lambs at home. Another factor which appears to have influenced relative profitability in the flocks of this sample is the provision made for fattening sheep on green crops, since where this existed the proceeds from sales show a much higher return per 100 ewes.

Lambing Results.

It was naturally impossible to say exactly how many lambs were born in these flocks. The nearest estimate is that obtainable from the number of

* East of Scotland College of Agriculture. Bulletin No. 4. Report on Financial Results of 26 Hill Sheep Farms.

lambs recorded in the first count. On average there were 72 lambs for every 100 ewes kept for lambing. There was considerable variation between individual farms, the range being from 5 to 103 lambs per 100 ewes for lambing. In one case where lambing was 53 per cent, about a quarter of the ewes had proved barren; where the average was 103 per cent, seven sets of twin lambs were born in a flock of 250 lambing ewes.

As was the case with a group of lowland ^{sheep} farms in Wales in 1945-6*, size of flock appears to have some influence on lambing percentages. In the lower group - where the average ratio was 53 to 67 lambs per 100 ewes for lambing - the average size of flock was 1094 ewes; the next group, with ratios of between 68 and 75, had an average size of 688 ewes; the groups with ratios of 76 to 83 and 84 to 103 had flocks averaging 738 and 444 ewes respectively (See Table VI, Appendix I).

Poor lambing results are among the main factors which account for the precarious character of hill sheep farming. The variations in weather conditions have a profound influence on the productivity of hill sheep. Again, to what extent mineral deficiency in pasture, for instance, affects lambing results is not known, but there is evidence to suggest that this factor is too often overlooked, and that malnutrition in in-lamb ewes is far too prevalent for a reasonable output to be expected on our hill grazings.

It would be difficult to measure with any precision the influence of lambing results on the productivity of flocks in this sample. The difficulty arises from the existence of various combinations of factors which affect flock profitability. As has already been pointed out, there appears to be some relationship between size of flock and lambing percentages, smaller flocks as a rule having higher ratios than larger flocks. Small flocks, on the other hand, tend to be uneconomic in the utilisation of resources. We thus have two opposing factors operating simultaneously, both of which are admitted to have an appreciable influence on productivity. In Table VI the costs and returns per 100 ewes are shown for flocks grouped according to lambing ratios. It appears obvious from this analysis that lambing ratios have a profound influence on profitability, in spite of the fact that the smaller flocks have a relatively high cost of labour, and other disadvantages attending small-scale production. As would be expected, this influence reveals itself in the relative output of flocks, particularly in sales of lambs, and in increase in valuation resulting from a larger number of lambs on hand.

It is noteworthy that the one flock which failed to show a margin of profit - even after including hill sheep subsidy payments - experienced the heaviest relative loss from lamb deaths. For every hundred ewes for lambing in this flock, 22 lambs were lost. Many casualties were due, however, to ravages of foxes and dogs.

As a rule between 30 and 40 lambs per 100 ewes are retained for ewe-flock replacement each year. Where provision is made for fattening lambs, a proportion of the remainder are graded. For this sample, the average disposal of lambs (per 100 ewes) was as follows:-

* Roberts, B. H. Costs of Fat Lamb Production on Lowland Farms in Wales in 1945-6. Pub. by Dept. of Agri. Econ, Univ. Coll. of Wales, Aberystwyth. 1947.

8.

Kept for ewe-flock replacement	33-34
Transferred to wether flock	11-12
Transferred to ram flock	1
Sold as fat lambs	5
Sold, or on hand, as store lambs	17
Deaths during the year	4
	<u>71-73</u>

Proportions would vary between farms according to requirements for stock replacement and conditions for feeding.

Output.

The output of the hill sheep enterprise is very largely made up of store sheep and wool, and it must be regarded as the product of a relatively extensive form of production, whether considered in terms of land area or expenditure of labour and capital. As was indicated by Phillips,* in 1944 a group of hill sheep farms in Wales derived well over half their income from sheep, and the larger the flocks the greater was the proportion of income so derived. Sales of sheep on the farms in the present survey averaged £187 per farm or about £24 per 100 ewes in flock. It is interesting to note that sales of ewes accounted for a greater proportion of total sheep sales than any other group. The distribution of receipts from sales of sheep was as follows:-

	<u>Per cent.</u>
Lambs	38.6
Wethers	19.0
Ewes	40.2
Rams	2.2
	<u>100.0</u>

Of the 38.6 per cent from sales of lambs, 15.8 per cent was derived from sales of fat lambs. Many of the farms producing fat lambs had fed them on rape, and this appears to have been an important factor in raising the output of these farms.

On an average 118 lambs, 33 wethers, and 105 ewes were sold per farm during the year, and the average prices realised, per head, were as follows:-

	£. s. d.
Fat Lambs	2. 2. 9
Store Lambs	1. 4. 4
Fat Wethers	2. 18. 9
Store Wethers	2. 8. 1
Ram Lambs	3. 7. 3
Fat Ewes	1. 15. 0
Draft Ewes	1. 14. 11

In the case of a group of 26 hill sheep farms in the East of Scotland** over

* op. cit.

** Edinburgh and East of Scotland College of Agriculture. Bulletin No. 4. Report on Financial Results of 26 Hill Sheep Farms.

the same period, the revenue from sale of lambs accounted for a greater proportion of total sheep sales. This was partly due to a better yield of lambs (between 85 per cent and 90 per cent). It is a significant feature of these Scottish farms that, for every hundred breeding ewes, about 54 lambs were sold; whereas for the group of Welsh farms only 26 lambs were sold for 100 breeding ewes lambing in 1946. The Scottish farms derived 56 per cent of their sheep sales from lamb sales, and only 25 per cent from ewe sales.

The "average" acre of a Welsh farm varies considerably, and the value of comparison of output in terms of unit land is thereby reduced. There is some difficulty also in determining the total area of land utilised by the sheep. It is probably true, however, that in the group of farms under study practically 1000 acres of grazing were utilised by sheep, per farm. If we accept the definition of gross output as the total proceeds of sales of sheep and wool, plus the valuation difference, with an adjustment for production on agistment ground, the value of the gross output on these farms is seen to be little more than 10s. per acre, and the value of the net output only about 7s. per acre (excluding receipts from Subsidy). The net output in this context is taken as the value of the gross output less expenditure on foods and grazing.

In view of the possible alternatives for employment of labour and capital resources, it might be of interest to examine the results of this investigation in order to determine what returns accrue to these factors in connection with the hill sheep enterprise. In Table VII the average returns are shown for flocks in the four size-groups, alongside those for the whole sample. The value of capital taken is that invested in permanent flocks, and for this purpose averages of opening and closing valuations are used.

It may be argued that receipts from the Hill Sheep Subsidy should not be regarded as a component of the output; if this subsidy, however, is regarded as a support for sheep prices, then it does enter into the value of the output and should therefore be included. In Table VIII averages are shown which include and exclude subsidy payments.

The margin is the amount remaining to cover interest on capital and managerial earnings.

It is evident that the return on labour is affected by size of flock. For every £100 spent on labour, - directly in attending to sheep, and indirectly in the production of pasture and feeding crops for them - the value of gross and net output increases with size of flock. Excluding receipts from the Hill Sheep Subsidy, the value of gross output per £100 labour from the group of largest flocks is about 37 per cent more than from the group of smallest flocks, and the value of net output nearly 30 per cent more.

The return per unit of capital investment, on the other hand, shows relatively little variation between the flock size groups, and there is no correlation between output per unit of capital and flock size. Of more significance is the relation between flock size and the margin per unit of capital investment.

Although here again the variation is very small, it does show slightly increasing returns with increasing size of flock. If capital were regarded as the residual claimant on the margin from these flocks, it is probable that a return of something like 15 per cent would accrue to it. But if we took the actual margin, - excluding subsidy payments, - capital, as a residual claimant would receive probably no more than 6 per cent, which, in view of the tremendous risks involved, can hardly be regarded as sufficient.

In the group of Scottish hill sheep farms under study at the same period,* the total farm profit for distribution to capital and management was between £12 and £13 per £100 capital investment. On these farms about 75 per cent of the capital was invested in sheep.

The data available from this survey does not permit an accurate measure of the quantum of output in sheep-meat. Some estimate, however, is possible. The data have provided weights of sheep passing through the grading centres, and in some cases estimates have been made of weight of store sheep which normally leave the farms. Where information was available the average weights were as follows:-

<u>Class.</u>	<u>Average liveweight</u>	<u>Average Deadweight</u>
	<u>per head.</u>	<u>per head.</u>
	lb.	lb.
Fat Lambs	55½	26¼
Fat Wethers	82	39
Fat Ewes	73	36
Store Lambs	42	-
Store Wethers	64	-

The estimated average numbers of sheep sold and available for sale per farm of the 48 farms in this sample were as follows:-

Draft Ewes	104
Fat Ewes	1
Store Wethers	31
Fat Wethers	13
Store Lambs	97
Fat Lambs	34

If we assume that each of the store lambs contributes 16 lb. and each of the store wethers and ewes 25 lb. deadweight of meat of the ultimate production from these sheep, we might estimate the total output of meat from a hill flock, in terms of per 1000 breeding ewes, as follows:-

* op. cit.

Class.	Average Deadweight, lb.	Average Numbers per 1000 Ewes.	Total product per 1000 Ewes. lb.
Draft Ewes	25	136.0	3,400
Fat Ewes	36	1.3	47
Store Wethers	25	40.6	1,015
Fat Wethers	39	17.0	663
Store Lambs	16	127.0	2,032
Fat Lambs	26 $\frac{1}{2}$	44.5	1,168
Total from hill flock.	-	-	8,325

This means that, for every breeding ewe in the flocks, the potential supply of dressed carcass would be just over 8 lb. "Exports" in the form of breeding rams have not been taken into consideration, but this item would relatively be very small.

Cost of Production of Store Lamb.

The store lamb is only one of a number of joint products of the hill sheep enterprise. Farmers would of course be interested to know what the cost of production of a store lamb is, and, particularly, the relation between this cost and prices of lambs offered for sale during the autumn.

Problems of allocation of costs between different classes of sheep make it difficult to make any accurate estimate of the cost of production of any one type. Even the store lamb itself is a variable product and needs definition. We might consider costing the lamb crop as a whole, attributing to it all the costs incurred in a full year with the breeding flock and the lambs while on the farms. That procedure implies crediting any profit on fat lamb and fat ewe production against store lamb costs; there is, moreover, the question of allocating costs to the associated wether flock. Not all farms keep wethers, however, and in cases where wethers are absent one may justifiably proceed to cost the store lamb. There are only eleven flocks in this category, and any estimate of cost must therefore be regarded as a crude one. In Table VIII costs incurred on these eleven flocks are expressed in terms of each lamb produced. The cost of eweflock replacement is lower than might normally be expected, because these farms sold out a relatively large number of ewes, many in a fat condition. On the other hand, costs of keeping all ewes are included in the total attributed to lamb production. The total number of lambs produced, used as the divisor, includes a number that were graded fat.

In the total sample of 48 flocks, there were 37 which included wethers, and the cost of producing a lamb over the whole sample can only be estimated by arbitrary methods. One method which may give an approximate net cost, but which does not provide a cost structure, is to adjust total costs incurred by making

allowance for a possible margin on wether production. For the whole sheep enterprise the margin (excluding subsidy) is just about 30 per cent of the gross output. The gross output of wethers can be determined; and, on the assumption that the margin from them will represent a similar proportion (i.e. 30 per cent) to that existing in the whole enterprise, an estimate of that margin can be made. If from the total net costs of the 48 flocks (adjusted for value of wool from breeding flock and lambs), we then deduct the estimated margin on wethers, the average net cost per lamb produced will be just under £1, which is practically the same as that determined on the flocks without wethers. It must be emphasised, however, that this figure is based on a very arbitrary method of calculation, and should be used merely as a guide.

By adjusting the total costs with the margin on wether production, we are only crediting a main process with profit from a subsidiary one.

If we isolate wether production as a separate process, we should deduct, from the total costs of the whole sheep flock, costs likely to have been incurred on the wether flock. Taking costs as the difference between gross output and margin on wethers, and deducting this sum from the total costs, we have an average net cost per lamb of about 18s.

One might be tempted to conclude that by maintaining a wether flock on the hills the farmer economises on his expenditure. It is, of course, conceivable that an addition of a certain number of wethers to a hill flock, will not entail additional expenditure of labour, and that the production in wethers will have been obtained at very little cost. This may be true, but the data available from the farms in this survey do not prove such a contention conclusively, notwithstanding the fact that, among flocks including wethers, the cost of producing a lamb does appear to be somewhat less.

The Structure of Grazing Costs.

In Table IX of the Appendix, costs involved on grazing ground have been analysed into their primary constituents. The grass crops grazed included rough grazing, other permanent and temporary pasture, and aftermath. It will be noticed that rent accounts for approximately half the total cost. Cost of manual labour includes charges for labour expended on establishment work on fields utilised by sheep.

Other grazing crops, such as rape and turnips, occupied an area of 189 acres, and the net cost to sheep, after allowing for residues and unconsumed crops, averaged just under £5 per acre. The total cost of production, however (after allowing for residues carried forward) was about £6 per acre. In a few cases the crop acted as a nurse crop for seeds, and in those circumstances costs were suitably allocated between the two crops.

Conclusion.

This survey, it must be realised, was carried out during the year 1945-6, and the lamb crop involved was that of 1946. It was what may be regarded as a normal year on the hills, except that conditions were extremely poor for the hay harvest.

The hills were subjected to a severe storm last winter, and a survey for 1946-7 (which has just been completed) will show a totally different picture.

In interpreting the results of the 1945-6 survey, therefore, one must be conscious of the risks involved in hill sheep farming practice, and make allowance for possible losses now and again.

Hill sheep farmers do not benefit directly from the existing procedure of fixing agricultural prices, and prices of store sheep are still conditioned by the supply and demand position. They do, however, get a price-support in the form of a subsidy on breeding ewes, and, as the results of this survey show, this subsidy contributes very substantially to any margin of profit accruing to the flock-owners. An artificial price-support, however, does not induce confidence; and, although the Hill Farming Act will guarantee a limited flow of capital to the hills over the next few years, many who have experienced a lifetime in such areas, doubt whether it will rehabilitate the land to such an extent as will enable it to achieve anything approaching its potential productive capacity. The possible alternative utilisation, and increasing income-earning capacity, of lowland pastures is likely to intensify the problem of farmers who have to "tack" their ewes in winter, and we can only expect the already crippling costs per head to increase commensurately with the income-earning capacity from the other productive uses to which lowland areas can be put.

Unfortunately hill sheep farming prosperity is tied up with emergency situations; it is at a time when every effort needs to be made to grow more of our food from our own soil that there is a market for the product of the hill shepherd's efforts. Hill land and stock are not so amenable to constitutional improvement as are lowland pastures and stock. No one is more conscious of this fact than the hill shepherd and flockmaster, and the problems of improving the productive capacity of the hills needs to be approached with great care. The hill farmer is already making "a good job of it"; and what he most needs is a guarantee that his efforts will be adequately recompensed.

The solution of the economic problem of increasing output per man from hill farms might very well create a social problem - possibly one of re-allocation of land and re-distribution of rural population. The administrator, on the one hand, and the scientist, on the other, must provide sufficient positive and conclusive evidence to guide the future course of land utilisation on our highlands. Sir George Stapledon has asked the pertinent question - "Can this country afford not to maintain a viable hill population; can we afford to deny ourselves that reservoir of human genius, capacity, enterprise and endeavour that, like the silt in mountain streams, forever flows down to invigorate and strengthen the lowlands?" Whatever evidence the scientist or the economist may provide, the social and cultural aspect merits due consideration.

APPENDIX I.Table.

- I. Average Stocking and Land Utilisation per Farm.
- II. General Statement of Account for 48 Flocks.
- III. Costs and Returns per 100 Ewes - in Flock Size Groups.
- IV. Costs and Returns per 100 Ewes - in Profit Margin Groups.
- V. Analysis of Losses in Sheep - Deaths per 100 Ewes.
- VI. Lambing Results and Relation with Profitability of Flocks.
- VII. Output of Flocks (Value) - Size Group Comparisons.
- VIII. Average Cost per Lamb Produced - on 11 Flocks without Wethers.
- IX. Structure of Grazing Costs.

Table 1.Average Stocking and Land Utilisation per Farm.

Land Utilisation.	Acres.	Stocking.	Number.
Rough Grazing	721 + *	Horses	2
Pasture	42	Cows in Milk and In Calf	7
Hay	26	Other Cattle over 2 years	13
Tillage	18	Cattle 1 - 2 years old	9
Total	807 +	Calves	5
		Pigs	1 to 2
		Poultry	25 to 30

* This includes 3 farms where area of mountain was indeterminable.

Table II.

General Statement of Account for 48 Flocks.

	£. s. d	£. s. d	:		£. s. d
Opening Valuation		80,814. 1.10	:	Sales of Sheep	21,949.14. 0
Purchases of Sheep		517. 9. 0	:	Sales of Wool	5,963. 5. 8
<u>Foods:-</u>			:	Hill Sheep Subsidy	10,131.12. 6
Hay, Sheep Nut etc.	244.17. 4		:	Closing Valuation	84,091. 8. 4
Grazing	5,561. 3. 7		:		
Rape, Turnips etc.	857.14.10		:		
Agistment	<u>5,007. 0. 9</u>	11,670.16. 6	:		
Labour		8,428.11.11	:		
Transport & Marketing		396.18. 3	:		
Vet., Medicines etc.		716. 8.10	:		
Margin		<u>19,591.14. 2</u>	:		
			:		
		<u>£122,136. 0. 6</u>	:		<u>£122,136. 0. 6</u>

Table III.

Cost and Returns per 100 Ewes. (In Flock Size Groups).

	Size Groups.			
	1.	2.	3.	4.
	400 Ewes	401-550	551-850	Over 850
	or Less.	Ewes.	Ewes.	Ewes.
	£. s. d	£. s. d	£. s. d	£. s. d
<u>Expenditure:-</u>				
Opening Valuation	221.17. 0	220. 0.10	225. 4. 4	218. 8.10
Purchases of Sheep	2.15. 2	0.15. 1	2. 4. 6	0.19. 4
Hay, Sheep Nuts etc.	0. 5.10	0. 2. 3	0.12. 6	0.17.10
Grazing	20.11.10	18. 5.11	16. 5. 3	12.18.10
Rape, Turnips etc.	4.12.10	2. 3. 2	3.15. 0	1. 6.10
Agistment	9. 3. 3	16.17. 5	17. 0. 5	12. 1. 3
Labour	28. 6. 0	28. 4. 3	26.15. 4	19. 0. 6
Transport and Marketing	0. 9. 8	0.13. 2	1. 6. 9	1. 3. 3
Vet and Medicines etc.	1.17. 6	1.16. 3	2. 5. 1	1.17. 2
Total	<u>289.19. 1</u>	<u>288.18. 4</u>	<u>295. 9. 2</u>	<u>268.13.10</u>
<u>Income:-</u>				
Sales of Sheep	54. 9.10	57.19. 1	67.17. 8	57. 8. 5
Sales of Wool	16. 0. 8	18. 3. 6	18. 9. 2	14.15.10
Hill Sheep Subsidy	27. 5. 6	26. 1. 1	26.13. 5	28. 9. 2
Closing Valuation	242.14. 1	236.14. 8	234.17.11	223. 2. 1
Total	<u>340.10. 1</u>	<u>338.18. 4</u>	<u>347.18. 2</u>	<u>323.15. 6</u>
Difference between Income & Expenditure				
and Valuation Change, (= Margin)	50.11. 0	50. 0. 0	52. 9. 0	55. 1. 8
Number of Flocks	12	10	13	13
Average Size of Flock (Ewes)	277	480	688	1510
Average Margin per Flock	£141	£241	£369	£332

Table IV.

Cost and Returns according to Profit Margins (Per 100 Ewes).

	Profit Margin Groups.			
	1.	2.	3.	4.
	Up to £25	£25 - £50	£50 - £70	Over £70
	£. s. d.	£. s. d.	£. s. d.	£. s. d.
<u>Expenditure:-</u>				
Opening Valuation	220. 0. 10	199. 16. 1	223. 0. 5	252. 1. 0
Purchases of Sheep	2. 0. 8	0. 14. 8	1. 12. 1	1. 16. 9
Hay, Sheep Nuts etc.	0. 1. 6	1. 5. 2	0. 9. 7	0. 6. 9
Grazing	15. 3. 10	13. 19. 1	15. 9. 9	16. 11. 0
Rape and Turnips etc.	2. 4. 0	1. 15. 10	1. 8. 5	4. 17. 7
Agistment	22. 16. 10	14. 18. 8	11. 5. 4	9. 17. 5
Labour	27. 11. 5	20. 16. 7	25. 13. 10	19. 2. 4
Transport and Marketing	1. 9. 5	1. 5. 11	0. 18. 1	0. 15. 7
Vet and Medicines	1. 14. 5	2. 16. 9	2. 6. 9	2. 2. 6
Total	293. 3. 2	256. 2. 11	282. 4. 3	307. 10. 11
<u>Income:-</u>				
Sales of Sheep	51. 3. 2	43. 15. 3	69. 7. 10	75. 16. 2
Sales of Wool	14. 17. 5	15. 14. 11	16. 6. 9	17. 14. 10
Hill Sheep Subsidy	26. 13. 1	28. 2. 10	27. 8. 4	27. 10. 4
Closing Valuation	216. 8. 2	210. 0. 4	228. 13. 9	271. 18. 0
Total	309. 2. 2	297. 13. 4	341. 16. 8	392. 19. 4
Difference between Income and Expend- iture & Valuation Change (= Margin)	15. 19. 2	41. 10. 5	59. 12. 5	85. 8. 5
Number of Flocks	9	15	13	11
Average Size of Flock (Ewes)	496	830	957	670
Average Margin per Flock	£79. 2. 7	£344. 8. 10	£570. 15. 0	£581. 13. 11

Table V.

Analysis of Losses in Sheep. Deaths per 100 Ewes.

Class of Sheep.	Flock Size Groups.				Profit Margin Groups. (Per 100 Ewes).			
	400 Ewes or Less.	401-550 Ewes.	551-850 Ewes.	Over 850 Ewes.	Up to £25	£25-£50	£50-£70	Over £70.
Ewes	12.3	8.0	9.0	7.5	12.4	9.2	6.6	7.6
Wethers & Rams	2.1	4.5	3.1	1.9	6.2	2.2	2.1	1.6
Lambs	1.6	2.8	3.4	2.9	6.4	2.2	3.3	2.8
All Sheep	19.0	15.3	15.5	12.3	25.0	13.6	12.0	12.0

Table VI.

Lambing Results and Relation with Profitability of Flocks.
Costs and Returns per 100 Ewes.

Number of Lambs born per 100 Ewes for lambing.	53 - 67	68 - 75	76 - 83	84 - 103
Average Size of Ewe Flock	1094	688	738	444
Number of Flocks	12	15	11	10
<u>Expenditure:-</u>	£. s. d.	£. s. d.	£. s. d.	£. s. d.
Opening Valuation	211.16. 7	205.12.10	232.11. 5	294.15. 9
Purchases of Sheep	1.14. 9	0. 8. 3	1.12. 5	2.11. 8
Hay, Sheep Nuts etc.	0.18. 9	0. 4. 5	0.14.11	0.17. 4
Grazing	11.10. 7	17.12. 8	16.12. 9	19.16. 1
Rape, Turnips etc.	1. 6. 9	1.19. 0	2.15. 6	5.15. 1
Agistment	15. 6. 3	9. 5. 2	14.12. 5	19. 4. 9
Labour	16. 4.11	25.17. 6	27.19. 4	30. 9.10
Transport and Marketing	1. 4.11	0.19. 3	1. 5. 2	0.16.11
Vet. and Medicines etc.	1.12. 0	1.11. 0	2.18. 4	2. 9. 4
Total	264.14. 8	263.10. 1	301. 1. 6	376.16. 9
<u>Income:-</u>				
Sales of Sheep	50. 3. 5	52. 9. 6	80. 0. 2	77.13. 9
Sales of Wool	14.18. 0	14.11. 6	18.17. 8	21.16. 5
Hill Sheep Subsidy	28.12. 2	27. 3. 5	27.16. 5	29.11. 0
Closing Valuation	216.19. 8	213.11. 3	236. 8. 6	327.18. 0
Total	310.13. 3	307.15. 8	363. 3. 0	456.19. 2
Difference between Income and Expend- iture and Valuation Change (= Margin)	48.18. 7	44. 5. 7	62. 1. 6	80. 2. 5

Table VII.

Output of Flocks (Value). (Comparisons of Size Groups).

	Flock Size Groups.				
	400 Ewes or Less.	401-550 Ewes.	551-850 Ewes.	Over 850 Ewes.	All Flocks.
	£.	£.	£.	£.	£.
<u>Gross Output</u> *:-					
Per £100 Labour inc. Subsidy	318	344	450	455	395
Per £100 Labour exc. Subsidy	243	268	349	331	297
Per £100 Capital in Sheep inc. Subsidy	50	52	52	47	50
Per £100 Capital in Sheep exc. Subsidy	38	35	41	34	37
<u>Net Output</u> ∅:-					
Per £100 Labour inc. Subsidy	239	235	309	336	282
Per £100 Labour exc. Subsidy	164	159	209	212	184
Per £100 Capital in Sheep inc. Subsidy	38	40	36	35	35
Per £100 Capital in Sheep exc. Subsidy	26	24	24	22	23
<u>Margin</u> :-					
Per £100 Capital in Sheep	22	22	23	25	24

* Gross Output = Total Receipts adjusted for changes in Stocks of Sheep and wool.

∅ Net Output = Gross output less costs incurred other than that of farm labour.

Table VIII.

Average Costs per Lamb Produced
on 11 Flocks without Wethers.

Breeding Flock Replacement Cost:	£. s. d
	0. 1. 0
<u>Foods</u> :-	
Hand Fed	0. 0. 4
Rape, Turnips	0. 0. 10
Grazing	0. 6. 7
Agistment	0. 5. 6
Labour	0. 9. 11
Transport and Marketing	0. 0. 8
Vet., Medicines etc.	0. 1. 3
Total Gross Cost	1. 6. 1
Credit Wool	0. 5. 11
Total Net Cost	1. 0. 2
Total No. of Lambs Produced	3,587

Table IX.Structure of Grazing Costs - Primary Constituents.

Primary Cost.	Grazing.		Rape,	
	:(Grass Crops):		Turnips etc.	
	£.	s. d.	£.	s. d.
Manual Labour	1,796.	11. 5	206.	15. 6
Horse Work	44.	12. 10	98.	6. 4
Tractor Work	20.	8. 4	36.	5. 11
Contract Work	177.	11. 6	175.	10. 5
Rent	2,715.	16. 2	62.	11. 7
Seeds	183.	19. 7	71.	16. 11
Manures	435.	4. 11	206.	8. 2
Sundries	186.	18. 10	-	-
Total	5,561.	3. 7	857.	14. 10

APPENDIX II.Notes on Costing Details.

Valuations. These are based on farmers' estimates of the value of sheep, including acclimatisation values on 'permanent' flocks. In a few cases the fixed 'agreement' values have been applied.

Foods and Grazing. Home-grown foods have been charged at estimated cost on the farms. Grazing ground has been costed separately, and allocation of costs chargeable to sheep has been determined from a grazing record for each type of pasture, reducing stock to grazing units. Costs of establishment work on grazing land have been included and spread over two years. This procedure was adopted because it was not possible, by the survey method, to get precise information of work done beyond one year previously.

Labour. Except where special rates of pay applied, labour was charged at 1s. 8½d. per hour.

Overhead Costs. Charges for organisational expenses, for use of farm buildings by sheep or for storage of sheep feed, and for capital equipment (e.g. dipping tanks) provided by the occupier, have not been allowed for.