Milk - Cost of prod.

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MILK PRODUCTION 1980-81

J. WRIGHT
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Miscellaneous Study No. 70
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UNIVERSITY OF READING

DEPARTMENT OF AGRICULTURAL ECONOMICS & MANAGEMENT

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Results of a survey carried out in Central Southern England and the South West Midlands as part of the National Investigation into the Economics of Milk Production in England and Wales 1980-81.

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FOREWORD AND ACKNOWLEDGEMENTS

The National Investigation into the Economics of Milk Production, which forms part of a continuing programme of studies in agricultural economics, is sponsored and financed jointly by the Milk Marketing Board of England and Wales and the Ministry of Agriculture, Fisheries and Food. Collection of the data at farm level is the responsibility of investigational staff in departments of agricultural economics at nine centres in England and Wales and the national results are presented in a joint M.M.B/Ministry publication.

The latest survey to be undertaken covered the period April 1980 to March 1981, and this report summarises the results relating to sixty-eight dairy farms situated in the Reading province, which covers the counties of Avon, Berkshire, Buckinghamshire, Gloucestershire, part of the Greater London Council area, Hampshire, Hereford and Worcester, the Isle of Wight, Oxfordshire, Warwickshire, the West Midlands and Wiltshire.

The field work was carried out by the following members of the investigational staff: Mrs. S. Burns, Mrs. E. I. Harland, Miss F. Wilks, and Messrs. M. Lewis, A. K. Martin, R. L. Vaughan and J. Wright. Mr. Wright supervised the study and was responsible, with Miss Wilks, for the preparation of the report, which was typed by Mrs. B. J. Reeves.

However, neither the survey nor this report would have been possible but for the help received from the farmers in the region who co-operated in the exercise, and the Department is indebted to them and their staff, not only for supplying the basic information, but for the degree of patience and the hospitality shown to field staff on the occasion of their visits.

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SUMMARY

1. This report summarises the results of a survey carried out in the Reading province as part of the National Investigation into the Economics of Milk Production 1980-81.

2. The province, which covers eleven counties in Central Southern England and the South West Midlands, contains 17% of the cows and 13% of the milk producers in England and Wales.

3. During the 1970s the structure of dairy farming at both national and provincial level has undergone marked changes. Although cow numbers have remained relatively stable, the number of registered producers has fallen by over 40%, which in turn has resulted in a marked increase in average herd size. There has been a steady expansion of milk sales off farms and a corresponding improvement in average yield per cow.

4. The 68 farmers who co-operated in the survey farmed a total of 9,500 hectares, and the farms carried almost 8,000 cows in 76 herds. The Friesian was the dominant breed comprising almost 90% of the cows in the survey.

5. The main climatic feature of the 1980-81 farming year was the very wet mid-summer period which made silage and hay making very difficult.

6. For the particular group of dairy farmers involved in the survey, 1980-81 proved to be a particularly successful trading period, with an average net margin of £117 per cow. The average margin in the most profitable herds was over £70 per cow above this level and was achieved by a combination of higher returns and lower total costs. However, the gap between the level of profitability achieved from the most profitable herds and that of the overall average had narrowed considerably since 1976-77 when the last milk costs investigation was undertaken.

7. The costs of milk production, when examined in some detail, reveal that concentrates accounted for 35% of total production costs. This was followed by miscellaneous costs (21%), labour (17%) and bulk food (15%).

8. The general tendency was for margins to increase with herd size up to about 100 cows with a reduction in profitability above that point. When the results were examined according to average yield, margins increased with yield, although the difference in margin per cow achieved by the two highest yielding groups was not as great as between the other groups. Under the prices and conditions prevailing in 1980-81, there did appear to be a financial advantage to be gained from winter milk production, although the differential between winter and summer production was less than previous surveys have indicated. For the producers involved in the survey there appeared to be a strong correlation between margin over concentrates and net margin per cow.

1. DAIRYING IN THE REGION

This section of our report will establish a background to the survey results, by illustrating the importance and structure of dairying in the region. The Reading province covers eleven counties in Central Southern England and the South West Midlands, and accounts for 17% of the total area of crops and grass in England and Wales. The province contains nearly 17% of the country's cows, and over 13% of total milk producers. These farms and cows produce 18% of the total milk output of England and Wales. Table 1 shows the importance of dairying in the Reading province, and changes in its structure over a ten-year period to 1980.

Milk Producers

Over the ten years prior to 1980, the number of registered milk producers in England and Wales fell by 46%, and this trend was reflected in a 44% drop in the Reading province, although the decline varied between 54% in both Hampshire and Berkshire, and only 41% in Wiltshire.

Dairy Cows

Although the number of milk producers in the province has declined by slightly less than the national average, the number of dairy cows has dropped considerably more than the average, and has been falling steadily since 1971. As a result, while in June 1970, the province contained 17.6% of the national herd, this proportion had fallen to 16.7% by June 1980.

Milk Sales

The Reading province provides 18% of the total milk production of England and Wales, and has reflected the national trend of an increase in milk production; in 1980/81, the province provided 24% more milk than ten years previously.

Average annual milk sales and herd size

The figures in this section of Table 1 have been calculated from those in the previous three sections. They should, therefore, not be read as absolute figures, but are intended for use as comparison between regional and national figures.

In the 10 years leading up to 1980, average annual milk sales per cow were consistently higher in the Reading province than the national average, and the gap between the two widened from 2% in 1970/71 to nearly 7% in 1980/81. The province showed a 33% increase in average yield over the 10 years, compared with 27% for England and Wales.

The 44% fall in the number of milk producers, coupled with only a 6% decline in cow numbers, has obviously resulted in an increased average herd size, as illustrated in Table 1. The national increase in average herd size was considerably more than that recorded in the province, where herds have always tended to be somewhat larger than the national average.

Table 1 Milk production trends and the importance of dairying in the Reading province

	Reading province	England and Wales	Proportion in the Reading province
Number of registered producers			%
March 1970	10267	80265	12.8
March 1975	7697	60279	12.8
March 1980	5794	43358	13.4
Per cent change (1970-1980)	-44%	-46%	-
Dairy cow numbers ('000s)			
June 1970	478	2714	17.6
June 1975	459	2701	17.0
June 1980	447	2672	16.7
Per cent change (1970-1980)	-6%	-2%	-
Milk sales off farms (Million litres)			
April 1970 - March 1971	1851	10261	18.0
April 1975 - March 1976	2032	11258	18.1
April 1980 - March 1981	2298	12805	18.0
Per cent change (1970-1980)	+24%	+25%	-
Average annual milk sales (Litres per cow)			
1970-71	3872	3781	-
1975-76	4427	4168	-
1980-81	5141	4792	-
Per cent change (1970-80)	+33%	+27%	-
Average size of dairy herd (Cows per herd)			
1970	47	34	-
1975	60	45	-
1980	77	62	-
Per cent change (1970-1980)	+64%	+82%	-

Source: M.M.B. Dairy Facts and Figures 1970-81

Table 2 Dairy herd size distribution in England & Wales

Herd size (cows)	Herds (as a % of the total)			Cows (as a % of the total)		
	1970	1975	1980	1970	1975	1980
Less than 20	35.9	25.7	14.7	12.9	6.3	3.0
20 - 39	35.1	29.7	26.1	29.8	18.8	13.1
40 - 69	20.4	26.1	30.4	31.6	29.8	27.5
70 - 99	6.0	10.8	15.5	14.6	19.4	21.9
100 - 199	)	6.6	)	)	18.4	)
200 and over	) 2.6	1.1	)13.3	)11.1	7.3	)34.5
Total	100.0	100.0	100.0	100.0	100.0	100.0

Source: M.M.B. Dairy Facts and Figures 1981

Table 3 Dairy herd breed distribution in England and Wales

Breed	1970	1973	1978
Friesian	76.3	81.0	88.6
Ayrshire	9.7	3.6	3.4
Dairy Shorthorn	2.5	0.9	0.4
Guernsey	5.2	2.8	2.4
Jersey	3.8	2.2	2.0
Other	2.5	9.5	3.2
Total	100.0	100.0	100.0

Source: M.M.B. Dairy Facts and Figures 1981

Table 2 shows changes in herd size distribution between 1970 and 1980, clearly demonstrating a significant change in the structure of the national herd. In 1970, 71% of all herds, and nearly 43% of all cows, were in herds of less than 40 cows. By 1980, these figures had fallen to 41% and 16% respectively. In contrast, herds of over 100 cows represented only 2.6% of herds and 11.1% of cows in 1970, but by 1980 accounted for 13.3% of herds, and 34.5% of cows. Regional figures have shown a similar marked change over the same period. The largest herds in the province are now in Oxfordshire (average 141 cows), Hampshire (108) and Buckinghamshire (85).

Table 3 shows the national distribution of dairy herd breeds between 1970 and 1978. The apparent increase in the "other" breeds category in 1973 resulted from the inclusion of cross-bred cattle under this heading. In 1970 and 1978 they had been included with the breed they most closely resembled. The table clearly illustrates the increasing dominance of the Friesian, which by 1978 accounted for 88.6% of the national dairy herd.

2. BACKGROUND INFORMATION TO THE SURVEY

Introduction

When the Milk Marketing Board was established in 1933, the need to monitor the costs of milk production was recognised, and in 1934 the first national milk costs investigation took place. From that date until the early 1950's the costings took the form of continuous surveys, but in 1952 the system was changed and surveys became intermittent, covering pairs of years up to and including 1960/62 and single years thereafter. Since 1965 the survey has been carried out every three or four years using a randomly selected sample of farms to ensure that all types of milk producers are represented, and that the results are representative of the industry as a whole. Nationally, 400 farms stratified by herd size and selected in this way are considered sufficient to provide an acceptable level of accuracy and to ensure overall representation.

The sample

For the purposes of the 1980-81 investigation, the national sample was drawn at random from a list of farms with at least 10 dairy cows at the time of the June 1978 census. Lists of reserves were also prepared to provide replacements in the event of unsuitability or non-co-operation in the case of the initially selected farms.

The Reading province had a quota of 66 farms, although in the event a total of 68 were included in the survey. A number of these farms carried more than one dairy herd and in some cases it proved more convenient and meaningful to cost the herds separately. This approach resulted in records from a total of 76 herds being available for inclusion in the analysis.

The farms in the survey

Structural features of the farms, together with a summary of rents are shown in Tables 4 and 5 respectively. The total area farmed by the 68 farmers was almost 9,500 hectares, giving an average farm size of 139 hectares with a range from 11 to just over 750 hectares. Over the sample as a whole, 45% of the total farm area was devoted to dairy cows; the ratio varying from over 90% in the smallest farm size group to less than 30% on the largest farms. Of particular interest in Table 4 is the ratio of temporary to permanent grassland where the trend was towards increased reliance on short terms leys as farm size increased. However, the greater area of potentially more productive grassland did not manifest itself in the form of improved stocking rates. In fact, the best stocking rate was achieved by farmers in the 50-100 hectare group, where some 40% of total grassland was defined as temporary, compared with the two largest farm size groups where almost 60% of the grassland was down to short term leys.

In order to cost all the herds on the same basis, it was necessary to apply a rental value figure to those owner occupied farms in the sample. In addition, on rented farms, an allowance was made to cover the annual value of tenant right as applied to buildings erected by the tenant. The average figures used, together with rents actually paid on the tenanted farms, are shown in Table 5.

Table 4 Distribution of dairy cows and land use by farm size

	Farm size (hectares)				
	Less than 50	50-100	101-200	More than 200	All farms
Number of farms	18	20	19	11	68
Average farm size (hectares)	33.8	74.1	142.5	423.0	139.0
Average number of cows per farm	55.5	97.3	131.2	225.5	116.4
Number of cows as a proportion of the total sample (%)	12.6	24.6	31.5	31.3	100.0
Percentage of total farm area devoted to dairy cows	92.5	65.4	49.9	29.6	45.1
Stocking rate (hectares per cow)	0.56	0.50	0.54	0.55	0.55
Land use	%	%	%	%	%
Arable crops[1]	3.7	10.1	26.1	40.6	29.2
Fodder crops	3.1	4.6	3.7	3.0	3.5
Temporary grass	26.3	34.4	37.2	27.2	31.2
Permanent grass	64.8	47.7	29.1	23.0	31.3
Other areas[2]	2.1	3.2	3.9	6.2	4.8
Total	100.0	100.0	100.0	100.0	100.0

1. Cereals, cash crops and fallow
2. Rough grazing, buildings, roads, etc.

Table 5 Summary of tenure & rents by farm size

	Farm size(hectares)				
	Less than 50	50-100	101-200	More than 200	All Farms
Tenanted land					
Proportion of total (%)	44.8	40.4	33.1	24.2	30.6
Average rent paid (£ per ha.)	63.3	57.6	52.3	66.2	59.9
Value of tenant right(£ per ha.)	26.4	12.1	4.2	3.7	7.7
Owner occupied land					
Proportion of total (%)	55.2	59.6	66.9	75.8	69.4
Rental value (£ per ha.)	67.6	66.8	72.6	70.7	70.6
Overall average rent[1] (£ per ha.)	77.5	68.0	67.3	70.5	69.6

1. In this context, "rent" is a combination of rents actually paid, tenant right and imputed rental value figures.

In terms of actual rents, the highest rents per hectare were being paid by farmers in the largest farm size group, although, not surprisingly, tenants on the smallest farms were carrying the highest property charges per hectare when tenant right was included in the calculation. Similarly, the overall average rent (the combination of rents, tenant right and rental values) was highest in the smallest farm size group, although there was little difference in overall average rent between the other three size groups. At almost £70 per hectare, the overall rent figure for the sample as a whole had increased by 80 per cent on the 1976/77 level.

Of particular interest in Table 5 is the proportion of land that was owner occupied compared with that which was rented. The figure of almost 70% for owner occupied land shows a marked increase over the results in 1976/77, when the corresponding figure was 56% and, while it is true that the trend is towards increased owner occupation, in absolute terms the proportion is rather higher than the 60% - 65% generally accepted as the proportion of agricultural land that is owner occupied. The figures within the size groups are also at variance with the national picture where the trend is towards an increasing proportion of rented land as farm size increases. For the particular group of farms in this survey the exact opposite was the case.

The herds in the survey

The geographical location of the herds in the survey is shown in Table 6, which also gives some indication of the herd size distribution. Bearing in mind the way in which the sample was selected, this table tends to reinforce observations made earlier in the report regarding average herd size in the province. For example, over 40% of the herds were of 100 cows and over, compared with a national average in 1980 of 13%.

The farms carried a total of almost 8,000 cows - an average of 116 cows per farm and 104 per herd. The smallest herd had 18 cows and the largest individual herd was one of 336 cows. Several holdings carried more than 300 cows but they were in two or more separate herds and, as indicated earlier, were costed separately.

As might be expected, the Friesian was the dominant breed, comprising 85% of the herds and almost 90% of the cows in the survey. Even among the herds classified "other/mixed", Friesian cows were in the majority; in three herds they were run with Holsteins, in another three with Ayrshires and in two others with Channel Island cows. Only two herds were genuinely "mixed" in the sense that no one or two breeds predominated.

Table 8 gives some indication of housing and milking systems employed. Those herds housed in yards and milked through a cowshed had, in some instances, outgrown the cowshed but were milked through it in batches; in others the system of loose housing was preferred to keeping the cows in a number of small, often scattered cowsheds. As might be expected, this housing/milking combination resulted in the highest labour requirements per cow.

The popularity of the cubicle is well illustrated in Table 8 and, while in terms of labour requirements there was little to choose between this form of housing and loose housing, the main savings from the use of cubicles are in terms of space and straw requirements.

Table 6 Distribution of herds by county and herd size

County \ Herd size (cows)	Less than 60	60–80	81–100	101–140	More than 140	All herds
Avon	1	1	3	1	–	6
Berkshire	–	–	–	–	1	1
Buckinghamshire	1	2	–	1	–	4
Gloucestershire	2	3	2	5	1	13
Greater London (South East)	–	–	–	–	1	1
Hampshire & the Isle of Wight	1	–	4	2	4	11
Hereford & Worcester	4	4	2	1	–	11
Oxfordshire	1	–	1	–	2	4
Warwickshire & the West Midlands	1	2	1	2	–	6
Wiltshire	2	2	4	7	4	19
Total	13	14	17	19	13	76

Table 7 Breed distribution by herds and by cows

Breed[1]	Herds		Cows	
	Number	%	Number	%
Friesian	65	85.5	6940	87.6
Channel Island	1	1.3	46	0.6
Other/Mixed	10	13.2	932	11.8
All herds	76	100.0	7918	100.0

1. Eighty per cent of the herd or over in the breed.

Table 8 Distribution of herds by type of housing and place of milking

Type of housing	Milking location	% of all herds	Average herd size	Labour hours per cow
Yard	Cowshed	3	38.8	64.3
Yard	Parlour	17	98.0	40.3
Cubicles	Parlour	57	105.6	37.5
Kennels	Parlour	10	136.7	37.2
Other	Various	13	93.1	52.8
All herds		100	104.2	40.7

Herds in the "other/various" category did not readily fit into the broad classification used and comprised those herds employing a combination of housing systems together with a few herds using minority systems of housing or milking, e.g. outwintering, bail milking, etc. Looking more closely at milking location, 68 of the 76 herds were milked through parlours of which the herringbone (65%) and abreast (29%) were the most popular.

A summary of the climatic conditions

The spring of 1980 was marked by low night temperatures, and generally dry conditions, which together restricted grass growth. By May, grass quality was good, but growth still slow, producing good silage but below-average yields. In contrast, June was extremely wet, encouraging grass growth, but presenting severe problems for hay and silage making, with some reports of hay rotting in the fields. These difficult conditions hampered hay and silage making right through July. The end of the summer turned dry and warm, and by September there was still plentiful grass, reducing the need for supplementary feeding. A wet autumn prevented any further use of the abundant grass in areas where poaching was a problem, and made harvesting of maize and fodder crops very difficult. In general, stock wintered well, the weather being mild and fodder supplies adequate, but a wet and cold March of 1981 delayed turnout, particularly on heavy land.

3. A SUMMARY OF THE FINANCIAL RESULTS

The costing method

As its title suggests, the milk costs investigation was designed to establish the economics of milk production, and thus the survey related solely to the dairy herd. Dairy followers were excluded and home bred heifers were transferred into the herd at estimated market value as though they had been purchased. Calves were credited to the herd either at actual sale price or estimated value at a few days old, and this figure was added to the value of milk produced to arrive at total returns. To enable all the herds in the investigation to be costed on a comparable basis, standard accounting methods and definitions were used, and these are shown in detail in appendix 2.

The financial results

The results of the 1980-81 survey are shown in Table 9, alongside those recorded in 1976-77, when the last milk costs investigation was undertaken. Comparison between the two years should, however, be made with care, since the survey results obtained in 1976-77 were influenced by the severe drought conditions in the summer of 1976. Additionally, there were some changes in the costing methods between the two surveys, particularly in the calculation of overheads and in the method of costing grassland.

With these considerations in mind, the picture in 1980-81 was much healthier than that recorded four years earlier. In keeping with the national trend, average herd size and yield per cow had increased, although in absolute terms both these features of the costed herds were higher than the provincial averages, particularly the average herd size. Average milk yield was almost 18% higher than it had been four years earlier, and the milk had been produced using a similar amount of concentrates per cow, although the concentrates fed per litre had fallen. It is, perhaps, appropriate to point out here that certain feeds, often used as part of a maintenance ration, e.g. rolled barley, dried sugar beet pulp, etc., were, for the purposes of the survey, included as concentrates. Greater reliance than usual on these feeds, and, to a lesser extent, on production concentrates, to supplement the shortage of grass in the summer of 1976, contributed to the high figure recorded in 1976-77. The introduction of modern technology to the milking and housing of dairy cows is reflected in the continued improvement in labour productivity.

The combination of an improvement in average yield and a 30% increase in the average milk price resulted in returns per cow from milk being over 50% higher than those of 1976-77, which, together with higher calf values, led to an increase of almost £250 per cow in total output. While total cost increases of 45% had eroded much of the improved output, the net margin, at £117 per cow, was appreciably higher than that recorded four years earlier, and, together with the improvement in stocking rate, this led to a significant increase in the net margin per forage hectare. Bearing in mind the fall in the value of the pound over the same period, in real terms, the enhanced profitability is not as great as the figures suggest. Even so, the indications are that for this particular group of dairy farmers, 1980-81 proved a very successful trading period.

Table 9 Changes in the performance & margins between 1976-77 & 1980-81

	1976-77	1980-81
Physical features		
Number of herds	95	76
Herd size	93.4	104.2
Dry cows - %	16.3	15.6
Yield per cow - litres	4573	5378
Winter milk % (Oct.-March inc.)	48.4	50.4
Concentrates - tonnes per cow	1.67	1.66
- kg. per litre	0.36	0.31
Labour hours per cow	45.6	40.7

Financial details	£ per cow	£ per cow
Output		
Value of milk produced	437.1	668.5
Value of calves	29.5	45.6
Total	466.6	714.1
Costs		
Concentrates - purchased	151.0	192.2
- home grown	12.3	14.9
Bulk food - purchased	12.6	10.1
- home grown	48.0	78.5
Grazing	31.1	43.5
Labour	60.2	104.1
Herd depreciation	13.8	27.1
Miscellaneous	82.5	126.4
Total costs	411.5	596.8
Net margin	55.1	117.3

Forage hectares per cow	0.60	0.55
Net margin per forage hectare - £	101.1	226.3

Table 10 Performance & margins achieved by the most profitable herds in 1980-81, compared with the average results.

	All herds	Top 25%[1] of herds
Physical features		
Number of herds	76	19
Herd size	104.2	126.1
Dry cows - %	15.6	15.7
Yield per cow - litres	5378	5807
Winter milk % (Oct.-March inc.)	50.4	49.5
Concentrates - tonnes per cow	1.66	1.72
- kg. per litre	0.31	0.29
Labour hours per cow	40.7	37.8

Financial details	£ per cow	£ per cow
Output		
Value of milk produced	668.5	721.8
Value of calves	45.6	44.7
Total	714.1	766.5
Costs		
Concentrates - purchased	192.2	189.7
- home grown	14.9	19.6
Bulk food - purchased	10.1	14.5
- home grown	78.5	71.6
Grazing	43.5	41.0
Labour	104.1	91.5
Herd depreciation	27.1	25.5
Miscellaneous	126.4	122.8
Total costs	596.8	576.2
Net margin	117.3	190.3

Forage hectares per cow	0.55	0.46
Net margin per forage hectare - £	226.3	416.3

1. Based on net margin per forage hectare.

Average figures can be notoriously misleading, and a significant feature of most farm surveys is the tremendous variation in results. Milk production, by its very diverse nature, tends to exhibit a wider variation than most enterprises, and it could be argued that, bearing in mind the random nature of the initial selection, herds included in this particular survey would produce an exceptionally wide spectrum of results. Some indication of this can be gauged by looking at the range in average yields, where the lowest figure recorded was just over 2,800 litres per cow, compared with almost 7,250 litres at the other end of the scale.

In an attempt to identify factors that may be associated with profitable milk production, the relationship between the average results and those achieved by the most profitable herds (as measured in terms of net margin per forage hectare) is shown in Table 10. The herds within the top 25% were larger, produced more milk per cow and fed concentrates at a lower rate per litre than the average. The herds also used less labour, and achieved a better stocking rate. In financial terms, their total returns were over £50 per cow higher but, significantly, most of the cost items were below average, and, in total, costs were over £20 per cow less than the "all herds" average, resulting in a net margin that was over £70 per cow higher than the average for the whole sample.

The figures do indicate that a high milk yield is not the be-all and end-all in profitable milk production. Indeed, the average yield in the most profitable herds was only 8% above the overall average and, while the extra returns from milk made a significant contribution to their higher profitability, the fact that the herds also had a lower cost structure should not be overlooked.

Finally, it is perhaps worth noting that the difference, in percentage terms, between the margin per cow of the most profitable herds and that of the average has narrowed considerably since 1976-77. At that time the top 25% achieved an average margin that was more than 120% above the all herds average, compared with a figure of just over 60% in 1980-81.

4. THE COSTS AND RETURNS OF MILK PRODUCTION

Under this heading the aim is to examine the costs and returns of milk production in 1980-81 rather more closely using Table 11 as a guide to the relative importance of the elements in each section. The 1976-77 figures are included for interest and to amplify points made in the text. The opportunity has also been taken to examine some of the physical features of the herds in the survey.

For the purpose of analysis, the non-Channel Island herds were grouped according to herd size, since a classification based on cow numbers approximates to a division by scale of operation, and probably provides a more satisfactory basis for comparison of dairy farms than any other readily available measure.

The results relating to the one Channel Island herd have been omitted from the tables in this section of the report in recognition of the rather different costs and returns structure associated with Channel Island herds in general. Consequently, certain total figures shown in Tables 12 to 20 may not tally with the totals shown in Table 11 and elsewhere in the report where the results relate to all seventy-six herds.

Table 11 Composition of costs and returns 1976-77 and 1980-81

	1976-77		1980-81	
	£ per cow	%	£ per cow	%
Returns				
Milk	437.1	93.7	668.5	93.6
Calves	29.5	6.3	45.6	6.4
Total	466.6	100.0	714.1	100.0
Costs				
Concentrates - purchased	151.0)	39.7	192.2)	34.7
- home grown	12.3)		14.9)	
Bulk food - purchased	12.6)	14.7	10.1)	14.9
- home grown	48.0)		78.5)	
Grazing	31.1	7.6	43.5	7.3
Labour	60.2	14.6	104.1	17.4
Herd depreciation	13.8	3.3	27.1	4.5
Miscellaneous	82.5	20.1	126.4	21.2
Total costs	411.5	100.0	596.8	100.0
Net margin	55.1	-	117.3	-

Returns

Milk

The 8,000 cows included in the survey produced a total of over forty-three million litres of milk over the twelve month period. Of this, 96% was sold wholesale, 3% was retailed and the balance fed to livestock and consumed by staff and members of the farmhouse in almost equal proportions. The average yield per cow of 5396 litres conceals a considerable range of from 2833 to 7241 litres per cow, although almost 60% of the non-Channel Island herds had average yields between 5,000 and 6,000 litres per cow.

Table 12 Summary of milk output by herd size

Herd size	Average yield	Average price	Milk returns	Winter milk production[1]
	Litres per cow	Pence per litre	£ per cow	%
Less than 60 cows	4855	12.24	594.1	46.4
60 - 80 cows	5310	12.38	657.5	50.3
81 - 100 cows	5393	12.42	669.7	49.5
101 - 140 cows	5706	12.48	712.3	51.8
More than 140 cows	5536	12.45	689.4	52.7
All herds	5396	12.41	669.5	50.3

1. October - March inclusive

The general trend was for yields to increase with herd size and this, combined with a somewhat higher average price, led to higher returns per cow. While the average price shows some relationship with the varying proportions of milk produced over the winter period, it is also, obviously, influenced by average milk quality and hence the relationship is not absolute.

The emphasis on winter milk production in the larger herds is well illustrated in the above table, although the seasonal distribution of milk production is shown in more detail in Table 1 of the appendix. In all herds size groups except one, more milk was produced in May than in any other month of the year. From this peak, production fell throughout the summer and in most of the groups monthly production was at its lowest in August and September, before increasing again as autumn calving cows made their contribution to the monthly production figures.

Calf returns and breeding policy

The contribution made to total returns by calves in both survey years was just over 6%. A summary of the disposal and average-value of calves born in the herds during the 1980-81 survey is shown in Table 13. A more detailed analysis by herd size appears in the appendix (Table 2).

Table 13 Calf disposals, retentions and average values

	Number	Per cent	Average value per head
			£
Sold	4094	49.8	47.2
Retained - dairy	2220	27.0	43.8
- other	1365	16.6	46.5
Deaths	547	6.6	-
Total	8226	100.0	43.0

Not surprisingly, the smallest herd size group among the non-Channel Island herds sold the highest proportion of calves (73%), and also exhibited the least number of "other retentions" (5%). This group also had the lowest level of dairy retentions (14%), and the general trend was for this figure to increase with herd size, with the group of herds with over 140 cows retaining 33% of their calves as potential herd replacements. Among the non-Channel Island herds, the mortality rate in four of the five groups was remarkably consistent at between six and seven per cent, and only in the smallest herd size group did the figure exceed seven per cent.

Although there was little variation between the average price received for calves sold from the three groups of herds with between sixty and one hundred and forty cows, there was a marked difference between sales from the smallest herds (average £56 per head) and the largest herds (£44). The most likely explanation for this differential is that the lower demands for heifer replacements enabled the owners of the smaller herds to make more use of beef bulls, whereas the replacement policy of the larger herds meant that the majority of the calves sold were of a pure bred nature. The timing of sales would also have an effect on the average price, and calf prices were certainly at their lowest in the autumn and early winter, when the calving pattern would suggest the majority of sales from the larger herds took place. After climbing steadily through the summer, market prices for calves fell sharply in September (largely as a result of the Continental veal boycott) and remained depressed until the turn of the year when there was a partial recovery.

There was considerable variation in the value placed on dairy heifer calves and on "other" calves (i.e. bull calves and non-dairy heifers), and while some of the difference may be due to the factors outlined earlier, the figures also reflect different attitudes by farmers to the value of calves. For example, the two groups in which the average value of "other" calves was lowest, also recorded below-average dairy heifer calf values.

Method of service and calving patterns

Of the 76 herds in the survey, 54 (71%) used artificial insemination as the sole means of getting cows in calf, 5 (7%) used a bull only and 17 herds (22%) used a combination of A.I. and natural service.

The monthly distribution of cow and heifer calvings is shown in Ta le 14, and this feature, together with the proportion of heifer calvings in relation to total calvings is shown in more detail in Table 3 of the appendix.

Table 14 Distribution of calvings

Month	Heifers	Cows	Total
	%	%	%
April	3.1	5.1	4.6
May	2.2	3.4	3.1
June	1.0	2.0	1.8
July	1.1	2.7	2.4
August	10.5	6.7	7.6
September	22.5	16.9	18.2
October	13.8	13.7	13.7
November	12.5	11.6	11.8
December	10.4	10.2	10.3
January	6.4	10.5	9.5
February	9.8	9.4	9.5
March	6.7	7.8	7.5
Year	100.0	100.0	100.0

Overall, the peak month for calvings of both heifers and cows was September, although there was considerable variation between groups. In all groups, however, calvings were at their lowest in June. Calvings were most evenly distributed in the smallest herd size group, whereas the concentration of calvings in the autumn in the larger herds was very evident. For example, 60% of all calvings in the group with over 140 cows took place during the period August to November. The late summer and autumn was also favoured by all groups as a time to calve heifers, and almost 60% of the total heifer calvings took place over that same four month period. Heifer calvings accounted for almost 23% of total calvings and the general tendency was for this proportion to increase with herd size.

Costs

Concentrates

As Table 11 demonstrates, concentrates accounted for almost 35% of the total costs of milk production in 1980-81, a somewhat lower figure than that recorded four years earlier. In the non-Channel Island herds surveyed in 1980-81, an average of 1.67 tonnes was fed per cow, of which

the majority (91%) was purchased and cost an average of almost £128 per tonne. The balance was made up of home grown cereals, valued at their ex-farm selling price which averaged just over £94 per tonne. Further analysis of concentrate usage and prices by herd size produced some interesting results which are tabulated below.

Table 15 Concentrate usage and cost according to herd size

Herd size	Concentrates fed		Average price (£ per tonne)		
	Tonnes per cow	Ratio of purchased to home grown	Pur-chased	Home grown	Total
Less than 60 cows	1.56	96 : 4	131.6	93.4	130.0
60 - 80 cows	1.67	93 : 7	127.6	95.8	125.2
81 - 100 cows	1.56	80 : 20	130.2	93.6	122.9
101 - 140 cows	1.77	92 : 8	128.1	94.4	125.5
More than 140 cows	1.76	94 : 6	121.4	94.3	119.7
All herds	1.67	91 : 9	127.7	94.2	124.5

With the exception of herds in the 81-100 cow group, the difference in the proportion of purchased to home-grown concentrates was not great, as the figures in Table 15 demonstrate. As supply does not appear to have been the limiting factor - on the farms in the survey almost 30% of the total acreage was used for cereal cropping - it must be assumed that the milk producers involved had reservations concerning the technical possibilities and/or economic advantages of retaining more home grown cereals for feeding to dairy cows. Although conventional calculations appear to suggest significant savings for cereal producers with dairy herds through home milling and mixing, there was clearly a strong preference in favour of selling cereals off the farm and buying back compounds.

With the exception of prices paid by producers in the largest herd size group, there was little evidence of any real economy of scale in respect of prices paid for purchased concentrates. The higher average price paid by owners of herds in the 81-100 cow group reflects their greater reliance on home mixing and hence on protein concentrates. Not surprisingly, the overall cost per tonne was highest in the smallest herd size group and lowest in herds with more than 140 cows. The differential of over £10 per tonne represents a saving of almost £20 per cow at the particular consumption levels recorded.

Purchased bulk food

At less than 2% of total production costs in 1980-81, this item was not of very great importance for the majority of herds in the survey. It was, however, of rather more importance to many herds in the 1976-77 survey, when the shortage of fodder meant that many herd owners had to buy in feed to supplement the deficiencies of grass and hay and silage.

There are, of course, some producers, usually the owners of small and medium sized herds, who rely heavily on purchased bulk foods and are thus able to carry more cows than if they relied solely on home grown forage and, as a means of expanding a business, the approach has much to commend it. There was, however, a little evidence from the analysis by herd size that any particular group in this survey relied heavily on purchased bulk feed.

Home-grown forage crops and grazing

Among the non-Channel Island herds, the combined cost of these two items increased from £114 per cow in the herds with less than 60 cows to just over £130 per cow in the group with between 101 and 140 cows. As a proportion of total production costs these figures represented 18% and 22% respectively. The overall average was almost £122 per cow (20% of total costs).

With grazing, hay and silage costs, samples were sufficient to permit a classification by herd size and these are summarised in Table 16. In this instance, in particular, attention is drawn to the crop costing methods outlined in appendix 2, since the conventions particularly in respect of rent, may differ from those used in other costings of this type.

Table 16 Grazing and forage crop costs by herd size

Herd size	Grazing		Hay		Silage	
	£ per hectare	£ per cow	£ per hectare	£ per tonne	£ per hectare	£ per tonne
Less than 60 cows	129.9	38.7	254.0	35.6	305.7	10.7
60 - 80 cows	160.9	44.5	304.7	39.7	296.7	10.2
81 - 100 cows	155.5	43.2	290.4	37.1	313.1	10.5
101 - 140 cows	168.5	43.6	328.0	43.5	306.6	10.4
More than 140 cows	172.1	45.5	234.8	34.1	314.7	10.7
All herds	158.6	43.2	291.3	38.9	308.3	10.5

The tendency with grazing was for costs per hectare to increase with herd size. This was a reflection not only of higher variable costs (seed, fertiliser, etc.) but also of the higher fixed costs (rent, labour, power and machinery, etc.) associated with this group of farms. However, the larger herds also achieved better stocking rates with the result that, with the exception of the smallest herd size group, grazing costs per cow were very similar.

There was no particular trend with hay and silage costs, although there was far less variation in silage costs (both per hectare and per tonne) than was the case with hay costs. Conditions for hay making in 1980 were far from ideal and the labour and machinery input was far greater than usual, with crops requiring frequent turning and tending to dry them out. This is the probable reason for the cost per tonne of hay being approximately three and a half times that of silage, compared with the factor of three suggested by the results of the 1976-77 survey.

A summary of the results of a separate study of hay and silage making which was based on national (as opposed to provincial) data is included in appendix 4.

Information on production costs and yields of various forage crops grown on the sample farms is shown in Table 17. As some of the figures are based on relatively small samples they should be treated with due caution. An important point to bear in mind is that with crops such as stubble turnips, rye and, to a lesser extent, kale, adjustments were made to overhead costs (notably rent) having regard for the length of time the crop occupied the ground.

Table 17 Forage crop costs

Crop	Number of records	Cost per hectare	Average yield per hectare	Average cost per tonne
		£	tonnes	£
Hay[1]	57	291.3	7.5	38.9
Grass silage[1]	63	308.3	29.5	10.5
Maize silage	5	477.1	38.6	13.5
Arable silage	6	254.8	21.0	12.8
Kale	19	222.9	-	-
Rye	5	226.0	-	-
Fodder roots[2]	4	498.4	57.2	8.7
Catch crops[3]	3	190.4	-	-

1. Costs and yields are calculated on adjusted hectares not on hectares cut.
2. Mangolds (1 crop), swedes (2 crops) and fodder beet (1 crop)
3. Mainly stubble turnips.

One of the most interesting features of the table is the fact that the average cost per hectare of growing and harvesting maize for silage was considerably higher than that recorded for grass silage and, although average yields were also higher, maize silage cost £3 per tonne more to produce than its grass counterpart. Seed and spray costs associated with maize were considerably higher than those for grass and, in the smaller herds, high contract charges also increased the average costs. Labour and power and machinery costs were also higher, and the fact that many of the maize crops received liberal dressings of farmyard manure or slurry, while no doubt resulting in savings of inorganic fertiliser, further increased production costs.

Although arable silage cost less to grow and harvest than grass silage, the lower average yield associated with the crop resulted in a more expensive form of silage in terms of cost per tonne. However, arable silage is often used as a means of establishing a ley and, in a direct reseed situation, has the advantage that production from a given area will be greater than if the seeds were sown without a cover crop.

Labour

In the context of this survey, the labour element is defined as that associated directly with the dairy herd and does not include labour used, for example, in forage crop production which is included in crop costs as appropriate.

Recent years have seen a significant decline in labour requirements per cow, mainly as a result of the adoption of new technology. While the effect of this capital-labour substitution has been most marked in the larger herds, many small herds have also benefited. For example, the introduction of pipeline milking to a cowshed and the installation of a bulk tank has brought significant savings in labour requirements over the traditional bucket plant and churns. The reduction in overall labour hours per cow has also arisen as a result of structural changes in the industry, notably the substantial decline in the number of small herds accompanied by compensating increases in both the number and size of large herds.

In spite of the improvement in labour productivity (as measured in terms of man hours per cow) between the two surveys, as a proportion of the total costs, the labour element in 1980-81 was rather higher than it had been four years earlier. This would suggest that unit labour costs have been rising at a rather faster rate than many of the other costs associated with milk production. Although for the sample as a whole, labour costs accounted for a little over 17% of total production costs, there were significant differences in the proportion between herd size groups. For the smallest herd size group the direct labour cost comprised almost 25% of the total costs, a figure which diminished to around 15% for the two groups with the largest herds.

Another feature highlighted by the analysis of labour requirements was the relative importance of family labour in milk production which is illustrated in Table 18.

In the survey, labour was recorded as paid or unpaid according to the presence or absence of a "contract of employment", and unpaid labour, usually consisting of that supplied by the farmer and his family, was charged at an hourly rate equivalent to that of paid labour. As one might expect, the proportion of unpaid labour decreased with increasing herd size, although even on the larger herds the contribution made by the family to the total supply of manual labour was not insignificant and, in fact, on nearly half of the 32 herds with over 100 cows there was some element of unpaid labour.

Table 18 Labour in milk production

Herd size	Labour per cow				
	Paid		Unpaid		Total
	Hours	%	Hours	%	Hours
Less than 60 cows	11.4	19	49.3	81	60.7
60 - 80 cows	13.0	31	29.5	69	42.5
81 - 100 cows	20.0	53	17.5	47	37.5
101 - 140 cows	24.9	75	8.3	25	33.2
More than 140 cows	33.2	98	0.7	2	33.9
All herds	20.8	52	19.6	48	40.4

On a more general theme, it is interesting to note that the labour efficiency, as measured in terms of total labour hours per cow, among the largest herds was slightly inferior to that achieved on herds of between 100 and 140 cows. One possible explanation for this is that a number of the larger herds were split up into separate units and, although some were costed separately and the individual herds included in their appropriate herd size group, on some holdings this was not possible. Thus a number of the herds in the largest herd size group were in fact an amalgamation of two or more smaller units. Additionally, on those herds that were maintained as single units, while in terms of cows per milker the labour situation often appeared highly efficient, when the staff responsible for the ancillary tasks were brought into the reckoning the number of cows per man assumed less satisfactory proportions.

Herd depreciation and replacement policy

The average herd depreciation charge in 1980-81 accounted for less than 5% of total production costs; a relatively small component in comparison with the other items. This is not to say though that the subject of herd replacement is unimportant; rather the very opposite, in fact, since less reliance on replacements reduces the uncertainties associated with either the home-bred heifer or the bought-in replacement. In general, a lower replacement rate will lead to an increase in the average age of cows in the herd, which in turn should lead to an increase in average yields. This generalisation would not, of course, necessarily be true in circumstances where the genetic potential of the replacements was above the level of existing members of the herd. In the whole-farm context, where the reliance is on home-bred stock, a lower replacement rate means less young stock have to be carried, and the land thus released could be put to more profitable use.

Table 19 Replacement rates, self-sufficiency and changes in herd sizes

Herd size	Outgoing cows as a percentage of the opening valuation	Herd depreciation	Home reared as a percentage of incoming cows and heifers	Percentage change in cow numbers[1]
	%	£ per cow	%	%
Less than 60 cows	17.6	24.6	50.4	+10.7
60 - 80 cows	19.0	24.1	91.1	+ 1.7
81 - 100 cows	18.1	23.9	88.1	+ 5.9
101 - 140 cows	21.9	30.3	92.6	+ 8.7
More than 140 cows	23.4	31.8	95.4	+ 4.3
All herds	21.0	27.1	89.8	+ 5.9

1. Between April 1980 and March 1981.

Over the sample as a whole, the replacement rate was 21% with a general tendency for the rate to increase with herd size. The overall rate was somewhat lower than that recorded in the province in 1976-77, when the corresponding figure was 25%, and the higher figure at that time was certainly due, in part, to the heavy culling by some herd owners in response to the fodder shortage.

The depreciation charge shows a fairly strong correlation with replacement rate, but, in addition to turnover, this figure is also influenced by the relationship between the average cull cow price and the valuation placed on cows. In this respect, the depreciation charge incurred by the smallest herds is rather higher than the below-average turnover figure would suggest. This arises principally as a result of a high proportion of casualties and deaths among the disposals, which reduced the average price of outgoing cows.

Over the sample as a whole, deaths and casualties accounted for 7% of all cow disposals; a figure which varied from 4% among the largest herds to 13% in the smallest herds. A feature of cow disposals from the herds with over 100 cows was that a relatively high proportion (over 10%) of such cows were classified as "transfers", implying that the herd owners had either beef suckling herds into which "problem cows" could be transferred, or that additional milking herds, not necessarily being costed as part of the survey, were available to receive (and, presumably, supply) such transfers.

Almost 90% of all herd replacements and additions in 1980-81 were home-bred, with the accent on increased self-sufficiency with increasing herd size. This is the relationship one might expect, bearing in mind that the owners of small herds are, in the main, the occupiers of small farms where the scope for rearing replacements is limited. On the other hand, the bigger herds tend to be found on larger farms where ample resources exist for heifer rearing.

Changes in the size of herd

All herd size groups showed an increase in average herd size between the beginning and end of the survey year. The overall increase was almost 6%, with the highest figure recorded in the smallest herd size group. This may give some indication of the financial pressure being felt by herds of less than 60 cows, and the resolve by certain herd owners to expand and create units that are more viable. Other figures in Table 19 would confirm this in that culling rates are below average, and that cows and heifers are being purchased to achieve the expansion that home-bred replacements alone cannot sustain. The below-average increase recorded in the group with between 60 and 80 cows would suggest that a number of herds in this group have reached the limits that physical resources allow, and further expansion is proving difficult to achieve.

Miscellaneous costs

At over 20% of total production costs, this item was the second most important element of the cost structure, exceeding both labour costs and total home grown forage costs including grazing. The items included under this heading are shown in Table 20, together with the variation between herd size groups.

Service fees and veterinary charges tend to increase with herd size, probably reflecting greater reliance on nominated bulls and more in the way of routine veterinary visits. Consumable stores include bedding and such items as teat dip, detergents, milk filters, etc. The figures for both rental value of dairy buildings and for dairy equipment repairs and depreciation reflect the additional capital investment by the owners of large herds. Similarly, the greater use made of machinery in the largest herds for many of the routine jobs on a dairy unit is demonstrated under the "miscellaneous tractor costs" heading. By far the biggest single cost item in this category is the share of farm overhead expenses, which itself covers an aggregation of many sundry individual items. Economies of scale in this particular area are well-illustrated by the figures in the table.

Total miscellaneous costs were highest on the smallest herds, with a trend for costs to fall up to the 100 cow herd size. Then, however, the higher variable costs and capital investment associated with the larger herds manifested themselves in an increase in total miscellaneous costs.

Investment in cows and dairy equipment

It is perhaps appropriate at the end of this section to examine the capital invested on the surveyed farms in dairy cows and in dairy equipment. In Table 21 the cow valuation was taken as the average of the opening and closing values in the herd stock account. The valuation of dairy equipment was the average of the opening and closing inventories, valued at replacement cost and not at current prices. The values shown are thus considerably below what would be required to set up a new unit at any given size level.

The figures in the table do not purport to measure the total amount of capital invested in dairy enterprises. Dairy equipment refers only to such items as bulk tanks, milking equipment, etc. and does not include buildings. No account has been taken of the machinery required on a dairy unit for grass conservation etc., nor of the working capital required to finance the running of the enterprise.

Table 20

Miscellaneous costs by herd size

Herd size group	Less than 60 cows	60-80 cows	81-100 cows	101-140 cows	More than 140 cows	All herds
Number of herds	12	14	17	19	13	75
Average herd size	42.5	70.4	92.0	115.9	200.8	105.0
Cost Item	£ per cow					
A.I. fees	5.8	6.8	6.3	7.9	8.2	7.0
Vet. and medicine	11.2	8.9	11.2	12.2	13.1	11.3
Consumable stores	16.3	15.4	12.8	15.8	13.3	14.7
Herd insurance & recording fees	3.7	3.6	4.5	4.4	5.0	4.3
Rental value of dairy buildings	10.9	16.9	11.9	18.7	19.1	15.6
Dairy equipment repairs & depreciation	14.5	11.1	8.7	13.3	15.6	12.5
Miscellaneous tractor costs	10.9	11.2	11.4	10.0	12.9	11.2
Share of farm overheads	60.7	51.6	46.7	46.6	44.2	49.4
Total	134.0	125.5	113.5	128.9	131.4	126.0

Table 21 Capital invested in dairy cows and dairy equipment by herd size

Herd size	Capital invested per cow		
	Dairy cows	Dairy equipment	Total
	£	£	£
Less than 60 cows	433	73	506
60 - 80 cows	444	69	513
81 - 100 cows	442	47	489
101 - 140 cows	449	84	533
More than 140 cows	443	72	515
All herds	444	69	513

The average investment per cow was £513, of which £444 was in the cow and £69 in its associated dairy equipment. The lower average cow values associated with the smallest herds may reflect poorer quality stock (if average yield is taken as the criterion this was indeed the case), but could also reflect differing farmer attitudes to cow valuations. In the three groups with less than 100 cows, economies of scale in respect of investment in equipment are very evident, although once herd size exceeds 100 cows the implications are that capital requirements per cow increase markedly.

5. FACTORS AFFECTING PROFITABILITY

This section is concerned with the presentation of average results for groups of herds classified according to different criteria. The variables chosen were herd size, yield and seasonality of milk production. The opportunity has also been taken to examine margin over concentrates as a measure of profitability. It should be borne in mind though that, although useful for descriptive purposes, this method of analysis has limitations. For example, the value of a particular item such as milk yield or labour-use will be affected by factors other than the one chosen for the classification.

For the purposes of this analysis, results relating to the one Channel Island herd have been excluded, because of its rather different costs and returns structure, and the results thus relate to herds which consist almost wholly of Friesians. The tables shown in this section merely summarise the financial situation; full details of the costs and returns are set out in appendix 3, together with additional physical data relating to the same groups of herds (Tables 4-11 inclusive).

1. Herd size

Table 22 A summary of returns, costs and margins per cow by herd size

Herd size	Number of herds	Total returns (milk & calves)	Costs	Net margin
		£	£	£
Less than 60 cows	12	645.6	643.2	2.4
60 - 80 cows	14	705.0	596.3	108.7
81 - 100 cows	17	713.4	555.6	157.8
101 - 140 cows	19	758.0	604.7	153.3
More than 140 cows	13	732.3	592.1	140.2
All herds	75	715.6	596.0	119.6

The margin per cow increased with herd size up to 100 cows with a falling off in profitability above that point, mainly as a result of higher costs associated with the larger herds.

Average milk yield increased with herd size up to the group with between 101 and 140 cows. The large herds also produced a higher proportion of their milk in the winter months (October-March inclusive). Concentrate usage per cow increased with herd size, although in terms of kilogrammes per litre the average rates were very similar.

The main area where the large herds did have a clear advantage was in terms of labour, although there was little difference in hours per cow in the two groups with more than 100 cows. Economies in this particular area arise for two main reasons. Firstly, there are economies of scale in that it does not take proportionately longer to bring in more cows, to clean the

parlour and milking equipment or to perform many of the other jobs that are a part of the daily routine of a milking herd. Secondly, larger herds are able to introduce labour-saving technology that would be too expensive for smaller herds. The larger herds achieved better stocking rates, in keeping with the higher usage of fertiliser on grassland, and the margins per forage hectare achieved by the herds with more than 80 cows were appreciably higher than those recorded for the other two groups.

2. Yield

Table 23 A summary of returns, costs and margins per cow by yield

Yield group (Litres per cow)	Number of herds	Total returns (milk & calves)	Costs	Net margin
		£	£	£
Less than 4,500	9	538.4	556.3	- 17.9
4,500 - 5,000	10	643.5	580.2	63.3
5,001 - 5,500	22	697.2	572.2	125.0
5,501 - 6,000	22	768.1	606.9	161.2
More than 6,000	12	845.8	662.5	183.3
All herds	75	715.6	596.0	119.6

Returns, costs and margins all increased with higher yields, although the difference in net margin per cow achieved by the two highest yielding groups was not as great as between the other groups.

In the main, the higher yielding herds were larger than average, and produced a greater proportion of their milk in the winter period. Although concentrate usage per cow and per litre was higher in the herds with an average of over 6,000 litres per cow, the additional milk output was sufficient to give them an appreciably higher margin over concentrates.

At 0.52 hectares per cow, the stocking rate in the three groups producing over 5,000 litres per cow was identical, with the result that the financial advantage of the highest yielding herds, in terms of £ per cow, was also evident in terms of £ per forage hectare.

3. Seasonality

Table 24 A summary of returns, costs and margins per cow by seasonality of production[1]

Proportion of winter milk	Number of herds	Total returns (milk & calves)	Costs	Net margin
		£	£	£
Less than 40%	7	626.8	563.4	63.4
40.0 - 45.0%	11	716.3	586.0	130.3
45.1 - 50.0%	18	679.7	597.4	82.3
50.1 - 55.0%	22	754.1	608.6	145.5
More than 55%	17	739.9	598.2	141.7
All herds	75	715.6	596.0	119.6

1. Proportion of milk produced in the winter period (October to March inclusive).

While herds producing less than 40% of their milk in the winter period appeared to be at a financial disadvantage, there was no clear relationship between time of production and net margin per cow. However, the two groups producing more than half their milk over the winter did achieve the highest margins per cow, which, combined with superior stocking rates, led to appreciably higher margins per forage hectare.

4. Margin over concentrates

Although little reference has been made to it in this report, margin over concentrates is widely used in the dairy industry as a performance measure. Margin over concentrates (M.O.C.) is simply the value of milk produced per cow per year minus the cost of purchased and home-grown concentrates fed per cow in the same year. Its main advantage as an efficiency indicator lies in the fact that it is a relatively easy measure to calculate. The main disadvantage, however, is that it only goes part of the way towards assessing the overall profitability of the dairy enterprise; gross margins take the process a stage further, with net margin the ultimate objective.

In an attempt to assess the relationship between M.O.C. and overall profitability, the survey results have been analysed according to the level of M.O.C. and are shown in summarised form in Table 25. The implications are that, for this particular group of milk producers, there appeared to be a strong correlation between M.O.C. and net margin per cow.

Table 25 Relationship of margin over concentrates with net margin

Level of margin over concentrates	Number of herds	Total output	Total costs	Net margin
		£ per cow		
Less than £400 per cow	12	563.8	577.9	-14.1
£400 - £450 per cow	15	686.2	587.6	98.6
£451 - £500 per cow	25	729.3	586.3	143.0
£501 - £550 per cow	15	788.0	620.8	167.2
More than £550 per cow	8	819.9	622.9	197.0
All herds	75	715.6	596.0	119.6

Summary

Of particular interest in Tables 22 to 25 is the fact that at the lowest end of the scale for each variable, the margin per cow is significantly lower than the one achieved by herds in the next group.

The results achieved by the smallest herd size group give some indication of the financial pressure owners of small herds are under and, in fact, losses were recorded on four of the twelve herds in that group. While the results would indicate that increasing herd size and spreading the overheads over more cows would help the situation, farm size and buildings often place limitations on the maximum number of cows that the farm will carry.

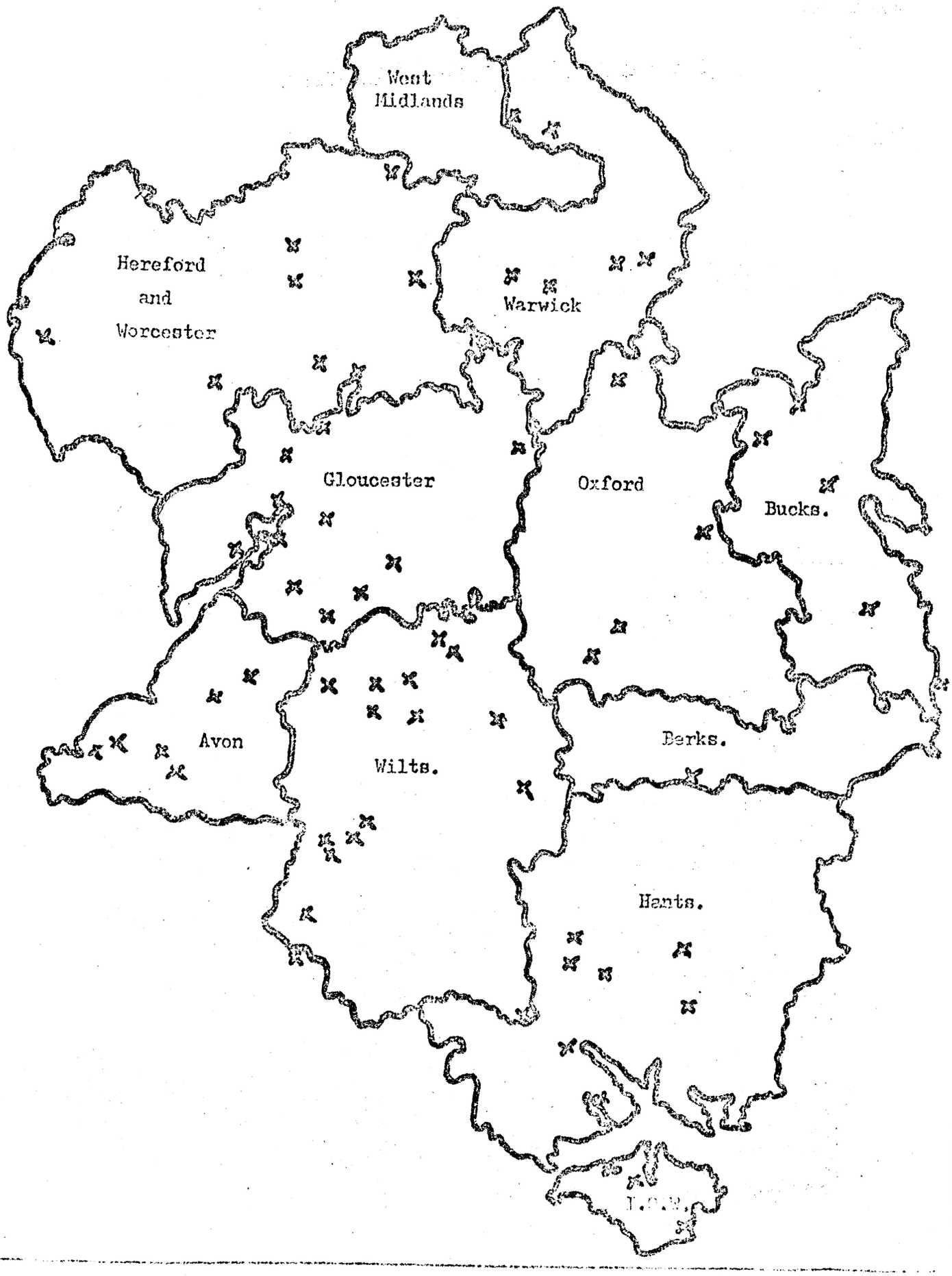
The accent in dairy farming in recent years has been on increasing individual cow yields, and while Table 23 demonstrated that the highest yielding group produced the highest margin per cow, analysis in a previous section showed that the most profitable herds earned their "top 25%" status by a combination of moderately high yields and below average costs.

Under the prices and conditions prevailing in 1980-81, there did appear to be a financial advantage to be gained from winter milk production, although the differential between winter and summer milk production was less than previous surveys have indicated. This reflects, no doubt, the fact that the differential between winter and summer milk prices has narrowed in recent years, and the key to the winter milk producers' success would appear to lie in the yield advantage they enjoy.

Although the limitations of the margin over concentrates calculation are recognised, the results obtained from this survey would suggest that it can provide a reliable guide to the actual profit per cow.

APPENDICES

APPENDIX 1 Map showing the location of farms in the survey



APPENDIX 2

Costing methods, definitions and terms used

Returns

Milk

The revenue from wholesale milk sales, together with the value of milk consumed in the farmhouse, milk supplied as a perquisite to workers and milk fed to livestock.

Calves

The net value of calves sold within a week of birth, together with the estimated value, at seven days old, of calves retained.

Costs

Purchased feed

Purchased concentrates and bulk feeds were charged at the net cost delivered to the farm.

Home grown feed

Home grown cereals were charged at the average market price at the time of feeding.

Forage crops and grazing were charged at cost of production. The cost of each crop was calculated on a per hectare basis and apportioned to the cows in accordance with the proportion of the crop consumed by them. With hay and grass silage, adjustments were made for aftermath grazing.

Labour used in forage crop production was charged at a standard rate of £2.20 per hour, and tractors at rates of between £2.60 and £6 per hour depending on size. Depreciation of machinery and equipment was calculated on the replacement cost basis, together with an allowance to cover repairs.

The rent used in the crop costings was that portion of the gross rent applicable to the land. To arrive at this figure, the estimated rental value of all buildings (including the farmhouse and farm cottages) was deducted from the total rent paid (or imputed rental value) and the remainder divided by the total area of crops and grass to give a net field rent per hectare. Where applicable, adjustments were made to take the cost of grass keep into account.

Labour

Relates to all manual labour associated directly with the dairy herd and takes account of time spent milking, feeding and otherwise looking after the herd, cleaning dairy equipment, etc. Paid labour was charged at the actual cost to the farmer, including allowances for holidays, insurance contributions, etc., together with the value of perquisites. Unpaid family labour was charged at the average rate for paid labour.

Herd depreciation

The difference between the opening valuation of the herd plus the value of animals purchased or transferred in and the closing valuation of the herd plus the value of animals sold or transferred out.

Miscellaneous costs

Includes service fees, veterinary charges and medicines, consumable dairy stores, herd insurance, recording fees, repairs to dairy equipment, and tractor and machinery costs associated directly with the dairy herd. Also included under this heading is a rental charge for the dairy buildings, a dairy equipment depreciation charge and a share of general farm overheads.

Net margin

Per cow

Total returns minus total costs divided by the average herd size.

Per hectare

Total returns minus total costs divided by the total forage hectares used by the dairy herd.

Margin over concentrates

Milk returns less the cost of purchased and home grown concentrates.

Terms used

Averages

The averages used in this report are the average of the individual herd results and each of the 76 herds carried equal "weight".

Herd size

The number of cows (in milk and dry) were recorded monthly and herd size based on the average of the twelve monthly figures.

Dry cow percentage

The average number of dry cows expressed as a percentage of the average of the total cows in the herd.

Average milk yield

Total annual milk production divided by the average number of cows in the herd.

Winter milk (seasonality)

Milk production in the period October to March inclusive expressed as a percentage of annual production.

Forage hectares

The total area devoted to providing grazing and forage crops for the dairy herd.

Stocking rate

The total forage hectares used by the dairy herd divided by the average herd size.

Table 1

Distribution of milk production by herd size

(Non-Channel Island herds)

Month	Less than 60 cows	60-80 cows	81-100 cows	101-140 cows	More than 140 cows	All Herds
	%	%	%	%	%	%
April	9.5	9.2	9.1	9.3	9.8	9.6
May	10.4	10.1	10.2	10.1	10.3	10.4
June	9.5	8.9	9.1	8.7	8.5	8.9
July	9.0	8.0	8.4	7.6	7.0	7.8
August	8.0	6.9	7.0	6.3	5.6	6.5
September	7.2	6.6	6.7	6.2	6.1	6.5
Summer total	53.6	49.7	50.5	48.2	47.3	49.7
October	6.7	7.6	7.6	7.4	7.3	7.3
November	6.7	7.8	7.7	7.4	8.1	7.6
December	7.5	8.8	8.2	8.6	8.9	8.5
January	8.4	9.0	8.4	9.3	9.3	8.9
February	7.9	8.1	8.1	8.9	8.9	8.4
March	9.2	9.0	9.5	10.2	10.2	9.6
Winter total	46.4	50.3	49.5	51.8	52.7	50.3
Year	100.0	100.0	100.0	100.0	100.0	100.0

Table 2 Calf disposals, retentions and average values per head by herd size

(Non-Channel Island herds)

	Less than 60 cows		60-80 cows		81-100 cows		101-140 cows		More than 140 cows		All herds	
	%	£	%	£	%	£	%	£	%	£	%	£
Sold	73	56.4	43	47.1	55	48.6	51	47.7	44	44.0	50	47.6
Retained-dairy	14	38.5	25	48.0	22	40.6	27	43.0	33	45.0	27	43.8
-other	5	55.6	25	52.7	17	39.3	15	43.0	17	46.1	17	46.5
Deaths	8	-	7	-	6	-	7	-	6	-	6	-
Total	100	49.5	100	45.6	100	42.1	100	43.0	100	41.9	100	43.2

Table 3

Distribution of calvings (cows & heifers) by herd size

(Non-Channel Island herds)

Month	Less than 60 cows	60-80 cows	81-100 cows	101-140 cows	More than 140 cows	All herds
	%	%	%	%	%	%
April	6.8	4.6	6.4	4.4	3.3	4.6
May	6.0	3.8	5.6	2.5	1.3	3.1
June	4.5	2.5	2.7	1.5	0.7	1.8
July	5.8	3.5	3.0	2.9	0.5	2.4
August	7.8	8.3	7.2	5.2	9.5	7.6
September	8.4	17.5	14.6	21.3	19.9	18.2
October	12.3	15.0	12.4	11.5	16.1	13.7
November	13.2	13.6	11.0	11.4	11.6	11.8
December	11.1	9.7	8.1	12.7	9.6	10.3
January	7.4	6.6	7.9	9.7	11.9	9.5
February	9.1	7.3	11.6	9.3	9.3	9.5
March	7.6	7.6	9.5	7.6	6.3	7.5
Year	100.0	100.0	100.0	100.0	100.0	100.0
Heifer calvings as a percentage of total calvings	13.8	18.2	20.2	24.8	25.4	22.6

Table 4

Average returns, costs and margins by herd size

(Non-Channel Island herds)

	Less than 60 cows	60-80 cows	81-100 cows	101-140 cows	More than 140 cows	All herds
Number of herds	12	14	17	19	13	75
Herd size (cows)	42.5	70.4	92.0	115.9	200.8	105.0
	£ per cow					
Returns						
Milk	594.1	657.5	669.7	712.3	689.4	669.5
Calves	51.5	47.5	43.7	45.7	42.9	46.1
Total	645.6	705.0	713.4	758.0	732.3	715.6
Costs						
Concentrates - purchased	196.9	196.1	162.5	208.5	200.9	192.6
- home grown	6.2	12.0	29.1	13.0	10.2	14.9
Bulk food - purchased	11.5	12.8	11.1	7.1	9.6	10.2
- home grown	74.9	76.1	76.9	87.5	72.3	78.3
Grazing	38.7	44.5	43.2	43.6	45.5	43.2
Labour	156.4	105.2	95.4	85.8	90.4	103.7
Herd depreciation	24.6	24.1	23.9	30.3	31.8	27.1
Miscellaneous	134.0	125.5	113.5	128.9	131.4	126.0
Total costs	643.2	596.3	555.6	604.7	592.1	596.0
Net margin	2.4	108.7	157.8	153.3	140.2	119.6

Table 5

The main physical and financial features by herd size

(Non-Channel Island herds)

	Less than 60 cows	60-80 cows	81-100 cows	101-140 cows	More than 140 cows	All herds
Number of herds	12	14	17	19	13	75
Herd size (cows)	42.5	70.4	92.0	115.9	200.8	105.0
Dry cows (%)	16.8	14.4	16.5	15.2	15.4	15.6
Milk output - Litres per cow	4855	5310	5393	5706	5536	5396
- £ per cow	594.1	657.5	669.7	712.3	689.4	669.5
Winter milk (%)	46.4	50.3	49.5	51.8	52.7	50.3
Concentrates - tonnes per cow	1.56	1.67	1.56	1.77	1.76	1.67
- kg. per litre	0.32	0.31	0.29	0.31	0.31	0.31
- £ per cow	203.1	208.1	191.6	221.5	211.1	207.5
Margin over concentrates - £ per cow	391.0	449.4	478.1	490.8	478.3	462.0
Labour - hours per cow	60.7	42.5	37.5	33.2	33.9	40.4
Total costs - £ per cow	643.2	596.3	555.6	604.7	592.1	596.0
Stocking rate - ha. per cow	0.61	0.55	0.53	0.55	0.52	0.55
Net margin - £ per cow	2.4	108.7	157.8	153.3	140.2	119.6
- £ per ha.	4.5	213.9	304.5	286.8	284.3	231.6

Table 6

Average returns, costs & margins by yield group

(Non-Channel Island herds)

	Less than 4500 litres	4500-5000 litres	5001-5500 litres	5501-6000 litres	More than 6000 litres	All herds
Number of herds	9	10	22	22	12	75
Average yield per cow (litres)	3993	4810	5244	5795	6481	5396
	£ per cow					
Returns						
Milk	492.9	597.0	651.3	721.6	800.3	669.5
Calves	45.5	46.5	45.9	46.5	45.5	46.1
Total	538.4	643.5	697.2	768.1	845.8	715.6
Costs						
Concentrates - purchased	149.5	169.2	180.4	196.0	260.5	192.6
- home grown	17.0	14.2	13.9	20.6	5.2	14.9
Bulk food - purchased	11.5	4.0	6.8	16.5	9.3	10.2
- home grown	62.1	77.7	81.1	77.4	87.6	78.3
Grazing	33.4	43.8	42.5	44.8	48.7	43.2
Labour	136.1	121.4	96.1	93.0	98.0	103.7
Herd depreciation	26.8	26.2	25.1	30.6	25.0	27.1
Miscellaneous	119.9	123.7	126.3	128.0	128.2	126.0
Total costs	556.3	580.2	572.2	606.9	662.5	596.0
Net margin	-17.9	63.3	125.0	161.2	183.3	119.6

Table 7 A summary of the main physical and financial features by yield group

(Non-Channel Island herds)

	Less than 4500 litres	4500-5000 litres	5001-5500 litres	5501-6000 litres	More than 6000 litres	All herds
Number of herds	9	10	22	22	12	75
Herd size (cows)	68.2	84.4	116.6	115.5	109.1	105.0
Dry cows (%)	18.1	14.4	16.1	15.2	14.7	15.6
Milk output - Litres per cow	3993	4810	5244	5795	6481	5396
- £ per cow	492.9	597.0	651.3	721.6	800.3	669.5
Winter milk (%)	46.2	47.3	51.7	50.9	51.8	50.3
Concentrates - tonnes per cow	1.29	1.42	1.56	1.79	2.12	1.67
- kg. per litre	0.32	0.29	0.30	0.31	0.33	0.31
- £ per cow	166.5	183.4	194.3	216.6	265.7	207.5
Margin over concentrates - £ per cow	326.4	413.6	457.0	505.0	534.6	462.0
Labour - hours per cow	53.9	44.1	38.2	36.6	38.3	40.4
Total costs - £ per cow	556.3	580.2	572.2	606.9	662.5	596.0
Stocking rate - ha. per cow	0.63	0.66	0.52	0.52	0.52	0.55
Net margin - £ per cow	-17.9	63.3	125.0	161.2	183.3	119.6
- £ per ha.	-43.6	100.9	245.7	318.1	362.6	231.6

Table 8

Average returns, costs & margins by seasonality of production

(Non-Channel Island herds)

Proportion of winter milk	Less than 40%	40.0-45.0%	45.1-50.0%	50.1-55.0%	More than 55%	All herds
Number of herds	7	11	18	22	17	75
Winter milk % (Oct. -March inc.)	35.0	42.8	48.3	52.3	60.9	50.3
	£ per cow					
Returns						
Milk	576.9	666.7	635.1	707.5	696.9	669.5
Calves	49.9	49.6	44.6	46.6	43.0	46.1
Total	626.8	716.3	679.7	754.1	739.9	715.6
Costs						
Concentrates - purchased	152.9	182.2	183.0	204.0	211.1	192.6
- home grown	-	15.2	18.3	13.2	19.4	14.9
Bulk food - purchased	9.2	3.9	13.4	9.9	11.8	10.2
- home grown	66.2	89.3	74.1	82.8	74.8	78.3
Grazing	39.9	48.4	41.4	44.8	41.2	43.2
Labour	133.5	104.5	112.7	101.3	84.4	103.7
Herd depreciation	28.9	24.8	28.5	26.5	27.0	27.1
Miscellaneous	132.8	117.7	126.0	126.1	128.5	126.0
Total costs	563.4	586.0	597.4	608.6	598.2	596.0
Net margin	63.4	130.3	82.3	145.5	141.7	119.6

Table 9 A summary of the main physical and financial features by seasonality of production

(Non-Channel Island herds)

Proportion of winter milk	Less than 40%	40.0-45.0%	45.1-50.0%	50.1-55.0%	More than 55%	All herds
Number of herds	7	11	18	22	17	75
Herd size (cows)	93.8	85.1	89.7	112.0	129.5	105.0
Dry cows (%)	17.6	14.5	16.0	14.8	16.2	15.6
Milk output - Litres per cow	4684	5401	5155	5708	5535	5396
- £ per cow	576.9	666.7	635.1	707.5	696.9	669.5
Winter milk (%)	35.0	42.8	48.3	52.3	60.9	50.3
Concentrates - tonnes per cow	1.25	1.56	1.59	1.77	1.86	1.67
- kg. per litre	0.27	0.29	0.31	0.31	0.33	0.31
- £ per cow	152.9	197.4	201.3	217.2	230.5	207.5
Margin over concentrates - £ per cow	424.0	469.3	433.8	490.3	466.4	462.0
Labour - hours per cow	50.9	40.2	43.9	39.6	33.7	40.4
Total costs - £ per cow	563.4	586.0	597.4	608.6	598.2	596.0
Stocking rate - ha. per cow	0.60	0.65	0.50	0.54	0.53	0.55
Net margin - £ per cow	63.4	130.3	82.3	145.5	141.7	119.6
- £ per ha.	162.8	218.9	170.7	274.6	277.1	231.6

Table 10 Average returns, costs and margins by margin over concentrates

(Non-Channel Island herds)

Margin over concs.	Less than £400	£400-£450	£451-£500	£501-£550	More than £550	All herds
Number of herds	12	15	25	15	8	75
Av.margin over concs.- £ per cow	327.3	433.6	472.9	522.3	570.5	462.0
	£ per cow					
Returns						
Milk	517.3	640.8	684.4	741.1	771.1	669.5
Calves	46.5	45.4	44.9	46.9	48.8	46.1
Total	563.8	686.2	729.3	788.0	819.9	715.6
Costs						
Concentrates - purchased	177.2	184.9	195.3	206.2	196.5	192.6
- home grown	12.8	22.3	16.2	12.6	4.1	14.9
Bulk food - purchased	12.7	4.7	5.4	20.2	13.2	10.2
- home grown	62.7	77.1	80.3	82.4	89.9	78.3
Grazing	35.2	43.1	44.5	43.9	50.2	43.2
Labour	131.0	104.7	93.2	103.5	93.9	103.7
Herd depreciation	27.8	24.9	26.7	25.1	34.7	27.1
Miscellaneous	118.5	125.9	124.7	126.9	140.4	126.0
Total costs	577.9	587.6	586.3	620.8	622.9	596.0
Net margin	-14.1	98.6	143.0	167.2	197.0	119.6

Table 11 A summary of the main physical and financial features by margin over concentrates

(Non-Channel Island herds)

Margin over concs.	Less than £400	£400-£450	£451-£500	£501-£550	More than £550	All herds
Number of herds	12	15	25	15	8	75
Herd size (cows)	75.3	104.5	119.6	97.9	117.8	105.0
Dry cows (%)	16.9	15.7	15.8	14.9	14.3	15.6
Milk output - Litres per cow	4232	5154	5483	5954	6273	5396
- £ per cow	517.3	640.8	684.4	741.1	771.1	669.5
Winter milk (%)	45.4	53.6	50.7	52.5	45.7	50.3
Concentrates - tonnes per cow	1.47	1.65	1.71	1.78	1.64	1.67
- kg.per litre	0.34	0.32	0.31	0.30	0.26	0.31
- £ per cow	190.0	207.2	211.5	218.8	200.6	207.5
Margin over concentrates - £ per cow	327.3	433.6	472.9	522.3	570.5	462.0
Labour - hours per cow	52.2	39.5	37.0	40.3	35.4	40.4
Total costs - £ per cow	577.9	587.6	586.3	620.8	622.9	596.0
Stocking rate - ha. per cow	0.62	0.57	0.53	0.52	0.53	0.55
Net margin - £ per cow	-14.1	98.6	143.0	167.2	197.0	119.6
- £ per ha.	-29.8	183.4	279.5	328.8	381.9	231.6

Table 12

Heifer, cull cow and calf prices[1] 1980-81

Month	Accredited Friesian heifers in milk	Cull cows	Calves
	£	£	£
April	521	359	59
May	427	370	66
June	461	356	71
July	503	340	77
August	493	305	74
September	505	332	57
October	501	321	55
November	502	329	49
December	538	330	50
January	540	361	58
February	568	385	59
March	561	383	57
Year	510	347	61

1 Averaged from selected markets in the Reading province

APPENDIX 4

Grass Conservation : 1980

Introduction

This appendix contains a brief summary of data on hay and silage crops made in 1980, which is presented in its entirety in the full report 'Grass Conservation : 1980' published by this Department. The information for the study was collected as part of the National Investigation into the Economics of Milk Production, with field work carried out by investigational staff at Askham Bryan College of Agriculture, and the Universities of Aberystwyth, Cambridge, Exeter, London (Wye College), Manchester, Newcastle, Nottingham and Reading. The study was co-ordinated by staff at Reading.

The main aim of the study was to provide economic data on hay and silage harvesting for the 1980 season, as well as a limited amount of physical information on such topics as tractor and labour usage, storage and feeding methods, physical yields and areas mown.

The sample was selected using information supplied by co-operators in the Milk Production Survey regarding their intended methods of harvesting and the quantities of hay and silage to be harvested in 1980. Because of insufficient numbers of co-operators using certain harvesting methods, the final sample included only three different silage and two different hay harvesting methods. In total 107 hay and 108 silage crops were surveyed.

However, the comparisons between the two approaches to conservation, and the different techniques within each approach, do not take into account the quality of the end product, which would have required more information of a different kind than was possible from this survey.

Weather conditions for conservation were not very favourable in 1980, with a late spring and an early summer of near drought conditions. These conditions retarded growth of grass and led to silage cuts taken in May of below average yield, although the quality was good. The mid-summer tended to be wet and unsettled with periods of very heavy rainfall ensuring plentiful supplies of grass, but making silage and hay harvesting extremely difficult and protracted. Later in the summer, the weather improved which enabled satisfactory late silage cuts to be taken during August and September.

Hay 1980

The hay-making section of this survey covered 107 farms, with production per farm ranging from 5 tonnes to 320 tonnes. The sample was split into two groups based on method of making, a small baler being used in all cases:

(1) traditional methods;

(2) quick methods; i.e. those which accelerated the process to some extent by the use of mower conditioners, crimpers, additives or artificial drying.

The traditionally made crops, which accounted for 83% of all hay included in the survey, were subdivided into three size categories according to tonnage produced, in order to determine the effect of size on costs of production. Insufficient numbers in the sample of 'quick' hay crops prevented a similar analysis for this group.

Costs of production, detailed in Table 1, are subdivided into harvest and non-harvest costs. The harvest costs consist of labour, tractor and machinery and sundries, the latter being almost entirely composed of twine for traditional crops and a combination of twine and additives for the quick crops. Non-harvest costs comprise a share of ley establishment, fertilisers, sprays, rent and the costs of labour and machinery involved in applying fertiliser, etc.

For traditionally made crops, the results show a clear trend of decreasing costs of production with increasing size of output, ranging from £39.2 per tonne for farms producing less than 50 tonnes to £32.7 per tonne for farms producing over 100 tonnes. This trend applies to both the harvest and non-harvest share of costs, but is more pronounced in the former. The average cost of producing one tonne of hay traditionally in this survey was £35.2.

The hay crops made using some form of accelerated technique were more expensive to harvest than traditionally made crops, with an average cost per tonne of £40.4. Machinery was the major contributor here, accounting for 37% of total conservation costs. Labour, due to a higher level of machinery input, accounted for a slightly smaller proportion of the total costs than with traditionally made crops.

Levels of investment in hay-making machinery are also shown in the table. The figures represent the total investment in machinery i.e. mower, turner/tedder, baler, trailers, elevators and sledges, divided by the total tonnage of hay for which that item was used, excluding any operations carried out on contract.

Hay crops harvested using some form of accelerated drying technique were less extravagent in their use of labour and tractor resources in 1980 than crops made in the traditional manner, which, because of the wet summer, were subjected to more turning and tedding operations than is usual.

Information on physical yields of hay was collected, and the production of some 7801 tonnes of hay from 1442 hectares was covered by the survey. Most farmers took only one cut of hay, but 19 farms (18%) took a second cut, although often on a very small scale. Average yields obtained from first and second cuts are detailed in the table; the results for both cuts being sub-divided as shown. The highest average yields were from areas not grazed after 1st April (60% of the hay area), and the lowest from second cuts taken after a first hay crop. These latter crops accounted for only 2% of the total hay area.

Table 1

Hay Crops: Summary by methods of making

	Traditional crops by size group				Quick crops
	0-49t	50-99t	100+t	All crops	
Number of crops	36	33	21	90	17
Average crop size - tonnes	28.2	71.3	148.0	71.9	78.1
% of total output	13.0	36.3	48.0	83.0	17.0
COSTS OF PRODUCTION					
HARVEST COSTS	£ per t %	£ per t %	£ per t %	£ per t %	£ per t %
Labour	5.21 13.3	4.99 13.5	4.43 13.5	4.75 13.5	4.47 11.1
Power & machinery:					
Tractor	5.49 -	5.28 -	5.26 -	5.30 -	5.88 -
Depreciation & repairs	6.89 -	5.39 -	4.12 -	5.02 -	7.54 -
Contract changes	1.26 -	1.27 -	0.38 -	0.84 -	0.84 -
Other costs	0.02 -	0.05 -	- -	0.02 -	0.47 -
Total power & machinery	13.66 34.8	11.99 32.6	9.76 29.9	11.18 31.8	14.73 36.5
Sundries	1.31 3.3	1.15 3.1	1.01 3.1	1.11 3.1	1.52 3.7
TOTAL HARVE T COSTS	20.18 51.4	18.13 49.2	15.20 46.5	17.04 48.4	20.72 51.3
Share of non-harvest costs	19.06 48.6	18.71 50.8	17.46 53.5	18.17 51.6	19.64 48.7
TOTAL CONSERVATION COSTS	39.24 100.0	36.84 100.0	32.66 100.0	35.21 100.0	40.36 100.0
Machinery investment (i) - £ per tonne	42.74	33.11	21.03	28.26	30.52 (ii)
Total labour hours - per tonne	2.42	2.55	2.20	2.35	1.99
Total tractor hours - per tonne	1.91	2.03	1.82	1.90	1.64

PHYSICAL YIELDS	1st cut		2nd cut	
	Not grazed after 1st April	Grazed after 1st April	Taken after hay	Taken after silage
Yield - tonnes per hectare	5.9	5.4	3.3	4.0
Area cut as % of total	59.6	31.0	1.8	7.6

(i) written down replacement values

(ii) excludes barn hay drying investment

Silage 1980

A total of 108 silage crops from 106 farms were included in the survey, with production per farm ranging from 50 tonnes to 2725 tonnes. The sample was sub-divided into three silage-making methods:

1) use of a double-chop forage harvester;

2) use of a precision chop forage harvester;

3) use of a forage wagon.

All silage crops were wilted prior to ensilage, and the crops stored in either clamps or pits. Sufficient numbers of co-operators produced silage by use of a precision chop forage harvester (82% of the total) to enable the results for this group to be broken down into three size categories.

Costs of production are presented in Table 2, and are broken down into harvest and non-harvest costs for all three silage-making methods. Harvest costs comprise labour, tractor and machinery, additives and clamp covering materials. Non-harvest costs consist of a share of ley establishment, fertilisers, sprays, rent and the costs of labour and machinery involved in applying fertiliser, etc.

For all methods of making silage, harvest costs accounted for between 43% and 51% of total conservation costs, the rest being attributable to a share of non-harvest costs. Use of a forage wagon proved to be the cheapest silage-making method in this survey - £9.56 per tonne - with little difference in cost between the double chop and the overall precision chop methods: £10.74 and £10.84 per tonne respectively.

Within the precision chop sample, the results show that costs of conservation fall with increasing size of crop harvested - from £11.33 to £10.79 per tonne. For all methods, tractor and machinery costs are the largest item in the harvest costs, comprising between 30% and 39% of total conservation costs. Labour costs per tonne of silage were lowest for precision chop crops of 300-599 tonnes and highest for crops harvested using a double chop harvester. Additives were applied to some crops in all groups, although only one of the ten forage wagon crops was treated in this way. In the precision chop group, frequency of additive use increased with size of crop made, with an overall average of 72% of the crops so treated.

The level of investment figures shown in the table represent the total investment in harvesting machinery i.e. mower, turner, harvester, trailer and buckrake divided by the total tonnage of silage on which that item was used. Those operations carried out by contractors were omitted in order to arrive at the actual level of investment for farmers owning their own machines.

Because of its suitability for a small farm/labour force situation, one would expect that the forage wagon would be the least extravagant in terms of labour and tractor usage, and this was shown to be the case. The double chop forage harvester and the smallest size group of precision chop forage harvester, however, consumed the most labour and tractor hours per tonne of silage harvested.

Analysis of data on physical yields showed that the 79,860 tonnes of silage covered by the survey were harvested from a total area of 5502 hectares, with an average of just over two cuts. The majority of farmers (82%) took two or more cuts of silage, with 18% taking only one cut. More

Table 2 Silage Crops: Summary by method of harvesting

	Double chop	Precision chop by size group 0-299t	300-599t	600+t	All Crops	Forage Wagon
Number of crops	17	14	14	53	81	10
Average crop size - tonnes	523	202	434	1070	810	536
% of total output	11.1	3.6	7.6	71.0	82.2	6.7
COSTS OF PRODUCTION						
HARVEST COSTS	£ per t %	£ per t %	£ per t %	£ per t %	£ per t %	£ per t %
Labour	1.13 10.5	0.89 7.8	0.84 7.6	1.02 9.5	1.00 9.2	0.90 9.4
Power & machinery:						
Tractor	1.69 -	1.27 -	1.26 -	1.62 -	1.57 -	1.29 -
Depreciation & repairs	0.97 -	1.10 -	1.52 -	1.04 -	1.08 -	2.11 -
Contract charges	0.63 -	2.09 -	1.30 -	0.52 -	0.66 -	0.02 -
Total power & machinery	3.29 30.6	4.46 39.4	4.08 36.7	3.18 29.5	3.31 30.6	3.42 35.8
Additives	0.12 1.2	0.27 2.4	0.36 3.3	0.34 3.1	0.34 3.1	0.09 0.9
Clamp covering material	0.15 1.4	0.19 1.7	0.09 0.8	0.13 1.2	0.13 1.2	0.12 1.3
TOTAL HARVEST COSTS	4.69 43.7	5.81 51.3	5.37 48.4	4.67 43.3	4.78 44.1	4.53 47.4
Share on non-harvest costs	6.05 56.3	5.52 48.7	5.71 51.6	6.12 56.7	6.06 55.9	5.03 52.6
TOTAL CONSERVATION COSTS	10.74 100.0	11.33 100.0	11.08 100.0	10.79 100.0	10.84 100.0	9.56 100.0
No. of crops						
(a) treated with additives	9	8	9	41	58	1
(b) % of total	53	57	64	77	72	10
Machinery investment (i) - £ per tonne	5.68	21.97(ii)	11.01	5.75	6.33	9.22
Total labour hours - per tonne	0.65	0.68	0.55	0.56	0.56	0.41
Total tractor hours - per tonne	0.64	0.64	0.51	0.55	0.54	0.40
PHYSICAL YIELDS	Yield - tonnes per hectare					
First cut						
(a) not grazed after 1st April	16.4	14.5	15.8	16.4	16.3	15.6
(b) grazed after 1st April	15.6	13.6	15.5	21.0	20.2	17.7*
Second cut	9.2	9.7	12.8	13.1	13.0	14.2
Subsequent cuts	9.3	6.2	12.5	9.8	9.8	10.8
	%	%	%	%	%	%
Area of second cut as % of first cut	59.1	51.6	47.4	71.5	67.4	63.6
Area of subsequent cuts as % of area of first cut	24.7	19.8	23.3	28.4	27.4	8.7

(i) written down replacement values

(ii) may be untypically high as investment for harvester was the average of only 2 farms

* two crops only

than two cuts were taken on 27% of the farms in the survey. Yields from first cuts were appreciably higher than from second and subsequent cuts, as would be expected. Little difference in yields was evident between methods of harvesting, although for both first and second cuts there was a consistent increase in yield per hectare with increasing throughput.

Co-operators provided information concerning the quantities of silage they had harvested since 1976 and from this emerged the fact that there had been an increase of 22 in the number of silage makers over this 5 year period, only one of which harvested the crop for the first time in 1980. In the table below the method of harvesting applies to 1980 only and does not necessarily imply the same method was used for the entire period.

Table 3 Changes in quantities of silage made between 1976 and 1980 by an identical sample of 84 co-operators

Method of Harvesting	Quantities made - tonnes 1976	1980	% change	Number of Co-operators
Double chop	6090	7831	+28.6	11
Precision chop				
0 - 299t	1890	1842	- 2.6	9
300— 599t	2715	3948	+45.4	9
600+t	38199	50407	+32.0	46
All precision chop	42804	56197	+31.3	64
Forage wagon	4425	5208	+17.7	9
TOTAL ALL METHODS	53319	69236	+29.9	84

The change in the total quantity of silage made by the original 84 co-operators between 1976 and 1980 is presented in the table above. Overall, the total quantity harvested rose by nearly 30%, with only one group producing less silage in total than in 1976. This was as a result of a number of farms each reducing the quantity made by a small amount. The remaining groups harvested between 18% and 45% more silage than 5 years previously, although there was, of course, large variations within each group.

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