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*Cattle*

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UNIVERSITY OF EXETER  
Agricultural Economics Unit

# SEMI-INTENSIVE BEEF

A case study based on an experiment at  
Dartington Cattle Breeding Centre 1967-1972

S.T. Morris and B.R. Nixon

in conjunction with  
The Advisory Committee  
of The Centre

March, 1973

Price 30p.

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In conjunction with the  
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University of Exeter  
Agricultural Economics Unit  
Lafrowda  
St. German's Road  
EXETER  
EX4 6TL

March, 1973

## FOREWORD

The Dartington Hall Cattle Breeding Centre is constituted as a Charitable Trust. One of the ways in which it is empowered to spend its funds is in the furtherance of schemes of research and development designed to benefit the farming community.

In 1967 the Centre, finding itself with some surplus land on its Hatchland - Venton Farm, decided to set up an '18 month beef' enterprise. An idea current at the time was that 18 month beef was a viable supplementary enterprise for farmers with suitable land available.

A small survey of existing 18 month beef enterprises was carried out before launching the Centre's own venture in order to discover and thereby avoid any obvious pitfalls.

The experiment has now been wound up. During its existence it was recorded and advised by the University of Exeter Agricultural Economics Department and by the Centre's Veterinary Surgeons, Messrs. Hair and Beaumont. This report has been produced by Mr. S.T. Morris and Mr. B.R. Nixon of Exeter University, assisted by Mr. W. Beaumont, our Veterinary adviser, together with Mr. P. Wilkinson manager of the Unit and Mr. D.W.L. Mathews, the Board member most closely concerned.

In my view, the report is admirably objective and will, I hope, prove of valuable assistance to those farmers who are considering going in for beef, whose attractions now seem more tempting than when the Dartington experiment was set up.

Peter Sutcliffe  
Chairman  
Dartington Hall  
Cattle Breeding Centre.

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## 1. INTRODUCTION

"I have based my argument on the hypothesis that this country will have to become more self-sufficient in the future than she has been in the past, and if I am right I fail to see how it will be possible to spare for beef production land that will grow other crops or stock. The fattening beast will be able to justify himself only on those farms where land or produce would be wasted if he were not there to utilise them, and not even an improvement in the stock carrying capacity of the grassland which might result from better methods of grassland management would help to solve the problem if the need for other foods was so great that proportionately more grassland had to be ploughed out.....If, then, conditions improve to the extent of making it possible for us to devote some of our land to producing what we would like to eat, and not simply to keeping alive and reasonably energetic, then I can see a prospect for a certain amount of bullock feeding as a main enterprise on land with alternative uses, and not simply as a by-product of arable or dairy farming or as a means of grazing marginal pasture.....Finally, I see the likelihood of beef production being continued for as long as British farmers are allowed the freedom to make a loss, or a smaller than normal profit, on their farms or on part of their farms. For I still believe that the prestige of feeding bullocks, in yards and on grass, is sufficiently great to encourage some farmers to persist in this form of production even when all the evidence would show that it is not economically or nutritionally sound."

W. Harwood Long.

This quotation from a paper by W. Harwood Long given to the Agricultural Economics Society in 1950, and titled "The Place of Beef Production in British Farming",\* apart from its prophetic ring, illustrates well the contradiction which has long surrounded this enterprise in British farming. Indeed, more agricultural economists' reputations have been tarnished in attempts to unravel the economics of beef production than in any other area of farming where they have applied their expertise. The current round of attention which the commodity is attracting, resulting from the present imbalance between supply and demand, highlights once again the problems and prospects for the enterprise in the context of British farming, and many farmers must now be subjecting their farming plans and policies to close scrutiny to see if beef production in some form or other should now figure in those plans.

Economic surveys in the past have shown that, despite exceptions to the contrary, beef in general has not been particularly profitable and

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\* Journal of Proceedings of the Agricultural Economics Society  
Vol IX No. 1. July 1950 pp 12 - 13.

usually yielded lower margins per acre than other land using enterprises. But as a Manchester Study pointed out, "conventional costing procedures, by 'lifting' the beef enterprise out of the farm setting, tend to ignore its relationship to particular farm situations and thus often underrate its real contribution to total farm income".\* The study goes on to point out that on many farms beef production has, traditionally played no more than a secondary role, dependent as it is to a very large extent on another industry, dairying, for its main raw material, the calf, and after being fed the by-products of other enterprises, e.g. on arable farms beef cattle consume arable by-products and are often kept as a means of maintaining fertility. On dairying and mixed farms, beef cattle are often fed on seasonal surpluses of grass. Indeed, "beef production presents a picture of a great diversity of systems, production methods, and policies, not only within the whole country, but also within regions. This diversity considerably complicates the economic assessment of beef systems by reference to sample studies."\*

In South West England, the trend in the post-war period has been away from arable towards increasing dependence on grass as the basis of farming. The traditional cattle rearing and cattle fattening systems, particularly the former often for export outside the region, have given way increasingly to more intensive and more profitable systems of dairy farming. But not all farmers have a wish to become specialist milk producers and of those who have moved in this direction, not all would wish to continue any expansion plans they might have by way of the dairy cow exclusively. For farmers in both categories some form of beef cattle production has seemed the answer, not the traditional type of beef production, but some system which would, nevertheless, be more intensive and offer returns more comparable with those from dairying. Hence the search for a system of beef cattle production to meet the need of such farmers. Semi-intensive 18 month beef would appear to be one such system.

The term '18 month beef' was initially applied to a system involving the purchase of dairy bred calves in the late summer or autumn for

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\* 'Beef Production Systems', D.O. Jones, University of Manchester, December 1967.



bucket rearing and feeding during the winter, grazing in the summer and finally fattening in yards up to slaughter at about 18 months of age. A more recent variant of the system allows for the purchase of spring-born calves which are finished on grass the following year. It has been claimed that the system has advantages for arable farmers in combining inside feeding which, if of less importance for the utilisation of farm by-products, still provides farmyard manure, with summer grazing often on the ley break in the rotation.

During the mid-1960's dairy farming was experiencing problems and its future was uncertain. It seemed to many dairy farmers, but in particular to those tiring of the constant tie of dairy work, that the system of semi-intensive beef production offered an alternative, if not as profitable but still capable of providing a reasonable living from 100 acres of land, the average size of farms in Devon.

In order to improve our knowledge regarding the economics of 18 month beef and thus perhaps assist any farmer wishing to try the system, the Board of Management of Dartington Cattle Breeding Centre proceeded to establish a practical experiment in the production of 18 month beef cattle. A recently purchased block of 100 acres of land, intended eventually for research and experimental work in A.I., was used. The land was situated quite near to the Centre but in poor condition, the turf on a large part of it had been sold off and there were no buildings. Careful costings were to be kept and the results, whether showing success or failure, published.

The Agricultural Economics Unit of Exeter University agreed to cooperate with the Management in the recording and interpretation of the data and accepted responsibility for publication of the findings.

The Committee, after consulting Hurley, decided to visit several farms in Southern England reputed to be practising the 'system', i.e. producing 18 month beef from grass and conserved fodder, at a stocking rate of two animals to the acre. The main purpose of these visits was to discover how well the Hurley system made out under varying individual commercial circumstances. Little of value was gleaned from these visits, particularly as on a few of the farms the system was part of an arable-break policy. In general the picture obtained bore little resemblance



to the theoretical concept. Indeed, the experience underlined the dearth of solid information, but in particular for Devon conditions and local farmers' needs.

## 2. THE PROJECT

The project envisaged the purchase in the autumn of one week old calves of any beef type available in the locality at a reasonable price but including surplus calves from the parent dairy farm. The targets set were as follows:-

### Physical Targets

First Winter - Autumn born calves from purchase to turnout in the spring, an average daily liveweight gain of 1.7 lb.

Summer Grazing - From turnout in the spring to yarding in the autumn, at two animals per acre, at an average daily liveweight gain of 2 lb; the grassland was also to provide silage for the following winter.

Second Winter - From yarding to sale fat at 18 months, at an average daily liveweight gain of 2 lb.

### Financial Targets

<u>Costs</u>	<u>Per Head</u>	<u>Output</u>	
	£		£
Feed to turnout	15.00	Sales (9cwt @ £10 per cwt)	90.00
Conc. feed 2nd winter (10cwt)	15.00	Plus calf subsidy	11.25
Veterinary and medicines	3.00	Total Receipts	101.25
Fertilisers	8.00	Less Calf Cost	16.00
Miscellaneous	5.00		
<u>Total Variable Costs</u>	<u>46.00</u>		
<u>Gross Margin</u>	<u>39.25</u>		
	<u>85.25</u>	Enterprise Output	<u>85.25</u>
<u>Gross Margin per acre</u>	<u>78.50</u>		

## Resources

The land available was 100 acres which had recently been de-turfed. Of this 80 acres were re-seeded over a period of 2 years, and included 20 acres sown with a Timothy-Meadow Fescue mixture, 10 acres sown to Danish-Italian rye-grass, while, on the remainder, several varieties of perennial rye-grass with white clover, were used. An overall rental of £10 per acre was agreed as being reasonable in the circumstances. As the land needed a lot of cleaning and preparation in the first year, only 52 acres of re-seeded land was available, so that only 97 calves were purchased in the first autumn. As more land became available in subsequent years more calves would be purchased.

There were no buildings. For the fattening stage of the project a clear span, dual-purpose, umbrella type building, 105' x 80', including a central silo (30' x 90') was erected.\* The buildings located at the parent farm were adapted to accommodate the calves during the rearing stage.

Labour and machinery were to be provided by the parent farm and costed to the beef cattle at current rates.

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\* The building was considered necessary to the farm whatever the future policy adopted.

### 3. SOME CONCLUSIONS FROM THE STUDY

While an experiment which began in 1967 and finished in 1972 may have limited relevance in the context of current beef production economics, the Management Committee were, nevertheless of the opinion that the record of the experiment should be made available if for no other reason than that it illustrates, once again, the very real practical difficulties encountered in developing a clear cut planned system of beef production as an enterprise in its own right under near commercial conditions.

The project suffered from many imperfections in concept and execution, particularly the latter, the result of a considerable array of constraints which the system imposes and with which the organisers of the projects had of necessity to contend, e.g. the availability of calves, in quality, numbers and timing. Apart from the various technical problems, the period covered by the experiment was one in which the economic climate for British Agriculture generally, and for the beef enterprise in particular, was one in which the relationships and inter-relationships of both input and output factors showed considerable change.

What conclusions can be drawn from the experiment? Regrettably few. The study has confirmed the very real problems which face the producer in planning a clear cut beef production enterprise such as 18 month semi-intensive beef from grass in conjunction with dairying, or as an alternative to dairying. It has indicated only too clearly the consequences which stem from the constraints with which an individual farmer setting out to establish such a system has, of necessity, to contend with, e.g. the matching of calves with regard to age, size and type. These in turn give rise to all kinds of secondary problems, such as the introduction of disease and matching the supply of grass and fodder to cattle numbers.

In short the study has demonstrated the practical problems of developing a beef enterprise as an activity on one particular type of farm when according to one authority, "beef production is probably the one farm activity which is shared in the main among all types of farms"\*.

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\* W.H. Senior, J.A.S.E. Vol IX No 1 July 1950 p. 16.

The inference here being that beef cattle production fits in much better as a supplementary enterprise in different farming systems than as a main enterprise in its own right.

However this may be bearing in mind the nature of this experiment as an exercise in the alternative use of grassland in the conditions pertaining in South West England. Allowing for the short-comings of the experiment, which partly reflect the teething problems generally associated with the establishment of a new production process, the very considerable shortfall in the results compared with the theoretical targets for this system of beef production - in themselves modest by comparison with the gross margins of dairying - do confirm the view generally held by livestock farmers in grassland areas, that beef production as a commercial enterprise in its own right, compares unfavourably with milk production.

In other words, given present relative levels of technical performance for milk and beef production, if the system of 18 month beef is to achieve comparability with dairying, then either the price of the calf needs to be adjusted downwards considerably, or the price received for beef cattle needs to be raised substantially, or some combination of such adjustments in the relative calf and beef prices in favour of the latter.\* Another theoretical possibility would, of course, be a change in the price of milk. The potential for narrowing the gap between the milk and beef enterprise, through technical progress is limited; indeed all the evidence would suggest that the advantages, in this respect, are with the dairy farmer.

In this context it is interesting to note that in a recent European publication a similar view point has been expressed, "the key factor affecting the balance of milk and beef production in Europe is that in relatively few areas is it possible to make as much profit on a given farm out of specialist beef production as out of milk, or rather the joint production of milk and meat so common over wide areas of Europe."\*\*

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\* The chart on page 41 gives some guide to what the calf price should be with varying prices for the final beef animal.

\*\* O.E.C.D. Agricultural Review 1972. No 4, p. 112.

Managements' Comments

Although an economist could draw few concrete conclusions from the experiment, from the point of view of the Dartington Cattle Breeding Centre Management some valuable experience has been gained which is summarised as follows:-

1. Under the prevailing conditions the target of 2 animals per acre was too ambitious and was never actually achieved; 1.5 animals per acre would seem about right.
2. In the heavy rainfall in the area (65 inches per year), poaching of grassland by large numbers of cattle is a serious problem in early and late season.
3. Calf purchasing must be very carefully done, preferably direct from farmers. Buying large numbers in markets is almost bound to introduce disease, in this experiment Salmonella was the trouble.\*
4. The calves required must be born between mid-August and mid-October. Because of lack of calf accommodation, the buying was spread over 3 or 4 months and the later intake never caught up and were not large enough at turning out time to take full advantage of grass.
5. It is of the utmost importance to have the right conditions for calves on introduction. Not enough emphasis was put on this and the animals suffered for it. The losses were not only in the casualties that took place but also in the animals that were ill and recovered but never caught up with the others when in close competition with the stronger calves.
6. The cost of calves is very important. The South Devons in the first batch were not really viable compared with the Friesians because of the high original cost. On the other hand the cheaper calves in the second batch were also not viable because, in order to keep the price down, we bought lower quality calves which

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\* For further information see the Veterinary Officer's report p. 15.

neither produced good liveweight gains nor were the type the butchers were looking for.

7. Capital requirements can be very considerable, particularly in the peak period of overlaps of the separate batches.
8. The experience at Venton indicates that the system under the prevailing conditions and as a separate enterprise on an off-lying farm did not approach the profitability of a dairy unit and is not an alternative. On the other hand, it is felt that a suitably sized unit, run in conjunction with a dairy herd using home-bred steer calves plus others from a disease-free farm, could be worthwhile.

#### 4. SUMMARY OF RESULTS

The records of the 4 batches, which made up the project from Autumn 1967 to Spring 1972, revealed a considerable divergence from the recognised 18 month beef system. For example some store cattle had to be purchased in the 2nd batch to make up for the 24 per cent losses due to Salmonella. As a further precaution against this disease 60 of the 149 incoming calves in batch 3 were purchased as weaned calves. On the sales side, only in one batch (batch 3) were as many as 75 per cent of the animals sold fat, in batch 4 the figure was as low as 53 per cent. It is in the light of these facts that the results which are presented in the following account must be reviewed.

The basic data relating to the project are set out in Tables 1 and 2 pages 12, 13 and 14.

The profit realised fell well below expectations, the gross margins obtained were much lower than the target figures of £78 per acre (£39 per head) for this system of beef production. Gross margins per acre varied between the different batches of cattle, from £38.4 for batch 2 to £47.7 for batch 1; with an overall average of £41.7 (£28.5 per head). Net Margins, i.e. after enterprise overheads had been deducted, averaged £13 per acre (£9 per head) with a range from £9.4 (£5.3 per head) for

batch 1 to £16.4 (£11.5 per head) for batch 3.

Average total working capital required over the four batch period was £121 per acre (£83 per head), but, because of the more intensive stocking batch 1 needed the highest capital requirement of £144 per acre, compared with the lowest requirement of £107 in batch 2. On a per head basis working capital increased from £76 in batch 2 to £94 per head for batch 4. Return on capital averaged 10.8 per cent for the four batches but varied from 6.6 per cent in batch 1 to 14.4 per cent in batch 3.

Some causes for the shortfall in the results can be gathered from the detailed analysis of the data relating to the various batches which follow this summary. They include calf procurement problems, with regard to type, price, timing, and disease, particularly Salmonella; quality and quantity of forage available and inadequate stocking rates.

Over the period, the cost per lb liveweight of the calves purchased increased by 43% from 14p (batch 1) to 20p (batch 4), while the sale price of fat cattle increased by only 28%, from £10.60 per cwt in batch 1 to £13.6 in batch 4. Comparing the Friesian steers only, the calf cost per lb liveweight increased from 9.4p to 20.4p, a rise of 117 per cent, between batch 1 and batch 4.

Variable costs in the first winter (calf stage) increased over the period of the study from £20 per head in batch 1 to nearly £30 in batch 4. These were only partially offset by a fall of £3.5 per head in the second winter (fattening stage) from £24.2 to £20.7. Grazing variable costs per animal varied little and averaged approximately £10 per head, but on an acreage basis decreased from £17.3 (batch 1) to £13.4 (batch 4).

The daily liveweight gain is a crucial factor in the economics of beef production, and this averaged 1.36 lb for the 330 animals in the first 3 batches (batch 4 selling weights incomplete). For each separate stage the average daily liveweight gain was as follows:- First winter 1.35 lb (range 1.11 - 1.20), summer grazing 1.54 lb (range 1.49 - 1.59),



second winter\* 1.40 lb (range 1.13 - 1.57).

The average weight of animals at turnout to grass ranged from 325 lb per animal (batch 2) to 390 lb per animal (batch 1). The heavier weight for the first batch was partly the result of the higher purchase weight of the South Devon calves which accounted for 47% of the turnout of this group, and partly to the fact that calves were older at turnout.

Liveweight gain per animal over the grazing period, for all animals in the experiment, was 304 lbs. Liveweight increase per acre of grass, on average, was related to stocking rate. At 1.8 animals per acre (batch 1) the gain was 546 lbs, while at 1.3 animals per acre (batch 4) the gain was 444 lbs. The reduction in stocking rate over the period was due in part at least, to the difficulties of herding large numbers of cattle on a farm located at some distance from the parent farm.

As would be expected, the purchase of forage from outside the unit had an adverse effect on margins, particularly the purchase of fodder at the fattening (second winter) stage. The resort to purchases of food from outside was partly due to deficiencies in the quantity and quality of the silage available. Undoubtedly the quality of the silage varied quite a lot over the period. Generally it was of lower quality than might have been expected and certainly of lower quality than was good for the economy of the feeding process. Improving the quality of the silage proved a more difficult undertaking than the theory of grass conservation would suggest in this respect, the experience of the project was very similar to that of many grass conservation practitioners.

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\* Batch 1, 2, 3, only.

Table 1 (Part 1)

Summary of Financial Results for 4 Batches of '18 Month Beef'

	Batch 1			Batch 2			Batch 3		
Period	Autumn 1967 - Spring '69			Autumn 1968 - Spring '70			Autumn 1969 - Spring '71		
Average Numbers	93			102			136		
Acreage	52			72.5			95.5		
	Totals	Per Head	Per Acre	Totals	Per Head	Per Acre	Totals	Per Head	Per Acre
	£	£	£	£	£	£	£	£	£
Total Receipts*	9,117	98.0		10,354	101.5		14,323	105.3	
Less Calf and Cattle Purchases <sup>+</sup>	1,591	17.1		2,728	26.7		3,805	28.0	
<u>Enterprise Output</u>	7,526	80.9	144.7	7,626	74.8	105.2	10,518	77.3	110.1
Concentrates	3,161	34.0		3,095	30.4		3,873	28.5	
Fodder purchased	185	2.0		167	1.6		440	3.2	
Fertilisers and Seed	875	9.4		845	8.3		1,143	8.4	
Veterinary	290	3.1		254	2.5		350	2.6	
Miscellaneous	532	5.7		483	4.7		658	4.8	
<u>Total Variable Costs</u>	5,043	54.2	97.0	4,844	47.5	66.8	6,464	47.5	67.7
<u>Gross Margins</u>	2,483	26.7	47.7	2,782	27.3	38.4	4,054	29.8	42.4
Direct Labour and Machinery	1,474	15.8		1,178	11.6		1,533	11.3	
Rent	520	5.6		725	7.1		955	7.0	
<u>Total Overheads</u>	1,994	21.4	38.3	1,903	18.7	26.3	2,488	18.3	26.0
<u>Net Margins</u>	489	5.3	9.4	879	8.6	12.1	1,566	11.5	16.4
Average Marginal Capital <sup>o</sup>	5,884	63.3	113.2	6,221	60.9	85.8	9,511	69.9	99.6
Average Total Working Capital	7,461	80.2	143.5	7,762	76.1	107.1	10,825	79.6	113.4

\* includes calf subsidies    + includes casualties    o calf and variable costs

Table 1 (Part 2)

Summary of Financial Results for 4 Batches of '18 Month Beef'

Period Average numbers Acreage	Batch 4			Total Four Batches		
	Autumn 1970 - Spring '72 130 95.5			Autumn 1967 - Spring '72 461 315.5		
	Totals	Per Head	Per Acre	Totals	Per Head	Per Acre
	£	£	£	£	£	£
Total Receipts*	15,052	115.8		48,846	106.0	
Less Calf and Cattle Purchases <sup>+</sup>	3,436	26.5		11,560	25.1	
<u>Enterprise Output</u>	11,616	89.3	121.6	37,286	80.9	118.2
Concentrates	4,077	31.4		14,206	30.9	
Fodder purchased	1,020	7.8		1,812	3.9	
Fertilisers and Seed	850	6.5		3,713	8.1	
Veterinary	820	6.3		1,714	3.7	
Miscellaneous	1,016	7.8		2,689	5.8	
<u>Total Variable Costs</u>	7,783	59.8	81.5	24,134	52.4	76.5
<u>Gross Margins</u>	3,833	29.5	40.1	13,152	28.5	41.7
Direct Labour and Machinery	1,661	12.8		5,846	12.7	
Rent	955	7.3		3,155	6.8	
<u>Total Overheads</u>	2,616	20.1	27.4	9,001	19.5	28.5
<u>Net Margins</u>	1,217	9.4	12.7	4,151	9.0	13.2
Average Marginal Capital <sup>o</sup>	10,813	83.2	113.2	32,429	70.3	102.8
Average Total Working Capital	12,229	94.1	128.1	38,277	83.0	121.3

\* includes calf subsidies

+ includes casualties

o calf and variable costs.

Table 2

Summary of Physical Data for 4 Batches of '18 Month Beef'

	Batch 1			Batch 2			Batch 3			Batch 4		
Period	Autumn 1967 - Spring '69			Autumn 1968 - Spring '70			Autumn 1969 - Spring '71			Autumn 1970 - Spring '72		
Average Numbers	93			102			136			130		
Acreage	52			72.5			95.5			95.5		
	Total	Per Head	Per Acre	Total	Per Head	Per Acre	Total	Per Head	Per Acre	Total	Per Head	Per Acre
Liveweight Purchases <sup>+</sup> (cwt)	100	1.1	-	150	1.5	-	214	1.6	-	151	1.2	-
Liveweight Sold (cwt)	766	8.2	-	872	8.6	-	1024*	7.5*	-	n.a.	n.a.	-
Liveweight Output (cwt)	666	7.1	12.8	722	7.1	10.0	810	5.9	8.5	n.a.	n.a.	n.a.
Period of time (cattle days)	53881	579	-	56145	550	-	72050	530	-	69889	538	-
Daily Liveweight Gain (lbs)	-	1.37	-	-	1.44	-	-	1.25	-	-	n.a.	-
Acreage Utilised	52	0.56	-	72.5	0.71	-	95.5	0.70	-	95.5	0.73	-
Liveweight Output 1st Winter(cwt)	225	2.4	-	191	2.2	-	262	1.8	-	279	2.1	-
Liveweight Output at Grass (cwt)	253	2.7	4.9	281	2.7	3.9	357	2.7	3.7	378	2.9	4.0
Liveweight Output 2nd Winter(cwt)	188	2.0	-	250	2.2	-	191	1.4	-	n.a.	n.a.	-

+ excludes casualty calves

\* includes estimated weight of in-calf heifers

n.a. - not available

## 5. VETERINARY REPORT - W. BEAUMONT, MRCVS

The profitability of this venture was greatly influenced by disease losses; in particular by outbreaks of Salmonella Dublin infection in batches 2 and 4.

Several factors contributed to the heavy losses encountered:-

1. The virulence of the strain of S. Dublin encountered.
2. The high incidence of S. Dublin in calves offered for sale.
3. The buildings available for calf rearing were not ideal from a disease prevention point of view.
4. Difficulty in providing good quality, palatable 'calf hay'.

The outbreak of Salmonellosis in batch 2 was the first such outbreak in calves to occur in the area. Calves born on the farm, or purchased from nearby farms had no natural immunity whatsoever to Salmonellosis. On coming into contact with infected carrier calves, they readily developed the disease. Due to the high virulence of the strain of S. Dublin involved, response to treatment was disappointing even when using combinations of drugs to which this strain was sensitive on laboratory test.

Both live and dead vaccines were used for preventive purposes after the first outbreak, but did not provide as much protection as was hoped for.

Routine oral dosing of calf purchases was adopted using S. Dublin specific drugs.

The test period coincided with an explosive rise in the incidence of S. Dublin in South Devon.

The trial was carried out using existing calf pens and other buildings not designed for calf rearing. Individual penning of bought-in calves for 2 weeks on entry would have greatly reduced early disease spread and given time for vaccination to build up an immunity in healthy calves.

With the buildings available, it was necessary to move young calves out of a warm house into much colder buildings when the weather was cold. When this was done soon after weaning and disbudding, the stress was considerable.

Calves do not build up a strong natural immunity before about 3 months of age; so calves being moved to colder surroundings before this age should have access to a warmer area within a yard e.g. by making a house of straw bales and providing false roofing. If they get cold, they tend to stand about, do not bother to feed properly and become very susceptible to respiratory disease.

In general it is wise to:-

1. buy calves from as few sources as possible, preferably direct from only one or two farms known to be free from Salmonellosis,
2. provide single penning in isolation for the first 2 weeks in case any calves are incubating disease.

In this particular test these conditions could not be fulfilled due to the time factor, calf supply and buildings available.

The test has shown that it is possible to encounter severe disease problems in calves in any one year, even when using the same management and buildings which had given good results in the previous year.

The costs of providing single-penning and isolation for newly purchased calves are high, but the benefits obtained in disease prevention should justify this cost over a period rather longer than that covered by this experiment.

## 6. THE FOUR BATCHES.

(1) Individual Financial and Physical DataBATCH 1.Autumn 1967 to Spring 1969.

It was clear by the Autumn of 1967 that only 52 acres would be available for grazing the following summer. Consequently only 104 calves were assembled, made up of 56 Friesian steers and 48 South Devon steers, these being the two most numerous breeds in the area. Thirteen of the Friesians and a similar number of South Devons came from the main farm and were charged at market price, the remainder being purchased through a dealer. The average price per head for Friesians was £8.2 and for South Devons £23.6. However, taking into consideration the 7 Friesians and the 4 South Devons that died, the net cost was £9.3 per head for Friesians, £25.8 for South Devons. The Friesians weighed 99 lbs per head compared with 143 lbs for the South Devons, the latter thus costing exactly twice as much per lb of liveweight as the Friesians.

All calves were treated as being one week old and given 5 c.c. of Joint-ill vaccine on arrival. Glucose and water were fed the first day, then once a day high-fat milk substitute powder, hay, cold water and calf starter nuts were available. The calves were penned in pairs and weaned either at 5 weeks old or when eating  $1\frac{1}{2}$  lbs of nuts per day. At 12 weeks old they were transferred to a shed with an outside yard and fed 4 lbs rearing nuts per day plus ad-lib hay. All were given 5 c.c. Multivite in January together with Dictol vaccination against lungworm. The latter caused a severe setback due to the vaccine being too strong. Five calves developed pneumonia of which two died. At 16 weeks the ration was changed to 4 lbs of cattle nuts per day and silage was offered.

Ninety-three animals were turned out on April 9th, 1968, weighing on average 390 lbs. Their average daily liveweight gain had been only 1.2 lbs per day making a total gain of 270 lbs in 225 days. Feed used amounted to 7.7 cwt of concentrates and milk powder for a cost of £13.6 per head.

At turnout the cattle were drenched with a stomach worm drench and fed hay and 2 lbs of cattle nuts. All 93 head were put into approximately 6 acre paddocks. However, with the wet spring the new seeds got



badly poached. In March the grassland received about 50 units of nitrogen per acre and the majority of the silage area received an additional 2 cwt of high nitrogen compound per acre. Silage cuts were taken on 27 acres at the end of May, early June, producing 240 tons approximately. After the first grazing the grassland received 3 cwt of high nitrogen compound per acre as did the silage aftermath. Subsequent grazing received 60 - 70 units of nitrogen per acre and grazing was topped where necessary. Worm drenching was again undertaken in late August. A second cut of silage was taken on 14 acres in September and yielded approximately 85 tons. Minerals were made available after it was noticed that animals were grazing hedge banks. Animals were housed on 30th October 1968 and weighed on average 696 lbs, equal to a gain of 1.5 lbs per day over the 204 days on grass. The 52 acres produced 546 lbs of liveweight gain per acre, plus silage, for a fertiliser cost of £14.4.

Ninety-two cattle were yarded (one animal was killed having strayed onto the railway lines, insurance money was received,) and fed ad-lib silage plus 6 lbs a day of cattle concentrate. After three weeks a combined stomach worm and liver drench was given. Concentrates were increased to 8 lbs per day after Christmas. Sales of fat cattle took place from mid-February, and continued until end of April when the remaining animals, some 40% of the total, were sold as stores to enable the yards to be cleared ready for silage.

The average weight of fat animals was 990 lbs and the selling price £94, store cattle sold weighed 825 lbs and sold for £85. The overall average realised value was £87 for an average liveweight of 925 lbs. The increase of 229 lbs over the yarding period represented a daily liveweight gain of 1.5 lbs over the 229 days. Concentrate usage amounted to 12.2 cwt costing £20.6 per animal.

The overall financial performance for the 93 cattle is given opposite. Receipts, including subsidies, totalled £98: calf costs amounted to £17: giving an enterprise output of £81 per head. After deducting total variable costs of £54, £34 of which was for concentrates, the gross margin was just under £27 per head, but with rent, labour and machinery totalling some £21, the Net Margin amounted to only £5 a head. Average working capital amounted to £30 a head and if interest had to be

charged the enterprise would have made a loss.

Comparisons of physical performance between Friesians and the South Devons together with other beef animals will be discussed in a later section. Financially Batch 1's total receipts and costs (excluding the cost of the calf) were very similar, but because of the difference in calf price the Friesians produced a £16 higher margin per animal.

Summary of financial results of 1st Batch of 93 cattle which used  
52 acres of land

	<u>Per Head</u>	<u>Per Acre</u>
	£	£
Enterprise Output	80.9	144.7
Variable Costs including forage	54.2	97.0
Gross Margin	26.7	47.7
Direct Overheads	21.4	38.3
Net Margin	5.3	9.4
Average Working Tenants' Capital	80.2	143.5

BATCH 2.Autumn 1968 to Spring 1970.

Between July 1968 and February 1969, 117 calves were purchased or transferred in. Again half the calves purchased were Friesian steers, the remainder being a mixture of dairy-beef cross steers and heifers. The average price paid was £13.7. Due to the calves being purchased in batches by dealers, the cost of individual calves were not available. Unfortunately, an outbreak of Salmonella resulted in the death of 23 calves. Many more were affected, and a further 5 calves were resold because of their condition and performance. The surviving 89 calves weighed, on arrival, 86 lbs and cost £17.6. Fed on a similar system to the first batch the group averaged 327 lbs liveweight at turnout on 30th April having put on 241 lbs in 209 days, or 1.15 lbs per day. Obviously the performance was considerably affected by Salmonella, they were much lighter than the first batch. Concentrates and milk powder amounted to 7.2 cwts costing £15.4.

With 72.5 acres of land now available, the depleted stock numbers had to be supplemented by the purchase of 15 store cattle in the spring of 1969, weighing on average 310 lbs and costing £37 each. Even so, the stocking rate of 104 animals on 72.5 acres was a considerable drop from the previous year and in consequence nitrogen and potash fertiliser was reduced by almost a half. The overall cost per acre of fertilisers was £10.8 per acre. First cut silage was harvested in June on 48½ acres and yielded approximately 285 tons. A further cut in August on 20 acres produced an additional 90 tons. 1969 was fairly favourable for grass, for although the spring was late an open autumn enabled animals to stay at grass until October 30th. The animals in this group weighed 627 lbs at yarding having put on approximately 302 lbs, or 1.6 lbs per day, over the 190 days at grass.

In the Autumn a further 10 stores, average weight of 453 lbs, (considerably lighter than the animals yarded) were purchased for £61 thus a total of 114 cattle were yarded and subsidy claimed. Feeding arrangements were similar to the previous year, and again animals were sold from February on. Sixty three animals went off fat at £83.4, weighing 870 lbs; and 51 were sold as stores (including 9 of the stores purchased in autumn) for £76.5 and weighing 840 lbs. The overall

disposal weight was 857 lbs, equivalent to a liveweight gain of 1.57 lb per day over the 156 day period. Concentrates fed amounted to 9.6 cwt per head and cost £15.1. The 10 store cattle purchased in the autumn were sold for £70 and, with subsidy, the average received totalled £81. After deducting purchase price of £61 and variable costs of £17 these cattle contributed very little to the overall profit margin.

The figures for this second batch of cattle were seriously affected by the problem of Salmonella which not only necessitated the purchase of additional store cattle midway through the period, but affected the performance of many of the surviving calves. Even so, with an overall output including subsidy of £74.8 per animal, variable costs of £47.5, (£30 of which was concentrates), and a gross margin of £27.3 per animal, the results for this batch were very similar to those for the first batch. Overheads at £18.7 were lower, due to less labour and machinery hours. The Net Margin of £8.6 was therefore higher, and with average working capital lower at £76, this second batch, despite the problems encountered, probably broke even had interest been charged.

Summary of financial results of 2nd Batch of 102\*\* animals which used 72.5 acres of land.

	<u>Per Head</u>	<u>Per Acre</u>
	£	£
Enterprise Output	74.8	105.2
Variable Costs including forage	47.5	66.8
Gross Margin	27.3	38.4
Direct Overheads	18.7	26.3
Net Margin	8.6	12.1
Average Tenants' Working Capital	76.1	107.1

\*\* Animals purchased as store included proportional to the time in the system.

BATCH 3.Autumn 1969 to Spring 1971.

For the third batch 95.5 acres of grazing land would be available, so that considerably more calves were needed and with the Salmonella problem of the previous year in mind it was decided to buy a proportion of weaned calves. In this way the pressure on calf buildings would not be so great, the wide age variability of the calves would be obviated and there would be less chance of a high mortality rate. Sixty weaned calves and 89 small calves were purchased only 4 of which died. The average cost of the weaned calves was £36.1 per head, and the average weight 241 lbs. The week-old calves cost £18.4 per head and weighed 112 lbs which in terms of cost per lb of liveweight slightly favoured the weaned calves. The intake included 65 dairy-beef cross heifers, and 27 dairy-beef cross steers, the remainder being Friesian steers.

By the end of the first winter the cattle had added an average of 202 lbs per head in 182 days, a liveweight gain per day of 1.11 lbs. This was lower than the previous year. The reason appeared to be a breed difference. The Friesian steers put on 1.34 lbs per day, while beef-type steers added only 0.92 lb. a day and heifers 1.01 lb a day. The weaned calves on average did slightly better than the young calves although again the Friesian steers did better and the beef-type steers did worse than their respective group average.

On account of their small size 12 calves were sold in the spring for £34 each, weighing on average 243 lbs. Thus the average weight at turnout was increased to 383 lbs. Because of the cold and wet spring, as in the previous year, the animals were not turned out to grass until 20th April. This late start together with near drought conditions in May and June were unfavourable for grass production. However an exceptionally fine warm autumn followed. Silage harvested in May and June from 41.5 acres produced 300 tons and in August - September 150 tons from 31 acres. Fertiliser usage averaged 202 units of nitrogen, 82 phosphate, 43 potash, and cost £7.7 an acre. Two lbs of cake per head per day was introduced 14 days before yarding.

There was only one casualty during the summer grazing period. The remaining 132 cattle were housed on 9th November 1970. They weighed

686 lbs and had thus put on 303 lbs, a daily gain rate of 1.49 lbs. The stocking rate was 1.4 animals per acre plus a silage crop.

Unfortunately soon after yarding it became clear that some of the heifers were in calf, but the culprit remains a mystery!! The animals were divided on a liveweight basis into two groups, the larger animals received 8 lbs of concentrates a day and the smaller animals 6 lbs. The overall area per animal was just over 40 sq. ft. with 6 inch feeding face, at which level of housing the cattle had the appearance of being too crowded. There was one casualty due to injury with a stanchion. The silage quality was not good; it had overheated, and was of low digestibility, but the cattle appeared to like it. The first of the cattle were sold in late December, and in all 98 animals went off fat between that date and mid-May, at an average price of £97 and an average weight of 858 lbs. 33 were sold as stored, and 17 of these were heifers in calf. The average price for the store animals was £93, partly due to good price for in-calvers and they weighed on average 826 lbs.

The overall financial performance indicates that enterprise output, i.e. net of calf purchases was £77 (receipts £105 less calf costs of £28). Variable costs remained unchanged at £47.5 per head giving a gross margin of almost £30 per animal or £42 per acre. Overheads at £18.3 were very similar to the year before so that the margin was £11.5 per animal or £16 an acre.

Summary of financial results of 3rd Batch of 136 animals which  
used 95.5 acres of land

	<u>Per Head</u>	<u>Per Acre</u>
	£	£
Enterprise Output	77.3	110.1
Variable Costs, including forage	47.5	67.7
Gross Margin	29.8	42.4
Direct Overheads	18.3	26.0
Net Margin	11.5	16.4
Average Tenants' Working Capital	79.8	113.4

BATCH 4.Autumn 1970 to Spring 1972.

With the experience gained from three batches of calves of mixed breed and sex it was decided to concentrate on the Friesian steer, to see if the performance recorded by Friesian steers in the previous years could be more fully exploited. Of the 148 calves purchased in the Autumn of 1970, 135 were Friesian steers and the rest dairy-beef cross steers. It was unfortunate that once again Salmonella affected 50 calves of which 15 died, animals were injected on arrival but without noticeable results; on this occasion only 8 weaned calves were purchased in December. A new building became available for calves after weaning which helped the housing problem. The average price of surviving calves was £26, average weight 127 lbs. They received the same treatment as the cattle in the previous three batches, going out to grass on April 15th at an average weight of 362 lbs, indicating an increase of 1.15 lbs per day over the 205 days. Concentrates and milk powder (7.5cwt) cost £16.3 per calf. Again the animals were split by weight into two bunches, and put into paddocks of approximately 6 acres. Conditions for grass growth were again not particularly favourable in this particular area so that while 350 tons of silage were made in May and June from 60 acres, no autumn silage was made, which left the farm with substantially less silage than was required. Less fertiliser was used, but conditions were so dry that what was applied was of little use. Three calves died during the grazing period and two more were sold.

The remaining 128 animals tipped the scales at 693 lbs, a gain during the grazing period of 331 lbs or 1.57 lbs a day. The stocking rate for this batch was at the rate of only 1.34 animals per acre, plus silage. The cattle were housed on November 12th after 6 weeks of concentrate feed at grass. To prevent overcrowding a proportion of the cattle were housed in a second building. They were fed silage from the other farm which had been charged in at saleable value relative to hay. High store cattle prices in the spring of 1972 resulted in prices per cwt for store cattle in excess of fat prices, and consequently 60 of the 128 cattle were sold as stores. Unfortunately weighing facilities were not available so that the true price per cwt and the performance of these animals could not be assessed. The average price received



was £103. The fat animals sold between February and early March averaged £107·6 per head, and weighed 883 lbs.

The overall performance of this batch indicates that total receipts were almost £116 per animal which after deducting calf costs of over £26 gave an enterprise output of £89, £12 higher than for the previous year. However variable costs increased by a similar amount due to the fact of additional concentrates, higher veterinary costs and more forage purchases. Overhead costs also increased, and the overall margin of £9·4 per head or £12·7/acre with an average tenants' capital involvement of £94 per animal, gave a return of 10 per cent only.

Summary of financial results of 4th Batch of 130 animals  
which used 95·5 acres of land

	<u>Per Head</u>	<u>Per Acre</u>
	£	£
Enterprise Output	89·3	121·6
Variable Costs including forage	59·8	81·5
Gross Margin	29·5	40·1
Direct Overheads	20·1	27·4
Net Margin	9·4	12·7
Average Tenants' Working Capital	94·1	128·1

(2) Supplementary Information

Each individual batch of cattle differed in one aspect or another and in this section some comparisons of the results for the 4 batches have been made.

a) Calf purchases

In all four batches part of the calf requirements were transfers, at sale value, from the Dartington cattle breeding farm dairy herd. The remainder were purchased through a dealer, who, in the main, dealt through the open market. To a certain extent the method of calf procurement had a major influence on the level of profits. Contracts for buying calves off the farm within the three month limited period would appear the best method, in so far as this might possibly have prevented the Salmonella outbreaks in the 2nd and 4th batches. However, the numbers of calves required and the time span available to buy them, necessitated purchase through a dealer who, even with his farm contacts, had of necessity to resort to the open market to fulfil numbers.

The second problem was the type and capacity of the calf house. Larger capacity houses with individual pens would have increased the building costs, but a more uniform size of calves at turnout should be produced and could allow for pens to be rested, and in that way have prevented disease. At 1972 calf price levels, batch 2, with a casualty rate of 24 per cent, would have resulted in losses of over £1000. The lowest casualty rate achieved was in the third batch when only 3% of the 149 calves died; additional precautions were obviously taken after the previous batch but the purchase of 60 weaned calves certainly assisted the calf buildings and the risk of disease.

The price paid for calves increased from an average of £15 for a 120 lb calf (batch 1) in 1967, to £23 in 1970 for a 127 lb Friesian bull calf. Breed and sex of calf affected the prices and after batch 1 it was considered that calves of South Devon breed were too expensive for this lightweight finishing system, and for batch 2, beef-dairy crossed steers and heifers were purchased as well as Friesian steers. It is possible that this switch to the cheaper calf may have prejudiced

Table 3

CALVES - Numbers purchased, cost, and casualties 4 Batches  
of Cattle

Batch	1	2	3	4
Year of Purchase (Autumn)*	1967	1968	1969	1970
<u>Numbers</u>				
Purchased as young calves	104	117	89	140
Purchased as weaned calves	-	-	60	8
Total purchases	104	117	149	148
Number survived	93	89	145	133
Casualty rate %	11	24	3	10
<u>Weight surviving calves</u>				
		Per Calf		
At arrival as calves (lb)	120	86	112	120
At arrival as weaned (lb)	-	-	241	235
Average weight (lb)	120	86	166	127
<u>Cost</u>				
Calves (£)	15.3	13.7	18.4	22.7
Weaned calves (£)	-	-	36.1	32.9
Average all calves (£)	15.3	13.7	25.5	23.2
Net Cost including Mortality (£)	17.1	17.6	26.2	25.9
<u>Cost per lb. Liveweight</u>				
Calves (p)	13	16	17	19
Weaned calves (p)	-	-	15	14
Average (p)	13	16	16	18
Net cost of calves surviving (p)	14	20	16	20

\* period of purchase from August to December

the future performance of these batches, and was thus a step in the wrong direction. Breed performance will be discussed in more detail later in the report, when it will be seen that the Friesian steer would appear to compare very favourably with other breeds and crosses at the same price per lb of liveweight. The overall increase in the cost per lb of liveweight represents 43 per cent as between the first batch purchases (1967) and last batch (1970).

b) The 'First' Winter calf period

The average weight of incoming calves varied considerably between batches from 86 lbs (1968 batch) to 166 lbs (1969 batch) due to breed, sex, age, and class of calves purchased. The average time spent on the farm before turnout also varied from 182 days (1969 batch) to 225 days (1967 batch) the variation being due to the varying dates of purchase and varying dates of turnout to grass. The date of turnout, varied from 9th - 23rd April. The best average turnout weight (390 lbs) was achieved in the first batch due to a combination of length of period, original weight, and the daily liveweight gain. The lightest average turnout weight (327 lbs) was batch 2, due mainly to the light weights at arrival and no doubt the effects of Salmonella.

At no time did the average daily liveweight gain performance exceed 1.2 lbs per day, which was well below the target figure of 1.7 lbs per day. More worrying was the fact that no improvement in batches as between the 1st and 4th batches was observable. No one reason stands out for the poor performance, for example, the worst batch was the third (1969) batch, which had no recordable disease problems. A combination of breed, housing and management is the most likely explanation but in the relatively short period of the study no solutions were found. Concentrate feed levels remained fairly constant at between 7.1 and 7.7 cwt per head, and the concentrate per lb of liveweight increase cost increased from 5p to 7p over the period. Total variable costs increased from £20.3 per head for batch 1 (1971) to £29.7 per head for batch 4 (1970).

Table 4 Some Cost and Performance Data, 1st Winter Calf Period

	Batch 1	Batch 2	Batch 3	Batch 4
Year of Purchase (Autumn)	1967	1968	1969	1970
Number of Calves*	93	89	145	133
<u>Weight</u>	Per Animal			
Average Initial Weight (lb)	120	86	166	127
Average Turnout Weight (lb)	390	327	368	362
Average Increase (lb)	270	241	202	235
Number of days to Turnout	225	209	182	205
Daily Liveweight Gain (lb)	1.20	1.15	1.11	1.15
<u>Concentrates and milk powder used</u>				
Quantity (per calf) (cwts)	7.7	7.2	7.1	7.5
Cost (per calf) (£'s)	13.6	15.4	14.0	16.3
Conc. per lb l.w.g. (lb)	3.2	3.3	3.9	3.6
Cost per lb l.w.g. (p)	5.0	6.4	6.9	6.9
Total Variable Costs (£)	20.3	22.1	20.3	29.7

\* Survived

c) Summer Grazing Period

There are two main aspects to summer grazing - the individual animal performance and the per acre performance. These aspects are connected through stocking rate. The latter, that is the stock units per acre, almost reached the target of two animals per acre only in the first year. Grazing management of large numbers of cattle proved difficult and stocking rate decreased to 1.4 animals per acre for the 2nd and 3rd batches, and 1.34 for the 4th batch which proved more manageable. Daily liveweight gain reached 1.59 lbs per day for the 2nd batch, and dropped to 1.49 lbs for the 3rd batch. Which, for the latter, following the poor winter performance, suggested that perhaps it was the poor performance of the heifers which was affecting the overall figures.

Accompanying the fall in stocking rates fertiliser application decreased. Total liveweight produced per acre was in direct relationship to stocking rates and varied from a high of 546 lbs per acre plus silage, at a stocking rate of 1.8 animals per acre, to an output of between 419 lbs and 444 lbs plus silage at a stocking rate of the order of 1.4 animals per acre. In line with the falling stocking rate, variable costs decreased from £17.3 per acre for batch 1 to £13.4 per acre for batch 4. Variable costs per head at grass did not vary significantly; in batch 1 they were £9.7 per animal and for batch 4 £10. New Forest eye disease was a problem in two batches.

It is clear that performance both in terms of liveweight gain or stocking rate has not reached the target, even though the newly seeded land should have given good production. The basic problem was the difficulty of containing and satisfying young cattle in large numbers on a limited area. In the spring poaching in this high rainfall area occurred and fly problems in summer made a strict paddock system difficult. Unlike dairy cows, the different batches of young cattle had to be trained to an intensive paddock system, and the fact that an off-farm was involved added to the problem.

Table 5 Some Cost and Performance data, SummerGrazing period, 4 Batches of Cattle

	Batch 1	Batch 2	Batch 3	Batch 4
Grazing Year	1968	1969	1970	1971
Number of Animals	93	104	132	128
Acres Utilised	52	72.5	95.5	95.5
	Per Animal			
Average Turnout Weight (lb)	390	325	383	362
Average Yarding Weight (lb)	698	627	686	693
Average Increase (lb)	308	302	303	331
Average Number of Days	204	190	203	211
Daily Liveweight Gain (lb)	1.51	1.59	1.49	1.57
Total Variable costs at grass (£)	9.7	9.0	10.5	10.0
Variable costs* per lb of l.w.g. (p)	3.1	3.0	3.5	3.0
	Per Acre			
<u>Fertiliser Usage</u>				
Nitrogen (units)	312	161	202	172
Phosphate (units)	60	132	82	21
Potash (units)	60	28	43	21
<u>Total Liveweight Gain</u> (lb)	546	433	419	444
+ tonnage silage harvested	6.3	5.2	4.7	3.7
<u>Stocking rate (incl. conservation)</u>				
Animals per acre	1.8	1.4	1.4	1.3
<u>Variable costs at Grass</u> (£)	17.3	12.9	14.6	13.4

\* variable costs include silage acreage fertiliser and seeds



d) The 'Second' Winter Fattening Period

With the third and fourth batches the autumns were mild and reasonably dry so that the cattle were not yarded until mid-November, although concentrates were fed at grass from mid-October. Except for the second batch, animals were yarded at an average liveweight of something over 6 cwt.

With the first batch the object was to fatten all animals and concentrates were fed accordingly, but because of breed type and weight at yarding, 40 per cent of the animals had to be sold as store and the concentrate cost relative to the daily liveweight gain was expensive, being about equal to the value of liveweight gain. With the later batches those animals which appeared to have the potential for fattening were separated out and fed additional concentrates. The remainder intended for the store market were fed less concentrates. The daily liveweight gain improved for the 2nd batch with the concentrate cost per lb of liveweight gain reduced to 6p a lb, the changed system appeared to have been worthwhile. Unfortunately the 3rd batch was affected by the 'in-calf heifers' problems, but this misfortune apart the performance of the steer cattle was also lower at 1.31 lbs per day liveweight gain. With the 4th batch only the fat animals were weighed at sale and their performance, at 1.31 lbs, fell well below the target of 2 lbs per day. Over the four batches, variable costs decreased from £24.2 per animal for batch 1 to £16.2 for batch 3, but rose for batch 4 to £20.7 per animal due to higher concentrate prices and more purchased fodder.

The Winter fattening period performance will depend to some extent, at least, on the previous performance, on the weight of animal at yarding and type of cattle, as well as quantity and quality of silage, and it could be argued that additional concentrate feed fed may have resulted in more animals being fattened. However, in the circumstances that were found when cattle were yarded, and when the demand for store cattle pushed the price per cwt up to or in excess of the fat price in the spring, the policy appeared to be the right one.

Table 6

Some Cost and Performance DataSecond Winter (Fattening - stage) 4 Batches of Cattle

Batch	1	2	3	4
Winter	1968/69	1969/70	1970/71	1971/72
Number of Animals	92	114	131	128
	Per Animal			
<u>Weights</u>				
Weight at Yarding (lb)	696	612	687	723*
Weight at Sale (lb)	925	857	850	884*
Weight Increase (lb)	229	245	163	161*
Number of days fattening	152	156	144	123*
Daily Liveweight Gain (lbs)	1.51	1.57	1.13	1.31*
<u>Feed</u>				
Conc. (£)	20.6	15.1	13.5	13.3
Cost per lb. of l.w.g. (p)	9.0	6.2	8.3	n.a.
Concs. (cwt)	12.2	9.6	7.3	6.8
Conc. used per lb. l.w.g. (lb)	6.0	4.4	4.9	n.a.
<u>Variable Costs</u>				
Total during fattening (£)	24.2	17.0	16.2	20.7

\* Applies to fat animals only.

e) Sales of Cattle and selling practice

Selling contracts were investigated, but the restrictive clauses favoured the better animals, leaving the lower quality animals in a poor sale situation. Timing of sale was very important, especially for the store market.

The fat animals in batch 1, which were Friesian or South Devon steers went to market at 9 cwt. The other batches went off at approximately 8 cwt, except for batch 3 which weighed 7.6 cwt, the lower average weight being due to the numbers of heifers included. Receipts for fat animals varied from £83.4 per fat animal for the second batch to £107.6 for the fourth batch. Price per cwt was £10.6 for batch 1 and £13.6 for batch 4, an increase of 28 per cent over the period. The cattle sold as stores fetched a slightly lower price per cwt for the first two batches and although the store price appeared to be higher than the fat cattle price in the case of batches 3 and 4, lack of weight data prevented accurate comparison.

Table 7 Analysis of Cattle Sales - 4 Batches

	Batch 1	Batch 2	Batch 3	Batch 4
Year sold - Spring	1969	1970	1971	1972
Cattle Sold Fat (no)	56	63	98	68
Cattle Sold Store (no)	36	51	33	60
Total Cattle Sold (no)	92	114	131	128
% Sold Fat	61	55	75	53
	<u>Per Animal</u>			
Weight of Fat Cattle (lbs)	990	870	858	883
Stores (lbs)	825	840	826*	n.a.
Total (lbs)	925	857	850*	n.a.
Receipts for Fat Cattle (£)	93.7	83.4	96.9	107.6
Stores (£)	85.2	76.5	92.9	103.1
Total (£)	87.2	80.3	95.9	105.5
	<u>Per Cwt.</u>			
Fat Cattle (£)	10.6	10.7	12.6	13.6
Store Cattle (£)	10.5	10.2	12.6*	n.a.
Total Cattle (£)	10.6	10.5	12.6*	n.a.

\* Included estimation of weight of in-calf heifers.

f) Breed of Cattle (Comparison of Friesian steers and cross-bred steer and heifer calves).

Except for batch 1 all animals were run together and consequently there were no costings on a breed basis. In batch 1 costs did not appear to vary significantly as between the breeds.

As a calf the Friesian steer performed significantly better on average than other beef breed crossed steers and heifers. The same result held good for the grazing stage. In contrast in the fattening period the beef-cross steer tended to have a better liveweight gain than the Friesian steer but beef-cross heifers did not perform as well. On the overall performance, the Friesian steer did as well as, or sometimes slightly better than, the beef-cross steer. Beef-cross heifers did not perform as well as the steers and in addition had a lower selling price. In the circumstances in which this experiment was undertaken it could be said that by and large the Friesian steer calf was the most suitable type of animal, being generally more readily available and at a cost per lb which compared very favourably with other beef type steers and heifers.

g) Labour and Machinery

All labour and machinery were provided from the parent farm\*, and charged at current rates. If the unit had been completely self-contained an entirely different set of hours and costs would have operated. However, the labour hours<sup>+</sup> actually supplied to this unit do allow some reasonable estimates of the labour needed to run such a unit of 100 acres.

Batch 1 had a high requirement of 31 hours per animal with large peaks of labour requirements in May and June, and also September, October and November. With subsequent batches the labour varied between 16 and 20 man hours per animal throughput and while peaks in labour requirements were evident, they were not so pronounced. The critical periods were the spring silage making period, and the overlapping autumn silage and calf rearing periods; also the winter fattening and calf rearing period.

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\* Dartington Hatchland Farm

+ Appendix II

Table 8

Breed Comparison

	Friesian Steers				Other Beef Breeds and Crosses				
					Steers			Heifers <sup>∅</sup>	
	1	2	3	4**	1	2	3	2	3
<u>1st Winter</u>									
Number of Calves	49	46	52	125	44	21	27	23	65
Weight at Arrival (lb)	99	89	174	128	140	83	178	81	157
Average weight at Turnout (lb)	383	356	439	364	395	300	324	299	340
Average weight Increase (lb)	284	267	265	236	255	217	146	218	183
Average number of Days	223	224	197	205	228	197	157	198	181
Daily liveweight gain (lb)	1.27	1.15	1.34	1.15	1.12	1.10	0.92	1.10	1.01
<u>Summer Grazing</u>									
Number of Stock	49	48	48	120	44	27	24	28	60
Average weight at Turnout (lb)	383	350	442	373	395	288	333	313	352
Average weight at Housing (lb)	695	663	761	695	701	570	639	610	640
Average weight Increase (lb)	312	313	319	322	306	282	306	297	288
Average number of Days	204	190	203	211	204	190	203	190	203
Daily liveweight gain (lb)	1.53	1.64	1.57	1.53	1.50	1.48	1.51	1.56	1.42
<u>Fattening</u>									
Number of Animals	49	48	48	65+	44	27	23	28	43*
Average weight at Housing (lb)	695	663	760	724+	701	571	644	610	651*
Average weight at Sale (lb)	933	895	944	886+	916	877	831	795	805*
Average weight Increase (lb)	238	232	184	162+	215	306	187	185	154*
Average number of Days	161	152	140	123+	142	159	147	133	138*
Daily liveweight gain (lb)	1.48	1.50	1.31	1.31+	1.51	1.92	1.27	1.39	1.11*
<u>Total Period</u>									
Average weight at Arrival (lb)	99	94	174	146+	140	83	196	81	158
Average weight Disposal (lb)	933	895	944	884+	916	877	831	796	796
Average weight Increase (lb)	834	801	770	738+	776	794	635	715	638
Average number of Days	588	558	540	533+	574	546	506	521	533
Daily liveweight gain (lb)	1.42	1.44	1.43	1.38+	1.35	1.45	1.26	1.37	1.19
Average Selling Price (£)	98.7	96.4	102.3	107.6+	97.4	93.5	92.5	84.2	88.7

∅ heifers reared in batch 2 and 3 only.

\*\* batch 4 consisted of Friesian breed only.

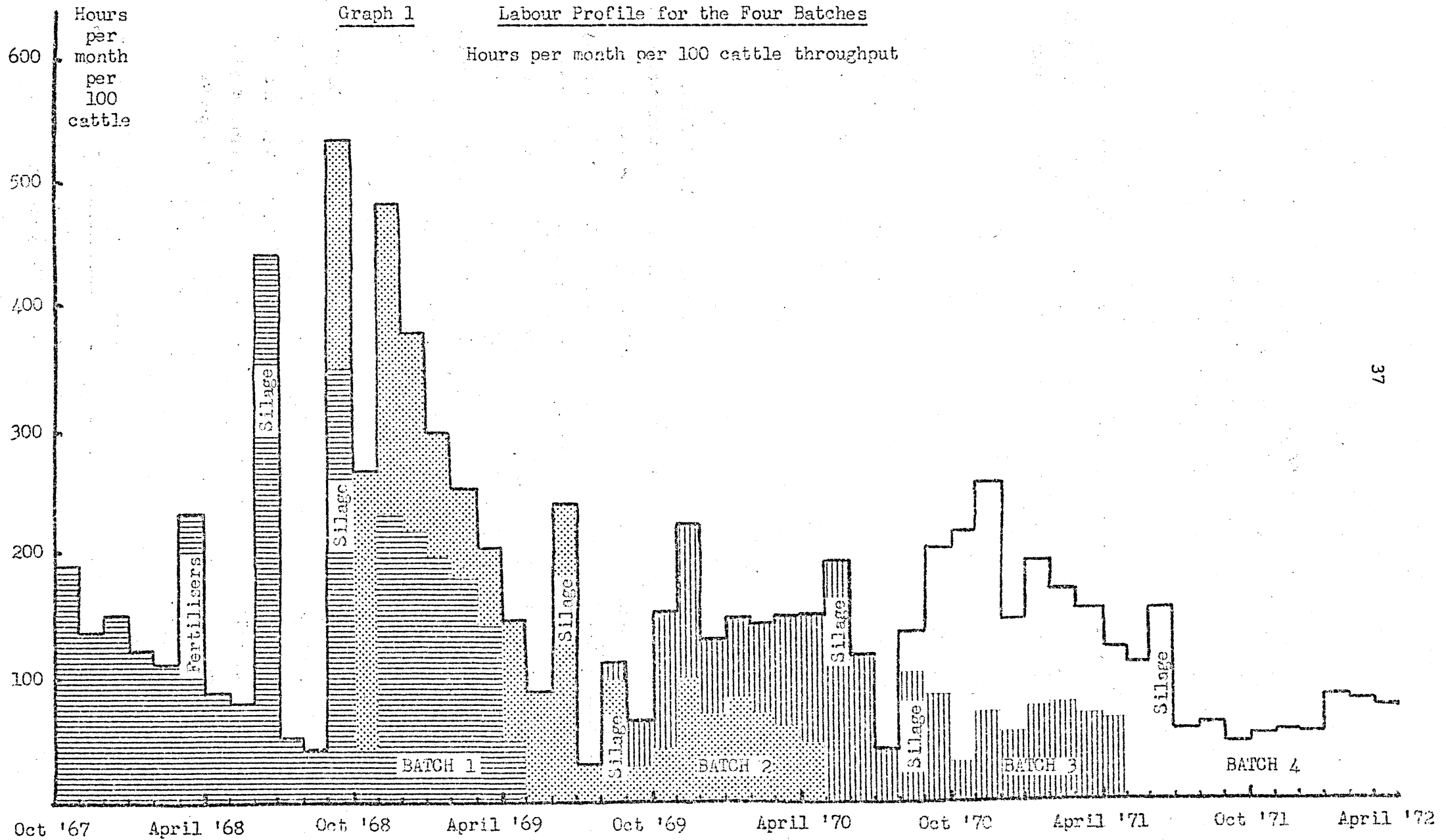
\* excludes heifers in calf.

+ only fat weight available.

Graph 1

Labour Profile for the Four Batches

Hours per month per 100 cattle throughput



It would appear from graph 1 that one man could manage up to 60 - 70 acres, supporting up to 100 head of cattle throughput per annum, with the help of silage contractors. However the winter period, when both young calves and fattening cattle have to be managed, would be the limiting factor for larger numbers of cattle.

Machinery requirements were similar to other intensive grazing livestock enterprises but for making improved quality silage for self-feeding by 12 - 18 month old cattle, a double-chop forage harvester would appear to be necessary.

#### h) Working Capital Requirements

The 18 month beef system of cattle production requires sufficient capital to pay the costs of an animal including its purchase price until it is sold. There is the additional requirement for the buying and feeding of a second batch of cattle for 6 months before the returns of the first batch are realised.

Working capital can be assessed as variable costs of feed, fertilisers, etc., plus the calf cost, together with, or without, the overhead costs of labour, machinery and rent. The peak capital requirement, with or without overheads comes in February immediately before the first group of cattle are sold and when the next batch of cattle are approaching 5 months old. In this study, in terms of variable and calf costs the level of investment rose from approximately £80 per animal throughput before the first batch was sold, to approximately £100 in the period immediately before batch 3\* was sold. The inclusion of overhead costs to these figures would increase the peak capital requirement by £15 - £20 per animal throughput.

In terms of 'average' capital requirement the investment in calf and variable costs amounted to £60 per animal throughput in the year to April 1969 and £75 per animal in the year to April 1971. Including overhead costs, the average total working capital investment amounted to over £90 in batch 4 compared to £76 - £80 for the three previous batches.

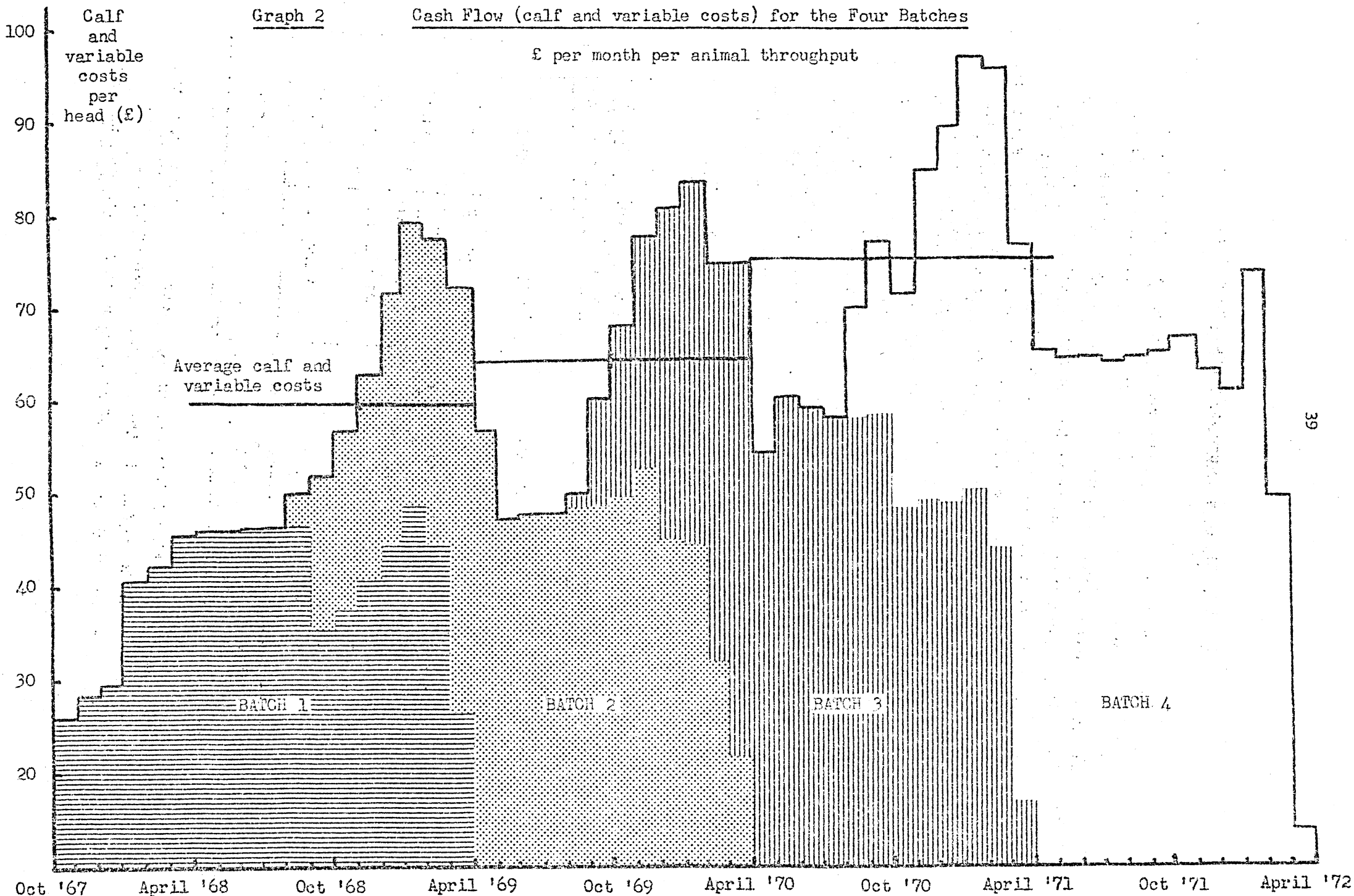
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\* Batch 4. In the final winter there were no young cattle purchased in batch 4 for the following batch and the peak capital was not comparable.

Graph 2

Cash Flow (calf and variable costs) for the Four Batches

£ per month per animal throughput





## 7. UPDATING THE EXPERIMENT RESULTS TO 1973

Although there were changes in costs and returns during the four year experiment there has been considerable increases in both prices and costs in the latter part of 1972. To update the experiment in the light of the present situation we have had to assume that performance will not alter significantly so that in the table below present day variable costs can be assessed. Because both calf prices and fat prices are the least predictable a table (appendix IV) and a graph have been constructed to give an indication of gross margin per head at variable calf and fat cattle prices. The calf price is net of any calf subsidy but includes losses due to mortality. To an average calf price of £50 one would add say £6 for mortality (12 per cent) and deduct £8.50 for calf subsidy (steer) to give a net price of £48. Paying such a net figure and hoping for a gross margin of £40 per head the price of fat cattle would need to be £20 per cwt at present performance levels.

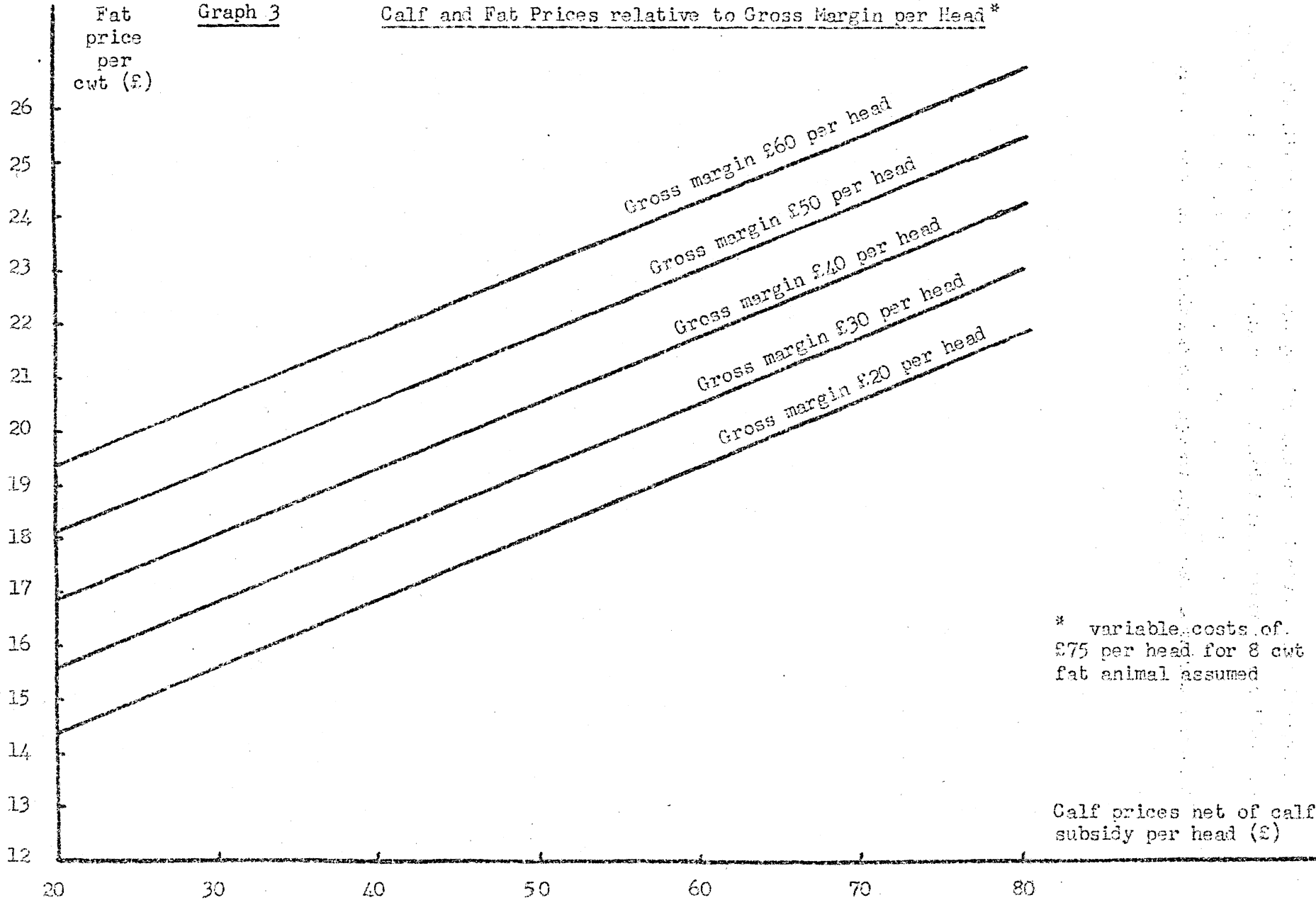
Updating of Past Performance Data to Present-day Prices

Variable Costs	Past Performance per Head	Present Prices per Unit	Present-day Cost per Head
1st Winter Concentrates	7.5 cwt	£3 per cwt	£22.5
2nd Winter Concentrates	8.0 cwt	£2.5 per cwt	£20.0
Fertilisers	143 units nitrogen 40 units phosphate 40 units potash	5p per unit 5p per unit 3p per unit	) ) £10.5 )
Purchased Forage	5 cwt hay	£1 per cwt	£ 5.0
Other Variable Costs	£14	20% increase	£17.0
Total Variable Costs	£60	-	£75.0

With the continual increase in calf prices and other costs the amount of working capital in this system is expanding also, this necessitates the introduction of further capital. The enterprise in

Graph 3

Calf and Fat Prices relative to Gross Margin per Head\*



\* variable costs of  
£75 per head for 8 cwt  
fat animal assumed

Calf prices net of calf  
subsidy per head (£)

itself does not appear to produce sufficient net returns to fund the additional costs even before tax and any other prior commitments on the eventual margin have been taken into account. It is for this reason that even a static 18 month beef enterprise would need to invest or borrow additional sums even though the margins would appear to be improving.

APPENDICES

Appendix I

Output, Costs, Margins, 18 Month  
Beef System, Autumn 1967-Spring 1972

All Batches

	No.	£		No.	£
Purchased	518 calves	10,444	Sales - Casualties	(63)	86
	26 stores	1,202	Young Stores	(15)	553
	544	11,646	Large Stores	(181)	16,000
			Fat	(285)	27,314
Enterprise Output (Carried Forward)		37,286	Calf Subsidy		4,979
		48,932		(544)	48,932

		Total £	£	Per * Head £
<u>Enterprise Output</u>	Brought forward	37,286		80.9
<u>Costs</u>				
Concentrates	£	14,206	£	30.8
Fodder Purchased		1,812		3.9
Fertiliser and Forage		3,713		8.1
Other Variable Costs		4,403		9.6
Total Variable Costs		24,134		52.4
<u>Gross Margin</u>		13,152		28.5
Rent		3,155	£	6.8
Labour and Machinery		5,846		12.7
Total Direct Overheads		9,001		19.5
<u>Net Margin</u>		4,151		9.0
<u>Capital</u>				
Average variable and calf costs per annum		32,429		70.4
Average Total Working Cap. per annum		38,277		83.0

\* average of 461 cattle on '18 months system'.

## Appendix II

Labour Profile for 4 Batches  
Hours per 100 cattle throughput

Month	From Aug 1967	May 1968 - April 1969			May 1969 - April 1970			May 1970 - April 1971			To April 1972
	Batch 1	Batch 1	Batch 2	Total	Batch 2	Batch 3	Total	Batch 3	Batch 4	Total	Batch 4
May		80		80	90		90	192		192	108
June		443		443	240		240	118		118	155
July		54		54	27		27	41		41	54
August		43		43	99	8	107	105	34	139	60
September	57	350	183	533	26	38	64	86	118	204	44
October	190	40	226	266	42	113	155	30	190	220	53
November	138	235	248	483	102	122	224	73	181	254	57
December	153	217	162	379	69	59	128	55	90	145	56
January	123	199	101	300	85	64	149	75	120	195	82
February	113	184	71	255	70	71	141	78	92	170	80
March	237	141	65	206	62	88	150	68	88	156	56
April	91	52	92	144	47	105	152	64	58	122	20
Total Labour	1102	2038	1148	3186	959	668	1627	985	971	1956	825

Cash Flow (calf + variable costs) for 4 Batches£ per animal throughput

Month	From Aug 1967	May 1968 - April 1969			May 1969 - April 1970			May 1971 - April 1971			May 1971 -April 72
	Batch 1	Batch 1	Batch 2	Total	Batch 2	Batch 3	Total	Batch 3	Batch 4	Total	Batch 4
May		46·6		46·6	47·2		47·2	60·4		60·4	64·7
June		46·7		46·7	47·6		47·6	59·1		59·1	64·9
July		46·8		46·8	47·8		47·8	58·0		58·0	64·3
August	11·8	46·8	3·5	50·3	48·3	1·8	50·1	58·0	12·2	70·2	64·7
September	21·4	35·1	16·8	51·9	48·3	11·9	60·2	58·3	18·7	77·0	65·1
October	26·5	37·3	19·2	56·5	49·5	18·5	68·0	48·4	23·1	71·5	66·8
November	28·5	40·8	22·2	63·0	52·8	24·7	77·5	49·2	34·8	84·0	63·2
December	29·5	44·5	27·3	71·8	45·0	35·9	80·9	49·0	39·9	88·9	61·3
January	40·7	48·8	30·2	79·0	44·6	39·0	83·6	50·3	46·2	96·5	74·2
February	42·4	44·7	32·4	77·1	32·1	42·5	74·6	43·9	52·0	95·9	49·4
March	45·8	26·5	45·6	72·1	21·8	52·6	74·4	17·0	59·8	76·8	13·1
April	46·6	3·6	53·0	56·6	-	54·6	54·6	3·8	61·5	65·3	-
Average Per Month*	32·5	39·1	27·8	59·9	43·7	31·3	63·9	46·3	38·7	75·3	59·2

\* Cash flow divided by no. of months involved.

Gross Margins obtainable given present day costs and varying  
calf and fat cattle prices

Fat Price		Calf Prices (Net of Calf subsidy receivable)										
Per cwt	Per head	£ 20	£ 25	£ 30	£ 35	£ 40	£ 45	£ 50	£ 55	£ 60	£ 65	£ 70
£	£	Gross Margin per head (assuming Variable costs £75* and 8cwt fat-cattle)										
12	96	1	- 4	- 9	-14	-19	-24	-29	-34	-39	-44	-49
13	104	9	4	- 1	- 6	-11	-16	-21	-26	-31	-36	-41
14	112	17	12	7	2	- 3	- 8	-13	-18	-23	-28	-33
15	120	25	20	15	10	5	0	- 5	-10	-15	-20	-25
16	128	33	28	23	18	13	8	3	- 2	- 7	-12	-17
17	136	41	36	31	26	21	16	11	6	1	- 4	- 9
18	144	49	44	39	34	29	24	19	14	9	4	- 1
19	152	57	52	47	42	37	32	27	22	17	12	7
20	160	65	60	55	50	45	40	35	30	25	20	15
21	168	73	68	63	58	53	48	43	38	33	28	23
22	176	81	76	71	66	61	56	51	46	41	36	31
23	184	89	84	79	74	69	64	59	54	49	44	39
24	192	97	92	87	82	77	72	67	62	57	52	47

\* Variable costs based on past physical performance and today's prices see Page 40.



Terms and Definitions used in this report

18 Month Beef	Calves purchased in autumn, turned out to grass following spring, yarded for their second winter and sold fat in the spring at approximately 18 months old.
Average Numbers	Cattle numbers present for the period under review e.g. For a complete batch, animals purchased in the spring and only present for 12 months in the system, would be included as two thirds the numbers involved.
Enterprise Output	Cattle sales plus subsidies, less calf purchases.
Variable Costs	Concentrate feeds, veterinary and medicines, fertilisers, seeds, haulage and miscellaneous expenditure specific to the enterprise.
Gross Margin	Enterprise Output less variable costs; it represents the contribution the enterprise makes towards meeting the overhead costs and profit of a farm.
Direct Overheads	Labour and machinery used specifically on the enterprise, together with the rent of land and buildings occupied.
Net Margin	Gross Margin less direct overheads.
Marginal Working Capital	Average investment in calves and variable costs of the enterprise.
Total Working Capital	Average investment in all costs of the enterprise (variable costs plus overheads).