Sheep

University of Cambridge

School of Agriculture

FARM ECONOMICS BRANCH

Mimeographed Report No. 62

(issued December 1965)

THE ECONOMIC POSITION OF SHEEP

in

The Eastern Counties

A report on a survey covering
the years 1961 to 1964

by

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Price 2/6d. post free

ACKNOWLEDGEMENTS

The author wishes to thank the farmers taking part in the survey for their assistance in providing data. Thanks are also due to the Directors of Boxworth, Drayton and Great House Experimental Husbandry Farms and the Principal of the East Riding Institute of Agriculture, for helpful comments on an earlier draft of Chapter 3, and for permission to refer to the results of experiments.

The Economic Position of Sheep in the Eastern Counties

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Chapter 1

INTRODUCTION

For climatic reasons, farming in the Eastern Counties[1] is dominated by arable crops for sale, particularly cereals, sugar beet and potatoes. Sheep are not a major farm enterprise, but with the right circumstances and management they can provide a useful source of income. During the past four years a sample survey of sheep flocks in the region has been carried out, and the present report summarises the results, and discusses some of the implications. Consideration is also given to the economics of some methods of intensifying the sheep enterprise.

A sheep flock is one of a number of alternative ways of using grassland. Most farms in the Eastern Counties have at least a small acreage of grass. In 1963 for example, of the 22 thousand agricultural holdings of 20 acres or more, in the region, nearly three-quarters had some permanent grass, and half had some leys (including clover and sainfoin). It is often assumed that the acreage of grassland should be kept at a minimum, except where dairying or the production of seed grass is possible. On many farms this view is well justified, but the possibility of combining a sheep flock with other complementary resources or enterprises should always be considered. For example, sheep can make use of permanent (unploughable) grassland, they usually fit in well with grass seed production, and they can make use of pea haulm silage, sugar beet tops and other by-products. Where there are substantial amounts of such resources it may be profitable to carry an acreage of leys greater than the minimum considered necessary for the rotation. (This point is discussed in Chapter 4.) Even if the grass acreage is at the minimum, it is desirable to make the best possible use of it.

The relative importance of sheep in the region

Sheep numbers in the region fell by 60 per cent. during the war, and the severe winter of 1947-48 reduced them even further. From then until 1960 numbers gradually increased but in the last few years they have remained fairly constant.

[1] The counties of Bedford, Cambridge (inc. the Isle of Ely), Essex, Hertford, Holland (Lincs.), Huntingdon, Norfolk, the Soke of Peterborough and Suffolk.

Total sheep and lambs recorded at the June census in selected years, Eastern Counties
(thousands)

1939	803.0	1957	373.0
1945	320.7	1960	465.3
1948	225.5	1962	470.0
1951	241.6	1963	462.4
1954	280.2	1964	451.5

The 1964 total was made up as follows :

	thousands
Breeding ewes	196.5
Rams	4.3
Sheep & lambs under 1 year old	235.8
Other sheep	14.9
Total	451.5

This total represents about 2.4 per cent of the number in England and Wales as a whole.

Within the region it has been estimated that sheep account for about 1 per cent of total agricultural and horticultural output, or approximately £2 million per year.

Chapter 2

SURVEY RESULTS

The sample of farms costed was composed of commercial late-lambing flocks, producing fat or store lambs for sale, rather than pedigree rams. The number of farms costed each year varied between 20 and 26, a small sample but one consistent with the importance of sheep in relation to the total resources available for surveys of this type. The composition of the sample changed considerably over the four years, and by 1964 only ten of the original number remained. The sample was only intended to be representative of late-lambing commercial flocks, but there is some reason to believe that the practice of tupping ewe lambs is not yet as widespread in the whole region as in the survey sample.

Most of the flocks in the survey were of Scots half-bred ewes, with Suffolk rams the most usual. There were also a number of flocks of Clun ewes, for which replacements could be home-bred. Tupping usually commenced at the beginning of October, and during November and December some of the flocks were run on sugar beet tops. Supplementary feeding of hay or mangolds usually began about Christmas, and concentrate feeding in January. With the rams in at the beginning of October, lambing was concentrated in March. After lambing the ewes were given whatever feed was available. A few grew kale for this period, but most relied on hay and mangolds to carry the flock until the grass came. Concentrates were also maintained at from 1 to $1\frac{1}{2}$ lbs. per ewe per day, for several weeks after lambing, and a few farms continued supplementary concentrates for the lambs until they were sold fat.

Gross Margins

Attention was concentrated on the gross margin approach rather than a complete costing although estimates of net profit were also made, using the conventional methods of allocating overheads. The average breakdown of output and variable costs for each of the four years is shown in Table 2.1. Flock depreciation includes cull sales because these figures were inflated by a number of farmers in the sample selling their flocks during the course of the survey, particularly in 1964.

Table 2.1. Average gross margin structure, per 100 ewes & ewe lambs tupped.

Lamb crop	1961	1962	1963	1964	Average	
Output:	£	£	£	£	£	%
Lambs -						
Market	638	578	585	583	596	59.7
Guarantee	199	116	47	19	95	9.5
Retained or valued out	88	140	245	207	170	17.0
	(925)	(834)	(877)	(809)	(861)	(86.2)
Wool	137	135	140	138	138	13.8
(a) Total output	1062	969	1017	947	999	100.0
Variable costs:						
Concentrates	120	170	169	153	153	31.8
Forage crops	26	32	40	38	34	7.0
Grazing	89	108	102	86	96	20.0
Flock depreciation (inc. cull sales)	189	136	138	128	148	30.8
Miscellaneous	55	48	43	52	50	10.4
(b) Total variable costs	479	494	492	450	481	100.0
Gross margin (a) - (b)	583	475	525	497	518	
Net profit	211	200	167	195	193	
Stocking rate, ewes per acre	2.9	2.8	2.9	3.1	2.9	
Gross margin per acre, £	16.9	13.3	15.2	15.4	15.1	
Gross margin per arable acre,	£24.0.	21.5	19.7	21.0	21.6	

Notes:

1. Lamb output includes some sales of store lambs, which do not attract a guarantee payment. Therefore the amounts of guarantee shown are not directly comparable with the market receipts.
2. Miscellaneous costs include veterinary charges, and any sheep netting, but not general farm fencing.
3. The gross margin per arable acre is discussed in Chapter 4.

It is evident that an output of £10 per ewe, and a gross margin of £5 per ewe, are close approximations to the average survey results. Even in a calculation of gross margins the results are considerably influenced by the method adopted. Here, no charge was made for arable by-products or for grazing of grass cut for seed. Home-grown concentrates were valued at market prices.

Physical data

Financial results are strongly influenced by the physical standards achieved. Table 2.2 shows the average results for the more important physical factors. In considering the figures for inputs, it should be noted that an individual flock is unlikely to be fed all the forage crops shown (hay, roots, silage, brassicas).

Table 2.2 Average physical results, output and inputs, per 100 ewes and ewe lambs tupped.

Lamb crop	1961	1962	1963	1964	Average
Output					
Lambing percentage	136	134	140	128	134
Ewe lambs tupped, as % of flock	8.0	13.4	8.3	8.6	9.6
E.D.C.W. of fat lambs sold, lbs.	42.0	42.0	42.8	37.7	41.2
Fleece weight, lbs.	6.7	6.7	6.6	6.3	6.6
Inputs					
Concentrates, cwts.	104	134	132	119	122
Hay, cwts.	97	90	110	87	96
Roots & silage, tons	15	15	13	13	14
Kale & cabbage, acres	1.7	1.4	1.7	1.1	1.5
Leys	21.0	23.0	21.5	18.5	21.0
Permanent grass	8.9	8.0	7.6	10.5	8.8
Total acres (incl. hay etc.)	34.3	35.4	34.2	32.7	34.2
Labour, man-hours	737	627	622	550	634
Flock size, ewes & lambs tupped	184	169	176	218	187

Notes:

1. Lambing percentage was calculated as lambs tailed per 100 ewes and ewe lambs tupped.
2. The carcase weight figures refer to lambs sold before 1st October in each year.
3. The acreage allowance for hay fed was based on a standard yeild of 50 cwts per acre (two cuts).

The cold winter of 1962-63 might be expected to have affected the results, but although the average hay useage was unusually high (and concentrates also above the 4-year average) the lambing percentage was the highest of the four years.

According to this sample, labour useage declined steadily over the period. If one man is assumed to supply 2,200 hours per annum, then the flock sizes corresponding to the man-hours shown in Table 2.2 are, in round figures, 230, 320, 320 and 360. The great majority of the flocks were in fact part-time, but in normal circumsatnces a full-time shepherd should be able to look after at least 400 ewes, with some help for a month at lambing, and on other occasions when more than one man is needed.

Variation between flocks

The average figures quoted in Tables 2.1 and 2.2 conceal a great deal of variation between flocks. To give an indication of its extent, Table 2.3 shows frequency distributions for the more important factors in each of the four years.

Table 2-3 Frequency distributions of some important variables, (values per 100 ewes and ewe lambs tupped).

Lamb crop	1961	1962	1963	1964
Output:				
Total output (lambs & wool) £				
Less than 900	5	7	4	8
900-999	2	12	6	4
1000-1099	6	2	5	6
1100-& Over	9	5	6	2
Lambing percentage				
Less than 110	2	2	0	1
110-129	3	10	7	9
130-149	12	9	8	5
150 & over	5	5	6	5
Inputs:				
Flock depreciation £				
Less than 100	0	7	4	9
100-149	6	8	10	6
150-199	3	9	5	5
200 & over	13	2	2	0
Concentrates £				
Less than 100	8	5	3	4
100-149	9	6	5	5
150-199	3	6	5	7
200 & over	2	9	8	4
Total acres				
Less than 25	6	7	5	5
25-34	6	7	9	7
35-44	6	5	3	4
45 & over	4	7	4	3
Labour, man-hours				
Less than 400	3	7	5	8
400-599	6	9	8	4
600-799	5	3	3	5
800 & over	8	7	5	3

Lamb crop	1961	1962	1963	1964
Gross margin, £				
Less than 400	4	9	5	8
400-599	8	12	7	6
600-799	7	4	9	5
800 & over	3	1	0	1
Flock size, ewes and ewe lambs tupped				
Less than 100	5	9	6	4
100-199	10	9	8	7
200-299	3	3	5	4
300 & over	4	5	2	5

Although the difference between flocks are clearly substantial, showing the variation in each factor separately can give a misleading impression, since one factor may vary in the opposite direction to another. For example, a low flock output may be caused by a low lambing percentage, itself caused by a high proportion of ewe lambs in the flock. On the other hand these ewe lambs will appreciate in value over the year, thereby reducing the flock depreciation charge and helping to stabilise the gross margin, for example. Similarly, if the lambing percentage is low, less grass and concentrates will be needed to fatten the lambs, tending to reduce costs and also improve the stocking rate.

Chapter 3

FACTORS AFFECTING PROFITABILITY

For comparison with cash crops and other farm enterprises, one of the more important measures of profitability of the sheep enterprise is the gross margin per acre. This is determined by the gross margin per ewe, and the number of ewes per acre. These two factors often work in opposite directions, and measures to increase the stocking rate may reduce the gross margin per ewe and vice versa. Then the gross margin per acre is higher if the increased rate outweighs the lower margin per ewe. In the present chapter a number of factors affecting the gross margin per ewe and the stocking rate are considered. Although each is considered separately they are often interrelated and this is mentioned where necessary. (As elsewhere in the report, attention is concentrated on fat lamb production, although this is not the only possible type of sheep enterprise). The factors considered are summarised as follows:

1. Increasing output per ewe (lambing percentage, selling heavier lambs)
2. Reducing costs per ewe (concentrates, flock depreciation)
3. Increasing the stocking rate (intensive fertilisation, inwintering ewes, finishing lambs on concentrates)

Some of these factors are more important than others, and Table 3.1 shows the average relationship between lambing percentage, stocking rate and the gross margin per acre, as found in the survey.

Table 3.1 Influence of lambing percentage and stocking rate on gross margin per acre.

Gross Margin per acre £

Lambing Percentage	Stocking rate, ewes per acre		
	2	3	4
110	8.1	12.3	16.4
130	9.6	14.5	19.4
150	11.1	16.8	22.5
170	12.8	19.1	25.5

Source: Survey results 1961-64

The Table was obtained from a regression of gross margin per acre on lambs per acre, [1] using the survey results from 1961 to 1964. Figure 3.1 is a scatter diagram giving the individual values[2] (farms) and the average relationship, shown by the line. The two variables, lambing percentage and stocking rate (expressed in the diagram as a single figure, lambs per acre) together accounted for 73 per cent of the variation in gross margin per acre. It will be appreciated that this is an <u>average</u> relationship, and it does not necessarily apply to a particular farm, or to farms outside the survey.

[1] $y = -0.2 + 3.78x$ where y = gross margin per acre, x = lambs per acre

$r = 0.855$; $r^2 = 0.73$

[2] The values at the upper (top right) end of this scatter diagram come from farms where there are large quantities of cash crop by-products, and the stocking rate is consequently high.

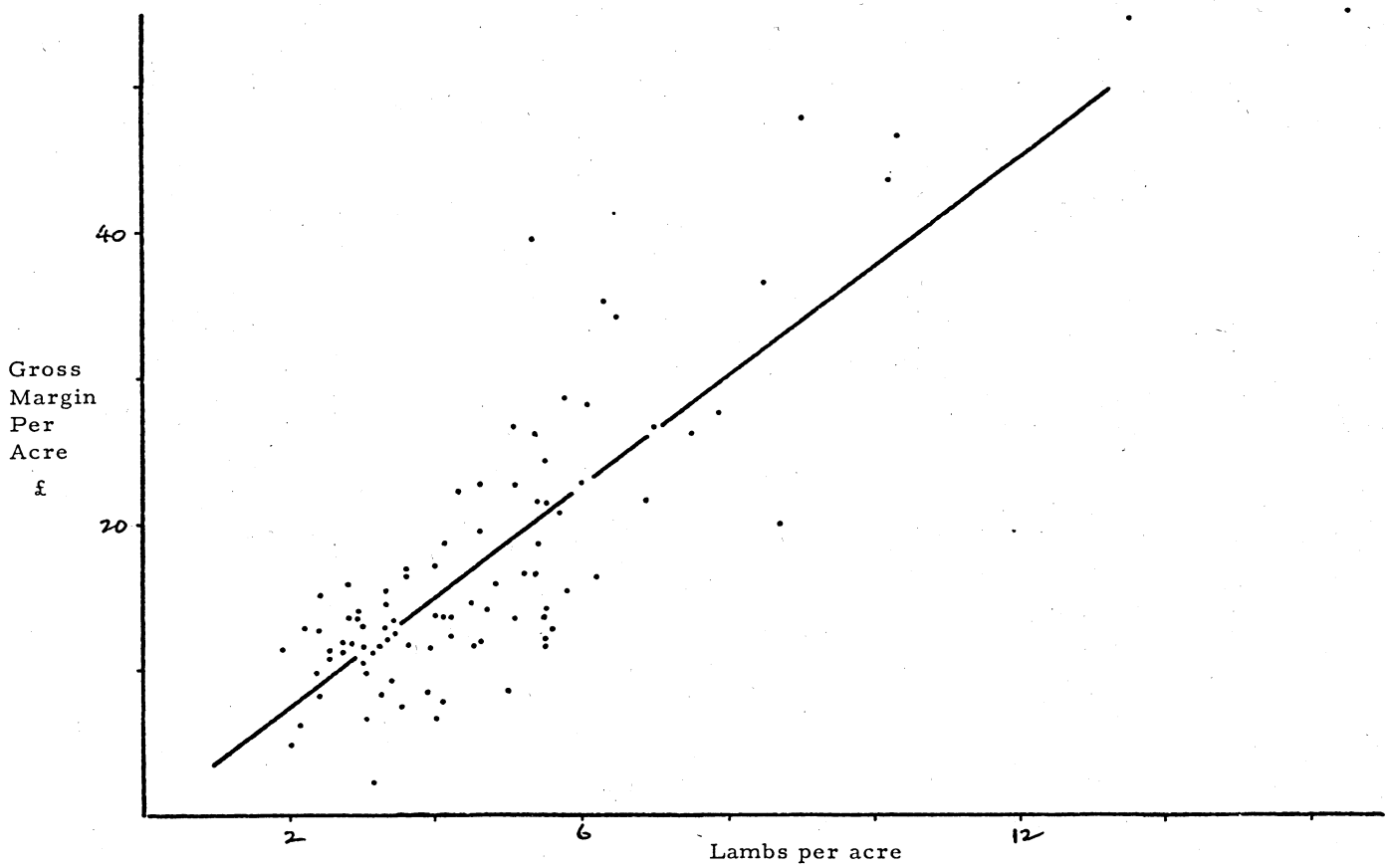

Fig. 3. 1 Relationship between gross margin and lambs per acre.

1. INCREASING OUTPUT PER EWE

a) Lambing percentage

For the purpose of the survey the lambing percentage was defined as the number of lambs tailed (or alive at 6 weeks) per 100 ewes tupped. The importance of this factor on the survey farms has already been indicated, and its influence at a given stocking rate can be seen from the figures in each column of Table 3.1. The reason for the rapid increase in gross margin per acre is that the extra costs incurred by fattening an extra lamb are usually small in relation to the money return from the lamb. The extra costs are some increase in feed, especially concentrates, and in veterinary bills. In money terms £2 per lamb should be adequate to cover these costs, although the actual amount depends on the year and the quality of the grassland. If each lamb sells for £6.10.0d it is not worth spending more than £4.10.0d to obtain an additional lamb.

Recent evidence indicates that a gradual build up of ewe condition during the summer, is more likely to increase the lambing percentage than suddenly flushing the ewes just before tupping. Where flushing is practised, there is some experimental evidence that grass is better than concentrates. On the other hand, what is technically best may not be economically justifiable. Providing better grazing during the summer and early autumn involves a cost, which must be offset against any gain in lambing percentage. The extra cost is likely to be particularly large if it takes the form of additional grassland which displaces a cash crop (and incidentally reduces the annual stocking rate). For example, if 100 ewes need an extra 5 acres of grass over the year, at the expense of barley, the loss in gross margin is likely to be about £130. To recoup this amount, at a "net gain" of £4.10s. per extra lamb, would require 28 additional lambs per 100 ewes. Putting it another way, on these assumptions, to justify the use of additional grassland it would have to increase output by at least 28 lambs more than is obtainable by flushing on concentrates.

b) Heavy versus light lambs

It may be possible to increase output per ewe by keeping lambs to heavier weights (say over 45 lbs. D.C.W.). Although the market price per lb. is usually higher for light lambs, it may not be sufficient to compensate for the smaller number of lbs. At any one date the price differential is usually of the order of 1d. or 2d. per lb. D.C.W., but since selling lambs heavier means keeping them longer, the comparison should be between the price per lb. for light lambs and the price per lb. for heavy lambs some weeks later. For example, in 1964 average market prices were reported as follows:

Table 3.2 Average market prices for fat lambs, mid-1964.

price per lb. D.C.W

	mid-June	mid-July
Light lambs (up to 45 lbs. D.C.W.)	s. d. 3. 7.	s. d. 3. 2.
Heavy lambs (45 lbs. D.C.W. & over)	3. 6½.	3. 1.

Source: M.A.F.F. market reports.

Although the price differential in mid-June was only ½d. per lb., that between light lambs in mid-June and heavy lambs in mid-July was 6d. per lb. (no guarantee was payable at this time). At these prices a 40 lb. lamb in mid-June would have totalled £7.3s. while a 48 lb. lamb in mid-July would have totalled £7.8s., giving a small advantage to the heavier lamb. On the other hand additional feed costs will have been incurred. Therefore, although output is increased by selling heavier, the gross margin per lamb may be even smaller.

The guarantee system tends to favour heavier lambs, since the rate of payment is constant per lb., provided the lamb is eligible for guarantee. Although in principle it seems fairer to allocate guarantee payments in proportion to market price, with the declining importance of the guarantee in recent years this aspect has become less important. On the survey farms the relative importance of the guarantee payments fell progressively over the four years considered, as shown in Table 3.3.

Table 3.3 Relative importance of market receipts and guarantee payments.

Lamb crop	1961		1962		1963		1964	
Fat lamb sales:	£	%	£	%	£	%	£	%
Market	4.5	64	5.2	80	5.9	91	6.3	97
Guarantee	2.5	26	1.3	20	0.6	9	0.2	3
Total	7.0	100	6.5	100	6.5	100	6.5	100

Too much significance should not be attached to the actual percentage figures, both because of the small sample and because the figures are influenced by such factors as date of sale, selling weight, and the number of lambs sold as stores. In these figures the percentage importance of the guarantee is consistently below that shown by the figures on p.42 of the 1965 Annual Review and Determination of Guarantees (Cmnd. 2621) but the trend is similar.

A further consideration in the comparison of light and heavy lambs is that keeping lambs to heavier weights will mean fewer ewes per acre, other things being equal. Therefore even if the gross margin per ewe is higher with heavy than with light lambs, this may be offset by a lower stocking rate. The actual outcome (in terms of gross margin per acre) depends on the relationship between the gross margins per ewe and the stocking rates, under the two systems.

REDUCING COSTS PER EWE

Two important cost items will be considered here, flock depreciation and the charge for concentrates

a) Flock depreciation

This cost is calculated as:

Opening valuation of breeding flock plus purchases minus cull sales
minus closing valuation

It therefore includes losses from casualties in the breeding flock

As explained earlier in presenting the survey results, cull sales are included in flock depreciation instead of in output because of the number of flocks sold up during the four years.

The following table (3.4) shows how the average annual depreciation is affected by differences in flock life and purchase price.

For simplicity it is assumed that all purchases are of shearlings.

Table 3.4. Influence of flock life and purchase price on the depreciation charge per ewe.

No. of lamb crops (from shearling stage)	Purchase price per shearling			
	£10.10s.	£11.11s.	£12.12s.	£13.13s.
3	£ 2.10s.	£ 2.17s.	£ 3. 4s.	£ 3.11s.
4	£ 1.18s.	£ 2. 4s.	£ 2. 9s.	£ 2.14s.
5	£ 1.12s	£ 1.16s	£ 2. 0s.	£ 2. 4s.
6	£ 1. 7s	£ 1.10s.	£ 1.14s.	£ 1.17s.

Assumptions: cull ewes £3. 10s. each

casualties 5 per cent per annum

The average flock depreciation of about £1.10s. per ewe, shown by the survey (Table 2.1.) corresponds to a rather higher figure in the above table, since most of the survey flocks contain a proportion of ewe lambs, which appreciate over the year[1].

Purchase of replacement ewes can be avoided by keeping pure-bred ewes, e.g. Clun Forest, or Kerry Hill. Replacements are bred by running a proportion[2] of the flock with rams of the same breed, making due allowance for ram lambs. The remaining ewes can be crossed with a Suffolk or Down ram. Alternatively, ewes of the Clun or Kerry Hill type can be bought-in for crossing with Suffolk or Down rams. These ewes are usually cheaper than half-breds, and have a longer useful life, but in general they do not have the same potential to make full use of good quality grassland. There is also some evidence of difficulty in selling the wether lambs from the pure-bred section of the flock.

In buying the replacement ewes for a cross-bred flock, there is a choice between ewe lambs and shearlings (or older ewes). Ewe lambs are always cheaper than the equivalent shearlings, since their lambing percentage is lower, usually about half that from shearlings. The important consideration is to know what price differential is justified. The following figures compare the two main alternatives, assuming lambing percentages of 140 (shearlings) and 70 (lambs).

[1] This difference should not materially affect the gross margin per ewe, because the lower cost in flock depreciation is offset by lower output.

[2] The proportion will vary with the average flock life, but half should be a generous allowance.

Buying in (or retaining) ewe lamb replacements instead of shearlings (per 100 animals)

Loss of output 70 lambs @ £6.5s. = £437. 10s.	Saving in concentrates, hay, etc. (say) £37.10s.
	Balance £400 approx.

On these assumptions the price differential should be about £4.0.0. per sheep, rather more than has been common at markets in recent years. There is the further consideration that about a third less capital is required for ewe lambs, and interest on this capital saved could be entered as credit. On a purchase of 100 replacements at a price differential of £4 per head, the interest gained should be at least £16.

Keeping ewe lambs for a year can give a reasonable return per acre, provided that a good lamb crop is obtained. The budget shown below assumes that half the hoggetts lamb, at 140 per cent, and that losses are 4 per cent.

Table 3.5 Gross margin from tupping ewe lambs (per 100 ewe lambs)

Variable Costs	£	Output	£
25 acres grassland @ £4 per acre	100	Increase in value 96 @ £3.10s.	336
40 cwts concentrates @ 25s. per cwt.	50	Fleeces 96 @ £1.5s.	120
Shearing	10	Lambs sold 70 @ £6	420
Lamb bonus	9		
Miscellaneous	40		
	209		
Gross margin	667		
	876		876

Gross margin per ewe lamb tupped, £6.13s.
Gross margin per acre £26.12s.

If no lambs were produced the gross margin would be reduced to approximately £11.10s. per acre.

b) Concentrates

Normally these are fed to the ewes in the latter stages of pregnancy, starting with $\frac{1}{4}$ lb. per head per day and working up to about 1 lb. Clearly, the amounts fed must be adjusted according to the weather and the quantities of other feeds available, which themselves are influenced by the date of lambing. A resonable concentrate feeding programme for March lambing in a normal season is a total of 30 lbs. before and 60 lbs. after lambing, including creep feeding. Thus about 90 lbs per ewe is a reasonable allowance, and at an average cost of 25s per cwt[1], the cost is about £1 per ewe. This is well below the average cost found in the survey. In both 1962 and 1963 additional concentrates had to be fed because of the cold spring weather, but nevertheless there can be no doubt that some extravagent feeding of concentrates occured. This is indicated by the frequency distribution in Table 2.3, while on a number of farms the concentrate cost exceeded £3 per ewe.

3 INCREASING THE STOCKING RATE

The stocking rate is defined as the number of ewes per acre of land chargeable to the sheep. Problems of estimating this acreage arise where there is mixed grazing, or a hay or silage cut is taken.[2] Acres of by-products, such as sugar beet tops, used by the sheep are best not debited to the flock. However, it may be realistic to charge a money cost, such as the rental value of grazing beet tops. Another complicating factor is that ewes vary considerably in size, and stocking rates achievable with small ewes may not be possible with large. For example, Masham ewes are likely to weigh half as much again as Kerry Hill ewes (say 155 lbs. liveweight compared with just over 100 lbs.). Thus there is a case for expressing stocking rates in terms of lbs. liveweight of ewes per acre.

The influence of the stocking rate on gross margin per acre has already been indicated (Table 3.1 and Fig, 3.1). Three possible ways of increasing the number of ewes per acre are mentioned here. Although they may all make a contribution towards higher stocking rates, their contribution to profitability is likely to be small compared with a farm organisation which can accommodate a sheep flock as a supplementary or complementary enterprise.

[1] Home grown cereals charged at market price.

[2] See Appendix B for notes on the method used here.

a) Intensive fertilisation of the grassland

The possibilities of this method depend on the response of the grassland to applications of nitrogen fertiliser, coupled with intensive grazing. As at least half the flock's annual grazing requirements are concentrated in the three or four months just after lambing, an increase in stocking density during this period can be particularly important. There are two aspects to this problem. One is the amount of grass obtained from spring fertiliser dressings, and the other is the use made of this extra grass by the ewes and their lambs. Various grazing systems have been tried, usually involving the grassland being divided into paddocks which are grazed in turn. This rotational grazing can be with set stocking (where both the ewes and lambs are confined to the same paddock) or with lambs being able to "creep" forward to the fresh grass on the paddock which the ewes will graze next.

In principle the creep grazing system is better suited to high stocking densities, because it reduces both the competition between the ewes and lambs for food, and also the level of parasite infection of the lambs. One variant of the system is to separate ewes with single lambs from those with twins, and allow the ewes with twins to graze ahead of those with singles. This method has been tried at Drayton Experimental Husbandry Farm during 1965, for example, resulting in more lambs being sold early than in previous years. There were insufficient survey farms using the creep grazing system for conclusions to be drawn from this source. Evidence from other sources is conflicting. At Boxworth E.H.F. and the East Riding Institute of Agriculture, no advantage over set stocking has been found, whereas results at Drayton E.H.F. and other centres have been more favourable. This lack of a consistent pattern seems to be reflected in the results obtained by farmers who have tried the system. The main disadvantage is a tendency to produce a higher proportion of store rather than fat lambs. In per acre terms, the lower return per store lamb might be more than offset by the increased stocking rate, but in these circumstances the return on capital invested in additional ewes is likely to be small. A probable reason for some failures of the system is delay in introducing the lambs to the creeps; this should be done before the lambs are three weeks old.

To be economically sound, the cost of additional fertiliser should be more than recouped through increased output. At Great House E.H.F. (Lancs.), for example, this was found to be the case, for an experiment comparing 42 and 420 units of nitrogen per acre. Averaging the two years 1963 and 1964, an increase in variable costs of £14. 16s. per acre (mainly nitrogen) resulted in an increase in output of £31. 8s. per acre, an increased margin of £16. 16s per acre of fattening grass. The high-nitrogen grassland was stocked for 9 weeks at a density of 10 ewes and 14 lambs per acre and the low-nitrogen area at half this rate. At the end of 9 weeks the ewes were removed and the lambs continued on the treatments until October. Similarly, at the East Riding Institute, stocking densities of 12 ewes (plus lambs) per acre are maintained for 10 - 12 weeks using rotationally grazed paddocks without creeps. Nitrogen fertilisation of the grass is similar to the high-nitrogen level used at Great House, with the addition of some phosphate and potash. Use of this system permits the annual stocking rate to be 5 ewes per acre.

Although the results quoted indicate the possibilities of intensification through additional fertiliser, it must be emphasised that they depend on the response of grass to fertiliser in the particular trials mentioned. It does not necessarily follow that similar responses would be obtained elsewhere, particularly in the eastern counties (as defined in this report) where the rainfall is generally lower. At present there is little experimental evidence to responses to nitrogen in this region, but in any case it will vary according to local circumstances, and the most appropriate level of nitrogen application is not necessarily the same on each field of one farm.

(b) Inwintering ewes

Experience at Drayton E.H.F., the East Riding Institute of Agriculture, and elsewhere, has shown that inwintering of ewes is technically possible and has a number of advantages. One of the main advantages is that the flock is easier to look after; another is the better state of the land and the flock after a wet winter, although on light land this factor is less important. The question is whether the land not grazed during the winter produces more grass as a result. Experience on the heavy land at Drayton indicates that there is better growth on the winter-saved plots early in spring, but the difference is made up later in the year. The main effect of the better grass on the winter-saved land appears to be an improvement in the proportion of lambs sold fat before weaning. At the East Riding Institute also, winter-saved grassland has shown better growth in the early spring. In 1964, for example, the growth advantage over grazed paddocks was at least three weeks. A further advantage of inwintering found at the East Riding Institute, was a higher lambing percentage from housed ewes, but this does not seem to have been experienced at other centres.

Although there may be advantages in convenience and improved lamb growth, inwintering will usually require a capital outlay to erect a building or adapt an existing one. Inwintered ewes also need more hay (or silage) than outwintered, but the difference varies from year to year depending on the weather. An additional 1 cwt. of hay per ewe inwintered seems likely to be adequate.

If the gain in grass production is small, and extra hay is needed during the winter, it follows that only a small capital investment per ewe will be justified, unless a high value is attached to the greater ease of tending the flock during the winter. To take an optimistic example, if inwintering enabled the annual stocking rate to be increased from 3 to $3\frac{1}{2}$ ewes per acre, a flock of 100 ewes could be increased to 117 without any extra land. If the additional capital is £187 for the ewes and £350 for the building[1] and the extra ewes yield a gross margin of £5. 10s 0d each, the rate of return after 5 years is nearly 7 per cent. (depreciating the ewes over 5 years and the building over 10 years).

1. The capital budget is based on the following assumptions.
Ewes, 17 shearlings @ £11
Building, 117 ewes @ 10 sq. ft. per ewe and 6s. per sq. ft.
This estimate is for an unspecialised building of the Romney hut type, materials cost only. For comparison, the building put up at the East Riding Institute cost about 14s. per sq. foot for materials, with a further 10s. per square foot if labour is charged. Although the building was designed primarily for inwintering ewes, it was so constructed as to be useful for other purposes, such as hay-drying.

If the cost of the building were shared with another use, the rate of return would be approximately double, and it is obviously desirable to have a multi-purpose building.

Reduction in the grazing area required for fattening the lambs may be achieved by feeding concentrates. These may be a supplement to the grazing, or form the major part or whole of the ration. Evidence on finishing lambs is available from trials at the East Riding Institute of Agriculture, where the almbs brought indoors are introduced to an ad-lib cereal diet at a relatively late stage, at least 70 lbs. liveweight. Deadweight conversion rates of between 10 and 12 to 1 were found. At a deadweight conversion of 11 to 1, and a ration cost of £25 per ton, the cost per lb. of carcass was 2/5. For a gain of 17 lbs. carcass weight, the margin over feed costs is about 12s. per lamb. Valuingin the lamb at £4, and allowing an average of £1 working capital for concentrates, the rate of return is 12 per cent in 10 weeks, assuming no lambs are lost. However, each lamb needs approximately 5.5 square feet of housing space, and if this is not already available, some additional long-term capital will be needed for a building. (At 6s. per square foot the total is 33s. per lamb).

This system of finishing lambs appears attractive when considered in isolation, but when applied to an existing ewe flock the stocking rate may have to be increased substantially to achieve the same gross margin per acre. For example, suppose the present flock is stocked at an annual average of 3 ewes per acre, at which level all the lambs can be sold fat off grass. At a gross margin of £5.10s. per ewe, the gross margin per acre is £16.10s. If the lambs are taken off the ewes as stores, valued at £4 each, output per ewe will drop to about £7 and the gross margin to about £2.5s. Total output will be maintained but only by feeding concentrates. To maintain the gross margin per acre, the system must permit the annual stocking rate to reach nearly 5.5 ewes per acre (assuming 140 per cent lambing).

5.5 ewes @ £2.5s.	gross margin =	£12.8s. per acre
7.7 lambs @ 12s.	" " =	£ 4. 12s. " "
		£17. 0s. " "

An alternative method of increasing the relative amount of concentrates in the overall lamb feeding programme, is to wean one lamb from each pair of twins (or two from triplets) at an early age, and fatten these on a high-cereals ration. As an example of this system, consider the case of a Clun flock in the Eastern Counties. About 250 ewes (including 40 hoggets) are run on 100 acres of indifferent permanent grassland, lambing at an average of 140 per cent. Experience has shown that if all the lambs are left on the grass, practically all have to be sold as stores, averaging about £4.10s. per head. Weaning one of each pair of twins at 35 lbs. liveweight (about 5

weeks) and transferring these lambs to an ad-lib high-cereals ration, has enabled most of the lambs to be sold fat, averaging about £6. Therefore there is an increase in output of 30s per lamb, which on 350 lambs amounts to a total of £525. Against this must be set an extra concentrate cost of approximately £250, leaving a margin of £275. It also appears probable that the flock can be increased to 300 ewes without reducing the proportion of lambs sold fat off the grass. Although housing the lambs for about two weeks after weaning has been practised, to encourage the lambs to eat the cereal ration, this may not be essential to the success of the system. After this period the lambs run on a paddock with access to the grain-feeders[1] in an open shed.

1 converted ad-lib pig-feeders.

General conclusions cannot be drawn from a single case study such as this, but the financial gain is so large in relation to the extra labour and equipment needed that it appears a promising method. It may be particularly useful on permanent pasture heavily infested with worms.

Chapter4

GROSS MARGIN PER ARABLE ACRE

The gross margin per acre from an arable crop naturally refers to arable land only, but the gross margin from a grazing livestock enterprise is often derived from a combination of permanent and temporary grassland. In everyday use the term 'permanent grass' varies considerably in meaning, but here it is defined as grassland which for some reason is entirely excluded from the arable rotation. Although there are usually a number of possible uses for such grass, arable cropping is by definition impossible, and comparisons between its profitability and that of arable land are only of academic interest. However, if this grassland can be used for livestock, in conjunction with leys (or other fodder crops), for purposes of comparison with arable cash crops the total gross margin from the livestock (less the gross margin from any hay sacrificed on the permanent grass) should be credited to the leys, i.e. the gross margin per acre of leys is compared with that of wheat, barley, etc. This is so because without the livestock the permanent grass would be unused, except for the hay cut for which allowance has already been made. The gross margin per acre of arable grass and forage crops as found in the survey, is shown in Table 2.1. It differs from the gross margin per acre according to the balance between arable and non-arable land used for the sheep, on the survey farms. Although the values per arable acre are appreciably higher, the averages shown are well below that for barley (about £27 per acre). However on some individual farms the gross margins per arable acre from sheep were well above those from cereals.

An example

A straightforward comparison of grass and cash crops, ignoring the alternative uses, may well be misleading for management decisions. This is shown by an example based on an actual farm in the Eastern Counties. The farm is primarily concerned with growing vegetables and cereals, but there is also a substantial acreage of rough grazing on chalk hills. This is suitable for sheep through most of the year, although inadequate for fattening lambs. This constitutes the permanent grass referred to above, and does so in an extreme form because the land is too steep to be cut for hay. There is thus no possible use for the land except sheep, or to a lesser extent cattle. For the purpose of the example the following assumptions are made.

The total area is 300 acres, 200 arable and 100 rough grazing. The latter can support 150 ewes through two-thirds of the year if necessary. The arable land requires a minimum of 20 acres leys each year, for rotational reasons. With a stocking density of 6 ewes per acre for the fattening period, 20 acres will support a flock of 120 ewes. Thus a flock of 150 ewes would require 25 acres of leys, slightly above the minimum. The question is whether a higher farm gross margin is obtained when the leys are at 20 acres (120 ewes) or 25 acres (150 ewes). The two cases are compared in Table 4.1. In case (ii) the extra 5 acres of leys displace barley.

Table 4.1

(i)	Case (i) 20 acres leys (i.e. 120 ewes)			Case (ii) 25 acres leys (i.e. 150 ewes)			
Crop	Acres	G.M. per acre (£)	Total G.M. (£)	Crop	Acres	G.M. per acre (£)	Total G.M. (£)
Wheat	50	32	1600	Wheat	50	32	1600
Barley	90	28	2520	Barley	85	28	2380
Vegetables	40	60	2400	Vegetables	40	60	2400
Leys	20	(33)	660	Leys	25	(33)	825
Arable	200		7180	Arable	200		7205
R.Grazing	100			R.Grazing	100		
	300		7180		300		7205

The Table shows that a higher total gross margin is obtained when leys are 25 acres, above the rotational minimum. In this situation the capacity of the rough grazing sets the limit to the sheep enterprise. If the gross margin per acre is used as the criterion for choosing between (in this case) sheep and barley, the correct answer is obtained by comparing the gross margin per acre of leys with that of barley. Including all the rough grazing results in an average gross margin of £5.10s. per acre in case (i) ($\frac{£660}{120}$); even if the acreage is discounted at the rate of (say) five acres rough grazing to one acre of leys, the gross margin per acre is only £16.10s.($\frac{£660}{40}$). Either of these figures suggests that leys should be kept to the minimum, and therefore implies the wrong management decision.

Although in the example sheep achieve a gross margin per acre of £33, this only continues until the stock-carrying capacity of the rough grazing is exhausted. Any further expansion would, on these assumptions, have to be based on leys alone.

Acres of leys, or other fodder crops, above the rotational minimum are justified if their presence increases the total farm gross margin. This will be so if the gross margin per acre of extra leys exceeds that per acre of a cash crop.

Chapter 5

SUMMARY

1. Sheep are a minor farm enterprise in the Eastern Counties, because climatic conditions favour arable cropping, but in the right circumstances they can make a useful contribution to farm income.

2. A survey of from 20 to 25 flocks was carried out over the four years 1961-1964. The principle average financial results were as follows:

	£
(a) Total output per ewe	9.99
(b) Variable costs " "	4.81
(c) Gross margin " " (a) - (b)	5.18
(d) Gross margin per acre	15.1

3. The main average physical results were as follows:

Stocking rate per acre	2.9 ewes
Lambing percentage	134
Fleece weight per ewe	6.6 lbs.
Concentrates fed per ewe	1.22 cwts.
Total acres per ewe	0.34
Labour per ewe	6.34 man hours

4. Methods of increasing the profitability of a sheep flock are discussed in terms of increasing output and reducing costs per ewe, and increasing the stocking rate. The contribution to profitability of the methods referred to is likely to be relatively small compared with that made by a favourable farm organisation.

5. The importance for management decisions of comparing sheep and cash crops in terms of the gross margin per arable acre is shown with the help of an example farm.

References

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Appendix A

Seasonal labour requirements as indicated by the survey.

(excluding shearing)

	Man hours per 100 ewes
October	30
November	25
December	30
January	36
February	47
March	119
April	56
May	45
June	27
July	30
August	25
September	30
TOTAL	500

Notes:

1. 500 hours per annum is considered a reasonable figure, although the survey average was rather higher.
2. Shearing was often on contract, and is therefore excluded here.

Appendix B

Notes on the costing method

1. Variable costs of grazing were based on the seed and fertiliser used. Seed costs of leys were spread over the life of the ley. No allowance was made for fertiliser residues, brought forward or carried forward, except that farmyard manure was charged at 15s. per ton, spread over two years. However, this was rarely applied. Slag and lime costs were spread over 3 years.

2. Variable costs of other forage crops were based on standards.

3. Purchased feeding-stuffs were charged at cost. Homegrown concentrates were valued at 20s. per cwt. (wheat and barley) 18s. per cwt. (oats) and 25s. per cwt. beans and peas.

4. The acreage charged to the sheep included an allowance for any hay or other crop fed (either homegrown or purchased). In the case of hay this allowance was at the rate of 1 acre per 50 cwts. hay (minimum of 2 cuts.).

5. Where the sheep used land also used for other livestock, the share chargeable to sheep was estimated on the basis of standard grazing equivalent days, e.g. 1 Grazing Equivalent Day equals 1 cow, or 3 ewes with lambs, or 8 other sheep. A good hay cut was charged at two-thirds of the total cost of the grazing, and a light cut at one half.

6. Cash crop by-products such as sugar beet tops and stubbles were not charged.

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