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Cattle - Cost of production
A SURVEY OF GRASS FATTENED CATTLE, 1961



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SURVEY OF GRASS FATTENED CATTLE 1961.

A study of costs and returns and factors affecting profitability.

by

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C O N T E N T S

	<u>Page.</u>
I. The Beef Situation.	1
II. The 1961 Survey.	4
III. The Farms.	4
IV. Costing Farm Enterprises.	6
V. The Year's Results :	7
1. Feeder's margins.	11
2. Gross margins.	12
3. Rates of stocking and throughput.	14
4. Variable Costs.	16
5. "Fixed Costs" and profits.	16
6. Returns for working capital.	18
VI. Summary.	20
Appendix A. Results of Individual Farms.	21
Appendix B. Standard charges and procedures.	27

SURVEY OF GRASS FATTENED CATTLE, 1961.

I. THE BEEF SITUATION.

Livestock and their products account for about 70 per cent of the total gross output of British agriculture. Among the livestock enterprises of this country beef is second only to milk in the size of its contribution to the output of the national farm, followed by eggs and pigmeat. Ten years ago beef accounted for ten per cent of the agricultural output and in 1960-61 its share was estimated at nearly 14 per cent. This increase has not been continuous in the intervening years, however, the figures having risen and fallen several times due to such factors as the level of imported meat, fatstock prices and guarantees, the availability of calves and the relative profitability of milk production.

In recent years beef has been considered to be one of the few farm commodities which has not been overproduced and the Government have given their encouragement by gradually raising the guaranteed price of beef cattle especially for quality stock. This trend was continued at the 1961 Price Review when there was an average increase of 10s. Od. per live cwt. in the guaranteed price for fat cattle. The award was made after consideration of the fact that present day consumption of beef per head was "still well below pre-war" and it was then stated that "the number of calves retained for beef production has recently been falling". Furthermore, it was "the Government's hope and intention that, unless there is a significant change in circumstances, the new guaranteed price [i.e. average 167s. Od. per cwt.] should not be reduced at the 1962 Annual Review". This, it was thought, would provide the incentive necessary to arrest the fall in numbers of beef calves and to encourage some dairy farmers to channel their resources away from milk production towards beef.

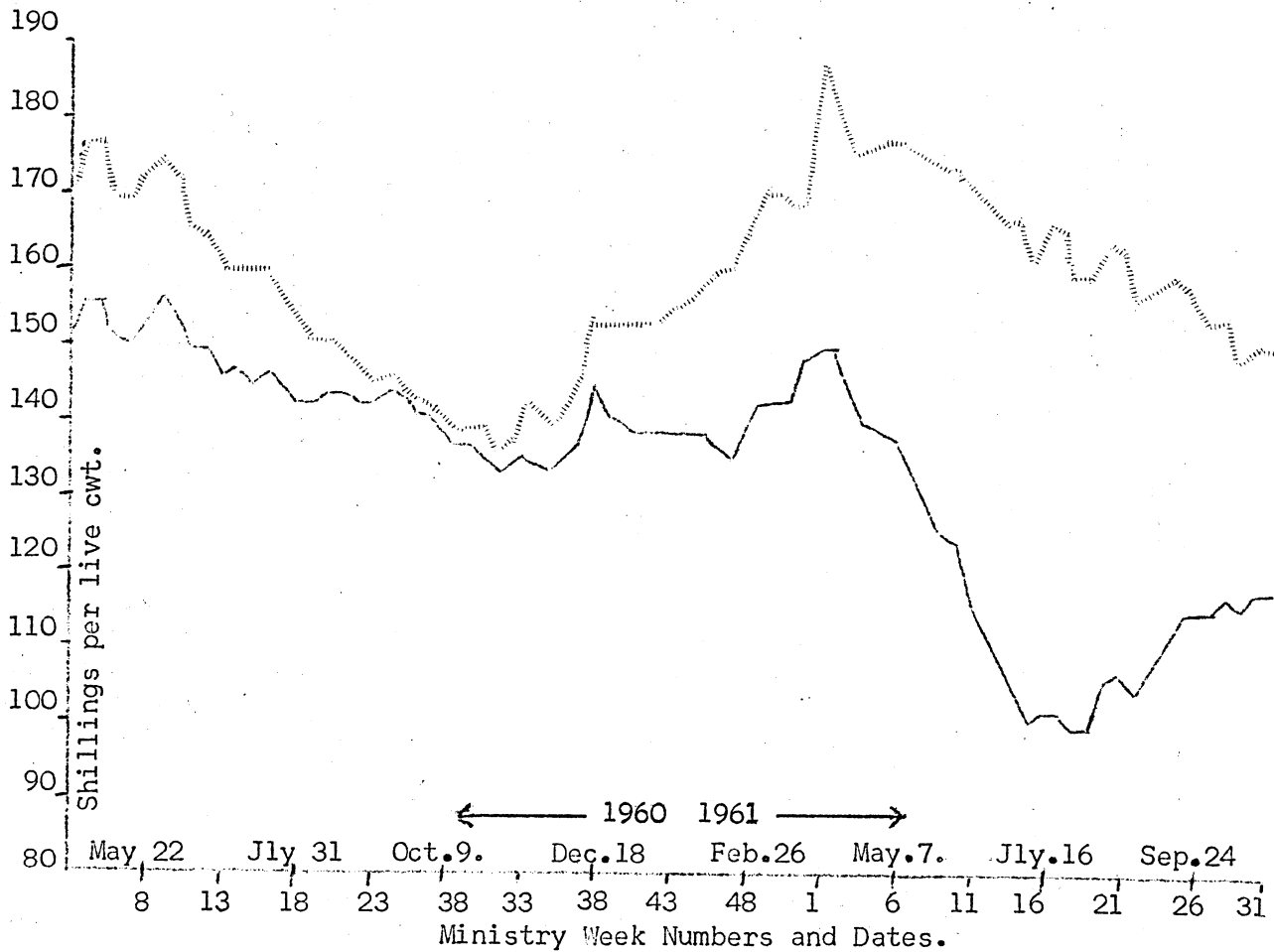
The Price Review announcement at the end of March coincided with the upward trend of store prices which is usual at that time of the year as the spring flush of grass forces farmers to buy grazing cattle. The fact that a fat beast would be worth about £5 more than in the previous year may have encouraged farmers to pay a little more for their store animals and these were, on average, about £2 dearer per head than during the same period of 1960.

Market prices for fat cattle on the other hand, reached a peak at the end of March and then declined steadily until early June when this fall was accelerated until, during July and August, prices were at their lowest for several years. Farmers, however, did not suffer because their returns were brought up to the guaranteed levels by large deficiency payments which amounted to more than half of the market price in mid-July and early August.

During September, October and November prices slowly improved, though the returns to farmers declined because of the seasonal difference in guarantees. These changes are illustrated in the graph below, where prices can be compared to those for 1960. The area between the lines for farmers' returns and market prices represents deficiency payments paid out by the Government. It is obvious that a large part of the much-discussed £78m. increase in the Exchequer payments to agriculture in 1961-62 is due to the low beef prices in summer and autumn last year.

AVERAGE MARKET PRICES AND RETURNS FOR FAT CATTLE

April 1960 - October 1961 ⁽¹⁾.



..... Average returns (including guarantee payments)
—— Average market prices.

(1) Weighted average prices for Grade I and Grade II steers and heifers sold through auction markets in England and Wales.

At the time when the market prices for beef were depressed, poor prices were also obtained for other home-produced meat and the deficiency payments for mutton, lamb and pigmeat were substantial. This was not, however, resultant from increased imports as, between April and November, the quantity of imported meat was 16 per cent down from 1960⁽¹⁾. The collapse of the market was mainly due to an increase in the numbers of fatstock coming forward and 15 per cent more cattle were slaughtered between April and November 1961 than in the same months of the previous year⁽¹⁾.

It remains to be seen how the Government will regard last year's experience at the 1962 Price Review. The situation seems to call for a complete re-appraisal of both the method of price support and meat marketing as a whole. It may well be that the market for beef, too, is now saturated and consumption may never revert to the pre-war level. Over the past five years consumption of beef per head of population has tended to fall and this has been offset by an increase in that of poultry meat. The level of consumption of all meats is today slightly higher than before the last war due to the striking increase in the popularity of pork and of poultry⁽²⁾.

Against this background of uncertainty and price fluctuation this report attempts to examine some economic aspects of beef production on a group of individual farms and to indicate its profitability relative to other enterprises.

Compared to arable cropping, enterprises involving grazing livestock are usually found to yield poorer profits per acre, and of the latter, beef cattle are frequently the least profitable. However, such generalisations cover up a multitude of variations and the present report is confined to a study of one of the traditional systems of beef production, namely the fattening of cattle off summer grazing for slaughter at 20 - 30 months.

(1) Monthly Digest of Statistics.

(2) Board of Trade Journal, September 1st. 1961.

II. THE 1961 SURVEY

Thirteen East Midland farmers agreed to co-operate with this Department in a survey of grass-fattened cattle between March and October 1961. For the first time in an enterprise study of this kind, the results included some accurate information on the liveweights of animals. To overcome the difficulties of weight estimation, a portable weighing crush was used to record liveweights very shortly after the cattle were initially put on to the spring pasture and again before marketing. In some cases, too, intermediate weighing enabled us to see the progress that cattle were making. Together with the financial information it was therefore possible to determine the effects of liveweight gains per head and per acre and store prices per cwt on profits.

The farms were situated in the counties of Leicester, Rutland and Northampton and the Survey embraced 326 acres of grazing and 381 cattle. The intention was to examine the beef fattening enterprise by fields rather than by herds and either one or two fields were observed on each farm. Records of cultivations, fertiliser applications, feedingstuffs and the daily grazing livestock were kept for each field. The steps and conventions adopted throughout the study in valuing and costing the cattle are given in Appendix B of this report.

III. THE FARMS.

The thirteen farms comprised a group having a fairly uniform farming system. Their average pattern of land use and stock numbers can be seen from Table I.

The average farm extended to 355 acres and 63 per cent of the land was in grass, two-thirds of this being permanent pasture. The grazing stock consisted largely of mature beef cattle and flocks of breeding ewes and lambs. In fact only two farms carried a herd of dairy cattle. Practically all the arable land was devoted to cereals as cash crops and for the production of straw and some feed corn where livestock were wintered. This constituted the relatively simple farming system of corn, beef and sheep. On farms of this type, cattle must obviously make a substantial contribution to the profit - a position unlike that found on arable farms where this is not expected because cash crops are by far the major item and cattle are often kept chiefly to utilise arable by-products and produce farmyard manure.

LAND USE AND LIVESTOCK NUMBERS, APRIL 1961.

TABLE I

	Per Farm	Per 100 acres.
<u>Land</u>	acres	acres
Cereals	114	32
Roots	9	3
Other tillage	6	2
Temporary grass	70	20
Permanent grass	155	43
Rough grazing	1	-
TOTAL	355	100
<u>Beef Cattle (Breeding and fattening).</u>	No.	No.
Cows and bulls	3	1
Other cattle 2 years and over.	92	26
Other cattle under 2 years	22	6
<u>Dairy Cattle</u>		
Cows and bulls	5	1
Others	7	2
TOTAL CATTLE	129	36
<u>Sheep</u>		
Ewes and rams	117	33
Lambs	157	44
TOTAL SHEEP	274	77

The cattle covered by this survey were grazed mainly on permanent pasture which was variable in quality but consistently managed by set stocking. Nine farmers had their cattle on permanent grazing and four used a mixture of permanent grass and leys, but generally the latter were cut for hay, and in some cases for silage.

The range of rents paid (from £1 to £4. 5s. per acre) was greater than one would have attributed to the variation in the quality of land, though the farms certainly did differ in their reputations as grazing farms. Some of the farms were situated in the famous Welland Valley where production from permanent

pasture is traditionally about the highest in the country.

Of the 381 cattle observed, four-fifths were bought during March and April when store prices were at their peak; while one-fifth, some of which were home-bred, had been wintered on the farms. Of the cattle purchased in the spring, the large majority came from local markets and Hereford crosses were the most common type, bearing out the fact that this breed is popularly recognised to have the greatest ability to convert grass into beef under the type of management practised on these farms. Aberdeen Angus and Shorthorn crosses were fairly common also, with a small group of other breeds such as pure Friesians, Welsh Black and Devon crosses.

When there is much current interest not only in beef cattle recording but also in the development of new techniques of beef production (all designed to produce cattle for slaughter at an earlier age) the results below may provide a useful indication of what is being achieved by more traditional methods.

IV. COSTING FARM ENTERPRISES.

Through the media of television, farmers' meetings and the agricultural press and publications, much attention has recently been given to the development and use of "gross margin analysis". This is a method of costing farm enterprises, which shows how much each is contributing to the total farm profit. In addition to its use within a farm, gross margin analysis provides a good basis for comparing similar enterprises on different farms.

The crux of this method is the calculation of a "gross margin" by subtracting from the gross output of an enterprise all "out of pocket" expenses directly incurred, that is, all costs which alter with the size or system of the enterprise. These are called "variable costs". Using beef cattle as an example, this means that the variable costs of fertilisers, feedingstuffs, marketing expenses etc., are deducted from the "feeder's margin", which is the difference between the buying and selling prices of the cattle.

Fixed costs, such as rent, regular labour and overheads which are shared by different enterprises are ignored because these must be paid whatever the scale or efficiency of the enterprise concerned.

A series of gross margins can thus be prepared for each section of the farm. When these are totalled and the fixed costs subtracted, the net trading profit of the whole farm is obtained. At this final stage it is possible to decide whether the fixed costs are at too high a level in comparison with the gross margins, which take no account of regular labour,

machinery expenses etc., and hence do not tell the whole story.

The gross margin achieved per acre gives a satisfactory criterion of the relative profitability of a single enterprise though, with beef, gross margin per head is also a useful figure.

This approach can be carried a stage further by observing the gross margin obtained as a percentage of the amount of working capital required for the enterprise in question. Nowadays, when farmers are more and more conscious of the large sums of capital required in farming, this is a useful measure of the returns resulting from investment in farm businesses.

Below, an attempt is made to present the results of the thirteen farms on this basis, together with certain physical information obtained from weighing the cattle.

V. THE YEAR'S RESULTS.

The 1961 grazing season was considerably better than average and farmers were generally pleased with the progress of their livestock. Apart from a rather dry period of weather in early summer there was sufficient moisture during the season to promote abundant grass growth well into the autumn months.

Tables II, III and IV set out the average results achieved by the seven farms with the highest and the six farms with the lowest, gross margins per acre and for the complete sample. In Appendix A a more detailed analysis of these figures for each individual farm is contained in Tables IIa, IIIa and IVa, where the farms are arranged in order of decreasing gross margins per acre.

The figures refer to the numbers of cattle and the grass acreages quoted in tables IV and IVa. The allocation of grazing refers directly to the costed cattle as an allowance has been made for other livestock on the same fields (Appendix B, note 3a). In most cases animals were put on to and removed from, the fields in batches and the numbers refer to the total throughput during the season.

It is obvious that there are wide variations between farms and in order to explain these differences it is simplest to consider the results under the following headings :-

1. Feeder's margins.(1)
2. Gross margins.
3. Rates of stocking and throughput
4. Variable costs.
5. "Fixed costs"and profits.
6. Returns on working capital.

(1) i.e. Receipts from outgoing cattle less payments for ingoing cattle.

VARIABLE AND FIXED COSTS WITH GROSS MARGINS AND PROFITS (PER ACRE)⁽¹⁾

TABLE II

	Average for 7 farms with highest Gross Margins	Average for 6 farms with lowest Gross Margins	Average for all 13 farms
<u>FEEDER'S MARGIN</u>	£ 28.01	£ 14.70	£ 21.86
<u>VARIABLE COSTS :</u>			
Fertilisers	0.65	0.55	0.60
Tractor running costs	0.03	0.04	0.03
Feedingstuffs	0.73	0.07	0.42
Marketing costs	1.29	0.80	1.07
Miscellaneous	0.15	0.23	0.19
<u>TOTAL VARIABLE COSTS</u>	2.85	1.69	2.31
<u>GROSS MARGIN</u>	25.16	13.01	19.55
<u>"FIXED" COSTS :</u>			
Rent	3.46	2.52	3.03
Manual labour	1.25	0.75	1.02
Tractor Overheads	0.03	0.04	0.03
Machinery depreci- ation	0.07	0.07	0.07
Share of general farm expenses	0.42	0.25	0.34
<u>TOTAL "FIXED COSTS"</u>	5.23	3.63	4.49
<u>TOTAL COSTS</u>	8.08	5.32	6.80
<u>PROFIT</u>	19.93	9.38	15.06

(1) The financial information for these tables is given in decimals of a pound (£). A conversion table for expressing £. s. d. in decimals is included at the end of Appendix B, page 27.

SUMMARISED COSTS AND RETURNS FOR THREE GROUPS. (1)

TABLE III

	Average for 7 farms with highest gross margins per acre	Average for 6 farms with lowest gross margins per acre	Average for all thirteen farms.
	£	£	£
Feeder's margin per head	18.60	12.41	15.74
Feeder's margin per acre	28.01	14.70	21.86
Variable costs per head	1.70	1.68	1.69
Variable costs per acre (A)	2.85	1.69	2.31
Gross margin per head	16.90	10.73	14.05
Gross margin per acre (B)	25.16	13.01	19.55
Fixed costs per head	3.28	3.50	3.38
Fixed costs per acre	5.23	3.63	4.49
Profit per head	13.62	7.23	10.67
Profit per acre	19.93	9.38	15.06
Maximum investment in store cattle per acre (C)	83.5	68.1	76.4
Maximum working capital per acre (A + C)	86.3	69.8	78.7
Gross Margin per £100 working capital. (B as % of A + C)	29.1	18.6	24.8

(1) In the calculation of these figures equal weight has been given to each farm irrespective of acreage or the number of cattle grazed. The ratio of "per acre" figures to corresponding "per head" figures is therefore not identical for each item.

GRAZING AND DISPOSAL DATA FOR THREE GROUPS.

TABLE IV

	Average for seven farms with highest gross margins per acre	Average for six farms with lowest gross margins per acre	Average for all thirteen farms.
GRASS ACREAGE (allocated to costed cattle)	20.5	23	21.6
Number of cattle grazed	33	25	29
Acres grazed per head	0.69	0.98	0.83
Throughput ⁽¹⁾ (head per acre).	1.61	1.16	1.41
Stocking rate (head per acre)	1.04	0.83	0.94
Incoming weight per head ⁽²⁾ (A)	cwts lbs 8 83	cwts lbs 7 75	cwts lbs 8 29
Final grazing weight per head (B)	10 98	9 96	10 46
Outgoing weight per head ⁽³⁾	10 42	9 40	9 102
Liveweight gain per head (B - A)	2 15	2 21	2 17
Liveweight gain per acre	3 34	2 64	2 108
	£	£	£
Incoming price per cwt.	7.25	8.03	7.61
Outgoing price per cwt	7.88	8.00	7.93
Method of disposal (percentage) :			
Live auction	42	46	44
Deadweight basis	22	21	22
Unsold	36	33	34

(1) This ratio is obtained by averaging the individual throughput figures for each farm within the group. Because this is an unweighted average it, therefore, cannot be used to convert "per head" figures for the group to "per acre", nor vice versa.

(2) weight at farm

(3) weight at market

1. Feeder's Margins. The feeder's margin per bullock represents the appreciation in value of the store animal during the time it is kept on the farm and this is the most vital single factor of profitable beef production. It is determined by the store and fat prices per cwt. and by the increase in liveweight during the grazing period. Tables III and IIIa indicate the values obtained for feeder's margin per head and per acre. It is obvious that the more successful farms were able to achieve much better feeder's margins than those with lower profits.

The reason why the cattle in the more profitable group appreciated in value by a greater amount is obvious from Table IV which shows that these farmers obtained their store cattle more cheaply than those with lower margins. The store prices per cwt. differed by 15s. 6d. which represented a saving of nearly £7 per head in favour of the first group. The actual price paid per head was very similar but the more profitable cattle were over 1 cwt. heavier.

Such differences in store prices per cwt. could possibly be explained by quality premiums and the second group might expect better prices for their fat cattle. They did, in fact, achieve a slightly higher selling price (£8 per cwt. against £7. 17s. 6d. for the most profitable farms) but it was far too small a difference to offset their dear store prices. Furthermore, the two groups achieved similar liveweight gains per head (i.e. about 2 cwts. 20 lbs.) so there was no reflection of quality in performance. The 1 cwt. difference in store cattle weights remained throughout the season and the first group consequently sold heavier cattle at prices only slightly reduced from those on the less profitable farms.

For the group of thirteen farms as a whole, their store prices were somewhat below the average price paid by other farmers in the country during 1961. Their cattle cost, on average, £63 when market prices for two-year-old first quality steers were around £71 and those for 18-month-old first quality steers were about £57. A fairly large proportion of the cattle in this survey would have been classified as first quality and the majority were steers. But, (as can be seen from the graph on page 2 and the price for fat cattle in Table IV) their returns for fat cattle were comparable. It is probable, therefore, that the average feeder's margin on these farms was rather higher than that for the average grazier last year. Furthermore, the average feeder's margin per acre was better than other reports for different farms in different years have indicated. This was mainly due to the increased returns for fatstock resulting from the rise in the guaranteed price for 1961.

The small difference in fat prices per cwt. between the two contrasted groups suggests that the method of sale was unimportant and this is further borne out by comparing the proportions of cattle disposed of through the two outlets. Forty-four per cent were auctioned alive at local markets and twenty-two per cent were sold on a deadweight and carcass grading basis to the Fatstock

Marketing Corporation or (in the case of one farm) direct to large scale butchers. The remaining thirty-four per cent were not finished by early October or had been withdrawn from costed fields earlier in the season in store condition. The latter groups of cattle were valued as outlined in Appendix B (note 4c) to give the most realistic estimate of their worth bearing in mind weights and current prices. Cattle were sold in similar proportions by the two methods for the two groups of farms and although the sample is too small to infer strong conclusions, the figures suggest that the method of sale exerts no appreciable effect on profit. The actual average prices per live cwt. for all cattle were £8. 0s. 7d. for animals sold alive and £8. 1s. 2d. when sold on deadweights.

The influence of feeder's margin per head on final results is evident from Table III where the gross margin per head differs by £6. 4s. between the two contrasted groups of farms and this is the same as the difference in the feeder's margins per head. Variable costs per head are, therefore, similar. On a "per acre" basis the difference in feeder's margin is greater than that in gross margin as the more profitable farms incurred higher variable costs per acre.

One, therefore, comes back to the conclusion that store price per cwt. is the figure mainly determining the feeder's margin and so influencing profits strongly, and the ability of a farmer to buy store cattle cheaply which will fatten well, has for long been the secret of success in this enterprise. There is a strong case for store stock to be sold over a weighbridge to avoid buyers being tempted to pay excessive prices. It was found that farmers' estimates of liveweight were not always as accurate as was supposed and a more reliable measure than the human eye would be very advantageous. In this respect it is worth noting that the variation in store prices per cwt. was considerably greater than in prices for fatstock (i.e. £1. 10s. 9d. and £1. 3s. 0d. respectively - Table IVA) where the cattle were, in fact, weighed. When exceptionally high prices occur in the spring it may be worth remembering that the fattening of cattle is not the only method of using grassland and such alternatives as younger cattle, sheep, hay or letting (where possible) are worthy of consideration if expensive stores will mean low profits. In the longer term, of course, dairy cattle or increased arable cropping can be considered where profits from beef are consistently low. However, in 1961 these farmers on average were able to purchase their store cattle at an economic price.

2. Gross Margins. Table II shows the average feeder's margin per acre achieved by the three groups of farms and, from this all variable costs are subtracted to give the gross margin per acre. In table III, these figures are summarised and are quoted on a "per head" basis in addition.

The average gross margin of £19. 11s. per acre from these farms compared well with results obtained in recent years on different farms. This was

partly due to the favourable prices as mentioned above and partly because of the good grazing season. The seven more profitable farms succeeded in achieving nearly twice the "gross margin" per acre obtained from the six farms with lower margins and the actual difference between the highest and lowest margin was £30. (Table IIIA) This very large spread of results is a reflection of the variation in feeder's margin per acre. This large variation in results from different farms is a typical feature of beef production which stems from the fact that high profits not only stem from an ability to farm, but more from an ability to deal in cattle.

Table IIA places farms in order of decreasing gross margin per acre and the sequence is much the same for feeder's margin per acre. There is, then, very strong correlation between these two values, mainly due to the fact that once store cattle have been purchased the remaining costs are relatively minor items. This is, of course, just as true for the gross margins obtained per head though these figures do not vary so greatly from farm to farm because they take no account of the turnover of cattle or the intensity of grazing. Gross margins per acre are therefore dependent on the increase in value of store cattle and the number of cattle fattened per acre. The level of costs exerts a comparatively small influence.

In normal years grass fattened cattle can be expected to yield a gross margin of £12 - £15 per acre under traditional management and it is worth while comparing this with alternative systems of beef production and land use.

Beef breeding herds are often more profitable than beef fattening enterprises based on purchased stores, especially where the progeny are fattened at an early age, and good results are not so dependent on the vagaries of the store market. A more intensive system is that of artificially rearing autumn-born calves for fattening at 18 months of age in early spring. This involves housing for two winters and grazing for one summer with heavy feeding to ensure sufficient liveweight gain. Gross margins are between £20 and £25 per acre⁽¹⁾ though risks are greater and considerable capital is required for this on a large scale. It must, however, appeal to farmers with a limited acreage at their disposal.

Recent developments and trends in beef production have been towards earlier finished cattle providing farmers with a more rapid turnover and butchers with the lean, tender meat which the modern housewife appreciates. The ultimate system to be evolved has been that of cereal-fed cattle on non-roughage or low-roughage diets fattened at 12 - 15 months weighing $7\frac{1}{2}$ - 9 cwt.

(1) "Beef on the Arable Farm". Cambridge Farm Economics Branch 1961.

This is the most intensive method of producing beef; grassland is no longer required and the management resembles that of fattening pigs. More research is needed to ascertain the profit levels widely attainable, as some farmers have experienced disappointing food conversions from their cattle and digestive upsets are additional hazards.

Gross margins from sheep enterprises with flocks of breeding ewes are normally in the region of £12 - £18 per acre, but under intensive management with creep grazing £20 - £25 is quite feasible. Commercial sheep flocks always have the advantage of having low capital requirements when contrasted with beef cattle.

The dairy cow has hitherto generally been the most profitable grazing animal with gross margins of £25 - £30 per acre, but with these new developments in fatstock production and with the milk price tending to fall, the difference will probably narrow in future.

Arable cropping on farms of this type is commonly more profitable than grassland farming with gross margins from wheat of £26 - £30 per acre and £20 - £24 per acre for oats and barley. Root crops which in the more arable districts give high gross margins of between £35 and £40 per acre are usually not feasible on these grazing farms where the land is heavy,

On the typical East Midland farm where cattle are fattened during the summer, however, the degree of arable cropping has hitherto been restricted by tradition, soil type and labour requirements. Furthermore, in many cases the steading is small and cattle housing is limited, which implies that the only alternatives to summer fattening are sheep (where fences are adequate) or grazing different classes of cattle ⁽¹⁾. It is apparent, however, from last year's results that by wise buying and with good grassland management grass fattened cattle can and should achieve sufficiently high gross margins to make a worthwhile contribution to the total farm profit.

3. Rates of Stocking and Turnover. After feeder's margin per head the next most important factors in achieving good results are the rate of stocking and throughput of cattle during the grazing season. In tables IV and IVA are quoted the numbers of cattle ^(B) and, the acreage grazed ^(A) for each farm and the acreage for the three groups of farms. From this the acreage required per beast has been calculated ^(A/B) and also the throughput of cattle per acre ^(B/A). The throughput is a measure partly of the density of stocking ^(C) and partly of the turnover of cattle during the season (i.e. the rate at which different batches of cattle were changed on the same field).

(1) A breeding herd of beef cows, or weaned calves; or, where possible to reduce the cost of stores, fattening out-wintered, autumn-purchased cattle.

Not only did the seven more profitable farms achieve better gross margins per head (Table III) but, due to higher rates of throughput the gross margins per acre differed even more between the two contrasted groups of farms. An average of 1.61 beasts were "fattened" per acre in the first group - an improvement of 39 per cent. This was achieved by (i) a 25 per cent increased average stocking rate by the first group together with (ii) a higher rate of turnover resulting from grazing more than one batch of cattle during the summer. Some farmers (particularly in the first group) were able to fatten and sell some cattle in mid-summer when the guaranteed price was fairly high and further stores were bought in as replacements to graze for the remaining season. This "doubling-up" practice can be very profitable on productive grassland with good management.

These results clearly indicate that intensive management is a very important factor in the success of this enterprise. On a restricted area of grass (assuming a sufficient capital supply to purchase cattle) the closer cattle are grazed the better, providing that liveweight gain is not jeopardised. The difficulty then arises of what safety margin to allow for a dry summer and only practical experience of the farm concerned will suggest the correct answer. In these thirteen cases during 1961, greater throughputs per acre have led to greater outputs of beef per acre as measured by the liveweight gains per acre (Table IV). It is particularly relevant to observe, however, that the greater intensity of grazing practised by the most profitable farms has not reduced the performance of individual animals. The average liveweight increases per head are similar for the two groups. This is in agreement with recent conceptions that there is a limit to the potential growth a fattening beast can achieve whatever grazing or feed is available. The aim should be, therefore, to graze cattle as intensively as possible allowing each animal just sufficient grass to attain its maximum potential for liveweight gain. In the beef fattening enterprise it is commonly found that significant responses to such practices as supplementary feeding of hay, silage or concentrates or the manuring of grassland only result where the rate of stocking is increased.

Compared to observations on liveweight gain per acre made by this Department in 1958 and 1959⁽¹⁾ the 1961 average figure of nearly 3 cwts. for the farms now under review, is very similar. Hence, although last year was widely thought to have been a splendid grazing season, the output of beef per acre was no greater than the average of 1958 and 1959. However, such comparisons are open to criticism where results from different farms in different years at different stocking rates are compared, and it is only safe to say that the liveweight gain per acre made on these thirteen farms was satisfactory.

(1) "Economics of Fertiliser Application to Permanent Pastures with Special Reference to Beef Production" - K. Hocknell, May, 1961, (unpublished thesis).

4. Variable Costs. The level and breakdown of costs per acre are shown in Tables II and IIA. Variable costs were those of fertilisers, feeding-stuffs, marketing and haulage charges and miscellaneous expenses such as petrol used in shepherding and contract services. Half the total tractor costs were included to cover the actual running costs⁽¹⁾ of spring cultivations.

On five farms the grassland was dressed with compound fertilisers containing nitrogen and one farmer applied basic slag as a routine measure. Manuring did not appear to affect profits or liveweight gains but no conclusions could be drawn from a survey of this size.

The most obvious differences in variable costs between the two groups of farms in Table II were in (i) the cost of feedingstuffs and (ii) marketing expenses. Only four farmers fed concentrates in small quantities and two supplemented early spring grazing with hay. The numbers concerned were therefore too small to correlate supplementary feeding with profits and the large difference in feed costs between the two groups did not indicate any usual trend.

Marketing costs, which comprise transport, auctioneers' fees and insurance, varied with the distance from farm to market and with the method of sale. The F.M.C. charged a standard rate of £1. 5s. per beast but no theoretical charge was set against unsold cattle. The higher marketing costs per acre in the more profitable group of farms were largely associated with the greater turnover of animals. Total variable costs per head were, in fact, very similar for the two groups and the average "per acre" level of variable costs of £2. 6s. was normal for this enterprise.

5. "Fixed Costs" and Profit. It was considered that the expenses of rent, manual labour, machinery and tractor depreciation would be unaffected by relatively small changes in the size of the enterprise and they were, therefore, defined as fixed costs for the purpose of the gross margin analysis in paragraph 2. The level of fixed costs for farms of this type is generally between £12 and £15 per acre. Therefore the average gross margin per acre from all the farm enterprises must be substantially above this level in order to leave a reasonable trading profit for the whole farm. From Table II it is clear that when fixed costs at this level for the farm as a whole are subtracted from the average gross margin per acre of £13 for the least profitable group, little or nothing would remain as a contribution to farm profit. But over £10 profit per acre would be left in the case of the more profitable farms where the gross margin was £25 per acre. This represents a useful level of farm profit for farms of this size and type.

(1) i.e. fuel and repair charges.

In this study, however, an attempt was made to allocate the proportion of these fixed costs taken by the beef fattening enterprise alone. The expenses of rent, labour, tractor and machinery overheads and a share of general farm expenses which could be specifically charged to the cattle were estimated as in Tables II and IIA and subtracted from the gross margin. The remaining net profit corresponds to the profit figure calculated in previous reports from this Department. It should be emphasised, however, that this treatment of "fixed costs" is not synonymous with that usually found in a gross margin analysis, where such costs are spread equally over the whole farm.

An average profit of £15. 1s. per acre and £10. 13s. per head was achieved on these farms, though again wide variation occurred between farms. It can be seen from Table IIA that (except for Farms 8 and 16) the order of profitability is unchanged from that indicated by gross margins. The loss incurred by Farm 7 was partly due to the death of one animal and this indicates the large effect this can have on profits.

The variation between farms in total fixed costs was due to differences in actual rents and labour use. Higher profits tended to occur on farms with higher rentals, the first group of farms in Table II paid £1 more rent per acre than the second group. This would always tend to be so, but due to the small number of farms studied and the wide spread of rents one could not infer that profits from beef production are better on expensive land. The average rent of £3 per acre is a realistic estimate of the general level for the types of farms studied in this survey.

The labour requirement of the grass fattening enterprise is always very low and on these farms in 1961 only about £1 worth of labour was spent on each acre for the complete grazing season. This represents about three-man-hours per bullock during the grazing period spent in shepherding and in some minor spring cultivations, with a small amount of work devoted to hedging and ditching. This figure is probably below the average for grazed cattle. The standard labour allowance for twelve months is sixteen man-hours per bullock over two years old.⁽¹⁾ The extra labour employed by the more profitable farms (Table II) was mainly associated with longer distances from farmhouse to field.

It is obvious, therefore, that the total costs (both "fixed" and variable) of grazing a herd of beef cattle are of much less importance than in most other farm enterprises. In beef production a given percentage reduction of these costs does not lead to as great an improvement in profits as often accrues from this treatment for other enterprises (e.g. reducing the expenses of feeding or labour for dairy cows).

(1) "The Farm as a Business" - H.M.S.O.

6. Returns for Working Capital. Capital requirements for beef production are normally broken down into fixed and working capital. The former is the capital required to purchase and maintain equipment used in the beef enterprise, such as harrows, water troughs, fences etc., and working capital corresponds to all variable costs, including those of store cattle.

When comparing the returns which different farmers have received for their investments in the enterprise it is most convenient to consider only the working capital because this overcomes the difficulty of estimating which equipment charges are specific to beef production and which are shared by other sections of the farm. It is also reasonably safe to assume that there is little variation in the level of fixed capital requirements for similar enterprises on different farms. In any case they are of a relatively minor importance when considered with working capital requirements for summer fattening of spring purchased store cattle.

Hence, in this survey, working capital was the outlay made by the farmer in purchasing store cattle and in meeting all the variable costs. The return which he received was the Gross Margin. Though this does not give the ultimate measure of returns obtained for total capital investment in the farm it shows what a farmer receives for his cash outlay in the enterprise from which he must pay for all fixed and overhead expenses. The approach is similar to that in Gross Margin Analysis and, as such, provides a good basis for comparison.

Investment in store cattle varies during the season as different batches are bought and sold. A "capital profile" could be drawn for each farm showing the amount of cash tied up for each month of the grazing season. Some farmers bought all their stores at the same time in early spring and their investment was then at a maximum. As animals were fattened during the summer fatstock receipts offset the original expenditure so net investment fell. Other farmers bought cattle in various groups during spring and summer and their investments therefore became greater if new purchases exceeded fatstock returns. At some point, however, total investment in store animals was at a maximum and this was used as a basis for calculating the farmers' percentage return (Table III and IIIA (C)). When variable costs (A) are added to this figure the total working capital is arrived at, which represents the amount of money which has to be available in each case and is shown on a "per acre" basis (A + C). The differences in outlay per acre between farms and between the two groups in Table III reflect the actual cost of stores, the heaviness of stocking at the start of the season, the rapidity with which cattle were finished and the degree of re-investment in new batches of store animals.

Table IIIA indicates the great variation between farms in the returns received per £100 working capital, from £6 to £41. A twenty-five per cent return for working capital was the average figure, indicating that as a group, these farms were very successful during 1961 especially as this was achieved in an average period of only 150 days.

Table III shows that the seven most profitable farms on average invested 24 per cent more working capital per acre than the remaining six, but their returns for this increased outlay were 57 per cent greater. Although "per acre" figures are given the actual returns obtained apply to the enterprise as a whole, irrespective of acreage. These results again indicate that, broadly, intensive grazing increased profits during 1961. Some farmers obtained only moderate gross margins per acre but because of their comparatively low capital demands their returns were consequently high (e.g. farms 24, 16 and 19). On the other hand, farms 1 and 8 achieved good gross margins per acre, but due to excessive capital cost their returns on capital were below average.

One therefore confronts the question, which is the best measure of success in beef production - return on capital or gross margin per acre? Where capital is the limiting factor on a farm with plenty of land the former is obviously the vital criterion. Where acres are limited and a farmer has access to more capital⁽¹⁾ (more often the case) it could be considered that high gross margins per acre should be the one aim, irrespective of capital requirements. But to the extent that extra capital could be used to purchase or rent extra land it would seem that capital is the scarcest resource and the returns obtained from it should be the ultimate measure of profitability. In practice, this may require some qualification because of such factors as the availability of more land and the length of time over which a loan can be taken. In addition, extra land may upset the farm economy as a whole if the existing labour force could not cope or if this land would be too distant from the main farm. Many farmers, too, concentrate on obtaining the maximum profit from each acre of their existing farms and would not be interested in additional land or moving to a larger farm. Nevertheless, there is no doubt that more farmers should and, indeed, are devoting more attention to the returns they obtain from investment in their own farms. This is especially relevant for the farmer who has surplus capital resources and wishes to ascertain whether investment in his own business will be more rewarding than alternative uses, such as investment in bonds, stocks etc. Farms with high gross margins per acre cannot truly be called "profitable" if these are obtained with excessive costs resulting in poor returns for capital. Gross margin analysis is therefore extremely useful but should where possible, be followed by a measurement of returns for capital, the two together being employed as yardsticks for comparisons and farm planning.

(1) Even if this means borrowing at seven or eight per cent for five months, his returns, at 25 per cent are still very attractive.

VI. SUMMARY

1. The small size of the sample of farms in the 1961 survey limits the width of application of results. Many more farms are required before strong conclusions can be drawn for the East Midlands. Nevertheless, the cost and return relationships indicated by these results are thought to be relevant to many graziers in this Province.
2. The liveweight recordings, though involving considerable time and cost, were important for a full explanation of the financial results. The advantage of the weighing equipment was principally in recording the liveweights of store cattle at the start of the season and of unsold animals in October. Some relatively accurate method of weight estimation is very desirable to ascertain (i) the store price per cwt., (ii) the liveweight gains per head and per acre and (iii) a realistic value for unsold cattle. These three items are essential for a calculation and full explanation of the profitability of the beef fattening enterprise. In future studies of this kind the decision to use a portable weighing crush should depend on the availability of this or alternative facilities (e.g. public weighbridges or farm weighing equipment) and on the accuracy with which a farmer can estimate liveweights by eye.
3. The beef enterprise was a major part of the economy on these East Midland farms and it therefore had to be organised to contribute a large proportion of total farm profit.
4. In 1961 favourable weather conditions during the grazing season produced even and abundant grass growth and farmers considered that the progress of their cattle was unusually good. However, using the limited comparison of the physical results obtained on different farms in 1958 and 1959, last year's figures for these farms indicate that the liveweight gains per acre were no better than average.
5. Gross margins per acre and the returns obtained from the investment of working capital are the best measures of financial success of grass fattened cattle. These farms averaged a gross margin of £19. 11s. per acre and received a 25 per cent return on their working capital, but there were large variations between farms.

These average results are better than those achieved by different groups of farms in similar surveys for different years. The success of these 13 farms during 1961 can be attributed to skill in purchasing store cattle and good returns for fat cattle resulting from the increased guaranteed fatstock price, coupled with the grazing conditions mentioned above.

6. Gross margins per acre were most noticeably affected by the appreciation in value of bought in store cattle (i.e. feeder's margin per head) and by the rate of stocking and turnover.

Costs exerted less effect than cattle prices on final results.

7. The feeder's margin per head was governed mainly by store price per cwt. and a farmer who was able to buy store cattle well was more than half-way to a profitable enterprise. The average feeder's margin per head of £15. 15s. achieved in this survey is a useful figure for graziers to aim at. This was not noticeably affected by the choice of outlets for fat cattle nor by quality differences.

8. The results point to the benefits obtained from heavy stocking and throughput of cattle and there seems a strong case for many farmers to carry more animals per acre particularly as liveweight gains per beast were not lower on the more intensive farms.

APPENDIX A.(Pages 22 - 25)

Individual results and data for each farm corresponding to Tables II, III and IV. Farms arranged in order of decreasing gross margins per acre.

VARIABLE AND FIXED COSTS WITH GROSS MARGINS AND PROFITS. (PER ACRE)

TABLE IIA

Farm Code No.	18	15	1	8	24	10	16	14	40	19	3	31	7
<u>FEEDER'S MARGIN</u>	38.20	28.20	30.08	28.68	23.42	23.45	24.06	21.74	18.30	18.05	16.41	9.47	4.22
<u>VARIABLE COSTS :</u>													
Fertiliser	1.52	-	1.43	-	-	-	1.56	1.36	-	0.79	-	1.14	-
Tractor running costs	0.07	0.03	0.05	0.03	-	0.06	-	0.04	0.02	0.02	0.06	0.03	0.04
Feedingstuffs	1.24	-	-	2.62	0.77	-	0.47	-	-	0.20	-	0.23	-
Marketing expenses	0.32	-	2.37	3.06	0.65	1.22	1.39	-	1.31	0.74	1.21	0.93	0.65
Miscellaneous	0.43	-	-	-	0.23	0.41	-	0.45	-	0.29	-	-	0.64
<u>TOTAL VARIABLE COSTS.</u>	3.58	0.03	3.85	5.71	1.65	1.69	3.42	1.85	1.33	2.04	1.27	2.33	1.33
<u>GROSS MARGIN</u>	34.62	28.17	26.23	22.97	21.77	21.76	20.64	19.89	16.97	16.01	15.14	7.14	2.89
<u>"FIXED COSTS" :</u>													
Rent	4.25	3.00	4.00	3.88	1.60	3.50	4.00	2.75	2.50	3.00	2.50	0.90	3.50
Manual labour	1.64	0.45	1.22	2.79	0.58	0.76	1.31	0.93	0.56	0.60	1.02	0.59	0.77
Tractor over-heads	0.07	0.03	0.05	0.03	-	0.06	-	0.04	0.02	0.03	0.06	0.03	0.04
Machinery depreciation	0.14	0.05	0.10	0.07	-	0.12	-	0.08	0.04	0.05	0.11	0.07	0.08
Share of general farm expenses	0.55	0.15	0.41	0.93	0.19	0.26	0.44	0.31	0.19	0.19	0.34	0.20	0.25
<u>TOTAL "FIXED COSTS"</u>	6.65	3.68	5.78	7.70	2.37	4.70	5.75	4.11	3.31	3.87	4.03	1.79	4.64
<u>TOTAL COSTS</u>	10.23	3.71	9.63	13.41	4.02	6.39	9.17	5.96	4.64	5.91	5.30	4.12	5.97
<u>PROFIT</u>	27.97	24.49	20.45	15.27	19.40	17.06	14.89	15.78	13.66	12.14	11.11	5.35	(-)1.75

SUMMARISED COSTS AND RETURNS.

TABLE IIIA

Farm Code No.	18	15	1	8	24	10	16	14	40	19	3	31	7
Feeder's margin per head	13.61	23.07	19.05	13.54	25.93	19.54	15.40	13.20	10.87	14.06	16.41	13.64	6.25
Feeder's margin per acre	38.20	28.20	30.08	28.68	23.42	23.45	24.06	21.74	18.30	18.05	16.41	9.47	4.22
Total Variable costs per head	1.28	0.02	2.44	2.70	1.82	1.41	2.19	1.12	0.79	1.59	1.27	3.36	1.97
Total variable costs per acre (A)	3.58	0.03	3.85	5.71	1.65	1.69	3.42	1.85	1.33	2.04	1.27	2.33	1.33
Gross margin per head	12.33	23.05	16.61	10.84	24.11	18.13	13.21	12.08	10.08	12.47	15.14	10.28	4.28
Gross margin per Acre (B)	34.62	28.17	26.23	22.97	21.77	21.76	20.64	19.89	16.97	16.01	15.14	7.14	2.89
Total fixed costs per head	2.37	3.01	3.66	3.64	2.63	3.92	3.68	2.50	1.97	3.01	4.03	2.58	6.88
Total fixed costs per acre	6.65	3.68	5.78	7.70	2.37	4.70	5.75	4.11	3.31	3.87	4.03	1.79	4.64
Profit per head	9.96	20.04	12.95	7.20	21.48	14.21	9.53	9.58	8.11	9.46	11.11	7.70	(-)2.60
Profit per acre	27.97	24.49	20.45	15.27	19.40	17.06	14.89	15.78	13.66	12.14	11.11	5.35	(-)1.75
Maximum investment in store cattle per acre (C)	110.1	68.1	107.4	90.7	52.5	82.5	73.2	107.6	90.9	52.1	65.4	48.8	43.9
Maximum working capital per acre (A + C)	113.7	68.1	111.2	96.4	54.1	84.2	76.6	109.4	92.2	54.1	66.7	51.1	45.2
Gross Margin per £100 working capital (B as percentage of A + C).	30.5	41.3	23.6	23.8	40.2	25.8	26.9	18.2	18.4	29.6	22.7	14.0	6.4

GRAZING AND DISPOSAL DATA

TABLE IVA

Farm Code No.	18	15	1	8	24	10	16
Grass acreage (allocated to costed cattle) (A)	26	9	19	12 $\frac{3}{4}$	31	30	16
Number of cattle grazed (B)	73	11	30	27	28	36	25
Acreage grazed per head (A/B)	0.36	0.82	0.63	0.47	1.11	0.83	0.64
Throughput (B/A) (head per acre)	2.81	1.22	1.58	2.11	0.90	1.20	1.56
Average stocking rate (C) (head per acre)	1.43	1.22	1.15	0.93	0.83	0.65	1.05
Incoming weight ⁽¹⁾ per head (D)	cwt lbs 8 17	cwt lbs 8 28	cwt lbs 9 4	cwt lbs 8 110	cwt lbs 8 72	cwt lbs 9 100	cwt lbs 8 27
Final grazing weight per head (E)	10 6	10 45	10 104	10 56	11 101	11 69	10 84
"Fat" weight per head ⁽²⁾	9 62	9 101	10 48	10 0	11 45	11 13	10 28
Liveweight gain per head (E - D)	1 101	2 17	1 100	1 58	3 29	1 81	2 57
Liveweight gain per acre	5 38	2 69	3 0	3 30	2 106	2 7	3 102
Incoming price per cwt.	£ 7.68	£ 6.78	£ 7.52	£ 7.11	£ 6.76	£ 6.95	£ 7.93
Outgoing price per cwt.	7.98	7.94	8.32	7.71	7.38	7.93	7.87
Method of disposal :	%	%	%	%	%	%	%
Live auction	-	-	87	100	-	75	32
Deadweight basis	56	-	-	-	57	-	40
Unsold	44	100	13	-	43	25	28

(1) Weight at farm

(2) Weight at market

TABLE IVA (continued)

Farm Code No.	14	40	19	3	31	7
Grass acreage (allocated to costed cattle) (A)	4 $\frac{1}{4}$	23 $\frac{3}{4}$	40 $\frac{1}{2}$	14	36	19 $\frac{1}{4}$
Number of grazed cattle	7	40	52	14	25	13
Acreage grazed per head (A/B)	0.61	0.60	0.78	1.00	1.45	1.47
Throughput (B/A) (head per acre)	1.64	1.68	1.28	1.00	0.69	0.68
Average stocking rate (C) (head per acre)	1.65	1.04	0.92	0.57	0.46	0.35
Incoming weight ⁽¹⁾ per head (D)	cwt lbs 8 22	cwt lbs 6 55	cwt lbs 6 31	cwt lbs 8 51	cwt lbs 8 27	cwt lbs 8 56
Final grazing weight per head (E)	10 45	8 111	8 82	10 9	10 92	10 13 ⁽³⁾
"Fat" weight per head ⁽²⁾	9 101	8 55	8 26	9 65	10 36	9 69 ⁽³⁾
Liveweight gain per head (E - D)	2 23	2 56	2 51	1 70	2 65	1 69
Liveweight gain per acre	3 69	4 22	3 16	1 69	1 87	1 11
Incoming price per cwt.	£ 7.97	£ 8.30	£ 7.97	£ 7.71	£ 8.57	£ 7.65
Outgoing price per cwt.	7.94	7.65	7.78	8.53	8.12	8.00
Method of disposal :	%	%	%	%	%	%
Live auction	-	75	-	92	28	82
Deadweight basis	-	-	46	-	72	9
	100	25	54	8	-	9

(1) Weight at farm

(2) Weight at market

(3) Disregarding one casualty

APPENDIX B.

STANDARD CHARGES AND PROCEDURES ADOPTED.

1. Variable Costs.

- (a) Fertilisers - total cost of manuring charged with no residual values.
- (b) Feedingstuffs - purchased, at cost on farm.
homegrown, at market value where saleable,
otherwise at estimated cost of production.
No residual values.
- (c) Tractor running costs (fuel and repairs) at 2s. Od. per hour.
- (d) Marketing costs - haulage, insurance and market dues.
- (e) Miscellaneous - petrol (at 5s. Od. per hour running) and horse labour (at 2s. Od. per hour) used while shepherding with car, Landrover or horse, plus cost of contract services.

2. "Fixed" Costs.

- (a) Rent - tenant farmers - at cost
owner occupiers - at a normal rent for district.
- (b) Manual labour - at 4s. 8d. per hour for worker or farmer.
- (c) Overheads :
 - Tractor depreciation - at 2s. Od. per hour.
 - Machinery depreciation - at 4s. Od. per tractor hour

Share of general farm expenses at 6s. 8d. per £1 manual labour (to cover establishment labour, net car expenses, unallocated fuel and tractor costs etc.).

3. Grassland.

- (a) Grass acreage - allocated to the costed cattle in proportion to the total grazing days utilised by them. This calculation involved the following scale of livestock units :

cattle	-	Over 2 years	= 1 livestock unit
		1 - 2 years	= $\frac{2}{3}$ livestock unit
		Under 1 year	= $\frac{1}{3}$ livestock unit
sheep	-	ewes with lambs	= $\frac{1}{4}$ livestock unit
		other sheep	= 1/16 livestock unit

(b) Maintenance operations - full cost of any hedging and ditching operations undertaken during 1961.

4. Cattle

- (a) Stores
 - purchased, at cost on farm home-wintered, at estimated value based on recorded liveweights and current prices and bearing in mind their quality.
 - (b) Fat cattle
 - All receipts and prices inclusive of deficiency payments and before deduction of marketing expenses.
 - (c) Unsold cattle
 - valued by subtracting 56 lbs. from their recorded final weights (assumed loss in transit between farm and market) and multiplying this assumed "market weight" by the current live fatstock price for Grade II animals at Leicester, plus the appropriate deficiency payment.
 - (d) Estimates of liveweight
 - for cattle sold on deadweight basis, liveweights calculated assuming a billing out percentage of 55,
 - the final grazing weight of cattle sold through auction market or on deadweight basis assumed to be 56 lbs. more than their liveweights at market.
5. Averages.
- Calculations of average figures give equal weight to each farm irrespective of acreage or number of cattle fattened.

TABLE FOR CONVERTING SHILLINGS AND PENCE INTO DECIMALS OF A POUND STERLING. (NEAREST TWO FIGURES).

s.	d.	£.	s.	d.	£.	s.	d.	£.
0.	1.	- .00	1.	0.	≠ .05	11.	0.	- .55
0.	2.	- .01	2.	0.	- .10	12.	0.	- .60
0.	3.	- .01	3.	0.	- .15	13.	0.	- .65
0.	4.	- .02	4.	0.	- .20	14.	0.	- .70
0.	5.	- .02	5.	0.	- .25	15.	0.	- .75
0.	6.	- .03	6.	0.	- .30	16.	0.	- .80
0.	7.	- .03	7.	0.	- .35	17.	0.	- .85
0.	8.	- .03	8.	0.	- .40	18.	0.	- .90
0.	9.	- .04	9.	0.	- .45	19.	0.	- .95
0.	10.	- .04	10.	0.	- .50			
0.	11.	- .05						

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