Milk Cost of production O.S.



NORTH OF SCOTLAND COLLEGE OF AGRICULTURE

AGRICULTURAL ECONOMICS DEPARTMENT

Miscellaneous Report NO. I.

# LABOUR UTILISATION IN MILK PRODUCTION

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## LABOUR UTILISATION IN MILK PRODUCTION.

The North of Scotland College of Agriculture has conducted a survey of milk production costs in the Aberdeen area for the year October 1945 to September 1946. Weekly records of feeding, grazing, labour and other items were kept by a number of farms under the supervision of the Economics Department of the College. At the end of the year these records were analysed and a full year's cost per cow and per gallon of milk was issued for each farm[*], calculated under the various headings of feeding, grazing, labour, etc. The net cost was obtained by deducting from the total cost the value of manurial residues and calves produced. These costs were for milk production only and in no case was retail work included. On examination, the final records showed a very great variation in costs, particularly under the heading of labour. Some farms showed a labour cost of about £8 per cow while others were as much as £24 per cow. Such variations merited further investigation.

### LABOUR REQUIREMENTS PER COW.

The records of 49 farms were used for special investigation. The first step was to group the farms according to labour requirements, and it was considered that more useful results would be obtained by using labour-hours rather than labour cost figures for this purpose. From the labour records, the number of labour-hours utilised per cow in the year was calculated for each farm. No allowance was made for woman or boy hours as distinct from man hours as the former are just as useful as the latter in such operations as washing dairy utensils and manipulating a milking machine where the primary requisite is not strength. The farms were grouped according to the labour requirements thus obtained and the average figures for other factors in each group were calculated.

The labour-hours per cow figure varied from 86 to 343.

TABLE I./

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[*] Milk Report No. 5.

TABLE I.

| Grouping Hours per Cow | Number of Farms. | Average size of herd. | Average Total Labour Hours per Cow. | Average Family Labour Hours Per Cow. | Average Yield per Cow. |
|---|---|---|---|---|---|
| Below 100 | 4 | 77.84 | 91.24 | 1.72 | 619.75 |
| 100 - 125 | 9 | 46.17 | 116.90 | 20.57 | 709.54 |
| 126 - 150 | 8 | 45.93 | 133.52 | 37.34 | 651.58 |
| 151 - 175 | 9 | 34.45 | 161.70 | 43.76 | 679.80 |
| 176 - 200 | 8 | 31.45 | 187.53 | 72.83 | 690.86 |
| 201 - 225 | 3 | 25.38 | 214.44 | 74.71 | 639.06 |
| 226 - 250 | 2 | 18.29 | 242.34 | 110.55 | 740.87 |
| 251 and over | 6 | 13.12 | 303.74 | 177.94 | 786.95 |

The most striking result obtained from this grouping is the relationship existing between labour requirements per cow and herd size (Table I.). High labour requirements per cow are associated with small herd size. In extracting the labour requirement figures for each farm, distinction was made between hired labour and family labour and it was found as shown in the Table, that the amount of family labour utilised increases with the total labour utilised. It is in the small herds where there is a high proportion of family labour, that the labour requirements are at their highest. There is, however, a tendency for milk yield per cow to increase with labour requirements and this may, to some extent, offset the increased labour requirements.

COSTS PER COW IN RELATION TO LABOUR REQUIREMENT.

From a study of average costs per cow under the same grouping no clear cut trends were noticeable in the individual cost items except, of course, in labour where the cost increases as labour-hours per cow increase. These increased labour costs are reflected in the net cost where the trend in general is in keeping with labour cost. The sequence, however, does not follow exactly that of labour-hours per cow indicating that in some cases other factors are having a greater effect on net cost than labour.

Table/

Table II shows the distribution of costs per cow according to the labour requirements per cow grouping.

TABLE II.

Average Cost per Cow in £ s. d.

| | Grouping Labour-Hours per Cow:- | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Under 100 | 100-125 | 126-150 | 151-175 | 176-200 | 201-225 | 226-250 | 251 & Over |
| No. of Farms | 4 | 9 | 8 | 9 | 8 | 3 | 2 | 6 |
| Foods | 23: 6:11 | 23:17: 4 | 22:19:11 | 27:12:10 | 23:11: 1 | 27: 4: 4 | 29: 1: 5 | 22:18: 9 |
| Grazing | 2:13:11 | 3: -:.3 | 3:11: - | 2:19: 7 | 3:10: 8 | 3: 6: 6 | 3:16: 9 | 4:16: - |
| Labour - Hired | 7:17: 8 | 8: 2: 2 | 7:10: 4 | 9: 1: 5 | 8:10: 7 | 9: 4: 2 | 8: 3: 8 | 9:11: 5 |
| Family | -: 2: 2 | 1:10: 3 | 2:15:10 | 3: 2: 2 | 5: 8:10 | 5: 8:11 | 7: 2:11 | 13: 5: - |
| Miscellaneous | 6: 8:10 | 7: 5: 9 | 6: 2: 8 | 7:18: 7 | 8: 7: 9 | 8:14: 1 | 8: 1:10 | 10: 5:10 |
| Herd Replacement | 8: 2: 9 | 8: -: 7 | 6: -:11 | 13: 3: 8 | 8:15: 6 | 3: 4: 4 | 16: 6: 3 | 12: 7: 4 |
| TOTAL COST | 48:12: 3 | 51:16: 4 | 49: -: 8 | 63:18: 3 | 58: 4: 5 | 57: 2: 4 | 72:12:10 | 73: 4: 4 |
| Credits | 3: 8: 1 | 3: 6: 9 | 3: -: 6 | 3:18: 2 | 3:17: 6 | 3:15: 9 | 4:12: 6 | 2: 5: 8 |
| NET COST | 45: 4: 2 | 48: 9: 7 | 46: -: 2 | 60: -: 1 | 54: 6:11 | 53: 6: 7 | 68: -: 4 | 70:18: 8 |

MILK OUTPUT PER LABOUR-HOUR.

The figures so far considered have been on the "per cow" basis. The returns to the farmer, however, depend on the quantity of milk sold. The next step therefore, was to approach labour utilisation from the "per gallon" figures. The output of milk per labour-hour was calculated for each farm and a grouping made according to these figures to compare them with herd size as shown in Table III.

TABLE III.

| Grouping output per Labour-Hour. | Average Herd Size. | Average Yield per cow. | Number of Farms. | Average Output per Labour-Hour. |
|---|---|---|---|---|
| Gals. Milk | | | | |
| Under 3 | 20.84 | 667.10 | 9 | 2.72 |
| 3 - 4 | 28.10 | 661.44 | 11 | 3.53 |
| 4.1 - 5 | 41.51 | 648.86 | 13 | 4.47 |
| 5.1 - 6 | 39.72 | 685.86 | 9 | 5.61 |
| 6.1 and over | 64.79 | 715.59 | 7 | 6.98 |

Average/

Average herd size increases with output per labour-hour, a result similar to that already obtained. In the fourth group (5.1 - 6 group), however, there is a break in the sequence showing a lower average herd size than the group before it. The lowering of this average has been brought about by the inclusion in the group of one or two small herd farms where, although the labour requirement as measured in hours per cow is high, the high yield per cow has had a compensating effect, thus giving a fairly high output per labour-hour figure. From the table it can be seen that the average yield per cow decreases up to this group when a large increase occurs.

COSTS PER GALLON IN RELATION TO OUTPUT PER LABOUR-HOUR.

From a consideration of the average costs per gallon figures in each group a tendency downwards is seen to exist in all items of cost as labour output increases. There is one exception, however, in the case of purchased foods which seem to fluctuate independent of labour output.

TABLE IV.

Average Costs per Gallon in Pence.

| | Grouping Output per Labour-Hour in Gallons:- | | | | |
|---|---|---|---|---|---|
| | Under 3 | 3 - 4 | 4.1 - 5 | 5.1 - 6 | 6.1 and over |
| Foods - Purchased | 3.69 | 4.30 | 4.70 | 4.45 | 4.33 |
| Home | 4.96 | 4.82 | 4.67 | 3.37 | 3.91 |
| Total Foods | 8.65 | 9.12 | 9.37 | 7.82 | 8.24 |
| Grazing | 1.44 | 1.25 | 1.26 | 1.00 | .97 |
| Labour - Hired | 3.85 | 2.67 | 2.89 | 2.80 | 2.93 |
| Family | 3.14 | 1.85 | 1.32 | .46 | .10 |
| Total Labour | 6.99 | 4.52 | 4.21 | 3.26 | 3.03 |
| Miscellaneous | 3.46 | 2.84 | 2.50 | 2.87 | 2.08 |
| Herd Replacement | 3.43 | 3.32 | 3.92 | 2.62 | 2.36 |
| TOTAL COST | 23.97 | 21.05 | 21.26 | 17.57 | 16.68 |
| Credits | 1.20 | 1.22 | 1.26 | 1.38 | 1.08 |
| NET COST | 22.77 | 19.83 | 20.00 | 16.19 | 15.60 |
| Average Output per Labour-Hour | 2.72 | 3.53 | 4.47 | 5.61 | 6.98 |

HERD SIZE.

So far it has been noticed that labour costs in milk production determine to a considerable extent the profitability of milk production. Now it is in small herds utilising a high proportion of family labour where labour requirements are at their highest. This is due to the inefficiencies which, of necessity, occur in the management of small production units and probably also to the fact that family labour does not necessarily work to regular hours and may take longer to do a particular job than is absolutely necessary. Also, in order to speed up or lighten the work, more family labour may be employed than can be fully utilised. On the other hand, however, it is possible that in the small family herd cow management is more individual, making for economies in other directions which may to some extent compensate for high labour costs.

In order to investigate this point a grouping of the 49 farms was made according to herd size. Labour requirements and output per labour-hour were first compared with herd size as shown in Table V.

TABLE V.

| Grouping Herd Size. | Number of Farms. | Average Herd Size. | Average Labour Hours per Cows. | Average Output per Labour-Hour. |
|---|---|---|---|---|
| | | | | Gals. |
| Under 16 | 8 | 11.41 | 228.78 | 3.25 |
| 16.1 - 26 | 8 | 20.19 | 218.43 | 3.58 |
| 26.1 - 36 | 12 | 31.50 | 152.21 | 4.58 |
| 36.1 - 46 | 7 | 41.40 | 166.38 | 3.94 |
| 46.1 - 56 | 6 | 50.26 | 129.12 | 4.72 |
| 56 and over | 8 | 78.15 | 114.53 | 5.84 |

As would be expected from the results already obtained the labour requirements per cow decrease as herd size increases. In the third group (26.1 - 36 herd size), however, there occurs a big drop in the number of hours per cow, the decrease amounting to much more than occurs between any other two consecutive groups. It is possible that here we have/

have an indication as to the most convenient herd sizes for economic labour utilisation. It seems that it is in herds of around 30 cows that the first labour unit becomes fully utilised. Herds above 30 require the additon of another labour unit but this additional unit is not fully utilised unless the herd is above 56. It is conceivable that the most suitable herd sizes occur in multiples of 30 or thereabout, although there are not a sufficient number of large herds in the survey to verify this. This break which occurs in the 26.1 - 36 herd size group is also apparent in the output per labour-hour figures.

COSTS PER COW IN RELATION TO HERD SIZE.

A further indication of the possible desirability of a 30 cow herd is shown in the cost figures per cow in the herd size grouping.

TABLE VI.

Average Costs per Cow in £ s. d.

| | Grouping Average Herd Size. | | | | | |
|---|---|---|---|---|---|---|
| | Under 16 | 16.1-26 | 26.1-36 | 36.1-46 | 46.1-56 | 56 & Over |
| Foods - Purchased | 12:14: 5 | 12:18: 2 | 11: 3: 4 | 12: 1:10 | 12:10: - | 12:19: - |
| Home Grown | 15: 8:11 | 11:15: 2 | 11:17: 2 | 12:11: - | 12:14: 8 | 11: 2:10 |
| Total Foods | 28: 3: 4 | 24:13: 4 | 23: -: 6 | 24:12:10 | 25: 4: 8 | 24: 1:10 |
| Grazing | 3:13: 9 | 4: 6: 4 | 3: 6: 7 | 3: 1: 1 | 3:11:11 | 2:15: - |
| Labour-Employees | 1:10: 6 | 9: 9: 9 | 7:16: 5 | 9: 3:10 | 9: 1: 7 | 8: 8: 5 |
| Family | 14:14: 3 | 6: -: 6 | 3: 7: 6 | 3:13: 2 | 1:14: - | -:18: 6 |
| Total Labour | 16: 4: 9 | 15:10: 3 | 11: 3:11 | 12:17: - | 10:15: 7 | 9: 6:11 |
| Miscellaneous | 8: 2:10 | 8:14: 5 | 7:12: 1 | 7:15: - | 6:18:11 | 6:16: 3 |
| Herd Replacement | 7:15:10 | 12:15: 2 | 6: 5: 8 | 7:13: 7 | 11: 8: 1 | 8:12: 4 |
| TOTAL COST | 64: -: 6 | 65:19: 6 | 51: 8: 9 | 55:19: 6 | 57:19: 2 | 51:12: 4 |
| Credits | 3:11: 5 | 3:12: 3 | 3: 9: 6 | 3: 6:10 | 3: 2: 4 | 3:12: - |
| NET COST | 60: 9: 1 | 62: 7: 3 | 47:19: 3 | 52:12: 8 | 54:16:10 | 48: -: 4 |

Here/

Here we see that the lowest net cost per cow occurs in the 26.1 - 36 group with the over 56 group a close second. In the other groups there is a tendency for net costs per cow to decrease as herd size increases.

Not much can be said about the individual costs except that generally in each case the groups in the right half of the table, i.e. the larger herds show lower costs than those in the left half, i.e. the smaller herd groups.

COSTS PER GALLON IN RELATION TO HERD SIZES.

Turning now to costs per gallon which represent the true cost of producing milk as it is on these figures that the profitability of milk production depends, it can be seen by comparing average yield per cow and average cost per gallon within the herd size grouping that the former has some considerable effect on the latter.

TABLE VII.

| Grouping Herd Size. | Number of Farms. | Average Net Cost per Cow. | Average Yield per Cow. | Average Net Cost per Gallon. |
|---|---|---|---|---|
| | | £ s. d. | Gallons. | Pence. |
| Under 16 | 8 | 60: 9: 1 | 744.17 | 19.50 |
| 16.1 - 26 | 8 | 62: 7: 4 | 781.16 | 19.15 |
| 26.1 - 36 | 12 | 47:19: 3 | 696.70 | 16.52 |
| 36.1 - 46 | 7 | 52;12: 8 | 655.86 | 19.26 |
| 46.1 - 56 | 6 | 54:16:10 | 608.88 | 21.62 |
| 56 and over | 8 | 48: -: 4 | 669.14 | 17.22 |

The most striking effect occurs in the second group 16.1 - 26 herd size which has the highest cost per cow figure but only the 4th highest cost per gallon figure. This difference is due to the relatively high yield per cow in this group. Similarly in the 46.1 - 56 herd size group the low yield per cow has increased the cost per gallon figure to highest place as compared with 3rd highest in the cost per cow figures.

The individual costs per gallon which make up the net costs according to the herd size grouping are given in Table VIII.

TABLE VIII./

TABLE VIII.

Cost per Gallon in Pence.

Grouping Average Herd Size.

| | Under 16 | 16.1-26 | 26.1-36 | 36.1-46 | 46.1-56 | 56 & Over |
|---|---|---|---|---|---|---|
| Foods - Purchased | 4.11 | 3.96 | 3.85 | 4.43 | 4.92 | 4.64 |
| Home Grown | 4.98 | 3.60 | 4.09 | 4.59 | 5.02 | 4.00 |
| Total Foods | 9.09 | 7.56 | 7.94 | 9.02 | 9.94 | 8.64 |
| Grazing | 1.19 | 1.32 | 1.15 | 1.12 | 1.42 | .99 |
| Labour-Employees | .49 | 2.92 | 2.69 | 3.36 | 3.58 | 3.02 |
| Family | 4.74 | 1.85 | 1.16 | 1.34 | .67 | .33 |
| Total Labour | 5.23 | 4.77 | 3.85 | 4.70 | 4.25 | 3.35 |
| Miscellaneous | 2.62 | 2.68 | 2.62 | 2.83 | 2.74 | 2.44 |
| Herd Replacement | 2.51 | 3.93 | 2.16 | 2.81 | 4.50 | 3.09 |
| TOTAL COST | 20.64 | 20.26 | 17.72 | 20.48 | 22.85 | 18.51 |
| Credits | 1.14 | 1.11 | 1.20 | 1.22 | 1.23 | 1.29 |
| NET COST | 19.50 | 19.15 | 16.52 | 19.26 | 21.62 | 17.22 |

The cost of foods increase slightly in the large herds. So also do the hired labour costs although the decrease in family labour costs gives a total labour cost which decreases. The other items show no definite trends.

CONCLUSION.

There is evidence from the foregoing investigation based on what is admitted a somewhat small sample for minute subdivision to indicate that small sized dairy herds are associated with high labour requirements per cow due to the inherent disadvantages of a small production unit and also to the fact that the small herds utilise a high proportion of family labour,/

labour, but in spite of high labour costs the small farm can and does compensate for this by effecting some economies in other spheres and by increasing to a considerable extent the output per cow. A large proportion of the dairy herds in the Aberdeen area are not self contained and are maintained by buying in. These dairy farms are thus able to keep the porportion of dry cows carried at a minimum by purchasing in-milk cows. Such farms mostly occur in the smaller herd groups where the high average output per cow has to some extent compensated high labour costs per cow.

One other interesting point which has arisen is the possibility of the existence of optimum herd sizes for economic milk production; the 30 cow herd and multiples of this number.

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14th March, 1947.