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VETERINARY AND MEDICINE COSTS AND PRACTICES IN LOWLAND SHEEP

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Veterinary and Medicine Costs and Practices in LOWLAND SHEEP

An analysis and commentary on information from a sample of lowland sheep flocks in England

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Lowland Sheep Study Group
September 1973

The Lowland Sheep Study Group

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School of Rural Economics and Related Studies
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Meat and Livestock Commission

Ministry of Agriculture, Fisheries and Food (including the Agricultural Development and Advisory Service)

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Foreword

Soon after it was brought together in 1968 the Lowland Sheep Study Group was asked to consider whether it could in its studies help to fill some of the gaps in the existing knowledge of veterinary and health aspects in lowland sheep production. The problem of disease in lowland sheep has been mentioned in a postal survey carried out earlier by the Group which was therefore aware of its importance. As a result Dr. D. D. Pout, then of the Ministry's Veterinary Laboratory, Weybridge, was invited to join the Study Group as he had a special interest in this subject.

Though Dr. Pout has since moved into private practice he has continued to work with the Study Group and this publication is the result of his collaboration with W. J. K. Thomas (Exeter University) who has edited previous publications on sheep in this series.

The information presented was collected during an enterprise survey on a sample of lowland flocks in four areas of England over the period 1969-71. Such was the complexity of the veterinary information that it could not be computerised and its analysis has taken rather longer than that of the financial data published earlier. Obviously a one-year survey of this important aspect of sheep production can only be of the nature of a pilot examination showing the way and, perhaps, encouraging further work in this field.

We are grateful for the help of the farmers who took part in the study and to the staff of the Universities below who jointly were responsible for the field work for the survey and have commented on this report.

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Chapter 1 Introduction

Despite their apparent predisposition to ill-health sheep do not figure prominently in current private veterinary practice. There are acceptable reasons for this situation; compared with cattle, horses and domestic pets for example sheep have a low capital value which makes the cost of a veterinary attention to one sheep proportionately far more expensive than one to most other livestock. Then sheep are often inaccessible, utilising the more distant parts of the farm and again are not observed individually as frequently as cattle for example. This is not a new phenomenon but one which elicited similar comments in the last century. A letter in 'the Veterinarian'(1) of 1835 states "Many of the practitioners in this part of the country (Kent) do not attempt to treat any other animal than the horse", but the writer could not decide whether this was because farmers were unwilling to pay for treatment for other livestock or because the vets were fully occupied dealing only with horses.

Few records are available on the cause of disease in the lowland sheep flock and this is reflected by the fact that only 607 carcases from sheep of all ages were submitted to the veterinary investigation centres at Reading, Wye and Weybridge in 1967-68. In the area covered by these centres, there were at that time 1·73 million sheep and lambs, thus at a mortality rate of say only 5 per cent, less than 1 per cent of dead animals had a post-mortem examination in a laboratory. Furthermore, as in response to an earlier postal survey a number of farmers had indicated that they had given up sheep because of disease there was much to recommend extending the economic survey of lamb production to cover some aspects of the veterinary field. This would be in the nature of a first step in obtaining a better understanding of losses in the national flock as well as providing information on the use and costs of veterinary medicines.

In rearing fat lambs the production process is based upon the principle that the potential built into the ewe is realised through the lambs she produces. This potential is built up by genetic selection and good nutrition but is eroded as a result of the complex interaction between the animal and its environment in which nutrition, weather, management and parasitic organisms play a part. If the animal does not adapt well to its environment then there is loss of production, unthriftiness and death. The only absolute measure of failure is death. Certain periods of the production cycle are accompanied by

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(1) Veterinarian 1835 Vol. 8, p.506.

severe changes in biological status of the animal such as conception, lambing and neonatal life. It is also known that malnutrition will tend to reduce the efficiency of animals to acquire immunity to disease producing agents, as well as prolonging their life on the farm. Thus it seems important that this study should include some measure of the failure in performance, and in the first chapter barrenness, lambing percentage at birth and the deaths of ewes and lambs are examined. This provides a background to the use and cost of veterinary medicines.

In examining the cost and use of veterinary medicines it is important to appreciate that feed costs are the other main component of the variable costs incurred by the enterprise, and both are closely linked in terms of the performance expected each year. Similarly stocking rate is important in affecting levels of grass intake during summer grazing and the density of animals can influence disease transmission. It was felt, however, that differences between flocks and farms would be so great in respect of nutrition, disease risk, veterinary costs and performance that any analysis of these variables would not be worthwhile on the scale used here.

In the second chapter the analysis of the use and cost of veterinary medicines starts with a consideration of nine categories of medicines based on their function. Since this report is based on the answers given by many of the farmers who co-operated in the economic survey, there are variations in the number of flocks which could be included in the various analyses, this number is usually given in the tables. It is to be expected that regional differences in climate and topography also give rise to differences in the risk of disease. There are also regional differences in the distribution of veterinary surgeons. For these reasons it was considered unwise to use the survey results to produce any figures purporting to be 'national' totals, and for the same reasons it was decided that where possible the average value should not be used because distributions of values would provide a more effective method of highlighting the size of the typical and the extreme values of any given factor.

An attempt is made in the third chapter to show if any relationship exists between a measure of physical performance and veterinary costs incurred. Such a procedure may have little value in such a complex subject as this, but this sort of analysis should provide a stimulus for further work. In this section a comparison is made of flocks which incurred high and low veterinary costs and this is informative.

This report covers one year's production, and by itself is of limited value in judging common practices or trends in the use of certain medicines, however, it may be of value for comparative purposes at a later date if similar studies are made in the future. It is also hoped that it might provoke workers in this field to examine the relationship between veterinary costs and loss of production a little more closely.

Chapter 2 The loss of physical performance

From the biological point of view the loss of physical performance can occur at any stage in the production process. However the periods of conception, lambing and neonatal life are particularly hazardous while the effective finishing of the lamb carcase is sometimes difficult. It seemed appropriate, therefore, to obtain estimates of performance in terms that are commonly used, in particular to examine the time at which deaths occurred and to obtain an estimate of the lambing rate in each flock.

Ewe mortality

The level of mortality in most flocks in each region was found to be in a narrow range between 1 per cent and 7 per cent. Table 1 shows that over three-quarters of the flocks in the whole sample had a ewe mortality within these limits and the figure in each region did not vary greatly from this.

From Figure 1 it can be seen that the vast majority of ewe deaths occurred in close association with lambing. In all four regions lambing was concentrated in the months of March and April (Table 2) but there was some variation in the degree of concentration. In the South West where lambing tended to start earlier than it did in the other regions approximately 30 per cent of all ewe deaths took place before the period of peak lambing. In contrast in the East Midlands where lambing was later a similar percentage of all ewe deaths occurred after the period of lambing.

Lambing percentage

There are several methods of calculating a measure of the lambing performance of ewes, frequently the number of lambs reared per 100 ewes put to the tup is used. However in order to obtain a measure of the lambing rate at birth the number of ewes actually put to the tup and the number of lambs born were used for the calculation in this instance.

The data on this are presented in Table 3 and shows that the modal value of the lambing percentage varied between regions, it lay in the range 150-174 lambs born per 100 ewes for the East Midland and Western flocks but in the 125-149 range for the South Eastern and South Western flocks. The mode or modal value of a factor is the most frequently occurring one in the results from a sample, and it can be seen in Table 3 that in respectively 50 and 58 per cent of the flocks in the East Midlands and Western regions between 150-174 lambs

Table 1 Ewe mortality

% ewe mortality	%'s of flocks in:-			
	East Midland	South East	Western	South West
Under 1·0	2	2	0	2
1·0 - 3·9	31	37	35	26
4·0 - 6·9	41	46	39	50
7·0 - 9·9	14	2	14	17
10·0 & over	12	13	12	5
Totals	100	100	100	100
No. of flocks	42	46	43	42

Table 2 Time of lambing in each region

Date of lambing	%'s of ewes lambing in:-			
	East Midland	South East	Western	South West
pre-January 1970	0	*	*	1
1970				
January	1	3	3	10
February	11	3	14	30
March	61	75	54	48
April	25	19	28	10
May	2	0	1	1
Totals	100	100	100	100

* Less than 0·5 per cent.

Table 3 Lambing percentage in each region

Lambing percentage	%'s of flocks in:-			
	East Midland	South East	Western	South West
Under 100	0	9	0	0
100 - 124	3	31	7	22
125 - 149	9	56	21	50
150 - 174	50	4	58	25
175 - 199	35	0	9	0
200 & over	3	0	5	3
Totals	100	100	100	100

were born alive per 100 ewes. In contrast in 56 and 50 per cent respectively of the flocks in the South East and South West the lambing percentage was between 125-149. The latter regions had the lowest lambing performance for significant proportions of the flocks had results in the percentage class below the modal one, i.e. with 100-124 lambs born per 100 ewes; the 31 per cent of the South East flocks in this class led to this region having the poorest overall lambing performance. The East Midlands with 35 per cent of its flocks in the class above the modal one, i.e. with 175-199 lambs per 100 ewes, produced the best overall lambing performance.

Lambing rates are, of course, determined by many factors, breed and age of ewes, condition of ewes at tupping, management during pregnancy to mention only a few. The survey was not designed to study these relationships in detail but to take a broader view of the economic results. However, in a separate study[1] of the survey results for a selected sub-sample of 85 flocks multiple regression analysis was used in an attempt to explain the variation in lambing percentages. Five independent variables were shown to explain about 57 per cent in the variance in lambing rate in the 85 flocks. Of these, the date of lambing proved to be by far the most important single explanatory variable accounting for 33 per cent of the variance in lambing rate. The peak lambing period was in March with the later lambing flocks having better results.

The cost of concentrates (related to forage acres) fed to the ewes, prior to lambing and immediately afterwards was calculated to explain a further 20 per cent of the variation in the lambing rate. Supplementary feeding at these vital periods is aimed to keep the ewes in good physical condition for it is now fairly well established that the latter has a significant effect on lambing performance.

The study showed, not unexpectedly, that the inclusion of ewe lambs in the flock reduced the lambing rate but that the other independent variables included, ewe stocking density and fertiliser cost, had no effect. Over 40 per cent of the variance in lambing percentage was unexplained by the equation used and while much of this would be due to random effects some will be accounted for by excluded variables, among which the expenditure on veterinary medicines may well be one.

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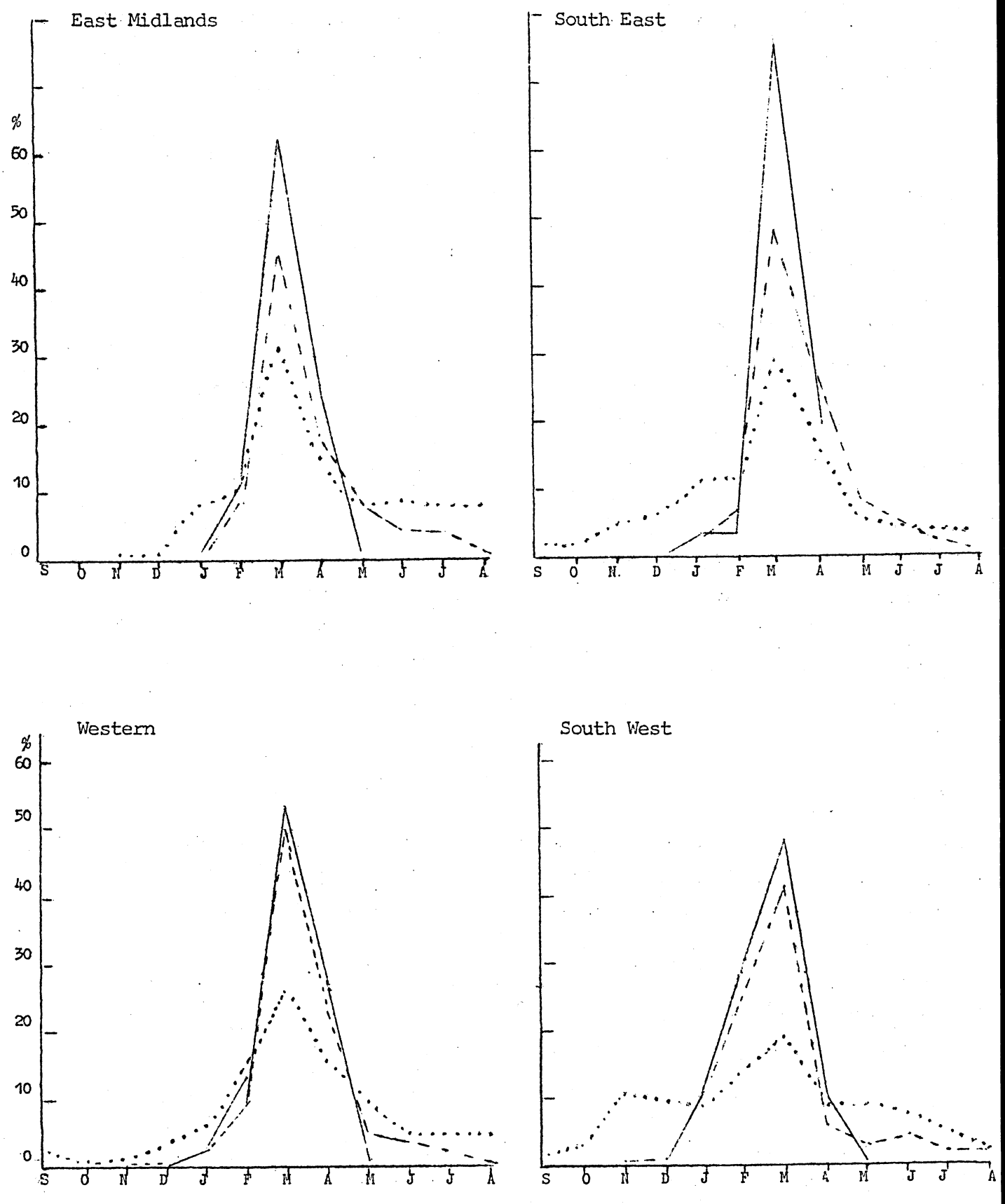
(1) Production Functions for Lowland Sheep Flocks, S.R. Wragg. University of Bristol, August 1972.

Figure 1. Seasonality of lambing, ewe and lamb mortality



Barrenness in ewes

The extent of barrenness in a flock, i.e. the proportionate number of ewes put to the tup which do not produce a lamb, can be calculated either for the whole flock including ewe-lambs (if any), or for the mature ewes only. The latter method avoids the effect of the lower lambing capability of ewe lambs. An earlier report of this survey included a calculation of barrenness using the first method and showed that the flocks in the South West had a much greater degree of barrenness than the flocks in the other regions. Further investigations revealed that the South West flocks differed in having a greater frequency of ewe-lambs forming part of the flocks. A fairer comparison is shown in Table 4 where the incidence of barrenness is shown for ewes only. Sufficient data was available for most flocks to enable the lambing results from ewe-lambs to be excluded.

The figures in the table are derived by relating the number of ewes put to the tup and the number actually lambing. Overall the modal percentage barrenness was between 1 and 4, for in 46 per cent of the flocks the figure was in this range; a further quarter of the flocks had between 4 and 7 per cent barren ewes. Regionally the figures varied with the flocks in the South West having the poorest results. To some extent this would be due to the fact, as mentioned earlier, that proportionately more ewes in this region died prior to lambing, a factor which would increase the barrenness figure calculated this way. The effect on the lambing rate of a barren ewe or a prelambing ewe death is obviously the same.

Lamb mortality

The graphs of lamb mortality in Figure 1 (p 7) show that there was a strong relationship between the incidence of lamb deaths and the time at which lambing took place. Since few lambs died after lambing[1] the total lamb mortality reflects in the main the losses of lambs at lambing itself. The modal range of lamb mortality was 5·0 to 9·9 per cent in the regions other than the South East where fewer lambs tended to be lost. Here 44 per cent of the flocks were in the class in which total lamb losses were less than 5 per cent of the lambs born.

It is reasonable to assume that there is a direct relationship between the level of lamb mortality and the lambing percentage in a flock, for it has been

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(1) In a previous report 'Economic Report No 8' in this series showed the average mortality of 'strong' lambs as 2 per cent.

Table 4 Barrenness in mature ewe flocks

% barren ewes	East Midland	South East	Western	South West
	% of flocks			
Under 4·0	62	50	40	31
4·0 - 6·9	17	29	24	31
7·0 - 9·9	19	9	19	15
10·0 & over	2	12	17	23
Totals	100	100	100	100
No. of flocks	42	42	42	39

Table 5 Total lamb mortality in flocks in each region

% lamb mortality	East Midland	South East	Western	South West
	% of flocks			
Under 5·0	14	44	7	14
5·0 - 9·9	46	40	44	45
10·0 - 14·9	14	9	28	36
15·0 & over	26	7	21	5
Totals	100	100	100	100
No. of flocks	42	43	43	42

Table 6 Total lamb mortality and lambing percentage

% lamb mortality	Lambs born per 100 ewes			
	Under 125	125-149	150-174	175 & over
	% of flocks			
Under 5·0	48	20	14	5
5·0 - 9·9	36	43	48	40
10·0 - 14·9	8	27	23	20
15·0 & over	8	10	15	35
Totals	100	100	100	100
No. of flocks	25	60	65	20

noted that many deaths occur at lambing time and there is a greater chance of losing a lamb from a multiple birth. The figures in Table 6 confirm that there was a tendency for lamb mortality to increase with lambing rate, but there was a large variation from flock to flock. Treating each regional sample as one large flock it can be seen, Table 7, that the two regions with the highest mean lambing percentage also had the highest means lamb mortality, i.e. the East Midlands and Western flocks and the converse was true for the South East and South West.

Table 7 Mean lambing percentage and lamb mortality for each regional flock

	East Midland	South East	Western	South West
Mean[(i)] lambing per cent at birth	169	125	158	141
Mean[(i)] per cent lamb mortality	10·8	7·3	11·1	9·5

(i) Unweighted means.

This relationship like many other features in a flock will be affected by several factors, e.g. the extent of shepherding at lambing time, the weather etc. Nevertheless the data confirm the expectation that losses of lambs would be greater in prolific flocks.

Chapter 3 The cost and use of veterinary medicines and treatment

Total veterinary costs

In the financial analysis of lamb production in 1970-71 reported on in a previous publication[1] and as summarised in Table 8 it is seen that the feed costs amounted to 75 per cent of the total Variable costs, veterinary and medicine costs to 14 per cent with the remaining 11 per cent of costs taken up by miscellaneous items.

Table 8 Lamb production 1970-71

Output, variable costs and gross margins

	East Midland	South East	Western	South West	All flocks	
					£ per ewe	%
	£ per ewe					
Output	11·4	8·3	10·4	9·9	9·7	-
Variable costs						
Feed	2·6	1·6	2·2	2·4	2·1	75
Vet & Med	0·4	0·5	0·4	0·3	0·4	14
Other	0·2	0·2	0·4	0·3	0·3	11
Total	3·2	2·3	3·0	3·0	2·8	100
Gross margin	8·2	6·0	7·4	6·9	6·9	-

In the South East flocks veterinary and medicine costs formed 22 per cent of total Variable costs, a feature which is further revealed in the distribution of these costs on a per ewe basis given in Table 9.

Whereas in the regions other than the South East the majority of sheep-farmers spent less than 40p per ewe on veterinary and medicine costs, nearly one-half of the South East producers spent more than 50p.

It is of interest to examine whether there was any correlation between the per head expenditures on 'Vet and Med' and any other factors concerning the flocks. If medicines are administered on a prophylactic basis, i.e. for the purpose of disease prevention, it may be expected that their cost would be

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(1) Lowland Sheep: An Economic Analysis of Lamb Production 1970. Agricultural Enterprise Studies in England and Wales, Economic Report No. 8. University of Exeter, December 1971.

Table 9 Veterinary and medicine costs per ewe

Vet & med costs per ewe	East Midland	South East	Western	South West
pence (p)	% of flocks			
Under 30	36	16	25	36
30 - 39	20	13	28	38
40 - 49	20	23	19	12
50 - 59	12	19	7	5
60 & over	12	29	21	9
Totals	100	100	100	100
No. of flocks	41	30	43	42
Average per ewe (p)	39	46	42	33

Table 10 Veterinary and medicine costs per ewe by size of flock

Vet & med costs per ewe	No. of ewes per flock		
	Under 150	150-399	400 & over
pence (p)	% of flocks		
Under 30	48	25	13
30 - 39	19	30	26
40 - 49	14	16	29
50 - 59	5	16	6
60 & over	14	13	26
Totals	100	100	100
No. of flocks	57	68	31

Table 11 Veterinary and medicine costs and stocking rate

Vet & med costs per ewe	Sheep per acre per year				
	Under 2·5	2·5-2·9	3·0-3·4	3·5-3·9	4·0 & over
pence (p)	% of flocks				
Under 30	37	43	17	33	18
30 - 39	26	18	38	19	28
40 - 49	15	12	24	24	18
50 - 59	-	12	7	10	18
60 & over	22	15	14	14	18
Totals	100	100	100	100	100
No. of flocks	27	40	29	21	39

related to flock size. Table 10 gives the distribution of 'Vet & Med' costs per ewe by size of flock and shows a different relationship. Whereas in 67 per cent of the smaller flocks less than 40p per ewe was spent, only 38 per cent of largest flocks spent as little as this, in contrast 34 per cent of the latter spent upwards of 60p per ewe on 'Vet & Med' items. To some extent this is a regional factor for many of the larger flocks were in South East England while more of the smaller flocks were in the South West region.

A further hypothesis may be put forward that expenditure on medicines is likely to be related to density of stocking, the argument being that the more heavily sheep are stocked per acre the less healthy they would be and the greater the expenditure on medication, particularly worm drenches. A distribution of these factors is given in Table 11. Veterinary and medicine costs tended to be lower in the less intensively stocked flocks. In 63 per cent of the flocks stocked at less than 2·5 sheep per acre 'Vet & Med' costs were less than 40p per ewe, compared with 46 per cent of the more intensively kept flocks, at 4·0 or more sheep per acre. But the table shows that there is a great deal of variation in the figures and this relationship is not the simple two-way one as analysed here; many factors, in particular grazing management, will be involved.

The components of veterinary costs

Nine categories of veterinary medicines and chemicals were selected as being sufficient to cover the basic requirements of sheep. It was assumed that the different items were purchased for a specific purpose even if the brand or pharmaceutical name was unknown. In fact very few items were recorded in an unspecified manner in the returned questionnaires. The fact that could not be ascertained was whether a particular medicine was used for prophylactic or therapeutic purposes, i.e. endeavouring to prevent disease rather than curing of a disease or ailment after it has developed.

The percentages of flocks in each region in which expenditure was made on a particular type of medicine is shown in Table 12. The figures show that nearly every flock used anthelmintics, slightly fewer used vaccines and over 40 per cent of them used antifluke compounds.

Table 12 also shows the composition in financial terms of the total veterinary bill in each region, treating all flocks in each region as one large flock. The costs of anthelmintics represented approximately one-half of the total veterinary expenditure in each of the regional flocks. The expenditure

on this item was far the biggest element in the veterinary bill followed by dips (and sprays), vaccines (and sera) and then antifluke compounds. These four items together accounted for upwards of 84 per cent of the total 'Vet & Med' bill in the East Midlands, Western and South West flocks but rather less in the South East flock in which expenditure on food additives and antibiotics was relatively high.

In the following sections each component of veterinary costs is examined separately.

Table 12 The pattern of veterinary expenditure

No. of flocks	East Midland		South East		Western		South West	
	41		31		39		42	
Item	% of flocks using item	% of total vet cost	% of flocks using item	% of total vet cost	% of flocks using item	% of total vet cost	% of flocks using item	% of total vet cost
Antifluke	44	10	42	6	49	8	64	8
Anthelmintics	90	46	100	49	90	53	90	47
Vaccines & sera	76	13	94	8	69	14	81	16
Dips & sprays	93	15	88	14	100	13	95	16
Footbaths	22	2	68	3	36	4	5	**
Veterinary visits	63	4	29	3	67	6	59	6
Antibiotics	22	2	2	**	41	1	50	4
Equipment	51	2	81	5	8	1	13	1
Food additives	41	6	7	5	13	**	10	1
Food additives, * antibiotics, misc.	-	-	74	7	-	-	-	-
Totals	-	100	-	100	-	100	-	100

* Not always specified, also in some flocks the expenditure on minerals and vitamin supplements would have been recorded under 'feed'.

** Under 0·5 per cent.

Antifluke compounds

These drugs are used against the common liver-fluke, Fasciola hepatica, and they are sold either as a pure compound or combined with an anthelmintic. In Table 13 the shortened chemical name of each drug is given together with the number of occasions on which each drug was used. By comparing the latter with the total number of flocks that used any type of antifluke drug, it is clear that, in general, one type of drug was favoured. A greater proportion of farmers in South West England used these drugs than anywhere else and they also

favoured the use of them in the pure form. Farmers in the South East also preferred to give the drugs in the pure form, in contrast to those in the other two regions.

Table 13 The use of antifluke compounds in each region

		East Midland	South East	Western	South West
Flocks in survey using antifluke drugs	Nos	18	13	19	27
	%	44	42	49	64
Solely Antifluke		No. of times used*			
Carbon tetrachloride		0	0	2	1
Hexachlorophene		0	8	0	7
Nitroxynil		3	2	0	5
Oxyclozanide		2	0	4	1
Rafoxanide		0	0	1	3
Combined Anthelmintic					
Hexachlorophene and phenothiazine		0	0	2	0
Oxyclozanide and tetramisole		13	5	12	3
Unspecified		1	2	2	8
Total		19	17	23	28

* i.e. in all flocks, a repeat dose in one flock was not counted as a second time.

When the frequency of dosing with antifluke compounds was examined, it was observed that when they were used in combination with an anthelmintic they were not only given more frequently but were also administered during the summer months as well as at the more conventional autumn and early spring seasons. Where the combined drug was used the cost was assumed to be equally divided between the two components and this may be one of the reasons why the relative cost of this type of medicine was particularly high in the East Midlands where it amounted to 10 per cent of the total veterinary cost (Table 12).

Anthelmintics

These compounds are used against roundworms, although the analysis in Table 14 also includes information on those drugs used for tapeworms. Most anthelmintic drugs are given on the understanding that they are active against

Table 14 The use of anthelmintics (anti-worm) drugs

		East Midland	South East	Western	South West
Flocks in survey using anthelmintics	Nos.	37	31	35	38
	%	90	100	90	90
Solely anthelmintic:		No of times used*			
Bephenium		1	8	2	6
Haloxon		1	3	0	3
Methrydine		2	1	1	4
Morantel tartrate		0	5	2	6
N.C.A.		5	0	0	0
Parbendazole		4	1	0	1
Phenothiazine		2	1	2	2
Rametim		0	0	0	1
Tetramisole		16	10	8	3
Thiabendazole		19	19	17	14
Combined antifluke:					
Phenothiazine & hexachlorophene		0	0	2	0
Tetramisole & oxyclosanide		13	5	12	3
Tapeworm remedies		1	3	0	0
Unspecified		1	1	1	6
Total		65	57	47	49

* i.e. in all flocks, a repeat dose in a flock was not counted as a second time.

Table 15 The frequency of dosing with anthelmintics

	Frequency of dosing	East Midland	South East	Western	South West
		% of flocks			
Ewes	1	52	46	32	59
	2	37	23	32	18
	3	11	12	25	18
	4 or 5	0	19	11	5
Lambs	1	32	14	35	10
	2	46	22	29	51
	3	11	32	21	10
	4 or 5	11	32	15	29

all species of important roundworms of sheep and lambs, but some of them, such as Bephenium, are used specifically against Nematodirus species. Notwithstanding the fact that these drugs are believed to have a broad spectrum of activity, it can be seen from the figures in Table 14 that the number of occasions when anthelmintic compounds were used far exceeds the number of flocks in which they were used. Thus the 38 East Midland farmers used 65 anthelmintic treatments, demonstrating that many farmers favoured several different compounds rather than relying on one particular type.

From Table 15 it is seen that the frequency of dosing with anthelmintics differed between regions. In the South East and South West where anthelmintics were not commonly used in combination with antifluke drugs the ewes were generally dosed once only. It is to be expected that the lambs would be dosed more frequently than the ewes. Especially was this done in the South East region where nearly 60 per cent of the farmers who used anthelmintics dosed their lambs three or more times. This may be due to the fact that about half the flocks in the survey in this region produced store lambs which stayed longer on the farm and were thus liable to require further dosing.

Vaccines and sera

The vast majority of vaccines are designed to protect the ewes and lambs against the toxins produced by bacteria. These are normally carried by the lamb but when environmental conditions are suitable they can proliferate rapidly causing sudden illness or death. It will be seen in Table 16 that if a farmer used vaccines at all then he used Clostridial ones, and if others were used they were for specific conditions likely to be endemic on the farm or in some purchased sheep. It is important to note that it was not possible to be accurate in recording the use of antisera because the answers to the questionnaire showed some lack of information as to whether the injections were for affected animals or not. In the majority of flocks most vaccines were combined and protection for lambs was given via the ewe before lambing.

Dips and sprays

From the replies to the questionnaire it was not possible to identify the nature of the dip or spray used, except in very few instances. However it was evident that apart from two flocks in the Western region the dipping in lowland flocks was against Blowfly strike. Table 17 gives this monthly distribution and frequency of dipping (or spraying) in each region. This tended to be a once-a-year treatment in most flocks and in the East Midlands was performed

Table 16 The use of vaccines and sera

		East Midland	South East	Western	South West
Flocks in survey	Nos	31	29	27	34
using vaccines and sera	%	76	94	69	81
		% of flocks using different types			
Vaccines					
Clostridial (Single or combined)		100	100	100	100
Enzootic abortion		3	3	4	0
Orf		6	3	7	6
Antisera					
Clostridial		13	0	0	6
Others		0	0	0	3

Table 17 The seasonality and frequency of dipping

Month of dipping	East Midland	South East	Western	South West
	% of dippings			
1970				
April	-	-	2	-
May	7	11	2	-
June	79	33	38	3
July	12	45	48	79
August	2	11	5	18
Later	-	-	5	-
	% of flocks			
Frequency of dipping				
1	89	86	86	94
2	8	7	14	6
3	3	7	-	-
Total	100	100	100	100

rather earlier than in the other regions. Here it was mainly carried out in June in contrast to July in the South West and rather more spread out over these two months in the South East and Western regions. Although some flocks were dipped or sprayed more than once the interval between dips was seldom greater than one month. In most cases ewes and lambs were dipped during the same month, in a very few flocks only the ewes were dipped or only the lambs.

The actual dipping operation was often carried out on a neighbouring farm when a contract charge, often fairly modest was paid per sheep. This was particularly so for the smaller flocks in the South West for which the installation of individual dipping facilities would not be justified. The contract charge would include a certain amount for the help made available by the farmer providing the dipping, but in the recording the whole cost has been charged against the dipping item.

Footbaths

Passing the flock through a footbath is a procedure which is very inexpensive and can usually be undertaken on the occasions when the animals have to be herded. In Table 18 it is evident that the chemical of choice was formalin, although some purchased aerosols containing antibiotics in addition. In the South West region more farmers used aerosols than used footbaths, again perhaps because the smaller flock size did not justify treating the whole flock and treatment was on an individual basis.

Veterinary visits

The costs of veterinary attention, as recorded in the survey, were primarily the costs of travelling by the vet and the examination of animals on the farm, but it also includes the cost of attention to sheep taken to the surgery by the sheep farmer. The costs of vaccines, sera or antibiotics purchased from a veterinary practitioner were usually recorded under the appropriate heading in the field book and were not included in the charge for veterinary attention.

Table 19 shows that the great majority of veterinary visits were made in the months January to April, a period covering prelambing and lambing times; visits were rarely made at other times of the year. Proportionately fewer flocks in the South East region were visited by veterinary surgeons than in any other region. In 73 per cent of the South East flocks the vet was not called in at all, and only 21 veterinary visits were made to the flocks in this area. This feature may be related to flock size and the system of farming large flocks

Table 18 The use of different foot-root treatments

	East Midland	South East	Western	South West
	No of flocks			
Footbaths:				
Formalin	9	16	9	2
Copper sulphate	-	4	1	-
Not specified	-	-	4	1
Foot root aerosols	1	3	7	10

Table 19 (i) Monthly distribution and (ii) the frequency of veterinary visits to flocks in each region

(i) Month of visit	East Midland	South East	Western	South West
	% of vet visits			
December	-	-	-	6
January	11	-	4	18
February	23	13	18	37
March	25	39	52	29
April	27	18	18	2
May	11	-	-	2
June	-	4	4	4
Later months	3	26	4	2
Totals	100	100	100	100
	% of flocks			
(ii) No of visits per flock				
None	32	73	34	41
One	27	7	45	20
Two	23	10	3	15
Three	10	3	8	12
Four	-	-	-	2
Five or more	8	7	10	10
Totals	100	100	100	100

fairly extensively. Many of the flocks contained more than 400 ewes and with low lambing rate and below average lamb mortality, there was perhaps less need for veterinary attention at lambing time as appeared to be the case in the other regions. There is also the possibility that these large flocks were looked after by specialist and experienced shepherds who were able to cope with difficult lambings without veterinary assistance.

In Table 19 the number of veterinary visits made to each flock is also recorded, and it can be seen that several flocks had five or more visits during the year. In some of the flocks this may be due to the veterinary surgeon visiting the farms primarily for other stock on the farm, particularly dairy cows, and then being asked to examine sheep whilst on the premises. There was one flock which received a routine visit monthly from the local practitioner, but the arrangement appeared to discontinue after a short while.

An opportunity was given in the questionnaire to state when the submissions were made to the local Veterinary Investigation Centre, but it appeared that very few were made at least with the knowledge of the farmer.

Antibiotics

Compared with the use of some other medicines this category appeared to be of little importance. It was not possible to obtain accurate data from the flocks in the South East region because the cost of antibiotics was included with that of food additives (see Table 12). In the other regions it was clear that more use of antibiotics was made in the flocks in the South West, probably because the smaller flock size would invite individual treatment of animals.

Food additives

The information on food additives,for example minerals, appears to have been recorded by two different methods in the survey. The minerals added when a cereal-protein mix was made up have been included as a feed cost, while the provision of a specific mineral such as copper either in the form of a 'bullet' or injection was treated as a veterinary cost. The data in Table 20 tends to prove this has happened in this survey for in the East Midlands and South East areas, where the provision of specific mineral was a more common practice,the information was shown in the veterinary section, whereas the data on non-specific minerals and mineral blocks which are known to be provided for the flocks in the two Western areas has been recorded in the feed section. The table shows that a minimal number of flocks provided 'elixers' and tonics and

while it is difficult to demonstrate that these contribute to flock health it must be assumed that when minerals and vitamins are used a nutritional deficiency

Table 20 The use of food additives in flocks in each region

Item	East Midland	South East	Western	South West
	No of flocks			
Vitamin supplements	2	2	-	3
Specific minerals:				
Calcium	-	-	1	-
Magnesium	2	2	-	-
Copper	7	4	-	-
Iodine	-	1	-	-
Non-specific minerals	8	-	1	2
Ewe tonics	-	3	3	-
Lamb elixers	1	5	-	-
Unspecified additives	-	23	-	-

has been experienced in the past or that the supplement has been of value to the performance of the flock.

Chapter 4 Some relationships between veterinary costs and the loss of physical performance

In order to study the relationship between veterinary costs and physical performance the flocks in each region were ranked according to average veterinary costs per ewe and then approximately one quarter of the flocks with the highest and with the lowest costs were separately grouped for analysis. In statistical terms these groups are respectively the upper and lower quartiles of the distribution. Some relationships between veterinary costs and performance for the two groups are shown in Table 21. It can be seen that the veterinary expenditure per ewe in the high cost flocks was upwards of three times greater than in the lower quartile flocks. In Appendix table 1 the separate items of expenditure are examined and it can be seen that the difference between the two groups were largely due to the greater use of anthelmintics, vaccines and antifluke compounds in the upper quartile flocks. Where the difference between high and low costs is greatest, namely in the Western region, the difference in the level of expenditure is extended to the less costly items such as food additives and veterinary visits.

While it is not possible to attribute performance achievement directly to veterinary expenditure it is of interest to note from Table 21 that ewe mortality was much lower in the high 'vet' costs flocks in the East Midlands, South East and South West areas while in the Western flocks the difference was slight. Lamb mortality was also generally slightly less in the flocks with above-average 'vet' costs, with the exception of the flocks in the Western area in which a few of the high costs flocks suffered severe lamb losses.

Anthelmintics and dips made up a large proportion of total veterinary costs and were used as much for lambs as for ewes. It would, therefore, be expected (partly as a matter of arithmetic) that veterinary costs calculated on a per ewe basis would be higher in the flocks with a better lambing rate. It can be seen from Table 21 that the flocks with the higher costs do have better lambing percentages but the cost differences between these flocks and the low cost ones appear to be too great to be explained in this way. Thus for the East Midland upper quartile flocks the combination of the better lambing performance (176 lambs born per 100 ewes) and the lower lamb mortality (8·8 per cent) resulted, on average, in the rearing of seven more lambs per 100 ewes. The extra 'vet and med' costs for these lambs would be minimal compared with the difference in the overall 'vet' costs between the high and low cost flocks, a matter of £45 per 100 ewes. The veterinary and medicine 'regime', as it were, in the high

Table 21 Some aspects of the loss of physical performance, lamb disposal and veterinary costs

	East Midlands		South East	
	Vet costs		Vet costs	
	Above average	Below average	Above average	Below average
No of flocks	10	10	7	7
No of ewes per flock	199	217	622	801
Vet costs per ewe - pence	63	18	80	31
Performance data				
Lambing % at birth	176	171	124	117
% mortality - Ewes	4·3	6·5	3·6	5·4
- Lambs	8·8	10·2	4·6	5·0
Lamb disposal				
% fat lambs sold by end August(i)	32·3	55·4	5·8	7·0
% store lambs sold	7·4	0·4	52·6	57·3
	Western		South West	
No of flocks	10	10	10	10
No of ewes per flock	195	177	136	154
Vet costs per ewe - pence	89	20	56	16
Performance data				
Lambing % at birth	169	144	151	132
% mortality - Ewes	5·8	6·1	4·5	6·5
- Lambs	14·1	9·0	9·1	10·2
Lamb disposal				
% fat lambs sold by end August(i)	34·4	39·5	35·2	49·1
% store lambs sold(i)	37·1	11·6	0	0·4

(i) As per cent of lambs reared.

Table 22 Lamb mortality and costs of vaccines per ewe

	East Midland flocks with:-		South East flocks with:-	
	High lamb mortality	Low lamb mortality	High lamb mortality	Low lamb mortality
No of flocks	10	10	7	7
% lamb mortality	18·8	4·7	15·4	2·0
Vaccines per ewe - pence	5·2	6·1	4·7	6·4
	Western flocks		South West flocks	
No of flocks	10	10	10	10
% lamb mortality	18·6	6·5	15·1	4·8
Vaccines per ewe - pence	5·6	3·6	4·6	5·8

cost flocks was on a very different plane from that in the lower quartile flocks, but the increased financial returns from the extra lambs reared should, other things being equal, be sufficient to offset the higher costs and leave a better margin.

The relationship between veterinary costs and the loss of performance was examined from another point of view. It is generally believed that lamb mortality at lambing time can be brought about by Clostridial infections. If the flocks in the upper and lower quartiles of the distribution of lamb mortality rates are compared with respect to the costs of vaccines, a more precise relationship between this cost and performance can be examined. Information on this aspect is given in Table 22 which shows that in general the flocks with the lower lamb mortality tend to spend more on vaccines. But the difference in expenditure on vaccines and sera between the two groups is so small as to lead to the conclusion that there is no relationship between this cost and lamb mortality rates.

In a similar fashion it can be argued that the longer a lamb stays on the farm the greater the chance that an anthelmintic will be given to it. Since one-half of the total veterinary cost in each region was incurred by use of anthelmintics, it seems reasonable to infer that the flocks with a larger proportion of lambs not sold by the end of August (i.e. for most flocks when the lambs are less than 20 weeks old) or which sell more store lambs are likely to incur greater veterinary and medicine costs. The information given in Table 21 confirms that the lower quartile flocks (below average vet costs) in the East Midlands and South West did sell many more of their lambs earlier in the year than the high cost flocks, this was also the situation in the other two areas but less positively so. For the East Midland and Western areas above-average 'vet' costs were incurred in those flocks which sold proportionately more store lambs, the position was slightly reversed for the South East flocks while in the South West virtually no store lambs were sold from the flocks under consideration.

This brief examination of veterinary costs and physical performance suggests that this might well be a field in which future study would be rewarding.

Chapter 5 Summary

In an attempt to provide a background for the cost and use of veterinary medicines in the lowland sheep flock, a measure of the loss of physical performance was obtained by this survey. In interpreting the results it is important to realise that weather, ewe nutrition, shepherding skill and grassland management are just as, if not more important, than veterinary medicines in maintaining flock performance and health. It is therefore impossible to demonstrate what the loss of performance would have been had not veterinary medicines been used, and whilst death was used as the absolute measure of failure very little was known about the cause and there was little evidence that any attempt was made to ascertain the causes of death in the flocks.

Examination of the survey data revealed that a high level of barrenness tended to occur in a few individual flocks in all regions but particularly in the South West and Western Regions. In these regions also a significant proportion of ewes died before the peak lambing period, probably associated with earlier seasonal lambing dates. In all regions the majority of ewe and lamb deaths occurred during the peak lambing period, with significant numbers of ewes in the East Midland and South East regions dying after this period. No evidence was obtained as to the specific cause of these deaths, but clearly as far as the ewes are concerned, their deaths occurring before lambing constitute a greater loss of production than perhaps those dying after their lambs are born. The lamb mortality increased as the lambing percentage at birth increased, and this generalisation is illustrated by the high and low values obtained from the East Midlands and South East respectively. Within each region covered by the survey there were flocks which showed a wide variation in both lambing percentage at birth and the level of lamb mortality. This information suggests that lambing conditions, shepherding skill and attention at lambing time were important factors in producing the farm to farm variation in lamb mortality on the scale observed.

Veterinary medicines are largely used for the prevention of disease and therefore their administration and cost are likely to be influenced by custom, management procedures and flock size as well as by the biological risk of disease. The pattern of using medicines varied little from region to region insofar as that nearly all flocks received anthelmintics, about three quarters of them were vaccinated and approximately half were dosed with antifluke drugs. Regional differences were observed however; for example only 7 per cent of flocks in the South West received foot-baths compared with over 70 per cent in

the South East. It is very likely that large flock size in the South East did not invite individual treatment. Similarly more farmers in the East Midland and South East regions used feed additives compared with other regions, but clearly whilst the higher lambing percentage in the East Midlands might be considered to justify the need, the same reason cannot easily be seen to apply to the flocks in the South East.

When the expenditure on veterinary medicines is measured in terms of mean cost per ewe, it varied little from region to region, but the proportion of the total veterinary cost spent on the various items shows regional differences. Whilst about half the total veterinary cost is taken up by anthelmintics, irrespective of the cost per ewe, proportionately more money is spent for example in the South East on feed additives and less on vaccines than say in the South West. Again visits to or by the veterinary practitioner proportionately cost less in the South East than they did in the Western region. In the South East the lower lambing percentages and also the presence of experienced shepherds in charge of the large flocks suggest that less veterinary assistance for difficult lambing cases would be required. Another possible explanation for the difference in the costs of veterinary attention is that on the Western farms where mixed stocking is practised the vet may be called in to see other livestock, a dairy cow or beef animal for example, but would examine a sheep at the same time.

Since most of the compounds available for medicines are competitively priced and there was only a small variation between regions in the proportion of flocks in which the important medicines were used, it is clear that the difference in expenditure arose from the frequency of their use. When flocks with high and low veterinary costs per ewe were compared with respect to individual medicines it was seen that the difference in expenditure arose from the use of anthelmintics mainly, antifluke drugs and vaccines. Clearly lambing percentage and the duration of the growth period of the lamb before it is sold will influence the cost of drugs if they are given on a preventative basis. It was shown that there were differences in the lambing percentages at birth, in the mortality rates in the ewe and lamb flocks but these were insufficient to account for the three-fold difference in total veterinary costs per ewe between the high and low cost flocks.

The conclusions to be drawn from the survey are that in general the farmers making an outlay on medicines must consider them necessary, because modest gross margins at the time of the survey would not allow for undue extravagance. On the other hand it is clear that many sheep farmers do not have

losses of animals although their veterinary costs are low and items such as vaccines are not used. It would appear that the cost of maintaining health cannot be measured by using the medicine costs alone, and a realistic measure would require information in some detail on the use of labour, particularly at lambing time and also during the periodic gatherings of the flock for treatment with drenches and vaccines.

It is suggested that a more comprehensive method of accounting should be developed to measure the full costs and effects of maintaining health in the lowland sheep as well as of the loss of production through any breakdown in health. In such a system full account would be taken of the labour aspects just mentioned, of the levels of nutrition which make a large contribution to health and productivity and of the cost of replacing dead ewes and ewes culled for ill-health. A survey to investigate these matters must be designed specifically for the purpose, the required information cannot properly be derived as an 'optional extra' from an economic survey, for example, carried out with another aim in view. The immediately measurable losses of lambs and ewes in the lowland flocks studied suggest that a study of this sort would be worthwhile if only to establish the magnitude of the subject.

Appendix

Table 1 The components of veterinary and medicine costs in the upper and lower quartile flocks

East Midlands

	Upper quartile		Lower quartile	
No of flocks	10		10	
Vet costs per ewe - pence	63		18	
	Flocks using item	Cost per ewe pence	Flocks using item	Cost per ewe pence
Item				
Antifluke	6	11·5	2	3·6
Anthelmintics	10	30·6	7	7·9
Vaccines	8	7·4	8	5·7
Dips and sprays	10	8·1	8	4·7
Footbath	4	3·3	2	3·6
Veterinary visits	8	2·9	6	2·4
Antibiotics	2	1·8	3	3·0
Equipment	5	1·4	4	2·0
Food additives	7	5·1	5	2·5

South East

No of flocks	7		7	
Vet costs per ewe - pence	80		31	
Item				
Antifluke	3	5·9	2	6·6
Anthelmintics	7	47·3	7	11·6
Vaccines	7	5·5	6	3·2
Dips and sprays	7	11·6	6	8·0
Footbath	6	3·8	4	0·9
Veterinary visits	3	4·1	0	-
Equipment	6	5·3	5	2·7
Antibiotics & food additives	7	15·4	5	4·4

Appendix

Table 1 continued

Western

	Upper quartile		Lower quartile	
No of flocks	10		10	
Vet costs per ewe - pence	89		20	
	Flocks using item	Cost per ewe pence	Flocks using item	Cost per ewe pence
Item				
Antifluke	5	10·1	5	6·4
Anthelmintics	10	44·5	7	9·8
Vaccines	7	8·6	5	4·2
Dips and sprays	10	10·1	7	3·9
Footbath	6	6·5	1	1·8
Veterinary visits	6	5·0	5	3·6
Antibiotics	5	5·8	6	1·5
Equipment	1	1·4	1	1·9
Food additives	1	6·1	2	1·1

South West

No of flocks	10		10	
Vet costs per ewe - pence	56		16	
Item				
Antifluke	9	8·5	7	3·1
Anthelmintics	10	31·9	7	4·5
Vaccines	10	7·0	8	5·2
Dips and sprays	9	6·6	9	4·7
Footbath	1	1·9	1	6·1
Veterinary visits	7	5·0	3	2·6
Antibiotics	4	3·7	3	2·5
Equipment	1	1·9	1	1·1
Food additives	2	9·5	0	-

Appendix

Table 2 Monthly distribution of ewe and lamb deaths

	% Ewe deaths				% Lamb deaths			
	East Midland	South East	Western	South West	East Midland	South East	Western	South West
1969								
September	-	1·9	2·7	2·0	-	-	-	-
October	-	2·0	0·7	3·3	-	-	-	-
November	0·7	4·7	1·6	10·6	-	-	0·2	0·6
December	1·1	6·3	3·9	9·6	-	-	0·4	1·2
1970								
January	8·4	10·8	6·3	8·9	0·8	2·4	2·7	13·5
February	10·4	11·4	15·8	14·5	8·8	7·5	10·5	26·1
March	31·2	29·0	26·8	18·8	43·9	48·3	49·8	41·7
April	14·5	16·7	16·0	8·6	28·7	25·7	24·0	5·7
May	8·4	5·3	10·1	8·2	8·1	8·2	5·1	2·8
June	8·9	4·2	5·7	7·6	4·6	4·6	3·9	4·2
July	8·2	3·9	5·4	4·6	4·0	2·6	2·7	2·0
August	8·2	3·8	5·0	2·3	1·1	0·7	0·7	2·2
Totals	100·0	100·0	100·0	100·0	100·0	100·0	100·0	100·0

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