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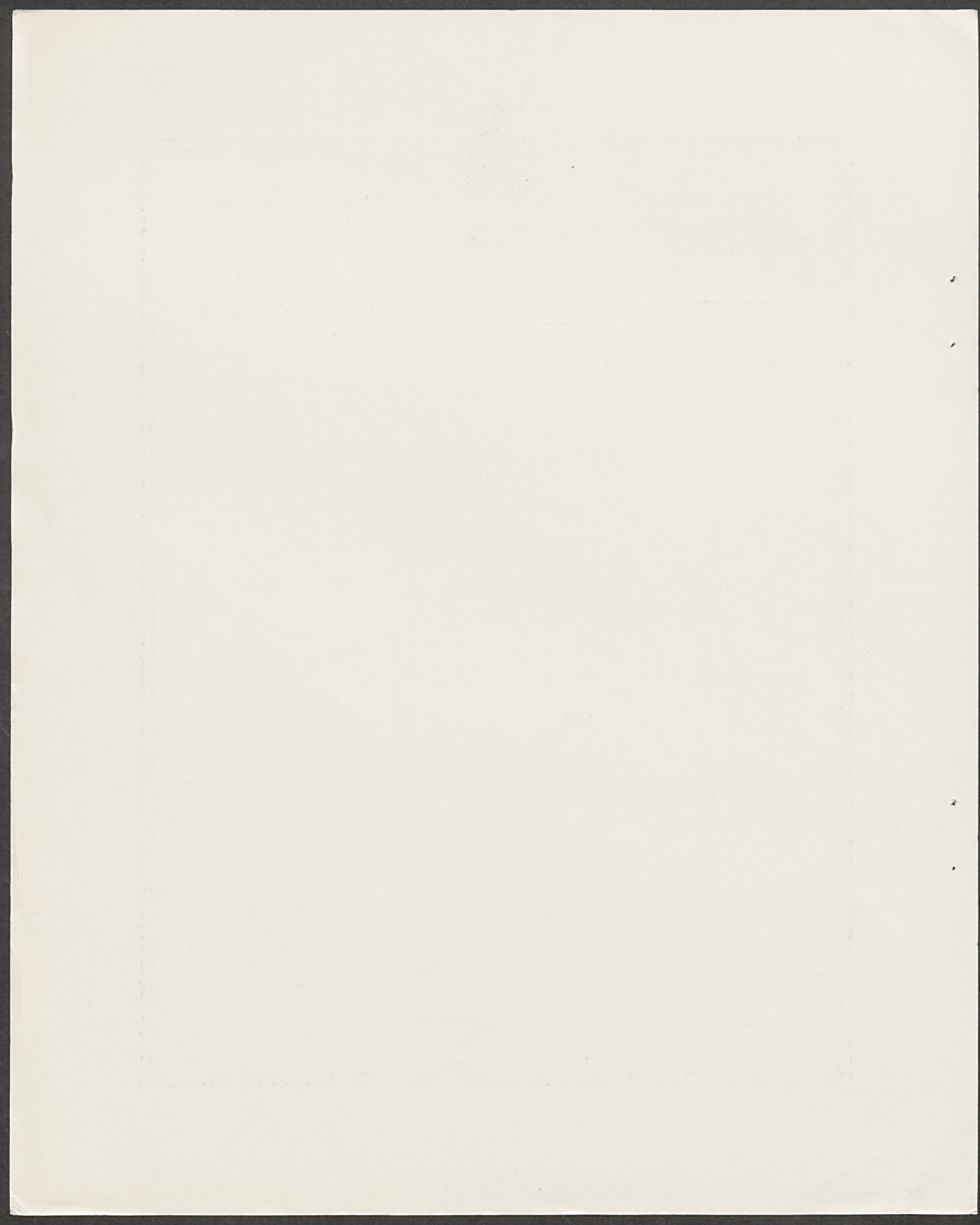
MILK PROFITS AND HERD SIZE

A Survey of 60 North-West Herds in 1965-1966

ROSEMARY F. WALKER

BULLETIN 115/M22

FOUR SHILLINGS



UNIVERSITY OF MANCHESTER
FACULTY OF ECONOMIC AND SOCIAL STUDIES

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MILK PROFITS AND HERD SIZE

I Introduction

The outstanding feature of dairy farming in the past decade has been the steady fall in the number of dairy herds whilst dairy cow numbers have been maintained or slightly increased. This means that the average size of dairy herds in England and Wales has increased substantially, indeed from about 17 cows per herd in 1955 to 26 cows per herd in 1965. With only roughly one-third as many herds of less than ten cows but twice as many herds of fifty or more cows, dairy farming has undergone a revolution in the last ten years.

This change in structure partially reflects the trend towards specialisation, both on individual farms and in a regional sense. In our north-western Province ⁽¹⁾ there had been comparative specialisation for a long time and structural changes in its dairy farming have done no more than maintain the region's relative numbers of dairy herds and dairy cows. Nevertheless, the size of the average herd in the N.W. has increased by slightly more than one cow per year, over the last five years.

Structural changes of this kind may be regarded as one of the responses to economic pressures such as rising costs and - a particular example of rising costs - a shortage of labour. Comparing 1965 with 1960, dairy compounds increased in cost approximately eight per cent, and farm wage rates 28 per cent. This report looks at the results of a survey of dairy farms carried out in 1965-66. to see what they might indicate to the

(1) Cheshire, Lancashire, Shropshire, Staffordshire.

co-operating farmers about the growth in the size of herds and possible economies to meet the cost squeeze.

II Influence of Herd Size

Use will be made of average⁽¹⁾ figures from the survey, because this makes discussion easier than if no figures are employed. No claim is made that these figures reflect any more than something of the economy of the herds for which they were collected. However, differences between dairy herds can be instructive; and it is chiefly to differences that attention will be drawn.

1. The Association of Farm Size and Dairy Herd Size : 60 Herds 1965-66

Acres per Farm	Number of Cows per Herd							
	Under 20	20-29	30-39	40-49	50-59	60-79	80 & More	All Herd Sizes
under 40	7	3	-	-	-	-	-	10
40-79	2	6	4	1	-	-	-	13
80-119	-	2	4	3	3	1	-	13
120-189	-	1	1	3	4	2	-	11
190-249	-	-	-	-	2	3	2	7
250 & More	-	-	-	-	1	-	5	6
All Farm Sizes	9	12	9	7	10	6	7	60

(1) See Appendix I for tables of results and a comment on 'averages'.

Larger herds, as might be expected in an area long specialising in grassland milk production, were found on the larger farms in the survey (Table 1). It is true that the larger farms were less exclusively dairy farms than the smaller ones but the land used for dairying was equally heavily stocked in all farm size groups. Profit per cow is, therefore, a realistic measure of the business success of the dairy herds. Profits per cow were generally higher the larger the herd (Table 2). What explanation for this pronounced trend can be obtained from the survey?

Higher profits per cow must result from a wider gap between costs incurred and receipts obtained. Bigger returns could arise if more products were sold per cow or if a better price were obtained for the produce. The larger herds sell no more milk per cow than the smaller herds, nor do they sell more calves. Equally, the returns for milk do

2. Profits per Cow by size of Herd : 60 Herds 1965-66

	Number of Cows per Herd			
	Up to 20	20.1-40	40.1-60	Over 60
	£	£	£	£
Average	14.5	18.7	30.4	41.2
Range	-31.5 to 45.5	-26.1 to 63.9	-7.2 to 62.1	8.8 to 78.8

not favour the larger herds, either on grounds of quality or of seasonality payments. Although all of these elements in receipts for milk are important to individual producers, their absence from the larger herds as a group means that these herds achieve higher profits by operating at lower costs.

The chief points at which economies are achieved are labour and feed costs. Since in many of the smaller herds all the labour is supplied by the family, this is charged at statutory minimum rates (adjusted for overtime, insurance, and similar extras); whilst on the larger farms the employed labour is charged at actual cost. Consequently, any economy the larger farms achieve with labour is entirely in the smaller number of man hours worked per cow. Such economies are obtained from two sources: first, there are the general economies which larger herds enjoy in that it does not take proportionately longer to bring in more cows, to sterilise the milking equipment, or to clean out the cowshed. Second, larger herds are able to obtain labour economies from adapting systems (e.g. of parlour milking) which would be too expensive of capital for smaller herds. Any system, however, can be operated effectively or not and the use of particular equipment does not guarantee labour economy. Nevertheless, the rate of milking (cows milked per man hour) accounts for almost half of the variation in total labour hours per cow and there is some evidence to suggest that farm work is done more speedily when the worker is not dependent

upon the co-operation of others. In milking this can sometimes only be achieved either by unduly extended milking times or by a high ratio of machine units to cows.

On the survey farms, all but one of the herds of less than 20 cows were milked by one man and all herds of more than 60 cows were milked by at least two people. For the intervening size groups, Table 3 shows the greater speed achieved by the single worker. It should be noted that five of the six one man teams in the smaller herds group worked in shippens with bucket plants, whereas three of the four one man teams in the larger herds group worked in parlours. Thus, herd size is important for labour economy because of a general saving and because of the introduction of systems which large herds justify. Also important, however, are the organisation of the systems and the personnel who operate them.

3. Relation of Milking Team to Speed of Throughput

Herd Size	20.1 to 40 cows			40.1 to 60 cows		
	No. in Milking Team	No. of Herds	Average Herd Size Cows milked per man hour	No. of Herds	Average Herd Size Cows Milked per man hour	Cows Milked per man hour
1	6	27.1	16.7	4	49.6	20.6
2	14	32.8	11.0	10	51.1	13.3
3	1	20.5	4.0	3	52.6	10.5

The most marked economy made by the larger herds was, however, in the cost of feeding and especially in the outlay on concentrates. Average expenditure on purchased concentrates was only just over half as much per cow in herds of over 60 cows as it was in herds of up to 20 cows. This economy was made partly by bulk buying, partly by mixing on the farm instead of buying compounds, and partly by feeding fewer concentrates. In other words, the larger herds managed to replace part of the more expensive concentrates with less costly forage crops: considerable use was made of silage and kale in feeding the larger herds.

III Small Herd Considerations

Although the sources of large herd economy may be clearly established, it is a fair question to ask whether there are any counterbalancing extra costs and whether large herd methods are appropriate to smaller herds.

It has already been suggested that some milking systems involve too large a capital outlay to be suitable for adoption by small herds in the pursuit of labour economy. In any case, achieving a minimum time with the dairy cows may not be an economy for the farmer with no paid labour. Unless time saved on the cows can be put to other profitable use, all that is achieved is more leisure whilst income remains unchanged. There is still some benefit in the farmer spending available time with his cows if it improves the general stock husbandry. It may be noted

that herd depreciation was higher in the large than the small herds.

The problems associated with applying the large herds' feeding economy to small herds are rather different. To purchase the field machinery necessary for growing cereals and forage harvesting on a small farm would scarcely prove economical. Whether the work could be done satisfactorily on contract or through the co-operative use of machinery (e.g. machinery syndicate) is for the individual farmer to judge. In terms of the land required, there is no reason why small farms could not adopt these methods for there was no significant difference between the acreage of land devoted to a cow in large and small herds.

There are two alternative methods by which small farmers might be able to obtain some of the feed economy of cereal growers. First, there is the traditional way of 'stretching' limited acres by purchasing hay for winter feeding. Second, one may buy barley, barley straw, and an appropriate supplement as a replacement for hay or silage. Both of these methods liberate all the grassland for unimpeded summer grazing and make it possible to carry more stock. The cereal based diet removes most of the quality uncertainty from winter feeding.

These methods are, however, subject to certain qualifications which each farmer should relate to his own situation. (1) The relevant prices cannot be known at the time when a decision about grass conservation has to be taken. During the past five years the price of seeds hay in

S.W. Lancashire has varied between £7 and £19 - 10s. per ton.

The cereal based ration (see Appendix Table V) is likely to be at least as much as hay purchased at £13 per ton. (2) If the cereal based ration were adopted by too many farmers, the supplies of barley would be inadequate. (3) The economics of herd expansion depend upon a variety of stock and product prices as well as upon the costs of additional housing.

When full account has been taken of the advantages available to the larger herd operator and the opportunities open to the smaller herd operator to offset those advantages, there are several observations still worth making. (1) Farming is not static and several farmers changed some of their methods (e.g. by introducing pipeline or parlour milking) during or shortly before the survey. Because changes in production methods (and the associated adaptations of scale which they may imply) take time, the profitability of a dairy enterprise during an arbitrary twelve-month period covered by a survey may in no way reflect the longer term managementability of the farmer concerned. These costs of change and adaptation confuse comparisons between individual herd results but they need to be included in a survey if its average results are to reflect all the kinds of cost incurred by the industry. (2) In so far as good management should be measured by the degree to which a manager achieves what he sets out to do, profit is only a partial measure of successful management. Farmers may sacrifice a little profit to obtain

a greater satisfaction - prize stock, high yields, leisure, are examples of additional sources of satisfaction. (3) Concentration upon one aspect of efficiency, whether it is labour use in the dairy enterprise or dairying within the farm business, may lead to neglect and shortfalls elsewhere. (4) Even taking profit as the yardstick, there may be more ways than one to "success": one way may be in achieving substantially better than average milk yields per cow whilst containing costs. Table 4 illustrates two alternative methods to "success" and perhaps an aspect of the third point also. Land was the limiting factor on the small farm and labour on the large farm; Table 4 illustrates the benefits derived from appropriately different combinations of resources.

4. Comparison of Two Profitable Herds of Different Size

	Small Herd	Large Herd
Herd size group (cows)	20-40	Over 60
Yield per Cow (galls.)	1078	834
Man Hours per Cow	65.6	30.8
Livestock Acres per Cow	1.1	1.8
Concentrates per Cow (cwt.)	29.8	11.0
Profit per Cow (£)	63.9	78.8
" " Livestock Acre (£)	58.3	43.3
" " Man Hour (£)	0.97	2.56

IV Breeding and Timing

It was remarked earlier that seasonal emphasis in milk production and the contribution of calves had not materially influenced the difference in average results between large and small herds. Nevertheless, these factors together with milk yield per cow are potent influences upon the receipts in individual herds. Thus, where accommodation is limited the only basis for enlarging the business may be by raising milk output. Milk output on a given farm may be raised either by improving the yield per cow or - where relevant - by using all the land for cows instead of partly for followers. The economics of rearing as against buying dairy herd replacements has been dealt with before and need not be repeated.⁽¹⁾ When the decision as to the method of replacing culled cows has been made, there is still a further decision about calf production.

Calves are a by-product of milk production and the milk enterprise benefits to the extent of their value at birth. In general, this contribution can be raised by ensuring a good calving index. If the herd is to be self-contained then it will be necessary to produce chiefly dairy calves, except perhaps from the first calving heifers. Where replacement cows are to be purchased, calves of any type may be produced for sale. For some time beef calves have been more valuable at birth than dairy calves and their production can therefore add marginally to the dairy herd receipts. A calf worth £6 at birth

(1) Bulletins 82/M19 and 89/M20, Department of Agricultural Economics, Manchester University.

represents about one-fifth of the average annual profit per cow.

Milk producers should bear in mind all the factors involved and particularly that the potential value of a calf sale can easily be offset by such factors as: a poor calving index, calf mortality (this includes the calf's inherent vigour, the rearing facilities, and marketing arrangements), the cost of replacement cows (both financial and the risk of introducing poor milkers or disease).

The fact that this survey shows little influence by seasonal emphasis of production upon profit may merely indicate that the monthly returns were well matched to the varying seasonal costs during 1965-66. Different seasonal emphases suit different systems. For example, the small herd striving for higher yields and feeding concentrates, will wish to do this in winter when the return per gallon is higher. This tends to be the pattern of the smaller herds in this survey.

Appendix I

The Calculation of Averages : Summary Tables

It is useful to have a representative figure, or set of figures, designed to summarise the results of a survey. Provided some of the limitations of such 'representative' figures are realised, they can be interesting and informative. Of the commoner ways of calculating a representative average, three are referred to and illustrated in the following paragraphs.

Suppose that there are four herds with 15, 30, 50 and 100 cows each and that the total milk production of each of those herds is 12,375, 24,600, 40,000 and 84,000 gallons respectively. One way of calculating the average yield per cow is to total the milk produced and to divide it by the total number of cows. Thus 160,975 gallons were produced by 195 cows, or an average of $825\frac{1}{2}$ gallons per cow. This is the way averages have usually been calculated in milk reports and this method is used here. It gives equal importance to each cow.

A second way is to say that the average yield of each of the four herds is respectively 825, 820, 800 and 840 gallons per cow; the average of the four herd results is $\frac{825 + 820 + 800 + 840}{4}$ or $821\frac{1}{4}$ gallons. This method gives equal importance to each herd.

A third way is to give the same relative importance to the herd results as their occurrence in the area surveyed. Thus, if the percentage of herds of under 20, 20-40, 40-60, and over 60 cows were 40, 35, 15, and 10

respectively, the average could be calculated as
$$\frac{(40 \times 825) + (35 \times 820) + (15 \times 800) + (10 \times 840)}{100}$$
 or 821 gallons. This
is only a justifiable procedure if one wants to estimate the average
yield of all cows, and the herds surveyed are typical of all herds
in their size groups.

Each method of calculation is appropriate according to the
circumstances. The method used here gives equal weight to each cow
and this means that the averages shown will be rather nearer to the
results of large herds than of small ones because the survey had more
cows in herds of more than 40 cows than in herds of less than 40 cows.

Appendix Table 1 Milk Production, 1965-66 Survey : Descriptive Data
for Herd Size Groups

Number of Cows per Herd	Up to 20	20.1 to 40	40.1 to 60	Over 60	All Herds
Number of Herds	9	21	17	13	60
Average Cows per Herd	15.4	30.6	51.1	102.2	49.6
Average Acres per Farm	34.5	71.2	149.0	349.0	147.9
Forage Acres per Cow	1.47	1.47	1.46	1.43	1.46
Livestock Acres per Cow	1.50	1.55	1.59	1.58	1.57
Labour Hours per Cow	116.9	93.6	71.4	66.0	75.9
Feed per Cow (cwts.)					
Concentrates - purchased	28.2	25.8	20.3	15.6	19.7
- homegrown	0.6	2.2	3.6	4.6	3.6
Hay - purchased	3.4	1.75	3.4	3.6	3.1
- homegrown	21.9	25.3	17.4	10.5	16.9
Silage	-	8.8	27.8	71.6	41.9
Kale	4.3	11.4	9.7	25.9	17.0
Milk per Cow (galls.)	825	823	806	842	826
Milk per Forage Acre (galls.)	560	560	508	588	564
Milk per Labour Hour (galls.)	7.05	8.90	11.29	12.76	10.89
Winter Milk (%)	49.5	50.2	46.2	45.2	47.4
Dry Cows (%)	14.4	17.9	19.1	18.0	18.1
Cost of Concentrates per ton (£)	34.0	33.0	32.0	31.3	32.4
Concentrates bought as Compounds (%)	76.2	74.4	72.0	35.1	58.1

Appendix Table II Milk Costs and Returns per Cow,
Sixty Herds, 1965-66, by Herd Size Groups

Number of Cows per Herd	Up to 20	20.1 to 40	40.1 to 60	Over 60	All Herds
	£	£	£	£	£
Concentrates	48.3	44.1	35.3	27.1	34.2
Grazing & Bulk Foods	20.3	21.8	23.1	23.8	23.0
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Total Feed Cost	68.6	65.9	58.4	50.9	57.2
Labour	35.9	27.1	20.4	20.7	22.7
Herd Depreciation	3.7	8.0	6.9	9.2	8.0
Miscellaneous	21.9	20.4	19.0	21.4	20.5
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Total Costs	130.1	121.4	104.7	102.2	108.4
Returns for Milk	136.3	131.3	126.4	134.8	131.7
Value of Calves	8.4	8.8	8.7	8.6	8.7
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Total Returns	144.7	140.1	135.1	143.4	140.4
Margin	14.6	18.7	30.4	41.2	32.0

Appendix Table III. Milk Costs and Returns per Gallon, Sixty Herds,
1965-66, by Herd Size Groups

Number of Cows per Herd	Up to 20	20.1 to 40	40.1 to 60	Over 60	All Herds
	d.	d.	d.	d.	d.
Concentrates	14.0	12.8	10.5	7.7	9.9
Grazing & Bulk Foods	5.9	6.4	6.9	6.8	6.7
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Total Feed Cost	19.9	19.2	17.4	14.5	16.6
Labour	10.5	7.9	6.1	5.9	6.6
Herd Depreciation	1.1	2.3	2.1	2.6	2.3
Miscellaneous	6.3	6.0	5.6	6.1	6.0
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Total Costs	37.8	35.4	31.2	29.1	31.5
Returns for Milk	39.2	38.3	37.7	38.4	38.3
Value of Calves	2.4	2.6	2.6	2.5	2.5
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Total Returns	41.6	40.9	40.3	40.9	40.8
Margin	3.8	5.5	9.1	11.8	9.3

Appendix Table IV Milk Costs and Returns per Forage Acre, Sixty Herds,
1965-66, by Herd Size Groups

Number of Cows per Herd	Up to 20	20.1 to 40	40.1 to 60	Over 60	All Herds
	£	£	£	£	£
Concentrates	32.8	30.1	24.2	18.9	23.4
Grazing & Bulk Foods	13.8	14.8	15.8	16.6	15.8
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Total Feed Cost	46.6	44.9	40.0	35.5	39.2
Labour	24.4	18.5	14.0	14.5	15.6
Herd Depreciation	2.5	5.5	4.7	6.4	5.5
Miscellaneous	14.8	13.9	13.0	14.9	14.1
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Total Costs	88.3	82.8	71.7	71.3	74.4
Returns for Milk	91.5	89.6	86.6	94.0	90.4
Value of Calves	5.7	6.0	6.0	6.0	6.0
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Total Returns	97.2	95.6	92.6	100.0	96.4
Margin	8.9	12.8	20.9	28.7	22.0

Appendix Table V The Cost of Hay per ton which is equal to the Cost of a Cereal based Maintenance Ration at Different Import Prices

(All figures are prices, £ per ton, for the various items)

		Supplement at £32			Supplement at £34		
		4	5	6	4	5	6
Barley	Barley Straw						
21		13.00	14.28	15.57	13.86	15.14	16.43
22		13.43	14.71	16.00	14.29	15.57	16.86
23		14.06	15.14	16.42	14.91	16.00	17.29
24		14.48	15.57	16.86	15.34	16.43	17.71

These comparisons are based on a maintenance ration of 20 lbs. of hay; or of 12 lbs. of barley straw, 4 lbs. of barley (rolled), and 4 lbs. of supplement.

Appendix II

Accounting Conventions and Definitions Employed.

Purchased Feed of all kinds has been charged at net cost delivered to the farm. Where milling and mixing was carried out on the farm an allowance has been made for this in the cost charged for concentrates.

Home Grown Feeds (with the exception of grass production, which was costed in 1965-66) were charged on the basis of previous records adjusted for subsequent changes in unit costs and for the level of yields on individual farms. This method applied also to grass conservation.

Farm Yard Manure applied to grassland was charged at the labour and tractor cost of carting and spreading.

Labour if paid, was charged at actual hourly rates, including the value of perquisites, employer's share of national insurance contributions, and paid holidays. Standard rates were used for any unpaid family labour.

Labour Hours covered all direct labour on milking, feeding, cleaning out, and handling the cows and on cleaning and maintaining the dairy equipment but not time spent on calves and other followers.

Miscellaneous Costs include (i) sundry charges, such as for stores used in milk production, service charges, and rental value of dairy buildings; (ii) an allowance for general farm overheads, taken as 15 per cent. of the direct labour bill plus £5 per £100 gross output.

Herd Depreciation was calculated according to the following formula:-

Opening valuation plus purchases, or the estimated market value of heifers

transferred in to the herd, minus closing valuation plus the value realised for cull cows. The same value per animal was used for opening and closing valuations.

Returns for Milk consist of the wholesale value of milk sold plus an estimate of the value of milk consumed by the household and by farm staff and of milk fed to calves.

Calves sold when a few days old were valued at actual receipts net of commission and transport charges. Calves kept longer on the holding were credited at their estimated value a few days after birth.

Forage Acres are the acreage of grassland, kale, roots and other succulents used by the cows.

Livestock Acres are forage acres plus the estimated acreage of cereals allocated to the cows.

Herd Size was calculated by averaging the number of cows (in milk and dry) on the farm on the first and last day of each month and then averaging the twelve monthly figures.

The Costing Period ran from April 1st. 1965 to March 31st. 1966. Any lime, farm yard manure, or fertiliser applied after September 1964 was included in the cost of grazing. Applications after September 1965 were excluded.

