Cattle - Feeding

THE WEST OF SCOTLAND AGRICULTURAL COLLEGE

Economics department

THE WINTER FATTENING OF BEEF CATTLE

An Interim Report for Winter 1970-71

by

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and

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FOREWORD

Beef production has not been traditionally associated with the west of Scotland but over the last few years for a variety of reasons there has been a rapid increase in the number of beef cattle. Beef as an adjunct to dairying or as a replacement for it, is now a well established part of the farming scene in the west.

Some time ago the West of Scotland Agricultural College realised the shape of things to come and steps were taken to initiate a series of beef cattle production studies - not theoretical concepts but an investigation and recording of the level of performance which was being achieved in commercial practice.

This interim report on the winter fattening of some 1200 cattle during the winter of 1970-71 is the first publication of this beef project work - work which it is hoped will provide guide lines, standards and even targets at which producers should aim in their beef enterprises.

The field work for this investigation was carried out by the Advisory and Development Service. Analysis of the data was the joint responsibility of the Economics Division and the Animal Husbandry Department. The report thus reflects the continuing integration of the work of the various disciplines of the College.

A. E. PARKINSON

Director of the Advisory
and Development Service

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ACKNOWLEDGEMENT

Grateful acknowledgement is made of the co-operation received from farmers and farm managers who not only kept feed records and notes of purchases and sales of cattle but also made their cattle available for weighing. Thanks are also due to colleagues who helped with the cattle weighings and shared in the work of this investigation.

SUMMARY

Winter Fattening 1970-71

1. This report gives some average results from 33 batches totalling 1216 cattle on 20 farms. About 75% of the cattle were sold fat. The remainder (apart from a few sold store) were turned out to be finished on grass. The average gross margin was £10 per head and the average liveweight gain was 1½ lb. per head per day.

2. Average results per head for different groups are summarised below:-

Type	Cereal Fed	Suckled Calves	Lighter Stores	Heavier Stores	Total
No. of batches	5	10	10	8	33
No. of cattle	84	317	400	415	1216
% sold fat	86%	60%	63%	92%	74%
	£ per head				
Sale Price* (incl. subsidy)	92	87	90	116	95
Less Purchase Price+	60	54	56	81	62
Cattle Output	32	33	34	35	33
Less Variable Costs	33	25	19	21	23
Gross Margin	(-) 1	8	15	14	10

*incl. value of animals turned out. +incl. value of home reared animals

In a year of high grain prices with home-grown barley charged at £28 per ton, the cattle in the cereal fed group gave a negative gross margin. Also they were housed for a slightly longer average period.

3. If the 5 mainly cereal fed groups are excluded, the remaining 28 batches showed an average gross margin of £12.13 per head or approximately £43 per forage acre.

4. The main breeds and crosses were Hereford and Hereford Crosses 55%, Friesian and Friesian Crosses 22% and Aberdeen Angus and Aberdeen Angus Crosses 14%. It may be that the above types are more readily identified than others.

5. Silage fed animals performed slightly better on average than those on a hay based ration.

6. High gross margins were found where the difference between the buying and selling price per live cwt. was high and were generally associated with a high rate of daily liveweight gain. Feed costs, however, have to be considered in the achievement of this liveweight gain.

7. The frequent observation of the unnecessary use of supplementary protein suggests that this is an area in which economies could be made.

INTRODUCTION

During 1970-71 the Advisory and Development Service and the Economics Division began what is intended to be a three year investigation into the winter fattening of cattle on farms in the West College province. The farms were chosen by the Area Advisers as part of an investigation covering different aspects of beef production. At the end of the three year period it is hoped that there will be sufficient information for an attempt to be made to identify the most efficient systems.

This interim joint report which summarises the first winter's work, draws on financial results prepared for an earlier Economics Division publication* and combines these results with information analysed by the Animal Husbandry Department relating liveweight gain to diet. Figures in the report are for some 1200 cattle grouped in 33 batches on 20 farms. Observed liveweight gains were available for 1143 of the 1216 cattle recorded in the financial sample.

Cattle weighings were carried out during the winter of 1970-71. Where a farmer already possessed weighing facilities, these were used. In other cases a mobile weighcrush manned by College technical staff was taken to farms as required. Section 4 of the report relating performance to feed intake (starch equivalent and digestible crude protein) is based on recorded weights between dates early and late in the season. For those parts of the report giving an economic assessment of the results, where it was not always possible to obtain actual weights at the start or finish of accounting periods, estimates of liveweight were made. Also it was the weight upon which payment was made at sale time that has been taken rather than the final actual weighings on the farm. There was some loss in weight of the cattle from the time of leaving the farm to passing over the market weighbridge where payment in any case is made to the last quarter cwt. shown on the scale.

There was a considerable range in individual results. The cattle were managed under various kinds of systems and conditions and were of different breeds and crosses, weights and quality. Also the average period of time for which batches were kept varied from two months to six months.

The batches in the sample have been arranged in groups according to the type of animal housed e.g. suckled calves, lighter stores and heavier stores with the average results from a small number of mainly cereal fed light stores being kept separate. There is also a grouping according to the main roughage fed - silage or roots and hay.

Cattle fattening has never generally been considered as one of the most paying branches of farming and the average gross margins summarised in this report may not be as high as those claimed in other parts. Nevertheless, on the type of farms in the West College province where cattle were recorded, a farming system without stock would be unusual. Even in the relatively small cereal-growing areas, grass still forms an important part of the rotation and stock are required for a balanced system of farming.

*Beef Cattle Survey, Winter Fattening 1970-71. Economics Division Statement No. 151, October 1971 (Limited Circulation).

SECTION 1

THE SAMPLE

Distribution by Area and by County

The table below shows the geographical distribution of the batches recorded in the sample.

TABLE I

Distribution by Area and by County

Area	County	No. of Batches
Argyll	Argyll	5
Central	Clackmannan West Perth	4 1
Clyde	Lanark Renfrew	5 2
Southern	Dumfries Kirkcudbright	6 3
South-Western	Ayr Wigtown	5 2
Total	Total	33

Breeds and Crosses

Table II summarises the breeds and crosses according to the supposed sire and classifies the sample by type of cattle. Some crosses are more readily identifiable than others. It will be seen that certain breeds predominated, notably Herefords which accounted for more than half the cattle and together with Friesians made up over three-quarters of the sample. When Aberdeen Anguses are added the three breeds made up 90% of the total. The breed or cross of cow was not always identified but where notes had been taken, Blue Greys, Shorthorns and Galloways as well as some dairy cows, were among the dams. There would also be some crossing between Herefords and Friesians.

TABLE II

Classification of Breeds and Crosses

Breed or Cross	Cereal Fed	Suckled Calves	Lighter Stores	Heavier Stores	Total Sample	%
No. of batches	5	10	10	8	33	
Hereford and He. X	10	201	232	227	670	55
Friesian and Fr. X	63	15	54	135	267	22
Aberdeen Angus and AA X	10	68	59	34	171	14
Devon and Dev. X	1	-	45	-	46	4
Galloway and G. X	-	19	4	5	28	2
Blue Grey	-	14	1	-	15	1
Ayrshire and Ayr X	-	-	2	8	10	1
Shorthorn and Sh. X	-	-	3	4	7	1
Charolais and Char. X	-	-	-	2	2	neg.
	84	317	400	415	1216	100

The fifteen Friesians in the suckled calf group were actually young stores but were with a batch of suckled calves and were not recorded separately.

The cattle in the cereal fed group could all be considered as light stores. Seventy-two were bought in as calves and bucket reared and the remaining twelve were bought as dairy cross stores.

Steers and Heifers, Home-bred and Bought-in

More than two-thirds of the animals in the sample were steers and of these about one-quarter were home-bred. Of the heifers in the sample just under one-quarter were home-bred. Table III below shows the analysis by groups. The suckled calves group was the only one where there were more heifers than steers and where there were more home-bred than bought-in animals.

TABLE III

Steers and Heifers, Home-bred and Bought-in

Type	Cereal Fed		Suckled Calves		Lighter Stores		Heavier Stores		Total		
No. of batches	5		10		10		8		33		
No. of cattle	84		217		400		415		1216		
Sex	Strs	Hfrs	Strs	Hfrs	Strs	Hfrs	Strs	Hfrs	Strs	Hfrs	All
Home-bred	-	-	146	58	44	29	18	-	208	87	295
Bought-in	58	26	8	105	181	146	395	2	642	279	921
Total	58	26	154	163	225	175	413	2	850	366	1216

In the group classed as heavier stores (over 9 cwt. liveweight when sold) all but two cattle were steers and almost all had been bought in. All were more or less classed as forward stores at the time that they were housed and although a few had been bought the previous autumn as suckled calves and a few had been bought as calves and bucket reared, three-quarters of the animals were forward stores when they were brought onto the farms where they were fattened.

Sales and Turn Out to Grass

From the table below it will be seen that 897 cattle or approximately three-quarters of the sample were sold fat. As might be expected the heavier stores were almost all finished and sold fat out of the courts. A fair proportion of the suckled calves and lighter stores were not ready to be sold fat at the end of the yarding period and were turned out to be finished on grass.

TABLE IV

Analysis of Sales by Groups

Type	Cereal Fed	Suckled Calves	Lighter Stores	Heavier Stores	Total
Sold fat	72	190	252	383	897
Sold store	-	-	21	2	23
Turned out	12	127	127	30	296
Total	84	317	400	415	1216

For the fat cattle a further division can be made between liveweight and deadweight sales. Table V gives an analysis.

TABLE V

Analysis of Numbers of Fat Cattle sold Liveweight and Deadweight

	Liveweight	Deadweight	Total
Cereal Fed	65	7	72
Suckled Calves	119	71	190
Lighter Stores	213	39	252
Heavier Stores	192	191	383
Total	589	308	897

These deadweight sales were nearly all from larger beef units which sold practically all their cattle by this method. Nevertheless of the cattle sold fat it will be seen that the ratio of liveweight to deadweight sales was about two to one.

Mortality

It is perhaps remarkable that only one casualty was recorded from over 1200 animals. The casualty was included with the deadweight sales.

Where cattle were sold by deadweight, the liveweight at time of sale had to be calculated on the basis of a killing out percentage or alternatively where possible the final weighing on the farm was used if this was close enough to the time of sale.

SECTION 2

OUTPUT, VARIABLE COSTS AND GROSS MARGIN

Output

Table VI gives a summary of the average cattle output for the groups and for the whole sample.

TABLE VI

Average Output per Head

Type	Cereal Fed	Suckled Calves	Lighter Stores	Heavier Stores	Total
No. of batches	5	10	10	8	33
No. of cattle	84	317	400	415	1216
Average time kept	152 days	144 days	115 days	117 days	130 days
Average Results	£ per head				
Sale Price* (incl. subsidy)	92	87	90	116	95
Less Purchase Price+	60	54	56	81	62
Cattle Output	32	33	34	35	33

*incl. value of animals turned out. +incl. value of home-reared animals.

Over the sample the numbers of cattle per batch varied greatly from 10 to 166. The largest batches were found among the store cattle. There were two batches of over 100 cattle in the heavier group and one of over 100 in the lighter group. These larger batches included several pens of cattle.

There was also a considerable range in the average length of time that the cattle were kept in the courts, from 73 days to 195 days. Some of the batches among the lighter and heavier stores were finished on average in under three months whereas the cereal fed and suckled calves groups were kept for a longer average time.

Cattle output averaged £33 per head and group averages were also around this figure although the range for individual batches was from £20 to £51 per head depending on the difference between the buying and selling price.

This output depends largely on the liveweight gain and the price or value per live cwt. Figures from individual results brought out once again the importance of the feeder's margin - the difference between the buying price (or incoming value for home-bred animals) and the selling price. The feeder's margin may be considered to be made up of two parts - the value of the extra weight put on by the animal during the feeding period (liveweight gain) and the difference in price per cwt. between the buying and selling price.

Table VII summarises the average liveweight per head and the value or price when calculated per live cwt. With fat cattle where the selling price per cwt. is to some extent fixed according to the period of sale it is the buying-in price per cwt. (or value per cwt. for home-reared animals) which has the greater bearing.

Over the whole sample the buying-in price (or value per cwt. for home-reared animals) ranged from £8.68 to £11.99 per live cwt. and the selling price (or value at turn out) ranged from £10.43 to £13.46 per live cwt. It may be that some of the home-reared animals were somewhat undervalued at yarding and again if unsold at the end of the winter. Compared with the 1971-72 fattening season some of the prices for cattle at the start of the investigation seem low. Nevertheless some cattle were very carefully bought at prices which worked out at around £9 to £10 per live cwt.

TABLE VII

Liveweight per Head and Price or Value per Live cwt.

Type	Cereal Fed		Suckled Calves		Lighter Stores		Heavier Stores		Total	
	cwt. per head	£ per cwt.	cwt. per head	£ per cwt.	cwt. per head	£ per cwt.	cwt. per head	£ per cwt.	cwt. per head	£ per cwt.
At sale or turn out	7.44	12.31	6.92	12.55	7.37	12.27	9.52	12.14	7.76	12.31
At yarding	5.53	10.79	5.18	10.45	6.09	9.31	7.87	10.24	6.16	10.09
Gain	1.91	1.52	1.74	2.10	1.28	2.96	1.65	1.90	1.60	2.22

Variable Costs

Variable costs (mostly feed) averaged £23 per head, and ranged from £13 to £42 per head depending on the length of the feeding period and the type, quantity and cost of the feed. A summary of these costs is given in Table VIII. Feed costs averaged £20 per head and ranged from £12 to £39 per head. Miscellaneous costs ranged from none at all (no bedding as cattle were on slats, no vet. and no hired transport) to £9 per head where a ton of bedding straw per head was bought in and where transport charges were about £2 per head.

TABLE VIII

Average Variable Costs per Head

Type	Cereal Fed	Suckled Calves	Lighter Stores	Heavier Stores	Total
Variable Costs	£ per head				
Conc. and Grain	25	15	11	11	14
Roots and Fodders	5	7	5	7	6
Total Feed	30	22	16	18	20
Bedding	2	2	2	2	2
Other	1	1	1	1	1
Total Miscellaneous	3	3	3	3	3
Total Variable Costs	33	25	19	21	23

The five batches classed as cereal fed were not "barley beef" but nevertheless were given a fairly heavy ration of concentrates and grain along with straw as the main roughage.

Gross Margin

Under the gross margin method, home-grown grain and straw are charged at market value but home-grown forage crops (hay, silage, turnips etc.) are charged at variable costs only. This was the main reason for the high feed costs and hence the negative average gross margin of the cereal fed group.

TABLE IX

Average Gross Margin per Head

Type	Cereal Fed	Suckled Calves	Lighter Stores	Heavier Stores	Total
No. of batches	5	10	10	8	33
Average Results					
Cattle Output	32	33	34	35	33
Less Variable Costs	33	25	19	21	23
Gross Margin	(-) 1	8	15	14	10

It should be remembered that out of these gross margins, charges for labour, depreciation and share of rent and other overheads have still to be met.

Gross margin averaged £10 per head over the whole sample ranging from (-) £8 per head in one of the cereal fed batches to £24 per head in one of the suckled calves batches. Table X shows the distribution.

TABLE X

Distribution according to Average Gross Margin per Head

Type	Cereal Fed	Suckled Calves	Lighter Stores	Heavier Stores	Total
Gross Margin					
Over £20	-	1	3	1	5
£20 - £15	-	-	2	2	4
£15 - £10	-	4	1	4	9
£10 - £ 5	-	-	4	-	4
£ 5 - £ 0	2	2	-	1	5
Deficit					
£ 0 - £ 5	2	3	-	-	5
Over £5	1	-	-	-	1
Total	5	10	10	8	33

As home-grown cereals have been charged at market value, this means that the gross margins from the home-grown cereals fed to the cattle have already been credited to the cereal growing enterprise. In order that a more valid comparison of the groups may be made (particularly of the performance of the cereal fed group) it could be argued that these gross margins should be considered along with the gross margins from the cattle. Table XI shows the results.

TABLE XI

Gross Margins from Cattle and Home-Fed Cereals expressed per Head

Type	Cereal Fed	Suckled Calves	Lighter Stores	Heavier Stores	Total
No. of batches	5	10	10	8	33
Gross Margin from cattle	(-) 1	8	15	14	10
Gross Margin from cereals	10	8	4	6	7
Amended Gross Margin	9	16	19	20	17

SECTION 3

GROUPING BY TYPE OF FORAGE FED

Silage Fed Group and Roots and Hay Group

When the five batches of cereal fed cattle are set aside an analysis by type of forage fed to the 28 batches which made up the three remaining groups showed that 16 could be classed as mainly fed on silage and 12 on roots and hay. Table XII shows this classification.

TABLE XII

Classification according to Silage or Roots and Hay

Type	Suckled Calves	Lighter Stores	Heavier Stores	Total
Silage	5	7	4	16
Roots and Hay	5	3	4	12
Total	10	10	8	28

The average results for the 16 silage fed batches and the 12 roots and hay batches are shown in Table XIII.

TABLE XIII

Output and Gross Margin per Head

Type	Silage Fed	Roots and Hay
No. of batches	16	12
No. of cattle	586	546
% sold fat	72%	74%
	£ per head	
Sales Price* (incl. subsidy)	97	95
Less Purchase Price+	63	62
Cattle Output	34	33
Less Variable Costs	20	23
Gross Margin	14	10

*incl. value of animals turned out. +incl. value of home-reared animals.

The silage fed groups performed slightly better than the roots and hay fed group.

The average liveweights per head and prices per cwt. were as follows:-

TABLE XIV

Liveweight per Head and Price or Value per Live cwt.

Type	Silage Fed		Roots and Hay	
	cwt. per head	£ per cwt.	cwt. per head	£ per cwt.
At sale or turn out	7.85	12.35	7.79	12.56
At yarding	6.25	10.07	6.29	9.89
Gain	1.60	2.28	1.50	2.67

The average variable costs per head were as shown in Table XV.

TABLE XV

Variable Costs per Head

Type	Silage Fed	Roots and Hay
Variable Costs	£ per head	
Conc. and Grain	12	13
Roots and Fodders	5	7
Total Feed	17	20
Bedding	2	2
Other	1	1
Total Miscellaneous	3	3
Total Variable Costs	20	23

Estimated Forage Acres per Head

If the five cereal fed batches are excluded as they used very little home-grown forage (only about 0.06 forage acres per head as straw is considered as a by-product of the grain crop), the remaining 28 batches required on average rather over quarter of an acre to supply the forage for a feeding period of 126 days. When these batches are divided according to type of cattle or by silage fed and roots and hay fed groups, the results calculated per head were as follows:-

TABLE XVI

Estimated Forage Acres per Head and Estimated Gross Margin per Forage Acre

Type	Suckled Calves	Lighter Stores	Heavier Stores	Silage	Roots and Hay	Total
No. of batches	10	10	8	16	12	28
Av. time kept (days)	144	115	117	124	128	126
Av. forage acres per head	0.32	0.23	0.29	0.29	0.27	0.28
Av. Gross Margin per forage acre	£24	£65	£49	£47	£38	£43

For the 28 batches as a whole the average gross margin per forage acre worked out at approximately £43 based on an average gross margin per head of £12.13 for the 28 batches.

Estimated Forage and Cereal Acres per Head

If the amended gross margins per head (as shown in Table XI) are related to the acreage required for home-grown forage and home-grown cereals (forage and cereal acres) then the results are as shown in Table XVII.

TABLE XVII

Estimated Forage and Cereal Acres per Head

and Estimated Gross Margin per Forage and Cereal Acre

Type	Cereal Fed	Suckled Calves	Lighter Stores	Heavier Stores	Total
No. of batches	5	10	10	8	33
Av. time kept (days)	152	144	115	117	130
Av. forage and cereal acres per head	0.38	0.60	0.36	0.49	0.46
Av. Gross Margin per forage and cereal acre	£23	£27	£53	£41	£37

Type	Silage	Roots and Hay	Total
No. of batches	16	12	28
Av. time kept (days)	124	128	126
Av. forage and cereal acres per head	0.49	0.48	0.48
Av. Gross Margin per forage and cereal acre	£40	£34	£38

As cereal acres have been taken into account the cereal fed group have been brought into this table. Over the sample as a whole about half an acre per head was required to supply the home-grown forage and home-grown cereals. The stores both lighter and heavier were also fed some draff and stock feed potatoes.

It may be somewhat misleading in Tables XVI and XVII to compare the per acre gross margins for the groups. The suckled calves relied more on home-grown feed (both forage and cereals) whereas the stores group had a certain amount of draff and stock feed potatoes bought in.

SECTION 4

RELATION OF LIVEWEIGHT GAIN TO DIET

Observed liveweight gains of 33 batches of cattle totalling 1143 head were examined in conjunction with information available on the ration they received.

Analyses were performed on most of the roughages fed. For other materials tabulated values were taken from Bulletin 48*. From these figures, theoretical estimates of performance were made.

Energy - Starch Equivalent

The requirement of starch equivalent for the production of liveweight gain is related both to absolute liveweight and to rate of liveweight increase. Young fattening cattle gaining 1 lb. of liveweight daily require approximately 2 lb. S.E. in excess of a maintenance diet. The relationship is not linear, so that a second pound of gain would be expected to need approximately 3 lb. S.E. More mature cattle have slightly higher requirements. It can be seen, however, that over most of the range of liveweight gains and animal liveweights encountered in practice, the average figure for lb. S.E. per lb. L.W.G. would be expected to fall in the range 2 - 3 lb.

The surplus of starch equivalent over a calculated maintenance requirement has been called "Productive Starch Equivalent" and has been calculated per lb. of liveweight gain. It is appreciated that this figure in isolation does not allow true comparisons to be made between groups, however, when considered alongside liveweight gain data it does enable a broad assessment of feeding levels to be made.

The frequency distribution of rate of liveweight gain is shown in Table XVIII.

*Ministry of Agriculture, Fisheries and Food. Bulletin No. 48. Rations for Livestock. 15th edition. H.M. Stationery Office. 1960.

TABLE XVIII

Frequency Distribution of Rate of Liveweight Gain per Day

Daily Liveweight Gain (lb.)	Number of Batches			
	Cereal Fed	Silage	Roots and Hay	Total
0.49 and under	-	-	-	-
0.50 - 0.99	-	1	1	2
1.00 - 1.49	2	5	3	10
1.50 - 1.99	2	7	7	16
2.00 and over	1	3	1	5
Total	5	16	12	33
Average	1.61	1.62	1.52	1.58

Performance on silage and cereal diets was very similar and slightly higher than that on roots and hay diet.

The frequency distribution of lb. "Productive" S.E. per lb. Liveweight Gain, i.e. $\frac{\text{(Calculated dietary S.E. (lb.) - Calculated Maintenance S.E. Requirement (lb.)}}{\text{(Average daily Liveweight Gain (lb.))}}$ is shown in Table XIX.

TABLE XIX

Frequency Distribution of lb. "Productive" S.E. per lb. Liveweight Gain

lb. "Productive" S.E./lb. Gain	Number of Batches			
	Cereal Fed	Silage	Roots and Hay	Total
1.99 and under	-	1	1	2
2.00 - 2.49	-	3	2	5
2.50 - 2.99	1	2	-	3
3.00 - 3.49	-	3	1	4
3.50 - 3.99	1	3	3	7
4.00 - 4.99	1	3	2	6
5.00 - 5.99	2	1	2	5
6.00 and over	-	-	1	1
Total	5	16	12	33
Average	4.43	3.35	3.92	3.72

It can be seen that only 10 batches fell below the level of 3 lb. "Productive" S.E. per lb. gain and 23 batches (70%) were above this figure. Since only 5 batches (15%) achieved 2 lb. or better daily liveweight gain per head, it would appear that feed levels, relative to rate of gain were higher than necessary in a majority of cases.

Digestible Crude Protein

While in maintenance diets the requirement for protein is related to liveweight, it has been suggested for fattening cattle that a figure of 1.25 lb. D.C.P. will meet the daily need for both maintenance and growth. The calculated daily provision of D.C.P. was compared to this figure. Values below 1.20 were considered lower and values higher than 1.30 were considered higher than requirements.

TABLE XX

Frequency Distribution of lb. Digestible Crude Protein

D.C.P. lb.	Number of Batches			
	Cereal Fed	Silage	Roots and Hay	Total
Under 1.20	-	-	3	3
1.20 - 1.30	-	3	1	4
Over 1.30	5	13	8	26
Total	5	16	12	33
Average	1.48	1.75	1.50	1.62

Where a ration contains a large proportion of silage or draff it is quite common for the diet to contain surplus protein due to the nature of the material. However, of the 13 silage rations with a protein surplus, 9 also contained supplementary protein. Of the 8 hay rations, 7 contained protein supplement and all the 5 cereal-fed groups contained supplementary protein.

Discussion

The explanations for differences between expected and actual performance are not readily found. In some cases it is possible that the animals were performing at the limit of their potential and that feed in excess of that level could not produce additional liveweight gain. At the overall levels of gain which were recorded, it seems unlikely that this would be a major factor in this study. In other cases differences of gut fill at opening and closing would depress calculated liveweight gains but only in situations where animals were fed for a very short period was this likely to have accounted for the large differences noted.

Management considerations such as housing and trough space could have an influence on performance but have so far not been examined.

The frequent observation of unnecessary use of supplementary protein (in 16 of 33 batches) suggests that this is an area in which economies could be made. In many cases protein supplements, or even conventional cattle rations are fed as a gesture towards mineral supplementation. Where there is no need for the additional protein this is a highly expensive method of adding minerals, which can be added more cheaply as simple mineral supplements.

SECTION 5

SOME FACTORS AFFECTING GROSS MARGIN

The investigation showed again that generally gross margin per head increases as the rate of liveweight gain increases and that there is a relationship between gross margin and the gain in price per live cwt.

The estimated rates of daily liveweight gain and their frequency distribution given in this section which deals with an economic assessment of the results, differ slightly from those given in the previous section. The reasons for this have been explained in the introduction.

Liveweight Gains

The average periods of time (calculated on the basis of cattle days) over which the batches were kept and the estimated average liveweight gain per head per day are summarised in Table XXI.

TABLE XXI

Time Kept and Daily Liveweight Gain

Batch Averages and Ranges expressed per Head

Type.	Cereal Fed	Suckled Calves	Lighter Stores	Heavier Stores	Total
No. of Batches	5	10	10	8	33
	Per Head				
Av. time kept (days)	152	144	115	117	130
Av. daily l.wt. gain (lb.)	1.41	1.35	1.25	1.58	1.38

Progress will no doubt be made in improving the rate of liveweight gain in order to fatten beasts in a shorter period but the cost of achieving these increased gains will have to be taken into account.

In Table XXII the 33 batches are distributed according to the estimated rate of liveweight gain per day. The centre column shows the average gross margin per head for the batches falling within each class interval.

TABLE XXII

Daily Liveweight Gain and Gross Margin

Rate of Liveweight Gain per Head per Day	Batch Average Gross Margin per Head	No. of Batches
lb.	£	
Under - 1.00	7.85	4
1.00 - 1.49	7.56	16
1.50 - 1.99	13.41	12
2.00 and over	22.02	1
		33

Price or Value per Live cwt.

Table XXIII shows the distribution of the 33 batches at intervals of £1 price difference per live cwt. in the buying and selling price of the animal.

TABLE XXIII

Price Difference and Gross Margin

Difference in Buying* and Selling Price+ per Live cwt.	Batch Average Gross Margin per Head	No. of Batches
£	£	
Under - 1.00	4.29	3
1.00 - 1.99	3.90	10
2.00 - 2.99	12.17	12
3.00 - 3.99	16.74	6
4.00 and over	18.51	2
		33

*incl. value of home-reared animals. +incl. value of animals turned out.

Feed Inputs and Costs

Over the whole sample the average cost of concentrates and grain was £1.51 per cwt. The average quantity fed per head per day worked out at 8.1 lb. When this was related to the average daily liveweight gain it gave a ratio of 5.8 lb. of concentrate and grain per lb. of liveweight gain and the cost was 8p per lb. liveweight gain. The average total feed cost (concentrates and grain roots and fodders) was 11½p per lb. liveweight gain.

Table XXIV shows the averages for the groups and brings out the difference of the mainly cereal fed group. It should be noted that, in the costs of feed per lb. liveweight gain, purchased concentrates, grain and bulky feeds such as draff or stock feed potatoes are at the prices paid; home-grown grain and straw are at market value and home-grown forage crops are at variable costs only.

TABLE XXIV

Feed per Day and per lb. Liveweight Gain

Type	Cereal Fed	Suckled Calves	Lighter Stores	Heavier Stores	Total
Conc. and grain per day	11.8 lb.	8.0 lb.	6.5 lb.	7.1 lb.	8.1 lb.
Conc. and grain per lb. L.W.G.	8.4 lb.	5.9 lb.	5.2 lb.	4.5 lb.	5.8 lb.
Conc. and grain cost per lb. L.W.G.	12p	7½p	7½p	6p	8p
Total feed cost per lb. L.W.G.	14p	11p	11p	9½p	11½p

These figures are averages per day over the feeding period. Actual quantities per day were less at the beginning but increased as the feeding period continued.

Table XXV gives similar information for the silage fed batches and the roots and hay fed batches.

TABLE XXV

Feed per Day and per lb. Liveweight Gain

Type	Silage Fed	Roots and Hay
Conc. and grain per day	7.23 lb.	7.31 lb.
Conc. and grain per lb. L.W.G.	5.01 lb.	5.57 lb.
Conc. and grain cost per lb. L.W.G.	6½p	7½p
Total feed cost per lb. L.W.G.	9½p	12p

It should be noted that, in the costs of feed per lb. liveweight gain, purchased concentrates, grain and bulky feeds such as draff or stock feed potatoes are at the prices paid; home-grown grain and straw are at market value and home-grown forage crops are at variable costs only.

The implications of charging home-grown grain and straw at market value have already been discussed. It could be argued that on some farms straw had little value whereas hay might have been thought of as a saleable crop. However, a standard gross margin convention had to be applied. (See Section 7 Definitions and Method.)

Other Variable Costs

After feed costs the others form but a small proportion of the variable costs.

The average per head for the whole sample was as follows:-

TABLE XXVI

Miscellaneous Costs

	£ per Head
Bedding straw home-grown	1.94
Bedding purchased	0.22
Vet. and medicine	0.23
Transport	0.56
Sundries	0.15
Total Miscellaneous	3.10

SECTION 6

LABOUR AND CAPITAL INVESTMENT

These items which fall outwith the gross margin calculations are briefly summarised in this section.

Labour and Tractor Hours

The time spent on attending to and feeding the cattle is shown in Table XXVII below. The averages are given for the various groups and are expressed per head. All normal work associated with the recorded cattle was included.

TABLE XXVII

Labour and Tractor (Average Hours per Head of Cattle)

Type	Cereal Fed	Suckled Calves	Lighter Stores	Heavier Stores	Silage	Roots and Hay	Total
No. of batches	5	10	10	8	16	12	33
Labour (hours)	6.7	5.8	5.1	4.3	5.4	4.8	5.4
Tractor (hours)	0.4	1.3	1.9	0.7	1.9	0.7	1.2

Buildings and Equipment

On nine of the farms the cattle were housed in the original traditional courts and there was no new capital expenditure except on one of these farms where a share of a new hay shed could have been charged against the fattening cattle.

On the other 11 farms capital expenditure varied considerably. At one end of the scale were courts built with farm labour using second hand trusses and cladding. At the other end were completely new units - mainly large buildings some with self-feed silage others with central feeding passages, some with concrete floors and others with slats high or low level. With a share of ancillary buildings and equipment for feed storage such as silos, bins, etc., some costs were between £60 and £90 per head net of any grant.

TABLE XXVIII

Estimated Capital per Animal for Buildings and Equipment

Estimated Capital Per Head	No. of Batches
None	16
Up to £20	6
£20 - £40	4
£40 - £60	4
£60 and over	3
	33

The summary above should be read only as a guide to what per head capital costs were estimated to be for the batches recorded in this survey. Prices for new buildings and equipment in 1972 will be different from the ones above which are in the main for the period between 1960 and 1970.

SECTION 7

DEFINITIONS AND METHOD

The results are presented on a Gross Margin basis. Gross Margin may be defined as the difference between the Cattle Output and the Variable Costs involved.

Cattle Output is the value of cattle sold*, transfers out and cattle turned out to grass at the end, less the value of cattle purchased, transfers in and cattle on hand at the beginning.

Variable Costs comprise feed costs (purchased and home-grown) and miscellaneous costs such as bedding, vet. and medicine, transport and sundries.

Purchased feeds both concentrates and grain and others such as draff and stock feed potatoes have been charged at actual prices paid.

Home-grown cereals and straw have been charged at estimated market value as follows:-

	£'s per ton
Moist grain	25.00
Barley	28.00
Oats	28.00
Straw	6.00

To conform to the standard Gross Margin analysis home-grown forage crops have been charged at their estimated variable cost only (i.e. the costs directly incurred in the growing of the crop - mainly fertiliser, seed, sprays, twine and any casual/contract work). As it was not practicable to gather these costs for individual farms, the following estimated standard variable costs have been used for home-grown forage crops.

	£'s per ton
Turnips and Swedes	1.50
Kale	1.50
Silage	1.50
Hay	3.50
Haylage	2.50

*(Net of commission etc. but including any deficiency payments.)

Home-grown stock feed potatoes have been charged at £5.25 per ton.

In the forage acre calculations, conserved grass yields were based on an acre of grass set aside to be cut solely for silage, hay or haylage with estimated yields per acre of 10.0 tons, 2.5 tons and 5.0 tons respectively. Estimated yields per acre of turnips and kale were taken as 20.0 tons and 15.0 tons respectively.

Unweighted averages have been used throughout this report.

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