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THE WEST OF SCOTLAND AGRICULTURAL COLLEGE

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RELIANCE ON GRASS IN DAIRY FARMING

A STUDY BASED ON A FEW FARM ACCOUNTS

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ECONOMICS DEPARTMENT REPORT No. 67
DECEMBER, 1960.

THE WEST OF SCOTLAND AGRICULTURAL COLLEGE

ECONOMICS DEPARTMENT

Report No.67. Reliance on Grass in Dairy Farming.

Corrections

I. Relation of U.S.E. per acre from grass to expenditure on manures, milk yield, etc.

Page 50. lines 11 and 12: Substitute:-

U.S.E. from grass, cwt per acre = 12.04 + 2.25A + 0.60B - 0.56C - 1.46D,

where A = Tenths of a cow equivalent per stock feed acre used.
B = Manures, £ per acre.
C = Milk yield, 100 gals per cow.
D = Concentrates, lbs fed, per gallon.

The standard errors of estimate and of the respective coefficients are as follows:-

Estimate		1.55
Coefficient of	A	0.28
	B	0.22
	C	0.22
	D	0.31

Page 5, 1st paragraph. Line 15. After 'influence of' insert 'density of stocking'.

Page 6, 3rd paragraph. Line 2, After 'influence of' insert 'by density of stocking'

Line 6 After 'between farms' insert 'by 2.25 cwt for an increase of density of stocking by one tenth of a cow equivalent per stock feed acre used and'

Line 6 alter 1.67 to 0.6
" 7 " 1 to 1.5
" 8 " 1.6 to 0.6

Page 11. 5th last line: alter 1.67 to 1.4
3rd " " after 'manures' add 'provided there was additional livestock to use it'. Delete the sentence in parenthesis.

II. Table III, page 43:

(a) Line D, for 668 and 39 read 740 and 35.

(b) Add at foot: 'Summer' refers to the five months, May to Sept.

C.W. ROBERTS

21st February, 1961.

CONTENTS

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RELIANCE ON GRASS IN DAIRY FARMING

INTRODUCTION

This report arises from an attempt to make financial accounts yield information about the effect of intensifying the management of grassland. It deals with the financial and other results of fourteen farms that were selected for study because they manured their grassland heavily, or used other intensive methods on their grassland, or relied fairly heavily on grassland for their livestock feed. Most of the figures relate to the years 1956 and 1957, but there are also figures for the three preceding years on nine of the farms. Throughout, comparisons are made with nineteen other farms in the same counties. A summary and some conclusions appear at p.11.

ACKNOWLEDGMENTS

The College is greatly indebted to the fourteen farmers whose businesses are the principal subject of this report. They gave freely and patiently of the information at their disposal and of their time. To their accountants, to other farmers, to fertilizer and feedingstuffs firms and to County Advisers and other College colleagues who gave general information and help, due thanks have already been given.

ORIGIN OF THE STUDY

During the course of the three years, 1954 to 1956, when members of the County Agricultural Advisory Service of this College were demonstrating intensive management of pastures, it became clear that an investigation was desirable into the effect of such intensive management upon the finances and organization of dairy farms practising it. Advisers and teachers alike wanted to know whether the advocated methods did, in fact, lead to enhanced profits.

The Economics Department of the College, therefore, asked County Advisers to tell them of dairy farmers who were either practising intensive management of pastures or were relying heavily upon well-manured grassland, and who were not already giving financial information to other investigators. In order to economize in expenditure, the enquiry was limited to Ayrshire, Lanarkshire and Renfrewshire. Because of difficulties in finding sufficient suitable farms of which the operators were willing to join in the study, the enquiry was broadened to include farmers who do not manure grassland heavily, but who rely heavily on grassland for their cattle feed.

METHOD OF ENQUIRY

Weekly visits to farms to make current records being impracticable, the method adopted for securing information was to analyse accounts for as many years (up to five) as possible and to back these up by oral enquiries and by reference to any cropping records and the like that existed. It follows that, in effect, the project developed into an exploration of methods of using farm accounts to secure information about the effects of intensifying the management of grassland.

As a background to the study, figures from the accounts of other dairy farms in the same counties and for the same years (1953, 1954, 1955, 1956 and 1957) have also been prepared. (In this report these latter farms are called "Control Farms" and the specially chosen farms are called "Selected Farms") Unfortunately the only farms available as controls happened to be somewhat smaller, in general, than the selected farms.

For a variety of reasons, all the figures have been adjusted so that they represent what would have resulted if there had been no pigs and no poultry on any of the farms. Any grain fed to pigs or poultry on the selected farms has been treated as sold: but, since no special questions for this study were addressed to the control farms, no such assumption has been made on the latter group. Moreover, because it was expected, from the outset, that maximum benefit from the enquiry would be likely only if details of individual farms were divulged, it was decided to measure financial success by the difference between Gross Output on the one hand, and Expenditure on Feed, Seeds, Manures and Labour (including a charge for the operator's labour) on the other. This difference (called "Margin" in this Department's reports) is bigger than Net Profit or Net Farm Income in that rent, depreciation, power costs and miscellaneous expenses have not been charged.

Again, because the co-operators prefer to remain anonymous the size of their farms has been indicated only roughly.

PRICES, SUPPLIES, WEATHER AND PROFITS IN THE YEARS CONCERNED

Prices in the years covered by the study grew progressively less favourable to dairy farmers as a whole: inclusive milk prices fell, wages rose by fully one third, net fertilizer prices rose, except in the last year, but feed prices varied little until 1957/58, when they fell substantially. The weather of the grazing season, which very often has a marked effect on profits, varied from that of the wet and sunless summer of 1954 to that of the very sunny and dry summer of 1955. (A more detailed statement about these matters appears in Appendix II). The combination of differences in weather and prices affected the profits on 78 dairy farms(a) in the College area so much that their average surplus, counting the average of the years 1953/54 and 1954/55 as 100, varied thus:-

Surplus on 78 dairy farms
(1953/54 - 1954/55 = 100)

1953/54	143
1954/55	57
1955/56	84
1956/57	108
1957/58	127

Similar, though much less extreme, variations in margin occurred on the studied farms.

THE FARMS

All the farms were Dairy Farms, by any generally acceptable definition. Size, measured in adjusted acres, varied on the selected farms from just over 50 to just over 300, and from around 40 to well over 200 on the control farms. The middle (median) size was about 170 on the selected farms and about 110 on the control farms.

EXPENDITURE ON MANURES

All the selected farms spent over £2 an acre a year on manures in the last two years, and all but two spent more than £3 an acre a year, whilst four of the control farms spent less than £2 an acre, and ten spent less than £3.(b) Ten of the selected farms spent more than the £4 which was the top rate of manuring on the control farms. The average rate on the selected farms was £4.6 an acre against £2.7 on the control farms. These figures include, on average, about £0.3 per acre of manurial value of pig and poultry food on the selected farms and about £0.1 per acre on the control farms. The highest charges for these manurial values were £0.8 per acre on each of three of the selected farms. Compared with averages of quantities quoted for Central Lanarkshire in 1958(c), appropriately priced, and after deduction of the above-mentioned entries for the manurial value of foods fed to pigs and poultry, twelve of the fourteen selected farms were using more than the Central Lanarkshire average (of about £2.7) whilst only nine of the nineteen control farms were so doing.

A further adjustment to eliminate manures applied to potatoes would make very little difference to the figures here quoted.

(a) Economics Department Report No.57.

(b) For the purposes of this study expenditure on manures is arrived at after deducting subsidies and adding manurial value of feed to pigs and poultry and is related to the whole area of the farm, rather than to the grass area alone.

(c) Survey of Fertilizer Practice in Scotland 1958. Report No.16. W.5: Lanarkshire (Central). West of Scotland Agricultural College and Agricultural Research Council.

Between the first pair of years and the last pair, all the nine selected farms that gave details for the whole period increased their total expenditure on manures, whilst only eleven of the nineteen controls did so. Average expenditure per acre on manures was as the table shows. These figures include about £0.3 for the manurial value of foods fed to pigs and poultry. The selected farms were already,

Expenditure on Manures
£ per acre

	9 Selected Farms (a)	19 Control Farms
1953	3.0	2.5
1954	3.3	2.7
1955	4.4	2.6
1956	4.2	2.7
1957	4.1	2.7

in 1953, using about 10% more manures than was a wide sample of dairy farms in Scotland as a whole, and, over the five years, they have increased their consumption of manures by about 33%, while the wider sample only increased its /more consumption by about 10%. The tendency towards the use of the/concentrated fertilizers was noticeable among the selected farms.

RELIANCE ON GRASS

The degree of reliance on grass cannot be determined precisely. Nevertheless, it has been assessed by relating the utilized starch equivalent (U.S.E.) of the grassland to the estimated total starch equivalent required for the farm livestock other than pigs and poultry. (The method of estimating U.S.E. is indicated at p.47).

Of the selected farms 11 out of 14 obtained more than 50% of their feed from grassland in the last two years: on the controls 12 out of 19 did so. If allowance could have been made for home-grown grain fed to pigs and poultry, the control farms would have shown somewhat heavier consumption of bought feed by the cattle and sheep, and this would have slightly reduced the computed reliance on grassland on these farms. Hence it can be confidently said that the selected farms were notably more reliant on grass than the control farms. Six of the selected farms relied on grass to the extent of more than 60% whilst only one of the control farms did so.

In view of the end of official rationing of feed and of the wet harvest of 1954, it is not surprising that, amongst both selected and control farms, average reliance on grass was less in 1954 than in 1953. In 1954, only one of the nine selected farms increased this reliance, though six out of the nineteen control farms did so. Between the second pair of years and the last pair only four of the nine and four out of the nineteen had failed to increase their reliance on grass. Average figures for the several years are as follows.

Total S.E. from Grass as % of Total S.E. needed

	9 Selected Farms	19 Control Farms
1953	55	53
1954	51	51
1955	53	49
1956	52	51
1957	56	54

Of all the five years, 1954 stands out as a year of diminished reliance on grass, caused presumably by the greater availability of bought feed, and by weather that spoiled and shortened the grazing season. On only one farm was the drop between 1953 and 1954 due to greater reliance on farm-grown tillage feed.

DENSITY OF STOCKING

In terms of the total farm acreage divided by the number of cows actually carried, the acres per cow varied from 1.20 to 4.34 on the selected farms and from 1.75 to 5.46 on the control farms, the respective medians being 3.14 and

(a) Five of the fourteen selected farms did not give figures for all five years.

2.50. These are considerably heavier stocking rates than on the average of the 150 dairy farms whose accounts are reported on by this department: on the 150 farms the number of acres per cow averages 3.50, at an average size of 145 acres.

Taking all the cattle, sheep and horses on each farm, and converting them to Cow Equivalents[x], the stock carry (omitting pigs and poultry) was lighter on the selected farms than on the control farms: eight of the fourteen selected farms carried a cow equivalent or more per two acres of farm crops and grass, while twelve of the nineteen control farms did so.

The higher stocking rates (both in terms of cows and in terms of cow equivalents) on the control farms than on the selected farms is related in part to the smaller size of the control farms, (the tendency of small farms to be relatively heavily stocked hardly needs stating), and in part to the more widely spread practice on the control farms of hiring grazing.

Between the first pair of years and the last pair, six of the nine selected farms increased their stock carry per farm stock acre used, while only nine of the nineteen control farms did so. Average numbers of cow equivalents per acre of crops and grass used as feed in those two pairs of years were as follows. The increase on the selected farms is considerably the greater:-

	COW EQUIVALENTS PER FARM STOCK ACRE USED	
	9 Selected Farms	19 Control Farms
1953 and 1954	0.492	0.548
1956 and 1957	0.520	0.552

UTILIZED OUTPUT OF FEED FROM TILLAGE FEED CROPS AND GRASS

A measure of the stock carrying capacity which takes into account the area of land that would have been required to grow the purchased feed and hired grazing as well as the farm-grown feed is probably the best indicator of the productivity of the farm and farm livestock. (For the method of calculation see p. 48).

Again there was very little difference between the selected farms and the control farms. In number of cow equivalents per acre of feed and grass used, the comparisons are as follows.

Stock carry per acre of feed and grass used, average of 1956 and 1957

Cow Equivalents per Acre

	Selected Farms	Control Farms
Average	0.374	0.366
Middle (Median)	0.386	0.376
Highest	0.456	0.580
Lowest	0.266	0.268

Acres per Cow Equivalent

	Selected Farms	Control Farms
Average	2.67	2.73
Middle (Median)	2.59	2.66
Highest	2.19	1.72
Lowest	3.76	3.73

The average output of feed per acre of feed crops and grass on the selected farms (0.374 cow equivalents, or 15.57 cwt S.E. in 1956 and 1957, was a very little less (about one eighth of a cwt of S.E.) than that on 59 milk costing farms in 1957.

Between the first pair of years and the last pair, five of the nine selected farms had increased the output from their feed crops and grass, measured in this way. Amongst the control farms only eight out of nineteen had done so.

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x For this purpose, a Cow Equivalent is equal to just under 42 cwt U.S.E. per annum.

The average figures for the several years were as follows:-

Cow Equivalents carried per Acre of Feed and Grass Used

	9 Selected Farms	19 Control Farms
1953	0.357	0.378
1954	0.354	0.351
1955	0.364	0.343
1956	0.365	0.360
1957	0.375	0.370

CARRYING CAPACITY AND EXPENDITURE ON MANURES

The relation of these carrying capacities in 1956 and 1957 to expenditure on manures is remarkably close, if three farms in the atmospheric pollution zone of Clydeside and one farm close to the moor are excluded. On average, these four farms obtained less food from their crops and grass than other selected farms using similar amount of manure, to the extent of about 5.5 cwt U.S.E. per acre, (or 0.13 cow equivalents). As between the ten remaining selected farms, an extra £2 worth of manures per acre of the farm was associated with the production of extra energy, which, expressed in cow equivalents, represented one fourteenth of a cow equivalent per acre. If reliance on farm grass and crops was at the rate of 75% usual on these ten farms, the extra actual stocking for each extra £2 worth of manures per acre of the farms would be one cow equivalent for every ten acres of the farms. The other 25% of the energy would come from extra bought feed. The absence of a corresponding pattern of relation of this sort amongst the control farms suggests that the influence of milk yield and feed per gallon (see p. 6), and, perhaps, of a divergence of actual yields of tillage crops from the yields assumed (see p.47), have had a considerable effect on the relation of carrying capacity to expenditure on manures on the control farms.

Although the foregoing statement of the relation between expenditure on manures and output of energy is expressed in terms of carrying capacity, the relationship could be stated with equal justification in terms of bought feed capable of being saved. Thus, of the ten farms mentioned above, it can be said that an extra £2 spent on manures per acre of a farm was associated with an extra output of 3.1 cwt U.S.E. per acre of the farm. If this resulted in saving equivalent bought feed, the extra £2 expenditure would lead to a saving of about £8.4 in bought feed.

Just as comparisons between ten farms in 1956 and 1957 show that an extra £2 spent on manures per acre was associated with the full keep (in terms of energy) for an extra cow for every 14 acres, so comparisons between the seven≠ farms that gave figures for the five years show similar, though not so wide, difference over the whole five years' experience. Thus, taking the whole five years together, the full feed for an extra cow for every 21 acres could be said to result from an extra £2 in manures per acre. As the 21 acres would include about 5 acres represented by bought feed, this comparison suggests that £32 of extra manure on 16 acres of the farm, along with about £30 of bought feed would cover the feed of an extra cow. Even though the total of these extra costs (£62) exceeds the current average cost of feeding and grazing for a cow by about £4 (Economics Department Report No.58, 1958-59), it is still likely that the extra cow would generate extra profit.

These comparisons of the five-years' experience of the seven farms can also be expressed in terms of the extra U.S.E. resulting from extra expenditure on manures. If the extra 2 cwt U.S.E. associated with an extra £2 of manures were to result in the saving of bought feed it would lead to a saving of about £5.3.

Changes in carrying capacity and manuring

Amongst the 28 farms represented in all five years, no general pattern of association can be detected in regard to changes in stock carrying capacity and changes in expenditure on manures. But amongst the seven selected farms giving figures for all the years, it happens that those that increased their manuring most increased their apparent stock carrying capacity least. Their self-sufficiency also decreased, whilst the self-sufficiency of the others increased. Some reasons for these unexpected results are given in the next paragraph and on p.7.

≠ excluding two farms in the pollution zone.

OUTPUT FROM GRASS: CARRYING CAPACITY OF THE GRASSLAND

In terms of Utilized Starch Equivalent (U.S.E.) from the farm grassland itself, per acre of that grassland, the selected farms were, on average, nearly equal to the control farms in the last two years, and the proportions of farms with estimated U.S.E. from grass per acre exceeding 15 cwt a year amongst the selected farms was the same as amongst the control farms. As has been pointed out already, if allowance had been made on the control farms for grain fed to pigs and poultry, the calculated U.S.E. from grass would have been somewhat lower than the figures given. Further, it is likely that, for a variety of reasons, U.S.E. per acre will tend to be higher on small farms than on large ones. Even so, it is contrary to expectation, that the output per acre was not larger on the selected farms with their higher manuring charges. It is, of course, possible that the control farms were more fertile or better placed than the selected farms. Moreover, it is possible that the selected farms had not seen their way to adjust stock numbers and feeding practices to make full use of the grass growth. Nevertheless, as the next paragraph shows, there had been an 8% improvement on average on nine of the selected farms, during the five years.

Between the first pair of years and the last pair, all but two of the nine selected farms raised their U.S.E. per acre from grassland, whilst only eight of the nineteen control farms did so. The average increase on the nine farms was 1.0 cwt per acre (8%) against an average decrease on the nineteen control farms of 0.2 cwt (2%).

As between farms in general, the relationship of U.S.E. from grass to expenditure on manures is obscured by the influence of milk yield per cow and the quantity of concentrates fed. However, examination of the 29 farms (selected and control, excluding the four mentioned on p.5) after eliminating manures on potatoes, shows that U.S.E. per acre from grass was higher (between farms) by 1.67 cwt for each extra £1 spent on manures, and was lower (between farms) by 1 cwt for every extra 1 lb of concentrates fed per gallon. It was also lower (as between farms) by 1.6 cwt per acre for every difference upwards of 100 gallons in the output per cow. These are yields and feed over the year as a whole, and it may well be that if it had been possible to isolate the feed to cows during the grazing period and the milk output during that period a positive relation between milk output per cow and U.S.E. per acre during the grazing season would have been detected. The tendencies above stated are in keeping with the recognized association of high yield per cow and high feeding per gallon with emphasis on winter production and the consequent relatively light yield in the grazing season. It may also be said that, while true over-feeding may have occurred and have resulted in reduced U.S.E. as calculated, it is also very probable that a major underlying cause of these relationships between U.S.E., fed per gallon, and yield per cow, is diminishing return of milk yield to feed. Thus this small study supports the view that standard production rations are more favourable to low-yield cows than to high-yield cows.

EFFICIENCY IN THE USE OF RESOURCES

Some assessment of profitableness and of efficiency is possible from a comparison of the Gross Output with the Expenditure on Seeds, Feed, Hired Grazing, Manures and Labour (including that of farmer and wife) expressed as a percentage. Comparisons between the selected farms and the control farms in regard to this measure of efficiency are impaired by the fact that the method of selecting the control farms almost certainly led to some bias in favour of the selected farms (see p.49). However, the bias would not completely account for the difference between the groups. In the last two years the average output per £100 of this expenditure was £170 on the selected farms, £139 on the control farms. On the selected farms twelve of the fourteen had figures of more than £150, whilst only three of the control farms exceeded this amount. Even if allowance is made for the smaller numbers of cows on the control farms, the average output per £100 of these items of expenditure is still £22 in favour of the selected farms.

There is insufficient information to permit a comparison of the other expenditure, including rent and the depreciation of equipment on these two groups. Clearly, expenditure on fuel oil and machinery, and the quality of the land and the fixed equipment of the farm could markedly influence the efficiency as measured in the foregoing paragraphs.

MARGINS

As is to be expected from the last section, the return measured in terms of the difference between gross output and the listed expenditure, called "Margin", was higher per acre on the selected farms than on the control farms. (This is, as already stated, after eliminating expenditure and revenue connected with pigs and poultry).

On average, margins were £7 more an acre a year in the last two years: £20.6 on the selected farms, £13.3 on the control farms. All the selected farms made margins of over £10 an acre whilst five of the control farms failed to do so. More than £21 an acre was attained on half the selected farms, but on none of the control farms. (The average margin on the 150 dairy farms mentioned on p.4 was £15.9 per acre - including the margin on pigs and poultry).

As between the first pair of years and the last pair, four of the nine selected farms reaped increased margins per acre - about the same proportion as on the control farms; but, on average, there were decreases of thirteen shillings and nine shillings respectively.

Setting the margins in the last two years against the numbers of cows carried, all the selected farms made margins of over £38 a cow, whilst ten of the control farms failed to do so. On average the selected farms made margins of £61.4 a cow, against £39.2 on the control farms. (The margins on the 150 farms was, inclusive of the margin on pigs and poultry, £55.7). Between the two pairs of years the average margin per cow fell by £1.9 on the nine selected farms and by £0.1 on the nineteen control farms. The numbers of decreased margins were five and eleven respectively.

When the estimated margins on sheep and potatoes and the acreage used by them have been eliminated, the margins per acre are still more heavily in favour of the selected farms than before that elimination.

Moreover, it appears that if the acreage of hired grazing were added to the farm acreage on each farm, the selected farms would show even better margins per acre (including hired grazing) than the control farms. (In the last two years fifteen control farms hired grazing, and their payments for it divided by the number of cows on the farm averaged £2.2, whilst seven of the selected farms hired grazing and their payments similarly calculated averaged £2.4. The hired grazing was normally used for young stock, and sometimes for dry cows).

Margins and Expenditure on Manures

Just as no simple pattern of association can be detected in regard to changes in carrying capacity per acre and in expenditure on manures (p.5) so it is impossible to detect such a pattern in respect of changes in margins per acre and in expenditure on manures. But, amongst the seven selected farms referred to at page 5 , it happenedthat, generally speaking, those that increased their manuring most showed greatest decreases in their margins per acre. Many explanations could be made for this unexpected result: suggestions of diminishing return from manuring do not apply markedly to any of the farms. Rather one might say that the largest increase in margin, associated with relatively heavy but virtually unchanged expenditure on manures, arose because the particular farm was developing;and the second largest decrease, associated with the heaviest increase in manuring, occurred because the earlier years were favoured by exceptionally good cows there and perhaps, because personal circumstances had necessitated some slackening of managerial effort. It is unnecessary to specify all the factors likely to have occasioned the varying response of margin to manuring on the individual farms.

Whilst the changes over the years on the seven farms mentioned in the preceding paragraph were contrary to first expectations, their results in the last two years conform to the expected, namely that the farms manuring most heavily reaped the highest margins. Indeed, amongst these seven farms, each extra £1 of manures was associated with an extra £18 of margin. But much of this increase is due to the influence of sheep and potatoes. Even after roughly eliminating the influence of sheep and potatoes, each extra £1 of manures is seen to be associated with the quite substantial extra margin of £2.5.

Similarly, in the last two years, comparisons amongst the 29 farms, selected and control, outside the pollution zone and moor, show that if the influence of potatoes and sheep are eliminated, each extra £1 of manures is associated with £3.5 of extra margin. Part of this £3.5 is due to heavier stocking and/or higher yielding cows; so that if the output of milk per acre is allowed for also, the increase in margin associated with each extra £1 of manures is reduced to £2.3. This supports and goes further than earlier calculations that on the ten farms demonstrating intensive management of cow pastures in 1954 to 1956 the extra return from £1 extra manures was about £2.2.* Since it may be argued that extra milk output per acre is partly due to extra manuring it is proper to say that the true extra margin for each extra £1 of manures lies somewhere between £2.3 and £3.5.

SELF-SUFFICIENCY AND MARGINS

Comparisons of the degree of self-sufficiency and the margins earned on the selected farms during the last two years lend a little support to the contention that great reliance on home-grown feed is one way to increased profits; but the evidence available from this study does not justify any great confidence in such a contention. Moreover, amongst the control farms the evidence both amongst the small farms and the larger farms in these two years tends strongly in the opposite direction. However, as between the 28 farms common to all five years, and comparing the last pair of years with the first pair, there was a moderately close relationship between increase in self-sufficiency and increase in margin per acre, each 1% change in self-sufficiency being accompanied by a change of margin in the same direction of 1.75%.

PROFITS

Although it was agreed at the outset that profits should not be divulged, somewhat formal estimates can be made of the profitableness in terms of Surplus or Deficit, Surplus being Profit less a charge for the manual work of farmer and wife. Using the information from the control farms, about the outlays on other expenses than those listed in arriving at the margin, it may be said that a 20-cow, 50-acre farm and an 80-cow, 200-acre farm would bear respectively £36 a cow and £24 a cow of these expenses. Thus it is possible to take account of size of herd and size of farm in estimating the probable level of expenses on each farm. Account may also be taken of the differences in margins, (for the lower the margin the lower, generally, were these other expenses), and so arrive at an estimated surplus on each of the farms. If this is done the estimated surplus, averaging 1956 and 1957, is found to range on the selected farms from £46 per cow to a deficit of £1, the middle rate being £26, and from £35 to a deficit of £24 per cow on the control farms, the middle rate being £10. Eight of the selected farms made surpluses higher than any of the control farms, except one; seven of the control farms made less than any of the selected farms.

These are, of course, broadly estimated surpluses and deficits, apart from any surplus from pigs and poultry. (Averages on the 150 farms, including pigs and poultry, were £18 per cow in the same two years). Corresponding estimates for earlier years have not been worked out.

STABILITY OF MARGIN

Not only were margins per acre and per cow notably higher on the selected farms than on the control farms, but the stability of those margins from year to year on each of the individual farms was generally higher also, the average variation in total margins on each farm being 16% on the selected farms, 24% on the control farms.

The proportion of farms showing increasing margins over the years was also greater among the selected farms.

LABOUR

An answer to the question, whether greater reliance on grass involves more or less labour, has been sought through estimating, for each of these farms, the labour hours needed to care for the stock and crops and other activities on the one hand, and, on the other hand, converting into man-hours the wage bills (including an allowance for the farmer's own time and his wife's). The former expressed as a percentage of the latter and called the

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* Economics Department Report No.41.

Labour Index indicates the so-called efficiency of the labour. A high figure usually indicates that labour-saving methods and labour-saving equipment are used and labour management is of a high order; it may indicate that wages per hour are low. A low figure may arise, as on Farm P in 1954, if an unusually high proportion of maintenance work, not allowed for in the calculation of the work load, has occurred. Table IV gives details.

On average, in the last two years the labour index was 19 points higher on the selected farms than on the control farms, eight out of the fourteen having indices of more than 130, whilst only five of the nineteen control farms exceeded 130. The indices range from 224 to 117 for the selected farms, and from 192 to 83 for the control farms.

If allowance is made for the greater size of the selected farms, the latter are, in respect of the labour index, still a few points ahead of the control farms. (In this particular comparison, two of the larger selected farms have had to be left out because they were so much larger, in terms of labour hours, than any of the control farms).

During the five years the labour index improved on all except one of the nine selected farms and on all except four of the control farms. The average improvement between the first pair of years and the last pair was thirteen per cent on the selected farms and nine per cent on the control farms. These can be contrasted with an estimated improvement for Scottish farms of all types of about 5%.

INVESTMENT IN EQUIPMENT

Nominal written down values of equipment other than cars, based on 1958 prices, varied from £27 to £9 an acre (£60 to £23 a cow), and nominal depreciation ranged from 102/- to 30/- an acre (£11 to £4 a cow). The median written-down values were £13 an acre (£41 a cow), and the median depreciation charges were 44/- an acre (129/- a cow). All the farms had at least one tractor: four had diesels alone, three had vaporising-oil tractors alone and seven had both types. Only two had less than two tractors. The rather artificial figures given above for depreciation may be compared with actual book depreciation charges on the 150 dairy farms, of £10.0 per cow. If, say, £4.5 is deducted for pig and poultry equipment and the farm car included in the accounts of the 150 farms, but excluded from the estimates above, the accounts suggest an average of 110/- a cow on the 150 farms, for comparison with the 129/- above. There seems therefore to be no reason to suspect that equipment is necessarily more expensive on the grass reliant farm than on others; though it is clear that the cost of a new forage harvester, a powerful tractor to pull it and a tipping trailer and a good silo for the product may readily add £3 or £4 per cow to the depreciation charges to be incurred.

MILK OUTPUT

As the table below shows, there were wide variations between farms in the output of milk, both per cow and per acre, the latter being, as usual, the more variable. The very high output per acre, of 631 gals and £104 occurred on Farm C, with its high number of cows per acre and few young stock, and the lowest output per cow occurred on Farm J, where ill-health had struck the herd.

These figures exclude milk fed to livestock: no deductions have been made for the milk equivalent of bought feed.

Milk Output, 1956 and 1957

	Per Cow	
	Selected Farms	Control Farms
Average	780 gals £121	716 gals £111
Highest	889 " £137	1000 " £171
Lowest	642 " £102	556 " £83

	Per Acre of the Farm	
	Selected Farms	Control Farms
Average	272 gals £42	259 gals £40
Highest	631 " £104	378 " £62
Lowest	158 " £25	154 " £23

Milk Output and Gross Cattle Output taken together varied a little more widely than did Milk Output alone. Average values were £140 per cow on the selected farms, £130 on the control farms. The highest values were £173 and £211 respectively; the lowest were £116 and £97.

CONCENTRATED FEED

The method of estimating the quantity of feed used is set out at p. 47 The quantities include feed fed to young stock and to sheep.

Bought feed per gallon over the whole year, as estimated, averaged 3.5 lbs. on the selected farms, 4.2 lbs on the control farms, the medians being 3.6 lbs and 4.2 lbs respectively; the highest, 4.8 lb and 7.2 lb, and the lowest 2.2 lb and 2.5 lbs.

Bought feed and home-grown cereals per gallon together averaged 4.9 lb and 5.2 lb on the selected farms and the control farms respectively; the medians were 4.8 lbs and 5.4 lbs, the highest 8.4 lbs and 7.2 lbs, and the lowest 2.5 lbs and 3.4 lbs.

It may be well to repeat that these quantities include feed fed to young stock and any sheep. Even so, it appears that most of these farmers either thought it profitable to rely on concentrates to a considerable extent for the maintenance of their cows, or thought standard production rations inadequate. Some, for whose cows roughages, succulents and grazing were inadequate for maintenance, may not have realized that this was so.

FEEDING OF THE DAIRY COWS DURING THE YEAR ENDED 30th APRIL, 1958

All except one of the selected farms provided information from which an approximate statement could be made of the feed used by the cows in the one season, ended on 30th April, 1958. For some of the farms, this season almost coincided with the last of the financial years for which results are quoted; but, for the farms whose accounts end in November, the period extended beyond the end of the last of the financial years.

Table III summarizes the information. Concentrates in the five summer months varied from about 0.6 cwt a cow to well over 6 cwt for average yields in the five months (excluding milk to calves) of from 262 gals to 411 gals a cow in herd - the latter in a bull-selling herd. Counting silage as one-third its weight in hay, the thirteen farms providing this information used from 17 cwt to (exceptionally) 54 cwt dry weight of hay and silage per cow. This compares with averages of 27 cwt on milk costing farms producing similar proportions of winter milk, in the year 1957-58, which covers the same winter.

Annual consumption of concentrates (including the dry weight of beet pulp and the dry weight of draff on one farm) ranged from 15 cwt to 29 cwt a cow, this latter on the farm producing milk worth £104 an acre.

All the farms used silage - from 18 cwt to 93 cwt a cow - six used roots and all but four used kale. All except three used some straw or sheaves, one of the exceptions being Farm A, which grew no grain.

PRACTICES AND RESULTS ON THE INDIVIDUAL SELECTED FARMS

Details of the individual farms - their policy, husbandry and physical and financial results - are set out in Appendix I. These are not repeated in the body of this report, though the section on hindrances to intensification and the summary and conclusions take account of the information in Appendix I.

HINDRANCES TO INTENSIFICATION AND TO GREATER RELIANCE ON GRASS

The individual farmer may be able to choose from a variety of ways of increasing the utilized output of his grass. He may extend the grazing season in spring, or in autumn, changing his system of manuring or his stocking and grazing system or his type of seeding, or all these in order to achieve this extension; he may manure more heavily in the main season and make corresponding adjustments in stock and stocking and harvesting to prevent waste of grass and may rest the grass more effectively; and he may adjust his harvesting dates and methods to secure the optimum yield of the kinds of fodder he can best use, be it high-protein hay or silage, bulky hay or silage of low protein content, or fresh grass for zero-grazing. If the output is to be greatly increased a substantial expenditure on buildings may be involved, if profits are to be maximised.

To adopt all or even only a small number of the possible ways of further increasing output from the grass necessarily involves a good deal of thought; and it may well be that few of the farmers would be willing to undertake the necessary additional mental exertion involved. Several of the selected farmers were far from confident that good health would continue among their stock and that enhanced profits would ensue from further intensification. These may have been the most common hindrances to notable intensification. Even if it were possible to make the appropriate estimate of managerial ability, it would obviously be invidious to particularize in this regard. Liability of grassland to poach in spring or autumn, or indeed under strip grazing at any time, has been a fairly common hindrance. So has shortage of capital for more livestock to use the extra grass. Reluctance to practise such high nitrogenous manuring that clover is inhibited was general. Reluctance or inability to undertake substantial expenditure on buildings would be a hindrance to thorough-going intensification in many cases.

Less frequent causes have been:-

(1) disease in cows, which reduces yields,
(2) conservative outlook on cow feeding,
(3) necessity to reduce personal effort,
(4) lack of personal incentive to effort,
(5) adequacy of existing profits and inadequacy of the higher levels of profit when they attract heavy rates of tax,
(6) fear of being short of keep if stock are increased, and
(7) insecurity of tenure, with its repercussions on the provision of fixed equipment.

Since the achievement of a high proportionate reliance on grass cannot be said to be looked upon as an economic objective, or indeed a direct objective of husbandry, no attempt is made to analyse the reasons for not increasing that reliance. This proportionate reliance will of course, be increased if the quantities of feed (other than grass) are increased less (or decreased more) than the utilized output from grass: and it is to be noted that the very act of restricting the quantity of feed used may increase the utilized output of the grass (because the feed has in fact been "wasted" in the past). But it is also to be noted that the restriction may lead to reduction of annual milk yield and reduced farm profits. Fear of such reduction is the reason why several of the farms fed relatively heavily in summer.

SUMMARY AND CONCLUSIONS

As in most farm management investigations in this country, this study has been concerned with farms which, though all depending principally upon milk as a main source of revenue, differ in many other respects. Some of those differences can be readily represented by figures; others, especially the quality of the management, cannot. Nevertheless, it is possible to include in this report not only statements of fact, such as stock carried, feed and manures consumed, and so on, but also some evidence of relationships between such relatively straightforward facts.

The fourteen farms selected for study lie within the Clydeside counties and have spent rather more on manures than the general run of dairy farms, and have relied a little more on grass and grassland products than nineteen control farms have done. They have also increased the stock carrying capacity of their crops and grass between the two years 1953 and 1954 and the two years 1956 and 1957, more than the nineteen control farms did.

Taking the results on seven of the farms over five years, (up to 1957/58) it appears that an extra £2 per acre of the farm spent on manures has been associated with the production from crops and grass of the full keep (in terms of energy) for an extra cow on 21 acres, or from 16 acres plus £30 worth of bought feed. Alternatively, 2.7 cwt extra U.S.E. per acre could be produced for the replacement of bought feed. Though this is the result of a comparison between farms, it appears likely that quite as good results would follow on many individual farms. Indeed, taking 29 of the farms, it appears that, in the two years 1956 and 1957, it was possible to get about 1.67 cwt utilized starch equivalent (U.S.E.) per acre more from grass for every extra £1 spent on manures. (This quantity of U.S.E. corresponds to the full keep of a cow from £25 spent on manures). Results from the same 29 farms support the view that there is diminishing return of milk to feed.

These inter-farm comparisons secure some confirmation from the fact that, over the five years, the selected farms increased their grassland U.S.E. by 1 cwt per acre whilst the control farms suffered a slight decline. After allowing for the effect of size of farm, the selected farms produced about £22 more(making a total of £167) for every £100 spent on feed, seeds, manures and labour than did the control farms. Although admittedly part of this advantage is probably due to many features of organization, it is a pointer to the general efficiency of the systems practised.

At £20.6, margins per acre, excluding margins on pigs and poultry, were £7 more than on the control farms. For the whole group of about 150 dairy farms for which accounts are reported on by this department, the average margin per acre, in the same two years, but including the margins on pigs and poultry, was just short of £16, about £5 less than on these fourteen farms.

Between farms, margins (omitting pigs, poultry, sheep and potatoes) were higher by £3.5 an acre for every extra £1 per acre spent on manures: of this about £2.3 was associated with the manuring, the other £1.2 being accounted for by heavier stocking and higher yielding cows or both. Margins were much more stable from year to year on the individual selected farms than on the nineteen control farms.

The Surplus, broadly estimated, and excluding the surplus on pigs and poultry, averaged £26 a cow on the fourteen farms and £10 on the control farms, against £18 (including pigs and poultry) on the general run of 150 farms.

Although modern grass harvesting and storing equipment may well add £40 a cow to the equipment investment and result in additional charges for depreciation after a few years, of between £3 and £4 a cow, the fourteen farms had equipment costing very little more than on the general run of farms. Four of the fourteen have bought up-to-date models of forage-harvesters since the end of the period of this enquiry.

Overall consumption of concentrates by cattle, sheep and horses on these selected farms set against the gallons of milk sold or used for farmhouse and workers averaged 4.9 lbs a gallon on the selected farms, 5.2 lbs on the control farms. This suggests that many of the farmers have either considered it profitable to rely on concentrates to a considerable extent for maintenance, or have thought standard production rations inadequate. Some may have failed to realize that they have been relying on concentrates for maintenance.

Incidentally, the analysis shows that, as between farms, a decrease of 1 lb in the overall consumption of concentrates per gallon has been associated with a rise of 1 cwt in U.S.E. per acre from grass.

Although inter-farm comparisons in the last pair of years gives no support for the view that self-sufficiency in feed is profitable, the trend over the five years suggests that each 1% change in self-sufficiency has led to an increase of 1.75% in margin - say an increase of £1 in margin for an increase in self-sufficiency of 5% or 6%.

Details are given about the individual farms, and reasons for not intensifying are discussed.

The study, undertaken when interest in changes in grassland husbandry is running high, was intended both to secure information about farms and to explore the possibilities of using farm accounts for the assessment of the effects of intensifying the management of grassland. Much of the information the study has produced is in this report; most of the methods used in the analysis are indicated at appropriate points.

APPENDIX I

PRACTICES AND OTHER DETAIL ON THE INDIVIDUAL FARMS

FARM A

It is appropriate to look first at the second smallest of the selected farms; for it has spent most per acre on manures and relied most on grass.

The farm, of under 80 adjusted acres at about 600' above sea level, includes pit bings, and some rough grazings and is within the range of Clydeside's atmospheric pollution. Two miles of road separate the main block of land from a field representing about a fifth of the whole adjusted acreage.

The soil is heavy loam, 7" to 18" deep, overlying clay for the most part; but one field is rocky. While no fields are flat, only one is really steep, all except the one being suitable for the use of a flail-type forage harvester. The herd of under thirty non-pedigree Ayrshires is mainly maintained by purchase, for two main reasons:-

(i) there seemed to be more money in cows than youngstock, and
(ii) atmospheric pollution is slightly detrimental to young stock.

The few home-reared heifers calve at just over two years. Whether the forgoing of a cattle output of about £19 a cow, such as is usual on the control farms, was profitable cannot be proved; but all the circumstances point towards the desirability of purchasing suitably tested herd replacements and, if the stock carry can be profitably increased, to the rearing of short-period young stock like quick-growing beef cattle. Some of these beef cattle are home-bred by A.I., others are bought in.

The general policy is broadly determined by shortage of capital - quite a normal circumstance for young owner-occupiers of farms - the heaviness of the soil, and confidence that well manured grass can produce useful profits.

The two years covered by this study are the second and third of the farmer's occupation of the farm. Many details are given in Table 1.

Except for a small area of kale for strip-grazing by cows, the whole of the farm is in grass. Normally all grass is mown for silage at some time in the season, except for one paddock which, becoming surplus to cow pasture requirements at a time when the silos have been sealed, is grazed by young stock. It should be said, however, that this one departure from the practice of mowing a paddock once it has been grazed twice running in a season, has only been in effect for two years.

Apart from one field which is never strip-grazed, all the grazing was controlled by electric fence. (In 1958 and 1959 paddock-grazing has been practised). The fields or sections of fields are of a size that corresponds to from 6 to 8 cows to the acre. On this heavy land it is fortunate that in wet periods, when heavy poaching would normally occur, the stock can be moved to the one old pasture on rock on which a good cover is maintained and which never poaches.

The cattle management during the two years under review demonstrates the possibility of cutting costs and output without suffering a drop in margin. Not that the evidence is as clear-cut as one would like; for the number of cows was increased at the same time as the quantity of concentrates per cow was reduced. Moreover, the number of cows has been reduced in subsequent years. However, it can be said that a purposeful reduction of concentrate feed from £51 a cow to £18 a cow (from £19 to £8 an acre) coupled with rather better utilization of the output from the grassland and, in particular, a good pasturage in April, 1957, was followed by a fall of only £6 an acre in milk production(£38 a cow). In subsequent years, the quantity of bought feed and milk output per cow have been slightly increased with the return in the size of herd to the lower level of 1950. There is even consideration of the possibility of increasing the inputs and yields per cow and increasing the number of cows to 40% above the 1957 level.

In January, fodders are, at best, considered sufficient for maintenance and ½ gallon, and on the poorer layers of the silo the fodders fail to equal maintenance requirements: draff was fed in 1956/57; not in 1957/58. Almost certainly some of the high quantity of silage and hay fed (Tables I & III) was wasted because of poor quality.

Where the small amount of hired labour is mainly used for improvements, and a good deal of the farmer's time is similarly spent, it is a matter for congratulation that the labour index stands at the relatively high figure of 142%. This is to be related, in part, to the very high nominal investment (at 1958, new prices) in equipment of £59 an acre, carrying a nominal depreciation of £5 an acre.

Cows normally lie out from 10th May to 10th October, day grazing having commenced about mid-April. There is exercise throughout the winter.

On pastures to be grazed early, typical manuring has been:-

2 cwt. Nitro-Chalk followed by cow grazing:
4 - 5 cwt main crop potato fertilizer (6.11.12) followed by cow grazing or mowing:
Poultry manure or Nitro-Chalk, followed by mowing or grazing.

Fields not to give early bite, have not had the early Nitro-Chalk.

Subsequent experience has led to a decision to abandon ensiling of second crops, and to substitute Italian ryegrass and rape, sown in June, for the kale. This would give autumn grazing, followed by early bite and silage the following spring and summer, before ploughing and re-seeding similarly. This would avoid the fall in milk yields associated with grazing kale in wet weather - a chancy crop, anyway - and would probably give as much total product in the season as the kale has done: for, since winter frost is essential for tilth production for the kale, the previous autumn's grazing has to be sacrificed. Each year about one twelfth of the home area is reseeded. Because of the mower-round-the-whole-grass policy there is no clear-cut area of cow-pastures such as there is under traditional systems. Hence, the area grazed by cows during the main season, as much as 1.55 acres a cow, includes the whole area of the grass except the reseed. Mowing for silage starts when the grass is about 11" tall; but the reaper may not be over the whole paddock before the grass has shot up to 24". Harvesting is by buck-rake, subsequently replaced by a flail-type harvester. The silage is in a covered pit 18' wide, normally filled to 6' settled depth at the middle. The art of silage-making has still to be brought to a satisfactory pitch.

In a herd maintained to a considerable extent by purchase of cows, some sickness and loss is to be expected, and a death resulting indirectly from a collision with a car could happen on any farm not in a ring fence. But, while some delay in settling to service occurred in 1956/57 and affected yields in 1957/58, and the cows lost condition during the lighter feeding of winter 1957/58, no diseases normally associated with lush grass occurred. The delay in settling to service was the main cause of the drop in importance of winter milk from 44.6% to 40.3%.

When allowance is made for size, the economy of this farm is rated third highest among the fourteen selected farms, and only four points below the highest.

The conclusion may be that the farmer is making quite successful attempts to find the best policy and practice to suit the land and capital at his command.

FARM B

Slightly smaller in herd-size than Farm A, Farm B stands rather higher above sea level, at about 750', and has no rough ground. Although he aims at high output from his grassland, the farmer does not pursue a policy of self-sufficiency: rather does he strive so to balance his stock carry, his grass capacity, his housing and his feed as to yield a high return. If he

can find more acres, as he did in 1956, the inputs per acre fall at first, but are soon restored to the former level.

Although most of the farm is either flat or gently sloping, there is one old pasture forming a glen in which in-calf heifers can winter admirably.

While the soil is light and gravelly, a few hard knowes exist that are inclined to burn in drought. Even this tendency has been largely conquered by manuring them early with f.y.m. and managing them so as to maintain a fair cover of grass.

Before the commencement of the five years for which information is given in Table 2, the tenancy had run for just over two years. So that, while those two years had covered building up the stock and raising the level of manuring, the five years represent normal consolidation, with some building up of stock as the growing family come to take a share of the work.

Table 2 demonstrates the steady increase in the number of cows, and in total stock, partly achieved by reducing the cash crops grown and so freeing a greater area of grass for the cattle and sheep, partly by increasing the fertility of the grassland, partly by renting additional land, and not at all by increasing the quantity of feed bought. Had it not been for a slight fall in output of cattle in the last year, due to building up the numbers of young stock in hope of more land, (these being valued at less than they would have sold for), the margin would also have continued to increase throughout the five years.

Perhaps the key to the decision-making is the dominant consideration that the cows should be kept to the number that can be supported fully in summer. Doubtless more cows could be carried in summer if less grass was conserved for the winter. But the present stocking, and feeding to a yield of about 845 gallons a cow, (nearly 50% in winter), which necessitates meeting in winter a small part of the need for maintenance from concentrates, has been decided upon after careful thought. Even in the five summer months, concentrates were fed in 1957, equivalent to nearly 2 lbs a gallon produced, the highest rate amongst the thirteen selected farms for which the facts are known; but over the year as a whole, the total quantity of concentrates used on the farm (except for pigs and poultry) at 4 lbs, is sixth lowest amongst the selected farms and only surpassed by three of the control farms. An estimated average surplus (see p. 8) in the last two years of £34 a cow is fifth among these selected farms and higher than all but one of the control farms.

The pattern of land use has changed over the years. Oats, and latterly oats and barley, have occupied between a third and a half an acre per cow and have contributed to cash income; a single acre of potatoes gave useful return in the first three years; turnips, plagued by finger and toe, were dropped in 1955; kale, dropped temporarily in 1955 and 1957, runs at one-twentieth of an acre a cow. The amount of grass mown has increased steadily, silage appearing in 1954.

Typical treatment of cow pasture is:-

March: 6 tons hen manure
3 cwt potassic supers

April: Divide into three plots, each equivalent to one-tenth of an acre a cow, and stagger the application of 2 cwt Nitro-Chalk in May.

Strip-graze three times, the second and third grazings starting 25 days and 46 days after the first started.

June & July: 2 cwt Nitro-Chalk staggered, before a fourth grazing (in paddocks), 69 days after the start of grazing.

July, end: a fifth (strip) grazing.

End August to mid-September: a sixth (strip) grazing.

Early October: a seventh grazing of 2 days on each paddock.

One-sixth of the field, surplus in late May and early June, was ensiled in mid-June, and grazed nine days later. Another similar field gave five grazings, chiefly strip-grazed.

The main silage field, after receiving a basal dressing of potato fertiliser or hen manure, received its 2 cwt Nitro-Chalk in staggered dressings in hope of securing a steady succession of grass for mowing with a high protein content. Two weeks of ensiling, except at the week-end, were followed by a second 2 cwt of Nitro-Chalk. A spell of warm dry weather, ideal for the haymaking proceeding on the fields, led to a slight delay in re-growth. But a second cut was taken in ten days at the middle of August. Thereafter the cows strip-grazed half-days for three weeks in October by about three cows to the acre.

Silage is collected by buckrake, (distances are not great), placed in a covered, brick sided, silo, (formerly in an earthen pit), consolidated by contractors' tractor and receives the second cut on top of the first. It may be of interest to notice that the silage making requires about 0.6 gals. of vaporising oil in the farmer's tractor per ton of silage.

It should be added that a short 'take' of a field equal to a third of an acre a cow, used for dry stock, was not manured at all. Total manuring in the five seasons has averaged:-

Manures	Cwt per acre per annum
F.Y.M. and hen manure	74
Shell lime	4.6
Ground limestone	0.4
Waste lime	4.4
Basic slag, chiefly low grade ...	1.7
Supers	0.4
Potassic supers	0.2
" mineral phosphate	0.3
Nitro-Chalk	1.1
Potato fertiliser	2.0
Miscellaneous	0.1

Livestock Until the last year no beef cattle were sold. To maintain and improve the herd, on average, a fifth of the number of cows was bought each year. Sales of cows and calving heifers were about twice that number. A.I. was used exclusively and as opportunity occurred heifer calves were bought to rear. The experience, in the middle year, when winter keep was short, of having to sell a small number of young stock that could not be conveniently wintered, has affected the stocking policy. However, as the pasture management improved, the surplus summer grass and a small surplus of winter keep, have been progressively used for (a) ewes, half the number of the cows, lambing and finished early, (b) hoggs for wintering and (c) young beef cattle to fatten. Cow numbers have also been increased.

Calving heifers winter well outside in the sheltered old pasture with a few green sheaves.

After experiencing one or two non-fatal cases of hypomagnesaemia each year, (one beast showing symptoms three years running), the farmer has regularly used calcined magnesite in the cows' dryfeed, starting in March 1957. No cases have occurred since. The only deaths of cows have been one due to bloat on clover aftermath in each of the years 1953 and 1954. No more than 4 calves in all have died over 7 years. One calving heifer succumbed to lead poisoning from eating roofing felt.

The quite high milk output per cow, nearly the highest amongst these farms, is evidence of the good stockmanship to be expected in an intelligently run small-holding, where emphasis is on timeliness and quality of work.

That a progressive approach to grassland exploitation has paid well is perhaps best demonstrated by the high margin per acre and per cow (fourth in the selected farms in the last two years), and the unbroken improvement over

the five years in the total margin and in the ratio between gross output and the expenses on feed, seed, manures and labour.

Having said this, it remains to point out that the aim is to improve this farm, whatever its relationship to others.

FARM C

Not many farms of between 80 and 120 acres carry 0.85 cows to the acre. Nor is it usual to carry so few followers as one to every six cows. Farm C is therefore not typical of dairy farms. However, it is interesting. Apart from the details shown in Table 3, it is well to note that the individual fields are all (except for one that is split by an unelectrified fence) of such a size that there are over 12 cows to the acre at a time in any one field. Contrary to what is generally considered good practice, the cows graze day and night in the same field, usually 4 days and nights on any one field. The fields normally grazed by cows are equivalent to 0.63 acres a cow, considerably less than is usual.

The cows are normally housed at night from 15th October to 12th May: 1957 saw them lying out on 24th April. Typical manuring of the grass is 5 cwt maincrop potato manure (8.9.12), in March for hay or grazing, with 2 cwt Nitro-Chalk for the hay aftermath. Silage is relatively unimportant, harvested with buckrake and made in a rough pit in a hillside.

The relatively low utilized starch equivalent per acre of grass, bearing in mind the heavy expenditure on manures, may be explained by the proximity to moor of some of the ground and the general elevation of 550 ft. There may also have been over-feeding of concentrates. Although rather below the middle of the selected farms in order of efficiency of use of resources (p. 6) (though higher than all but one of the control farms) this farm has by far the highest margin per acre. The very high labour index (Table IV), which has much to do with the high margin, is probably also associated with the only moderate milk output per cow. It might well be that a little more labour, were it available in sufficiently small units, would increase the margin still more.

FARM D

In terms of margin per acre in relation to expenditure on manures, of consistent profitability per acre, of efficiency in use of resources in general (p. 6), and of economy in the use of concentrates per gallon, Farm D is outstanding. It lies at 500 ft. and is between 120 and 200 acres in extent.

Typical manuring programmes for pasture are:-

(a) 4 cwt potassic mineral phosphate in winter, and
2 cwt Nitro-Chalk in late summer.

(b) 4 cwt potato fertilizer (8.9.12) in spring, and
1½ cwt Nitro-Chalk in summer.

Silage harvesting is by green-crop loader, and follows dunging, potassic mineral phosphate as necessary, and, usually, two dressings of about 2 cwt each of Nitro-Chalk. Experience on this farm is that milk production is never supported as well by the second cut of silage in any year as by the first cut. Hay is normally reserved for young stock and dry cows, milking cows rarely having it unless the silage quality is low, (as in 1956). Silage is fed once a day throughout the winter at about 46 lbs a head: turnips at 27 lbs and straw at about 4 lbs complete the milking cows' roughage and succulents.

Although he has difficulty in getting his men to take the trouble to make two rounds at feeding time with the silage barrow, to mix good and poor silage (when this occurs), this farmer's close contact with the herd at milking time, his practice of not feeding concentrates during the summer, and his use of the electric fence in spring and autumn (but not in summer) have presumably had a considerable effect on utilized starch equivalent and indeed on margins generally.

The general conclusion is that a good organization, with a normal supply of equipment, is here demonstrating the results of good management.

FARM E

Of between 200 and 310 acres in area, this farm derives, as Table 5 implies, a great deal of revenue from the sale of prime cows and heifers and young bulls. Further, it is capable of growing good crops of potatoes and cereals. Hence it is not surprising that the cows received 25 cwt of concentrates in the year 1957/58, and that in the last two years the total consumption of bought feed and homegrown cereals (by all stock) amounted to nearly $5\frac{3}{4}$ lbs for every gallon of milk output, exceeded by only two of the selected farms, but by five control farms. Manuring at £4.12s. an acre in the last two years (or £4. 2s. if the manuring of potatoes is deducted) was relatively heavy for the size of farm and might have been expected to result in a rather higher utilized starch equivalent from the grassland.

The land is a good loam, heavy in places and calls for continual attention to drains. The large quantities of milk fed to young stock (amounting to some 75 gallons a cow) mean that the measure used for milk production in this report puts this farm in a poorer light than figures for milk yield itself would do. Concentrates to all stock, per gallon of milk produced, was 5.4 lbs. rather than the 5.8 lbs above.

Cow pastures in five fields amount to 1.15 acres a cow. In any one field at one time there are from 3.6 to 5.4 cows to the acre. There are day pastures and night pastures, each grazed for about ten to fourteen days, and changes to fresh day or night fields are never simultaneous. The relatively long stay in pastures may be a cause of the relatively low output from grass. There are, of course, good reasons, in a bull-selling herd, for not dehorning and, therefore, for not using the electric fence, and not having very close stocking of cow pastures. Cows start grazing mid-April, lie out at the end of April, lie in mid-October and stay in at the end of October. Pastures receive about 4 cwt maincrop potato manure (8.9.12) in two dressings and silage fields 6 to 7 cwt of the same. Silage is collected by greencrop loader and placed in an uncovered bricked pit in two sections. Two cuts are usual. The use of magnesian limestone has not prevented occasional mild cases of hypoma gnesaemia, and the disposal of staggers-prone cows is the established policy. The one fatal case occurred in 1956, before magnesian limestone was decided upon.

Over the years, the change to greater reliance on grass has involved exchanging the arable silage for grass silage, as well as a rather more careful use of the pastures. Slight temporary reductions in the number of cows have been accompanied by increases in the number of young stock and of ewes (instead of hoggs).

It is possible that the relatively low increase in labour efficiency over the years is connected with the cattle policy; but it is also possible that some reduction of the peak demand during silage making could be effected by an earlier start on silage, and the use of a precision seeder for the root crop.

FARM F

Also between 200 and 310 acres in area, on undulating heavy clay loam that necessarily claims attention to draining, this farm has the fourth heaviest stocking amongst the selected farms, the fourth highest reliance on grass, and the fifth heaviest output from grass and field crops together. Utilized starch equivalent from grass and quantity of concentrated feed used per gallon is at about the middle of the selected farms and so is expenditure on manures - though, allowing for its size, the manuring is relatively heavy. General efficiency (p. 6) is third lowest if allowance is made for its size. Table 6 shows, indeed, figures that would be fairly typical of farms generally recognised (as this is) as well farmed. Although years of pasture management designed to encourage clover have greatly improved the texture of what was formerly a very stiff clay, the tendency to poach is so great that the cows are not turned out to grass until a good sole has been established each spring and there is little likelihood of a severe check to growth (and milk production) by the usual spring drought. There has thus been no attempt to practice 'early bite' methods.

The electric fence is occasionally used to divide fields, but strip-grazing is not favoured on this heavy land. Typical manuring of pasture includes basic slag and 4 cwt of potassic mineral phosphate at sow-out, 4 - 5 cwt super-phosphate in autumn and 4 - 5 cwt maincrop potato manure (8.9.12) in the spring. Silage fields get 2 cwt Nitro-Chalk in addition. Potash is applied whenever farmer and County Adviser think it necessary. It has apparently greatly encouraged the clovers and the finer grasses. The cows graze day and night as two herds on two groups of fields that represent 0.6 and 0.8 acres respectively per milking cow. These serve the herds well into July. Single-cut silage and hay each take about 0.36 acres a cow. If grass is likely to grow away from the cows, as in 1958, it is ensiled. Normally, silage is harvested by green-crop loader and placed in 'pits' that are largely on the surface. An irregular cut, taken when the pits are full, is harvested by pick-up baler and placed in a hay shed. The greencrop loader has subsequently been replaced by a cutter-collector.

Hay is arranged for pick-up baling, but once hay is fit for rucking it is either rucked or baled before nightfall and is not left to the chances of weather; the labour of rucking, even at overtime rates, is amply compensated by the security obtained. 28 man-hours and 8 tractor hours are required on this farm to put 5 acres of, say, 3 tons an acre into rucks on tripods. These hours are largely additional to the work that would be done for pick-up baling, and, since the hay is ultimately baled out of the ruck the whole of these costs of about £8.10. - for safeguarding 15 tons of good hay, are chargeable to this safeguarded hay. Remembering experience, the farmer would rather give bad hay away than use it himself, and regards the precautions fully justified. Adequacy of the labour force contributes to this decision.

Young stock go to grass in the middle of March, the cows being turned out first towards the end of April. The dairy herd is usually housed at night by the first or second week of October and wholly housed by the end of October. Prevention of poaching is the main consideration in the autumn. The introduction of the husk vaccine has already both prevented the great losses in condition that have been a scourge for some seven years and made it practicable to run the young stock as scavengers after the cows.

While it is clear from the table that the livestock are well cared for, there might well be room for some economy in feed, both at grass and during the winter.

Throughout the five years, a few store cattle have been carried. In addition, more recently, a few Friesian cross stirks have been fed. Additional ewes are also kept.

Slightly higher milk yields have brought difficulties in getting cows in calf, so that the former even calving pattern has moved to a slightly heavier proportion of calvings in spring than in the rest of the year.

One consequence of the change to silage has been that holidays, that used to be conveniently taken immediately after turnip singling and before the relatively late hay harvest, now have to be postponed until the much lengthier silage season is over. The validity of the method adopted in this study, for estimating the relation between the labour content of work and the labour force is confirmed to some extent in this case; for the low labour index is consistent with the recognition, by the farmer, that he has rather more labour than he needs, for planning is easy and many maintenance jobs are being overtaken. There are advantages in having a slight surplus of labour.

FARM G

A casual visitor would expect conditions on this farm of under 80 acres to be kinder to man and beast than on the other farms in this size group. Clean breezes blow from the sea, not six miles away and the soil is free working.

Manures cost £5 an acre, fifth amongst the selected farms, stock carry per farm stock acre used is highest except for Farm C, and feed obtained per acre from tillage crops and grass is practically equal to Farm B, which it

beats quite well as to utilized starch equivalent from grass; but in general efficiency adjusted for size (p.49) it is fifth lowest, but is beaten by only six of the control farms. Margin, per acre at £22 (sixth amongst the selected farms), is higher than on any control farms.

As the cow numbers on this farm are a little uncertain, due to some dry cows being at hired grazing, the per cow figures are somewhat suspect. However, they hang together, and appear to explain the apparent discrepancy between the standing of this farm in respect of per acre matters on the one hand and its relatively low standing in per cow matters and in the 'overall efficiency' factor. It is possible, too, that the hired grazing makes a particularly valuable contribution to the economy of the farm, and that it gives the advantage of notably increased acreages. The traditional day field and night field are respectively such as to represent 0.6 acres and 0.4 acres per cow. 'A wee field up the road' can be coaxed to give a little early bite before the home fields, to which the cows normally go on 1st May. Typical grass heights at mowing are 15" for silage and 30" for hay. Two heavy cuts of silage are taken from Italian ryegrass sown after potatoes and from a little other grass. The buckrake (later superseded by a pick-up baler) delivers this satisfactorily to a covered silo within the buildings, from which a handy 10-cwt three-wheeled trailer carries it to the stock.

Aftermaths are grazed behind an electric fence till well into October. No concentrates are fed between about 22nd May and 31st July, and it is clear from the records that the cows get nearly half their annual needs for energy from grazing.

Typical manuring is:-

Hay	F.y.m. 12 tons. Potato fertiliser (8.9.12) 4 cwt. Nitro-Chalk to aftermath, 1½ cwt.
Italian ryegrass for Silage after Potatoes.	Potato fertiliser, 4 cwt. Nitro-Chalk. 2 cwt. Hen manure, about 2 tons No manure on aftermath.
Grazing.	Potato fertiliser, 3 to 4 cwt.

The relatively low output of milk per cow is largely explained by a rather long succession of ineffective services, and in the earlier years to acetonaemia in about a quarter of the dairy herd. A few bullock stirks contribute usefully to output.

FARM H

This farm consists of between 200 and 310 acres of heavy soil overlying clay at 12" depth, and lies at 300 ft. above sea level. Like Farm G it is not far from the sea.

The dominant feature of this relatively large farm is that capital is the principal limiting factor so far as intensification is concerned. That being so, it is not surprising that in general efficiency (p. 8) the farm stands highest with a gross output four times the value of the feed, fertiliser, seed and labour that goes to make it. In margins per cow, it is only beaten by the bull-selling farm. Were its other expenses as estimated at p.6 the surplus would be £40 a cow or £10 an acre, a distinctly useful surplus on a farm of this size.

Pasture normally receives 3 cwt potassic supers or 3 cwt maincrop potato fertiliser (8.9.12), grass for silage or hay gets 4 cwt early potato fertiliser (10.8½.8) and dung; and an area of about ¼ acre a cow for strip-grazing followed by hay gets a little less early potato fertiliser and dung before the grazing, and 2 cwt Nitro-Chalk before mowing.

Apart from the ¼ acre a cow of strip-grazing before hay, the cow pastures, which serve for the whole summer as day and night pastures, are just under half

an acre (0.47) each per milking cow. Silage is harvested at a fairly advanced stage by green-crop loader and tipping trailer into a surface silo between two low walls. Seed hay is taken from about half of the 1st year mowing.

Cows go out about 25th April, lie out about 7th May and get no concentrates between mid-May and mid-August. Thereafter grass is expected to cover 3 gallons until 30th September, and 1 gallon thereafter, until they lie in at night in mid-October. They lie in completely by 28th October.

Turnip shaws cover those two weeks of October: one feed of turnips and one feed of silage, with hay, stand all through the winter. A fifth of the cows have to be treated for acetonaemia between New Year and turning out day; but calcined magnesite in the dry feed prevents hypomagnesaemia.

Economy in feed - 3.6 lbs of concentrates to all stock (except pigs and poultry, of course) per gallon of milk output is the consumption - and economy of labour, with nevertheless a quite high yield per cow, in both quantity and value, (though a lengthening calving index is tending to pull that down), associated with a moderate dependence upon moderately manured grass, linked with traditional production of turnips, and a small flock of sheep, contribute to a satisfactory return.

Even so, since the period covered by this report, turnips and the summer flock of sheep have been dropped, and more silage has been made.

FARM J

In many of the comparisons made in this report, Farm J stands rather poorly. The reason is that in the last year severe losses arose from Johnes Disease, that had been preceded also by crippling attacks of acetonaemia which often occurred within a few weeks of calving. But earlier years show margins per cow standing above midway in the selected farms, with margins per acre just below midway. It is a farm of between 80 and 120 acres, standing at about 300 ft., within the industrial belt of Clydeside. Ordinarily it carries a balanced stocking of young stock and grows quite useful crops of wheat. Pigs and poultry add to income and complicate the preparation of figures for this report. Considering its size, grass reliance has been quite high, though, with the decontrol of feed, there has been greater recourse than formerly to the feed bag.

Grass manuring has been fairly high, though rarely have fields had as much as 3 cwt Nitro-Chalk in a season; electric fences were used for paddock grazing in the first three of these five years and for strip-grazing in the last two. The fact that at the same time estimated output of starch equivalent from all the grass has run at about 12 cwt per acre implies that either the calculations are more than ordinarily subject to error because of the pigs and poultry or that, as is suspected, the effect of industrial pollution is quite important. Poaching in wet weather of May, 1957 and the illness of cows may be the chiefcauses of the very low figure for 1957. For the milking cows (some 93% of the average number of cows) in summer, strip-grazing of just an acre per cow in herd cared for the whole summer and gave a silage cut on one-fifth of itself. Certainly the farmer himself feels that without the control of grazing his feed bills would be higher or his milk output lower.

Grass for silage is conveyed by two buckrakes (now superseded, since 1957, by a flail-type harvester in shared ownership) to a covered pit.

Table 9 gives many details. It shows, for instance that hired grazing is quite important.

FARM K

Farm K no longer exists. It, too, lay in the Clydeside industrial belt and it will now be devoted to steel production. At the lower end of the 120 to 200 acres group, it consistently relied on grass for rather more than 50% of the feed needs (apart from those of pigs and poultry, which were a considerable

enterprise and complicate the computations for this study), could grow about 75% of its feed needs and 'sell' considerable amounts to the pigs and poultry, spent increasing amounts on manures, but stood no higher than midway in general efficiency of use of resources amongst the selected farms (though higher than all but two of the control farms).

Relatively low yields per cow (perhaps associated with apparently high labour efficiency (Table IV), and moderate use of feed, and low utilized starch equivalent from grass (perhaps due to industrial pollution) seem to point to the main reasons for the general position.

The cow pastures, arranged in paddocks in all years except 1956, (when strip-grazing ruled), represented about 1.1 acres per cow and yielded a silage growth of about 5 weeks on a fifth of them. Kale was grazed in part, carted in part.

The grazing season starts about the last week in April, the cows lying out at the end of April, and lying in about Oct.22nd, last getting maintenance from grass a fortnight or so before then. A very small number of cases of acetonaemia in 1956 and 1957 caused no serious trouble and the only case of hypomagnesaemia recovered to yield over 1000 gallons in her lactation.

Even though the calculations suggest low production from grass, the farmer was so confident that silage was likely to continue to give him good returns that before his farm was engulfed, he had built a substantial covered pit and hay shed and had recently jointly purchased a flail-type forage harvester.

During the five years, silage was brought in by buckrake to an uncovered shallow pit with sleeper sides.

FARM L

Carrying a herd of Friesians, Farm L, of a few acres less than 200, stands on undulating land at about 450'. The texture of the fairly heavy soil is improving with the application of the heavy dressings of f.y.m. from the herd augmented by purchase from piggeries. Rock is not far from the surface: and, indeed, there are some small rocky cliffs. Manuring costs are fifth amongst the selected farms and higher than any control farm, reliance on grass is nearly equal to the highest of the selected farms, stocking of the farm itself is not high (fifth lowest among the selected farms), efficiency of use of resources (p. 6) is midway amongst the selected farms and surpassed by four of the control farms, but output from the grass and from all grass and tillage feed (fourth highest among the selected farms) are fairly high. In margins per acre and per cow the farm stands a little above the middle. A few potatoes meet a retail and shop trade and a little wheat and barley are grown.

Grass is managed intensively. In 1957 just under an acre a cow was used for ensiling and strip-grazing, and the only unmown area used by the cows was a mere acre or so. In addition the cows had the aftermath from timothy hay and meadow hay and grass for drying - about 0.28 acres a cow. Free range for young and yeld stock accounted for the rest of the grass.

Including the relatively lightly manured young-stock pastures the average dressing apart from lime, in 1957 was:-

2.0 cwt maincrop potato fertilizer (8.8.12)
0.22 " C.C.F.(12.12.15)
1.37 " Nitro-Chalk
32 " f.y.m.

1956 dressings were slightly heavier in total and, none being applied to the young-stock pastures, represented, per acre:-

3.3 cwt 8.8.12.
0.4 " 12.12.15
2.7 " Nitro-Chalk
106 " f.y.m.

Day grazing starts between 25 April and 5 May, the cows lying out a few days later, and ends around Hallowe'en.

The electric fence is moved twice daily, about 16 sq.yds a cow each time, one particular cow timeously giving audible notice of any deficiency. About 2 cwt Nitro-Chalk is applied after each strip-grazing.

Silage, wilted before loading with greencrop loader (since superseded by a fan-type pick-up loader), is normally of high dry matter. Were the silage harvest just a little less labour-consuming, so that more silage could be made, the fairly heavy draff purchases could be avoided.

A simple, two-wheeled, flat-bottomed barrow easily transports the mature silage downhill to the byres. The unbaled hay is fed economically in 10-12 lb 'bottles'. Kale is always cut (with a hatchet) and carted indoors, never grazed.

The fall in milk output per cow over the three years to a little below the average of the selected farms, (not to be expected for Friesians), is attributed partly to lameness due to highway repairs and partly to lengthening calving intervals. The fall may be partly due to a higher apparent ratio of work to be done to workers to do it. Private milk records are kept in the hope of improving yields by selection. Health is generally good, though in 1957/58 one cow choked in the byre and one died in October with symptoms of hypomagnesaemia.

A few beef calves are housed and finished. Here is quite intensive pasture management, resulting nevertheless in lower utilized starch equivalent per acre than is often quoted as the average from Britain, but likely, with added experience, to yield very satisfactory profits.

FARM M

Pigs and poultry have been mentioned as causing difficulties in the estimations made during this study on Farms J and K. On Farm M the chief cause of uncertainty is the large turnover of sheep. Between 200 and 310 acres in size, and standing fairly level except for a hill of about as many acres as there are cows, the farm is relatively lightly stocked in total, and since grass sheep need between a fifth and a quarter of the total food (including grass) used, it can be seen that cow numbers per acre are lower than on any other selected farm except Farm K. Reliance on grass is fairly high - eighth among the selected farms and higher than on any control farm. (The high stocking of sheep would tend to lead to this high proportion). Milk output per cow is lowest among the selected farms except for Farm J, and milk per acre is similarly second lowest. So it is probably the sheep that put the overall efficiency (p. 6) to third place, well above any control farm. Milking cow pastures, which serve until aftermaths are ready, have varied between 0.7 and 1.1 acres per cow in milk, the dry cows being on the hill. The cow pastures typically receive 3.1 cwt potato fertilizer (8.9.12) and 3 cwt of Nitro-Chalk in the season. Hired grazing is used for sheep in winter and about half the young stock in summer. Electric fencing has been used, in 1955 for early strip-grazing and foggage, in 1956 to make paddocks for the first half of the summer and in 1957 for strip-grazing throughout the season. Cows lie out in late April, (early bite has been known in mid-March), and are housed at night about 21st October. Italian ryegrass is undersown in lea oats, eaten off by sheep in autumn and winter and ploughed for kale at the end of April.

Silage is harvested by two buckrakes and put into a covered pit from which young stock can be self-fed. (Since 1957, provision has been made for self-feeding the cows also). Happily there have been no cases of hypomagnesaemia or of acetonaemia.

The labour index suggests that either the work is well organized or that the stock do not get the optimum amount of attention. Spreading 50 acres of fertilizer at the rate of $2\frac{3}{4}$ cwt to the acre in a day of $7\frac{3}{4}$ hours (with a dung spreader) is one way of getting work done easily and quickly. Is it possible the cows would do with more attention? Calving heifers are sold: no beef animals have been reared.

Kale, unthinned, (broadcast on the flat in 1958) is considered to be a good support to autumn milk.

If the sheep ceased to contribute handsomely to output and to profits, it would presumably be necessary either to increase the cow stock or to increase their yield. It may be that the sheep have been enemies of the cows in the past. An increase in cow stock would probably be the easiest way to use the grass which could be grown and conserved, though there is scope for a few beef cattle, which could find good shelter on the hill and could indeed be housed.

FARM N

On gently sloping, fairly heavy loam with a dominant aspect that tends to delay the opening of the grazing season by comparison with other farms in the district, this farm is between 200 and 310 acres. Management is affected to a considerable extent by the absence of workers' cottages and to some extent by a desire not to increase the long-standing loan. These two factors, together with declarations of Government policy with respect to milk production, largely determined that the number of cows should be reduced in 1956 and 1957; and the few feeding cattle taken in to graze neither fully used the grass nor returned as great a gross output as milk cows would ordinarily have done.

In effect, then, this is a farm not run at full pressure. Nevertheless its feed output per acre is only slightly below mid-point among the selected farms and well above the middle of the control farms.

General economic efficiency (p.6) is about ninth among the selected farms, the margin per acre about eleventh, and the margin per cow about middle. If other expenses were as estimated at p.8 the surplus would be the third lowest and no better than the middle of the control farms.

Pastures for early bite receive 6 cwt potassic mineral phosphate in autumn, and 4 cwt Nitro-Chalk in spring. A cold spring can make this treatment of no value in the early weeks. Normal pastures get 4 cwt of early potato manure (9.10.9). Apart from early bite and aftermath the electric fence is rarely used, and instead of the traditional day pastures and night pastures there is no predetermined allocation of grazing. Rather is the practice one of grazing or mowing wherever the farmer's judgment determines. Cows normally lie out about 20th April, having been out to grass a few days earlier, and are housed at night early in October and by day by the end of October.

Non-fatal cases of hypomagnesaemia occurred in 1958.

Silage harvesting is by green-crop loader in shared ownership.

This farm seems to demonstrate that there is no profit in manuring pastures if the extra production is to be let as hired grazing.

FARM P

The largest of these selected farms lies at 300' above sea level on gently undulating land within the Clydeside industrial area. The soil is 10" to 12" deep, on clay.

Manuring, though increasing, is the lowest of the selected farms and the calculated reliance on grass is lowest too. This is partly due to the heavy cereal and root crops that contribute about 38% of the feed supply used. It may be due to some over-estimation of these yields, which would have the effect of reducing the calculated yield of utilized starch equivalent/. Thus, the quite low figures, of about 9 cwt per acre, for starch equivalent from grass may be under-statements, though they are reasonably in line with expenditure on manures. As has been said (at p.6), these estimates of utilized starch equivalent are severely depressed if there is heavy overfeeding during the

/from grass

winter; this may have occurred also, but it is unlikely.

The foregoing suggests that the farm, though interesting, hardly justifies inclusion in a group intended to represent heavy manuring and intensive use of grass, or heavy reliance on grass. But its inclusion is justified because of its continued use up to the end of July of the electric fence for the cows and the combination of heavy silage and turnip feeding.

The pasture grass normally received 4 cwt of 8.9.12 fertilizer: no early bite is sought; for the soil poaches readily then. In any of the fields, which are strip-grazed in rotation, there are approximately 4.2 cows to the acre at any one time, the total area of the main cow pastures being about 0.82 acres per cow in milk. A field usually serves both night and day for about three days and therefore needs no backfence. The fence is moved thrice daily for the first four to six weeks of the season; thereafter, once. Pastures are not grazed bare. Young calves are sometimes grazed ahead of the cows, New Zealand fashion. Pastures are normally topped. The silage ground, some of it of a special mixture for silage, receives 4 cwt 8.9.12 fertilizer and 10 tons f.y.m., and may also have 3 cwt Nitro-Chalk. Two cuts are taken and the aftermath is grazed by cows.

The purchase of a precision root drill and a turnip shawer contributed substantially to the improvement of the labour index in 1957.

Acetonaemia, troublesome long before grassland manuring was stepped up, as it has been, has dropped to about 3% incidence in winter and 2% in summer. Hypomagnesaemia occurred throughout the five years, usually in the cold spell after early spring grazing and after heavy feeding. Losses are not high - total losses of cattle averaging about 2% a year, - despite the lethal miscellanea jettisoned from passing lorries.

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TABLE 1

SOME PARTICULARS FOR FARM A

Acreage Group:- 40 - 80 acres Years ended 31st March.

Year including the harvest of		1956	1957
Index of Acreage		100	100
" " No. of Cows		100	120
Milk Output	£ per cow	148.2	109.8
	£ per acre	56.3	49.8
Cattle Output	£ per cow	3.7	3.6
Sheep Output	£ per cow	2.2	-
Potatoes Output	£ per cow	-	-
Other Output	£ per cow	9.3	6.1
Total Output	£ per cow	163.5	119.5
	£ per acre	62.1	54.2
Bought Feed	£ per cow	51.1	18.0
Hired Grazing	£ per cow	-	-
Bought Seeds	£ per acre	2.1	0.9
Manures	£ per acre	8.5	7.0
Labour	£ per cow	36.6	30.6
Total of these	£ per cow	114.6	66.0
	£ per acre	43.5	30.0
		22.4	15.4
Margin	£ per cow	48.9	53.4
	£ per acre	18.5	24.2
Milk Output	gals per cow	953	749
	gals per acre	362	340
Winter Milk	%	44.6	40.3
Hay made	cwt per cow	39	37
Silage made	cwt per cow	78	110
Acres per cow	Total	2.63	2.20
	Grass	2.44	2.10
	Roots	-	-
	Kale	0.20	0.10
Cow eqts per farm stock acre used		0.572	0.535
" " " acre of feed, fodder & grazing		0.390	0.458
Utilized starch eqt from grass, cwt per acre		15.2	19.1
Feed, lbs per gallon			
Bought		3.4	1.6
Bought plus home grain		3.4	1.6
Reliance on grass, %		59	82
" " tillage crops, %		9	4

TABLE 2

SOME PARTICULARS FOR FARM B

Acreage Group:- 40 - 80 acres Years ended 31st March

Year including the harvest of		1953	1954	1955	1956	1957
Index of Acreage		100	90	90	123	122
" " No. of Cows		100	103	108	106	119
Milk Output	£ per cow	129.6	125.4	140.7	140.3	127.8
	£ per acre	44.4	48.8	57.8	41.3	42.9
Cattle Output	£ per cow	9.7	16.8	26.4	33.1	21.8
Sheep Output	£ per cow	0.3	-	-	0.7	4.1
Potatoes Output	£ per cow	9.4	5.5	9.6	4.8	-
Other Output	£ per cow	10.3	17.8	6.2	8.6	5.7
Total Output	£ per cow	159.4	165.4	183.0	187.5	159.4
	£ per acre	54.6	64.4	75.1	55.2	53.6
Bought Feed	£ per cow	50.8	56.9	56.6	43.3	37.1
Hired Grazing	£ percow	-	-	-	-	-
Bought Seeds	£ per acre	1.4	1.2	1.6	0.5	0.7
Manures	£ per acre	6.1	4.6	6.1	6.5	4.4
Labour	£ per cow	42.8	40.4	33.4	39.8	36.7
Total of these	£ per cow	115.5	112.2	108.9	106.7	89.0
	£ per acre	39.6	43.7	44.7	31.4	29.9
Margin	£ per cow	43.9	53.2	74.1	80.8	70.4
	£ per acre	15.0	20.7	30.4	23.8	23.7
Milk Output	gals per cow	786	761	863	885	837
	gals per acre	270	296	354	261	281
Winter Milk	%			48.3	47.6	48.8
Hay made	cwt per cow	48	20	27	46	32
Silage made	cwt per cow	-	32	31	63	45
Acres per cow	Total	2.92	2.57	2.44	3.39	2.98
	Grass	2.19	1.95	2.03	2.68	2.44
	Roots	0.08	0.08	-	-	-
	Kale	0.03	0.03	-	0.05	-
	Cereals	0.56	0.46	0.36	0.05	-
	Potatoes	0.06	0.05	0.05	0.61	0.53
Cow eqts per farm stock acre used		0.510	0.648	0.666	0.535	0.592
" " " acre of feed,fodder & grazing		0.336	0.425	0.461	0.428	0.485
Utilized starch eqt from grass,cwt per acre		13.0	16.1	19.1	16.9	20.3
Feed, lbs per gallon						
Bought		4.1	4.6	3.9	2.8	3.1
Bought plus home grain		5.5	5.8	4.7	3.4	4.7
Reliance on grass, %		48	48	61	65	68
" " tillage crops, %		23	18	9	15	14

TABLE 3

SOME PARTICULARS FOR FARM C

Acreage Group:- 80 - 120 acres Years ended 31st March

Year including the harvest of		1955	1956	1957
Index of Acreage		100	100	100
" " No. of Cows		100	128	132
Milk Output	£ per cow	126.1	121.5	128.7
	£ per acre	80.7	99.0	108.4
Cattle Output	£ per cow	-3.9	-1.1	-4.2
Sheep Output	£ per cow	-	-	-
Potatoes Output	£ per cow	-	-	-
Other Output	£ per cow	2.6	2.0	2.0
Total Output	£ per cow	124.8	122.4	126.5
	£ per acre	79.9	99.8	106.6
Bought Feed	£ per cow	65.5	56.8	47.5
Hired Grazing	£ per cow	5.6	4.2	1.6
Bought Seeds	£ per acre	-	0.1	-
Manures	£ per acre	2.5	5.1	6.5
Labour	£ per cow	18.2	16.1	14.1
Total of these	£ per cow	93.2	83.3	70.9
	£ per acre	59.6	67.9	59.7
Margin	£ per cow	31.7	39.1	55.6
	£ per acre	20.3	31.9	46.9
Milk Output	gals per cow	773	734	788
	gals per acre	495	598	664
Winter Milk	%	46.7	54.9	52.9
Hay made	cwt per cow	20	8	9
Silage made	cwt per cow	-	19	18
Acres per cow	Total	1.56	1.23	1.18
	Grass	1.56	1.23	1.18
Cow eqts per farm stock acre used		0.851	0.865	0.914
" " " acre of feed, fodder & grazing		0.341	0.283	0.394
Utilized starch eqt from grass, cwt per acre		14.3	12.3	16.4
Feed, lbs per gallon				
Bought		5.1	4.9	3.7
Bought plus home grain		5.1	4.9	3.7
Reliance on grass, %		40	34	43
" " tillage crops, %		Nil	Nil	Nil

TABLE 4

SOME PARTICULARS FOR FARM D

Acreage Group:- 120 - 200 acres Years ended 30th November.

Year including the harvest of		1953	1954	1955	1956	1957
Index of Acreage		100	100	100	100	100
" " No. of Cows		100	104	105	107	108
Milk Output	£ per cow	145.2	133.0	122.0	131.4	122.7
	£ per acre	49.6	47.4	43.9	48.2	45.5
Cattle Output	£ per cow	5.5	13.1	17.5	14.9	10.2
Sheep Output	£ per cow	-	-	-	-	-
Potatoes Output	£ per cow	-	-	-	-	-
Other Output	£ per cow	9.9	4.6	5.9	7.9	15.2
Total Output	£ per cow	160.6	150.7	145.4	154.2	148.1
	£ per acre	54.8	53.7	52.4	56.6	55.0
Bought Feed	£ per cow	33.6	29.4	38.3	28.4	26.6
Hired Grazing	£ per cow	Neg.	-	0.2	0.2	0.4
Bought Seeds	£ per acre	0.8	0.8	0.8	1.0	1.0
Manures	£ per acre	2.4	2.9	3.6	4.2	4.3
Labour	£ per cow	28.6	30.0	31.4	32.8	33.4
Total of these	£ per cow	71.4	69.9	82.3	75.6	74.6
	£ per acre	24.4	24.9	29.6	27.8	27.7
Margin	£ per cow	89.2	80.8	63.1	78.6	73.5
	£ per acre	30.4	28.8	22.8	28.8	27.3
Milk Output	gals per cow	853	792	737	798	770
	gals per acre	293	282	266	293	236
Winter Milk	%	55.1	54.3	53.1	54.2	54.8
Hay made	cwt per cow	(0.49ac.)	(0.41ac.)	15	(0.38ac.)	7
Silage made	cwt per cow	(0.68ac.)	(0.71ac.)	52	73	65
Acres per cow	Total	2.91	2.80	2.78	2.73	2.69
	Grass	2.44	2.37	2.32	2.20	2.09
	Roots	0.08	0.09	0.11	0.13	0.13
	Kale	-	0.04	0.04	-	-
	Cereals	0.39	0.30	0.31	0.40	0.47
Cow eqts per farm stock acre used		0.538	0.504	0.485	0.496	0.503
" " " acre of feed, fodder & grazing		0.414	0.405	0.354	0.385	0.401
Utilized starch eqt from grass, cwt/acre		16.5	15.6	13.5	14.8	16.6
Feed, lbs per gallon						
Bought		2.6	2.4	3.2	2.2	2.2
Bought plus home grain		3.2	3.6	4.2	3.3	3.4
Reliance on grass, %		68	60	57	62	65
" " tillage crops, %		11	21	17	11	15

TABLE 5

SOME PARTICULARS FOR FARM E

Acreage Group:- 200 - 310 acres Years ended 30th November

Year including the harvest of		1954	1955	1956	1957
Index of Acreage		100	100	100	98
" " No. of Cows		100	104	99	95
Milk Output	£ per cow	127.7	125.6	131.7	123.5
	£ per acre	33.8	34.7	34.6	31.8
Cattle Output	£ per cow	43.0	37.8	43.8	47.9
Sheep Output	£ per cow	7.2	11.6	12.4	17.5
Potatoes Output	£ per cow	16.2	18.5	22.7	16.9
Other Output	£ per cow	8.8	7.7	2.4	6.2
Total Output	£ per cow	202.9	201.1	212.9	212.1
	£ per acre	53.7	55.6	55.9	54.5
Bought Feed	£ per cow	57.1	71.7	61.9	44.4
Hired Grazing	£ per cow	-	-	-	-
Bought Seeds	£ per acre	1.3	0.9	0.4	0.8
Manures	£ per acre	4.3	4.4	5.2	4.0
Labour	£ per cow	41.6	43.8	43.3	48.4
Total of these	£ per cow	119.8	134.6	126.7	111.8
	£ per acre	31.7	37.2	33.3	28.7
Margin	£ per cow	83.1	66.6	86.2	100.2
	£ per acre	22.0	18.4	22.6	25.8
Milk Output	gals per cow	812	851	860	851
	gals per acre	216	235	226	219
Winter Milk	%	48.3	43.1	42.7	44.3
Hay made	acre per cow	(.37ac)	(0.25ac)	(0.43ac)	(0.32ac)
Silage made	cwt per cow	50	74	90	88
Acres per cow	Total	3.78	3.62	3.80	3.89
	Grass	2.69	2.81	3.10	3.17
	Roots	0.07	0.06	0.05	0.04
	Kale	0.03	0.03	0.03	0.02
	Cereals	0.59	0.40	0.33	0.53
	Potatoes	0.22	0.17	0.18	0.11
Cow eqts per farm stock acre used		0.474	0.499	0.475	0.515
" " " acre of feed, fodder & grazing		0.324	0.273	0.312	0.395
Utilized starch eqt from grass, cwt per acre		10.4	11.1	11.3	15.2
Feed, lbs per gallon					
Bought		4.7	5.6	5.0	3.5
Bought plus home grain		6.0	6.3	6.6	5.0
Reliance on grass, %		43	46	50	61
" " tillage crops, %		25	15	16	15

TABLE 6

SOME PARTICULARS FOR FARM F

Acreage Group:- 200 - 310 acres Years ended 30th November

Year including the harvest of		1953	1954	1955	1956	1957
Index of Acreage		100	100	100	100	100
" " No. of Cows		100	100	100	102	103
Milk Output	£ per cow	137.2	138.1	138.1	138.1	135.3
	£ per acre	44.8	45.0	45.1	45.8	45.6
Cattle Output	£ per cow	20.9	20.8	19.1	26.2	20.6
Sheep Output	£ per cow	11.1	10.2	10.0	12.0	6.1
Potatoes Output	£ per cow	0.3	0.3	0.3	0.3	0.3
Other Output	£ per cow	5.5	8.0	3.4	3.0	1.8
Total Output	£ per cow	175.0	177.5	170.9	179.8	164.1
	£ per acre	57.1	58.0	55.8	59.6	55.3
Bought Feed	£ per cow	54.7	85.8	55.8	66.3	37.3
Hired Grazing	£ per cow	-	-	-	-	-
Bought Seeds	£ per acre	0.7	0.6	0.7	0.8	0.8
Manures	£ per acre	3.8	4.2	5.2	4.6	4.5
Labour	£ per cow	33.9	36.9	39.6	38.5	36.6
Total of these	£ per cow	102.3	137.4	113.6	120.6	89.6
	£ per acre	33.4	44.9	37.1	40.0	30.2
Margin	£ per cow	72.7	40.1	57.4	59.2	74.5
	£ per acre	23.7	13.1	18.7	19.6	25.1
Milk Output	gals per cow	865	871	874	885	893
	gals per acre	282	285	286	294	301
Winter Milk	%	44.2	46.3	47.4	45.9	46.5
Hay made	acres per cow	0.46	0.39	0.25	0.39	0.36
Silage made	acres per cow	0.25	0.25	0.32	0.32	0.36
Acres per cow	Total	3.06	3.06	3.06	3.02	2.97
	Grass	2.49	2.50	2.41	2.41	2.40
	Roots	0.11	0.11	0.12	0.11	0.06
	Kale	0.02	0.02	0.01	0.01	0.01
	Cereals	0.43	0.43	0.51	0.48	0.48
	Potatoes	neg.	neg.	neg.	neg.	neg.
Cow eqts per farm stock acre used		0.571	0.581	0.577	0.581	0.532
" " " acre of feed, fodder & grazing		0.400	0.320	0.418	0.364	0.421
Utilized starch eqt from grass, cwt per acre		14.1	10.5	15.8	12.4	16.4
Feed, lbs per gallon						
Bought		4.2	6.7	3.8	5.4	2.9
Bought plus home grain		5.8	7.8	5.2	6.5	4.1
Reliance on grass, %		47	35	51	42	59
" " tillage crops, %		23	19	21	20	20

TABLE 7

SOME PARTICULARS FOR FARM G

Acreage Group:- 40 - 80 acres Years ended 31st May

Year including the harvest of		1953	1954	1955	1556	1957
Index of Acreage		100	100	100	100	100
" " No. of Cows		100	96	96	103	100
Milk Output	£ per cow	116.3	109.9	112.0	116.2	108.6
	£ per acre	54.6	49.4	50.3	56.1	51.0
Cattle Output	£ per cow	14.3	20.1	10.9	10.3	27.2
Sheep Output	£ per cow	-	-	-	-	-
Potatoes Output	£ per cow	4.3	6.6	8.6	6.7	7.5
Other Output	£ per cow	7.9	5.3	1.0	0.2	12.8
Total Output	£ per cow	142.8	142.0	132.5	133.3	156.1
	£ per acre	67.1	63.8	59.6	64.4	73.3
Bought Feed	£ per cow	37.4	51.8	35.8	47.6	42.7
Hired Grazing	£ per cow	2.6	2.2	2.1	1.9	2.5
Bought Seeds	£ per acre	1.0	2.1	1.8	1.8	2.5
Manures	£ per acre	3.7	4.4	6.8	4.6	5.3
Labour	£ per cow	25.1	21.0	27.9	36.6	35.3
Total of these	£ per cow	75.1	89.4	85.2	99.5	96.9
	£ per acre	35.3	40.2	38.3	48.1	45.5
Margin	£ per cow	67.7	52.5	47.4	33.8	59.2
	£ per acre	31.8	23.6	21.3	16.3	27.8
Milk Output	gals per cow	702	710	722	763	711
	gals per acre	330	319	325	369	334
Winter Milk	%	40.6	37.2	37.0	40.8	38.7
Hay made	acre per cow	0.46	0.35	0.33	0.36	0.43
Silage made	acre per cow	0.14	0.24	0.21	0.15	0.14
Acres per cow	Total	2.13	2.22	2.22	2.07	2.13
	Grass	1.57	1.81	1.78	1.62	1.64
	Roots	-	-	-	-	-
	Kale	-	-	-	-	-
	Cereals	0.47	0.33	0.33	0.33	0.37
	Potatoes	0.09	0.09	0.12	0.11	0.11
Cow eqts per farm stock acre used		0.72	0.61	0.64	0.72	0.79
" " " acre of feed,fodder & grazing		0.48	0.36	0.44	0.44	0.47
Utilized starch eqt from grass, cwt per acre		21.0	14.4	20.0	19.5	20.7
Feed, lbs per gallon						
Bought		3.1	4.1	2.8	4.4	4.4
Bought plus home grain		4.9	5.7	4.0	5.8	5.5
Reliance on grass, %		57	48	62	55	55
" " tillage crops, %		14	15	11	13	7

TABLE 8

SOME PARTICULARS FOR FARM H

Acreage Group:- 200 - 310 acres Years ended 31st May

Year including the harvest of		1955	1956	1957
Index of Acreage		100	100	100
" " No. of Cows		100	100	107
Milk Output	£ per cow	129.0	136.0	129.7
	£ per acre	31.3	33.0	33.9
Cattle Output	£ per cow	24.3	19.5	28.1
Sheep Output	£ per cow	1.4	0.3	1.1
Potatoes Output	£ per cow	0.3	0.3	0.2
Other Output	£ per cow	28.6	14.8	16.2
Total Output	£ per cow	183.7	170.9	175.3
	£ per acre	44.6	41.5	45.8
Bought Feed	£ per cow	35.3	37.9	31.5
Hired Grazing	£ per cow	-	-	0.5
Bought Seeds	£ per acre	0.9	0.8	1.0
Manures	£ per acre	2.7	3.4	3.4
Labour	£ per cow	30.9	32.9	33.8
Total of these	£ per cow	81.0	88.3	82.8
	£ per acre	19.7	21.4	21.6
Margin	£ per cow	102.6	82.7	92.5
	£ per acre	24.9	20.1	24.2
Milk Output	gals per cow	776	859	855
	gals per acre	188	209	223
Winter Milk	%	50.1	48.3	46.7
Hay made	acre per cow	0.77	0.77	0.72
Silage made	acre per cow	0.34	0.34	0.31
Acres per cow	Total	4.12	4.11	3.83
	Grass	3.38	3.38	3.14
	Roots	0.13	0.13	0.12
	Kale	-	-	-
	Cereals	0.61	0.60	0.56
	Potatoes	neg.	neg.	neg.
Cow eqts per farm stock acre used		0.391	0.453	0.519
" " " acre of feed, fodder & grazing		0.319	0.363	0.418
Utilized starch eqt from grass, cwt per acre		11.8	13.5	16.3
Feed, lbs per gallon				
Bought		2.9	2.8	2.8
Bought plus home grain		4.0	3.7	3.6
Reliance on grass, %		60	62	65
" " tillage crops, %		20	18	15

TABLE 9

SOME PARTICULARS FOR FARM J

Acreage Group:- 80 - 120 acres Year ended 30th November

Year including the harvest of		1953	1954	1955	1956	1957
Index of Acreage		100	100	100	100	100
" " No. of Cows		100	100	100	106	108
Milk Output	£ per cow	120.3	120.8	124.5	114.8	90.2
	£ per acre	31.9	32.0	33.0	32.1	25.7
Cattle Output	£ per cow	14.3	15.6	25.1	18.6	7.6
Sheep Output	£ per cow	-	-	-	-	-
Potatoes Output	£ per cow	4.6	14.9	18.6	11.5	3.9
Other Output	£ per cow	2.5	7.7	9.0	29.4	6.2
Total Output	£ per cow	141.7	159.1	177.3	174.2	107.8
	£ per acre	37.5	42.2	47.0	48.8	30.7
Bought Feed	£ per cow	28.3	40.6	48.9	47.3	19.9
Hired Grazing	£ per cow	3.0	3.2	3.8	3.9	4.5
Bought Seeds	£ per acre	1.4	0.9	0.5	0.5	1.6
Manures	£ per acre	3.1	4.0	4.9	5.6	4.9
Labour	£ per cow	34.5	38.6	42.5	40.7	44.6
Total of these	£ per cow	82.8	100.7	115.6	113.7	91.7
	£ per acre	21.9	26.7	30.6	31.9	26.1
Margin	£ per cow	58.9	58.4	61.7	60.6	16.2
	£ per acre	15.6	15.5	16.3	16.9	4.6
Milk Output	gals per cow	726	736	771	707	576
	gals per acre	192	195	204	198	164
Winter Milk	%	43.6	44.4	45.0	45.8	46.1
Hay made	cwt per cow	8	11	16	9	-
Silage made	cwt per cow	75	104	150	93	126
Acres per cow	Total	3.77	3.77	3.77	3.57	3.50
	Grass	2.75	2.72	3.06	2.36	2.37
	Roots	0.02	0.02	0.02	0.02	0.02
	Kale	0.02	0.02	0.02	0.04	0.04
	Cereals	0.94	0.91	0.57	1.07	1.05
	Potatoes	0.04	0.11	0.11	0.09	0.03
	Sale crops	0.06	0.16	0.13	0.09	0.11
Cow eqts per farm stock acre used		0.395	0.473	0.492	0.570	0.433
" " " acre of feed, fodder & graz.		0.303	0.331	0.305	0.317	0.293
Utilized starch eqt from grass, cwt per acre		11.5	11.3	12.0	14.4	10.0
Feed, lbs per gallon						
Bought		2.3	3.7	4.1	4.4	2.1
Bought plus home grain		3.9	5.3	5.2	6.0	10.8
Reliance on grass, %		62	53	51	49	45
" " tillage crops, %		15	15	12	10	29

TABLE 10

SOME PARTICULARS FOR FARM K

Acreage Group:- 120 - 200 acres Years ended 30th November

Year including the harvest of		1953	1954	1955	1956	1957
Index of Acreage		100	100	100	100	100
" " No. of Cows		100	98	90	103	121
Milk Output	£ per cow	112.3	110.8	134.3	117.6	104.1
	£ per acre	24.1	23.3	25.8	26.0	25.0
Cattle Output	£ per cow	13.7	12.3	15.8	10.8	17.5
Sheep Output	£ per cow	-	-	-	-	-
Potatoes Output	£ per cow	5.6	12.2	22.5	4.0	2.3
Other Output	£ per cow	7.8	22.8	19.2	29.8	18.5
Total Output	£ per cow	139.5	158.0	191.8	162.2	142.5
	£ per acre	29.9	33.2	36.8	35.9	34.2
Bought Feed	£ per cow	20.8	40.0	45.9	37.3	45.1
Hired Grazing	£ per cow	-	-	-	-	-
Bought Seeds	£ per acre	0.9	1.3	1.0	0.6	0.9
Manures	£ per acre	3.1	4.0	4.1	5.1	4.5
Labour	£ per cow	30.9	38.8	37.3	33.8	33.6
Total of these	£ per cow	70.3	103.9	110.0	97.2	101.3
	£ per acre	15.0	21.9	21.1	21.5	24.3
Margin	£ per cow	69.2	54.1	81.8	65.0	41.2
	£ per acre	14.8	11.4	15.7	14.4	9.9
Milk Output	gals per cow	683	682	826	728	654
	gals per acre	146	143	158	161	157
Winter Milk	%	42.3	43.6	43.6	43.7	51.0
Hay made	cwt per cow	?	?	(.38ac.)	11	6
Silage made	cwt per cow	34	42	(0.77ac.)	115	114
Acres per cow	Total	4.67	4.76	5.21	4.52	4.17
	Grass	3.14	3.30	3.73	3.28	3.20
	Roots	0.10	0.04	-	-	-
	Kale	0.11	0.05	0.04	0.05	0.08
	Cereals	1.17	1.21	1.25	1.12	0.88
	Potatoes	0.09	0.16	0.19	0.07	0.01
Cow eqts per farm stock acre used		0.278	0.325	0.358	0.374	0.353
" " " acre of feed, fodder & grazing		0.245	0.243	0.267	0.286	0.245
Utilized starch eqt from grass, cwt per acre		9.0	8.6	9.8	10.5	9.0
Feed, lbs per gallon						
Bought		1.8	4.0	3.6	3.4	4.7
Bought plus home grain		3.5	5.6	4.8	5.4	5.6
Reliance on grass, %		58	53	56	52	54
" " tillage crops, %		29	21	18	22	14

TABLE 11

SOME PARTICULARS FOR FARM L

Acreage Group:- 120 - 200 acres Years ended 31st March

Year including the harvest of		1955	1956	1957
Index of Acreage		100	100	100
" " No. of Cows		100	110	121
Milk Output	£ per cow	138.3	122.9	115.5
	£ per acre	38.7	37.8	39.1
Cattle Output	£ per cow	20.3	13.2	14.7
Sheep Output	£ per cow	-	-	-
Potatoes Output	£ per cow	2.3	3.5	2.2
Other Output	£ per cow	4.8	3.9	5.7
Total Output	£ per cow	165.8	143.5	138.0
	£ per acre	46.3	44.2	46.7
Bought Feed	£ per cow	50.4	27.6	28.3
Hired Grazing	£ per cow	-	-	-
Bought Seeds	£ per acre	0.8	0.6	0.9
Manures	£ per acre	5.2	4.7	5.2
Labour	£ per cow	41.3	41.8	37.6
Total of these	£ per cow	113.1	86.7	83.9
	£ per acre	31.6	26.7	28.4
Margin	£ per cow	52.7	56.9	54.1
	£ per acre	14.7	17.5	18.3
Milk Output	gals per cow	873	788	750
	gals per acre	244	241	254
Winter Milk	%	49.2	45.9	51.1
Hay made	cwt per cow	14	10	10
Silage made	cwt per cow	40	63	74
Acres per cow	Total	3.58	3.25	2.95
	Grass	3.34	2.77	2.39
	Roots	-	-	0.01
	Kale	0.04	0.06	0.05
	Cereals	0.14	0.38	0.45
	Potatoes	0.06	0.04	0.05
Cow eqts per farm stock acre used		0.482	0.490	0.492
" " " acre of feed, fodder & grazing		0.319	0.399	0.394
Utilized starch eqt from grass, cwt per acre		12.8	16.0	15.1
Feed, lbs per gallon				
Bought		4.4	2.5	2.5
Bought plus home grain		4.7	3.5	3.6
Reliance on grass, %		62	70	65
" " tillage crops, %		5	11	15

TABLE 12

SOME PARTICULARS FOR FARM M

Acreage Group:- 200 - 310 acres — Years ended 30th November

Year including the harvest of		1953	1954	1955	1956	1957
Index of Acreage		100	100	100	107	107
" " No. of Cows		100	113	117	116	121
Milk Output	£ per cow	97.3	106.1	95.3	106.2	107.2
	£ per acre	20.7	25.5	23.6	24.2	26.2
Cattle Output	£ per cow	18.5	17.4	23.3	19.1	22.7
Sheep Output	£ per cow	28.9	31.1	23.3	26.7	15.0
Potatoes Output	£ per cow	neg.	neg.	neg.	neg.	neg.
Other Output	£ per cow	-5.1	3.0	6.7	5.6	2.7
Total Output	£ per cow	139.6	157.6	148.6	157.5	147.6
	£ per acre	29.6	37.9	36.8	35.9	36.1
Bought Feed	£ per cow	27.1	41.8	53.3	42.6	22.1
Hired Grazing	£ per cow	1.9	2.2	6.1	3.3	4.6
Bought Seeds	£ per acre	0.5	0.3	0.8	0.7	0.7
Manures	£ per acre	2.3	2.0	2.7	3.1	2.0
Labour	£ per cow	42.3	32.4	36.2	29.8	31.1
Total of these	£ per cow	73.5	85.9	109.8	92.4	68.8
	£ per acre	15.6	20.7	27.2	21.1	16.8
Margin	£ per cow	66.1	71.7	38.8	65.1	78.9
	£ per acre	14.0	17.3	9.6	14.8	19.2
Milk Output	gals per cow	611	679	612	668	674
	gals per acre	130	163	152	152	165
Winter Milk	%	41.4	40.4	43.1	46.8	45.8
Hay made	cwt per cow	(0.7ac)	20	(0.4ac)	(0.5ac)	21
Silage made	cwt per cow	(0.7ac)	(0.6ac)	(0.9ac)	(0.4ac)	57
Acres per cow	Total	4.71	4.16	4.04	4.38	4.17
	Grass	4.12	3.68	3.60	3.78	3.61
	Roots	-	-	-	-	-
	Kale	0.27	0.24	0.21	0.20	0.17
	Cereals	0.32	0.24	0.23	0.40	0.39
Cow eqts per farm stock acre used		0.380	0.475	0.441	0.491	0.402
" " " acre of feed, fodder & grazing		0.317	0.368	0.255	0.353	0.305
Utilized starch eqt from grass, cwt per acre		11.8	14.9	9.8	13.9	11.5
Feed, lbs per gallon						
Bought		2.6	4.0	5.5	4.2	5.4
Bought plus home grain		4.2	4.4	6.0	4.7	7.2
Reliance on grass, %		69	66	46	58	58
" " tillage crops, %		15	10	13	15	19

TABLE 13

SOME PARTICULARS FOR FARM N

Acreage Group:- 200 - 310 acres Years ended 31st March

Year including the harvest of		1953	1954	1955	1956	1957
Index Of Acreage		100	94	94	94	94
" " No. of Cows		100	105	100	91	90
Milk Output	£ per cow	113.8	92.4	102.1	119.0	110.8
	£ per acre	30.7	26.9	28.2	30.0	27.7
Cattle Output	£ per cow	15.5	17.8	20.3	10.8	28.6
Sheep Output	£ per cow	-	-	-	-	-
Potatoes Output	£ per cow	0.2	0.2	0.2	0.2	-
Other Output	£ per cow	6.6	5.0	17.8	9.8	10.0
Total Output	£ per cow	136.1	115.5	140.4	139.8	149.4
	£ per acre	36.7	33.6	38.8	35.3	37.4
Bought Feed	£ per cow	28.0	21.6	35.7	34.8	30.4
Hired Grazing	£ per cow	-	-	-	-	-
Bought Seeds	£ per acre	0.7	1.0	0.5	0.5	0.6
Manures	£ per acre	1.9	2.0	4.3	3.6	3.3
Labour	£ per cow	40.2	35.4	36.2	40.5	45.4
Total of these	£ per cow	78.2	67.6	89.2	91.3	91.4
	£ per acre	21.1	19.7	24.7	23.0	22.9
Margin	£ per cow	57.9	47.9	51.2	48.4	58.0
	£ per acre	15.6	13.9	14.2	12.2	14.5
Milk Output	gals per cow	721	623	657	784	764
	gals per acre	195	181	182	198	191
Winter Milk	%	43.5	36.5	43.9	43.7	42.0
Hay made	cwt per cow	11.0	10.7	8.3	20	21
Silage made	cwt per cow	68	99	76	(0.47ac)	85
Acres per cow	Total	3.70	3.44	3.62	3.96	4.00
	Grass	2.58	2.60	2.80	3.26	3.26
	Roots	0.05	-	Neg	-	-
	Kale	0.03	0.03	0.03	0.03	0.04
	Cereals	1.03	0.81	0.78	0.67	0.69
	Potatoes	0.00	0.00	0.01	0.00	-
Cow eqts per farm stock acre used		0.425	0.428	0.497	0.463	0.444
" " " acre of feed, fodder & grazing		0.368	0.375	0.408	0.389	0.375
Utilized starch eqt from grass, cwt per acre		13.1	14.9	16.6	15.8	15.2
Feed, lbs per gallon						
Bought		2.2	2.3	3.3	2.6	2.5
Bought plus home grain		5.5	4.2	4.8	3.9	4.1
Reliance on grass, %		54	64	69	71	68
" " tillage crops, %		32	23	13	13	16

TABLE 14

SOME PARTICULARS FOR FARM P

Acreage Group:- 200 - 310 acres — Years ended 31st March

Year including the harvest of		1953	1954	1955	1956	1957
Index of Acreage		100	100	100	100	100
" " No. of Cows		100	99	94	98	99
Milk Output	£ per cow	117.7	106.1	115.3	120.2	120.2
	£ per acre	40.7	36.3	37.4	40.6	41.2
Cattle Output	£ per cow	17.4	19.2	18.5	13.6	26.0
Sheep Output	£ per cow	-	-	-	-	-
Potatoes Output	£ per cow	2.3	-	-	5.4	7.8
Other Output	£ per cow	4.3	4.1	-1.1	3.9	2.9
Total Output	£ per cow	141.7	129.4	132.7	143.0	156.9
	£ per acre	49.0	44.3	43.1	48.3	53.8
Bought Feed	£ per cow	35.1	42.9	46.8	55.3	31.0
Hired Grazing	£ per cow	1.0	1.2	-	3.9	2.7
Bought Seeds	£ per acre	1.5	1.4	1.3	1.8	1.4
Manures	£ per acre	0.7	1.4	1.6	0.9	3.3
Labour	£ per cow	35.2	42.9	42.3	43.9	41.3
Total of these	£ per cow	77.5	95.2	98.2	111.0	88.8
	£ per acre	26.8	32.6	31.9	37.5	30.4
Margin	£ per cow	64.2	34.2	34.5	34.2	68.1
	£ per acre	22.2	11.7	11.2	10.8	23.3
Milk Output	Gals per cow	710	666	712	765	794
	gals per acre	246	229	231	258	272
Winter Milk,	%	47.8	45.9	47.7	48.6	47.2
Hay made	cwt per cow	-	-	-	-	-
Silage made	acre per cow	(0.42ac.)	(0.43ac)	(0.43ac)	(0.59ac)	(0.58ac)
Acres per cow	Total	2.89	2.92	3.08	2.96	2.92
	Grass	1.94	2.07	2.19	2.09	2.03
	Roots	0.19	0.14	0.19	0.18	0.19
	Kale	0.02	0.02	0.02	0.04	0.05
	Cereals	0.67	0.67	0.67	0.55	0.58
	Potatoes	0.07	0.01	-	0.08	0.07
Cow eqts per farm stock acre used		0.480	0.516	0.496	0.556	0.524
" " " acre of feed, fodder & grazing		0.353	0.358	0.364	0.321	0.379
Utilized starch eqt from grass, cwt per acre		9.4	9.6	8.9	6.4	9.5
Feed, lbs per gallon						
Bought		3.1	4.1	4.2	6.4	2.8
Bought plus home grain		5.9	7.4	8.4	7.4	5.7
Reliance on grass, %		34	31	28	18	34
" " tillage crops, %		39	38	44	38	38

TABLE I – THE RELATIVE POSITIONS OF THE SEVERAL FARMS IN RESPECT OF VARIOUS FACTORS: BASED ON AVERAGES OF 1956 and 1957 UNLESS OTHERWISE INDICATED.

The farm with the highest figure appears first.

Acres	Cows	Reliance on Grass	Self-sufficiency	USE from grass per acre of grass	USE from grass and tillage per acre of same	Cost of manures per acre	Efficiency Index	Efficiency Index Adjusted for size	Margin per acre	Margin per cow	Margin per acre Excl. sheep and potatoes
P	P	A	N	G	G	A	H	D	C	E	C
F	F	N	B	B	B	C	D	H	D	H	D
E	C	L	L	A	A	B	M	A	E	D	A
H	E	B	H	D	D	J	A	M	B	B	E
M	L	H	A	L	F	G	E	B	H	M	B
N	H	D	D	N	L	L	B	E	G	F	F
L	D	M	M	H	H	K	F	K	A	L	H
D	M	E	E	F	N	F	L	L	F	N	G
K	N	G	K	C	E	E	C	N	L	K	J
C	G	K	F	E	P	D	N	G	M	A	M
J	K	F	J	M	C	N	K	J	P	P	L
G	J	J	G	J	M	H	P	F	N	C	P
B	A	C	P	K	J	M	G	C	K	G	N
A	B	P	C	P	K	P	J	P	J	J	K

TABLE I (Contd.) - THE RELATIVE POSITIONS OF THE SEVERAL FARMS IN RESPECT OF VARIOUS FACTORS: BASED ON AVERAGES OF 1956 and 1957 UNLESS OTHERWISE INDICATED.

The farm with the highest figure appears first, except in the two columns about concentrates fed, in which the lowest figures are first.

Estimated Surplus per cow	Stability of Margin over 5 years	Labour Index	Equipment depreciation		Milk Output per acre		Milk Output per Cow		lbs. concentrates per gal.	
			Per Acre	Per Cow	Gals.	Value	Gals.	Value	Bought	Bought and Homegrown
E	N	C	A	A	C	C	F	F	D	A
H	D	M	G	E	G	G	B	B	L	D
D	E	K	C	K	A	A	H	H	A	L
B	H*	A	J	G	F	D	E	A	N	H
F	L*	H	P	P	B	F	A	E	H	N
C	A*	D	E	B	P	B	D	D	B	B
A	K	B	B	J	D	P	P	C	J	C
M	F	G	D	N	L	L	N	P	K	F
L	G	P	K	M	E	H	L	L	F	K
G	M	L	F	F	H	E	C	N	E	G
P	B	J	L	H	N	J	G	G	C	E
N	C*	F	H	L	J	N	K	K	G	M
K	J	N	N	D	K	K	M	M	P	P
I	P	E	M	C	M	M	J	J	M	J

*Indicates less than 4 years.

TABLE II

FINANCIAL EXPERIENCE OVER THE FIVE YEARS

For each of the farms listed below the five yearly entries for each item have been averaged and scaled up or down to what they would have been had the farm been of the indicated size. The scaling up or down has been in simple proportion to acreage.

Farm	Manures	Bought Feed	Total listed Expenditure	Milk output	Total output	Net output	Margin
			£ per annum.				
Standardized to 60 acres							
B	332	1020	2222	2774	3584	2502	1362
G	298	1202	2492	3140	3942	2568	1448
Average	315	1111	2357	2957	3763	2535	1405
Controls(8)	158	1124	2464	2796	3234	2026	772
Standardized to 130 acres							
D	454	1456	3496	6108	7090	5511	3594
J	582	1302	3568	4022	5360	3800	1794
K	542	1060	2698	3226	4418	3236	1720
Average	526	1273	3254	4452	5623	4182	2369
Controls(9)	360	2068	4172	4630	5910	3626	1740
Standardized to 250 acres							
F	1108	4932	9272	11314	14284	9174	5012
M	598	2198	5046	5992	8820	6262	3774
N	754	1974	5564	7180	9488	6916	3524
P	398	3568	7964	9814	11926	7838	3964
Average	714	3168	6962	8575	11030	7548	4068
Controls(2)	554	3346	6700	7928	9982	6406	3282

Farms omitted, because less than five years' figures are available are:-

Group	Farm
60 acres	A
130 acres	C & L
250 acres	E & H

TABLE III - DAIRY COW FEEDING AND MILK OUTPUT DURING TWELVE MONTHS ENDED 30th APRIL, 1958

FARM	MILK OUTPUT PER COW			FEED: CWT PER COW								
	SUMMER gals	YEAR gals	SUMMER %	CONCENTRATES IN SUMMER	CONCENTRATES	HAY	SILAGE	ROOTS	KALE	SHAWS	STRAW	SHEAVES
A	375	731	51	0.6	10.5	23	93	-	20	-	2.2	-
B	365	837	44	6.3	27.1	9.5	43	-	-	-	2.8	1.0
C	292	788	37	0.6	28.9	10.9	18	2.6[x]	-	-	-	-
D	262	668	39	1.3	16.5	5	75	35	-	-	3.6	-
E	411	934	44	n.a.	25	14	44	23	8[x]	11	6	-
F	406	912	44	2.5	19	18	36	29	8	-	-	-
G	362	719	50	3.2	20	8	42	-	-	-	-	-
H	381	857	56	1.2	25	← n.a. →						
J	289	681	42	2.5	15.2	0.9	59	-	16	-	6.3	-
K	267	688	39	1.3	17.0	2.5	61	-	27	-	2.8	-
L	309	744	42	0.8	18.5[x]	11.2	80	12	44	-	6.9	-
M	332	755	44	1.1	15.0	6.4	70	-	53	-	-	5.6
N	371	766	48	3.2	21.8	10.1	68	-	20	-	6	-
P	351	798	44	4.1	24.0	-	51	41	7	-	8.4	-

[x] including dry wt. of draff

[x] potatoes [x] including cabbage

TABLE IV - LABOUR INDEX

Farm	1953	1954	1955	1956	1957
A	-	-	-	130	154
B	90	95	119	127	144
C	-	-	177	197	250
D	122	124	131	133	139
E	-	112	104	117	117
F	110	107	105	110	130
G	148	176	104	119	142
H	-	-	128	132	144
J	110	118	108	120	121
K	142	124	141	150	154
L	-	-	105	111	138
M	132	128	122	162	156
N	103	112	112	124	113
P	120	99	109	120	135

TABLE V - INVESTMENT IN EQUIPMENT

£ per cow, based on 1958 prices (see p. 9)

	New Price	Book Value	Annual depreciation
A	130	60	11.3
B	106	51	7.8
C	50	23	4.0
D	69	31	5.5
E	109	54	8.5
F	82	39	6.1
G	91	41	7.4
H	79	37	6.1
J	87	44	6.5
K	115	56	8.2
L	78	38	5.6
M	82	39	6.2
N	88	42	6.4
P	87	40	7.1

APPENDIX II

PRICES AND SUPPLIES IN THE YEARS CONCERNED

Milk Against a general background of slightly or sharply rising prices of requisites the price of the most important product, milk, was generally downwards, as the table shows.

MILK PRICES, PENCE PER GALLON

Year ended March 31st	Pool Prices unweighted		Winter Production Bonus on 600 gals	Inclusive actual net average price on Milk Costing farms: Winter Producers	
	Summer	Winter	Winter	Summer	Winter
1953	-	45.6	5.0	-	50.25
1954	27.8	46.0	5.0	29.88	50.0
1955	27.3	45.6	3.0	29.25	47.88
1956	28.5	46.0	3.0	29.48	48.43
1957	28.5	44.1	3.0	29.72	45.48
1958	28.5	42.7	2.0	28.79	43.97

The influence of the drop, on most of these farms, in the Attested Bonus of 1d in October 1954 and a further 1d (to nil) in October 1956 is seen in the fifth and sixth columns.

Feed Early in the period covered by this enquiry the subsidy on feeding stuffs was withdrawn, official rationing of feed supplies was ended and control of imports of cereals ceased. Not surprisingly, consumption of imported feed in Scotland increased by about 40% between 1952/53 and 1954/55; but it had fallen in 1956/58 to little more than a tenth above 1952/53. While prices of individual concentrates fluctuated fairly widely for various reasons it was possible during these years so to select kinds of feed, that the average prices per ton paid year by year for dairy cakes and meals could vary (as they did on the Milk Costing farms) by less than 2% from the 1953-54 level, until in 1957-58 they fell to 8% below 1953-54.

Labour There was, of course, no occasion during these years on which the price per hour of labour decreased. Using estimates of hours worked and premiums above the minimum paid, together with allowances for holidays-with-pay and insurance, it appears that, counting the price in mid-1953 as 100, the cost of the average dairyman's labour in Scotland rose successively to 110 as from 14/9/53, 116 from 14/2/55, 129 from 5/3/56, 136 from 11/3/57 and 141 from 9/12/57.

Fertilisers and Lime The net prices paid by farmers for manures were heavily influenced by the level of subsidies ruling at the time of purchase, as well as by the various early delivery rebates. Net prices (correcting for changes in composition) of one widely used compound varied by as much as 9% from the 1953 level, 1954 being down by 3%, while 1955, 1956 and 1957 were from 6% to 9% above 1953. The 1958 prices were down to about 3% above 1953. A comprehensive series of net prices of fertilizers and lime, correcting for changes in the proportions of the several plant foods bought, might well have shown rather wider fluctuations.

Net Expenditure on fertilizers and lime on dairy farms in Scotland, and on dairy farms in south-west Scotland in particular, expressed, (i) in terms of its relationship to revenue excluding revenue from pigs, poultry and eggs, and (ii) per acre, was as follows overleaf.

EXPENDITURE ON FERTILIZERS AND LIME (Net of subsidies)

	Dairy Farms in Scotland*		Dairy Farms in South-West Scotland	
	Per Cent of Revenue	£ per acre	Per Cent of Revenue	£ per acre
1953/54	5.4	2.4	5.1	2.2
1954/55	5.5	2.5	5.4	2.3
1955/56	6.2	2.9	6.4	2.8
1956/57	6.2	2.9	5.9	2.6
1957/58	6.2	2.9	6.2	2.8

The first pair of columns includes arable dairy farms in the east and north-east of Scotland which may well use heavier dressings of manures. The 1957/58 figure in the last column is about two shillings higher than the estimated net cost of fertilizers and lime used on Lanarkshire farms in 1958. (See Fertilizer Practice in Scotland: Lanarkshire (Central), 1958, for quantities and kinds).

THE WEATHER

On farms based largely on grass, it is to be expected that the weather will considerably affect feed consumption or milk production, or both; and, unless the changes in production lead to compensating changes in prices, it is to be expected that margins will be correspondingly affected. Hence this small section about the weather.

Though wet and cool, the calendar year 1953 was generally suited to milk production; an open autumn and winter made up for a cool April, and though heavy rain hampered harvest of both hay and cereals, there were adequate stocks of fodder for the winter of 1953/54. They were needed, for there was hard weather in late winter. The wet sunless summer of 1954 that followed seems to have produced adequate grazing, though continued rain made it necessary to bring in cattle from pastures earlier in the autumn than usual. Hay making was very difficult, and indeed the disastrously wet harvest will long be remembered. Quality of fodder for the winter of 1954/55 was poor and many herds were also faced by reduced stocks of harvested feed, further reduced by the early housing of the cattle.

1955's record sunshine and low rainfall led to an easy, early harvest of high quality cereals and hay, though crops of hay were light. Root yields, too, were naturally low and grass was scarce in some areas, and more concentrates were thought necessary in the grazing season than usual, but fodder was saved because of the mild and relatively dry autumn. Some of it was needed in the abnormally dry spring of 1956, which was, however, followed by a milky, though cold and wet, grazing season. There were bulky cereal crops, and adequate, though poor quality, crops of hay.

1957, the year covered by the record of cow feeding, (Table III) opened so mild that cows were turned out much earlier than usual, continued dry and warm until mid-July, and deteriorated for harvest. Early hay was of good yield and quality; but all other crops gave reduced yields. Late September and October remained open. Heavy snow and severe frosts in the early months of 1958, though necessitating heavier feeding of outlying young stock, did not materially affect cow feeding or milk production.

Broadly, therefore it would be expected that purchase of winter feed for cattle and sheep would be relatively heavy in 1954/55 and relatively light in 1955/56, and that purchases of feed for the grazing season would be relatively heavy in 1955 and light in 1957. Total milk production in the grazing season, judged from S.M.M.B. statistics fell only slightly in 1954 but rose greatly in 1956/57. The index numbers of total sales are as overleaf.

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* Figures supplied by the Department of Agriculture and Fisheries for Scotland.

Indices of total milk production in S.M.M.B. area

(1953/54 = 100)

	May - Sept.	April - March
1953	100.3	100.5
1954	99.5	99.5
1955	100.2	101.0
1956	107.8	107.0
1957	107.9	109.3

APPENDIX III

DEFINITIONS AND METHODS

Selected Farms These are the farms selected for this study because of their practice of intensive treatment of grassland, or their apparent heavy reliance on well manured grassland, and their ability and willingness to supply the desired information. Many other farms approached were either unsuitable for one reason or another or, rarely, were unwilling; but no farmer who fitted into the foregoing definition and who was not giving financial information to any other investigators, was rejected. To this extent, 'selected' may be a slightly ill-chosen definition.

Control Farms are farms of which the occupiers give financial and other particulars year by year to this Department and which lie in the counties concerned. Those with a high proportion of potatoes, pigs or poultry have been excluded.

Adjusted acres is the area of crops and grass plus one quarter of the area of rough grazings. Hired grazing is included if it was virtually on a full-year tenancy; not otherwise.

Output, also called Gross Output, consists of sales plus the value of produce used in the farmhouse and as perquisites, adjusted for changes in values of stock on hand. Revenue from pigs and poultry is excluded. Purchases of livestock are deducted, and A.I. fees are deducted on the selected farms, not on the control farms. The market value of home-grown feed used for pigs and poultry is included on the selected farms.

Expenditure consists of purchases and other expenses, adjusted for changes in the value of feed, seeds and manures on hand. Expenditure on pigs and poultry, including a share of labour and bought feed, is omitted. The estimated manurial value of feed for pigs and poultry is included.

Expenditure on manures This includes expenditure on lime, is net of subsidies, and includes an estimate of the manurial value of feed fed to pigs and poultry.

Per acre Unless clearly indicated by the context, this implies comparison with the whole adjusted area of the farm.

Utilized Starch Equivalent from grass (U.S.E. from grass) This is calculated by estimating, in terms of starch equivalent, (S.E.), the energy required by the livestock carried, and subtracting the S.E. of the bought feed used, of the hired grazing used and of the home-grown cereals and fodder crops used. For the control farms, standard factors were used for estimating the yields of crops and the S.E. represented by expenditure on feed. It has not been possible to distinguish the feed and milk production of the grazing season. Consequently the U.S.E. from grass is likely to have been considerably underestimated.

Cow-Equivalents These are the S.E. requirements of the stock carried, divided by the S.E. estimated to be needed in a year by an Ayrshire cow giving 810 gallons of milk, namely 41.6 cwt.

Stock numbers These are all simple averages of the numbers of livestock in the valuations at the beginnings and ends of the years concerned. The weakness of this basis is recognized.

Farm Stock Acres Used is the total adjusted area of grass, cereals and fodders, less allowances for changes in stocks on hand and for sales.

Tillage feed crops These include all crops used for livestock feed except grass and its products.

U.S.E. from Tillage Feed Crops and Grass and Cow Equivalents per Acre of Feed and Grass. The estimated S.E. content of the bought feed used on each farm has been divided by the combined estimated yield of S.E. per acre from grass, cereals and fodders grown on the farm. This gives the number of acres represented by the bought feed used. When added to the Farm Stock Acres Used the total gives the total area represented by all the feed, feed crops and grass used. The Cow Equivalents represented by the feed needs of all the stock have then been divided by this acreage to give the true stock carrying capacity per acre of the farm itself. (As already indicated, the calculations for the control farms have necessarily been based upon standard forage crop yields instead of those for the individual farms).

Reliance on Grass This is the ratio (expressed as a percentage) of the U.S.E. from the farm grass (i.e. excluding hired grazing) to the S.E. needed by the livestock.

Self-Sufficiency, % This is the ratio between the total S.E. derived from the farm grass and the farm tillage feed crops on the one hand and the total S.E. needed by the livestock, on the other hand.

Expenditure on Labour This includes, throughout, an allowance for the manual work of farmer and wife.

Surplus This is Net Farm Income less a charge for the manual labour of farmer and wife.

Investment in equipment From information about the numbers of implements, machinery and fixed plant, an estimate has been made of the capital invested on each of the seleeted farms. Cars have been excluded. The method has been firstly to value each item at the price ruling in Sprin, 1958 for new equipment of similar type, except that old standby tractors have been priced at two-fifths of the 1958 price. The total of such prices yields the nominal capital invested. Then, to arrive at a current estimate of written down values (based on 1958 prices) each item has been written down on normal Inland Revenue scales to age three years for the tractors, sprayers, lorries, fertilizer drills, f.y.m. spreaders, greencrop loaders, greencrop cutter-collectors, silage blowers and electric fences, and to age six years for all other equipment. Thirdly, to represent current charges for depreciation, the charges in the fourth (or seventh) years have been summed. No comparable figures are available for the control farms.

Milk Output excludes milk fed to livestock. Any milk sold as certified milk has been re-valued as T.T. milk, and extra labour charges connected with certified milk have been omitted from Expenditure.

Concentrated feed The expenditure on feed has been converted to weight of concentrates, with a greater chance of error on the control farms than on the selected farms. Beet pulp is necessarily included. Similarly the weight of home-grown grain used by cattle and sheep has been estimated. These weights have been divided by the total amount of milk sold or used for the farmhouse or for workers. Feed to young stock and to sheep are therefore included.

Year by year results and the date of valuation The annual figures are grouped according to the harvest included in the accounting year concerned. Thus the accounts for a year to 30th November, 1957 include the harvest of 1957 and most of the winter of 1956/57, whilst an accounting year ended on 31st March, 1958, which includes the harvest of 1957, covers the winter of 1957/58.

The scrutiny of the results from the control farms gives no firm support to the view that, as would be expected, differences due to seasonal effects on margins would be more marked in the years ending in spring than those ending in autumn.

Year to year results in respect of U.S.E. from grass and in respect of cow equivalents per acre of feed and grass are likely to be more affected than are margins, by the date of closing the accounts. For, although valuation lists of crops on hand existed, the accuracy of these lists could not be expected to be really high, and, in any case, the quality of silage, for example, may vary so greatly from year to year that a small quantity in one year may be worth more in total than a much larger quantity of poorer stuff in another year.

For accounts ending in spring, inaccuracies in valuation lists would be of relatively little importance; but for accounts ending in autumn, inaccuracies in valuation lists might seriously influence the relation between the results of one year and the next. An example of inaccuracies, equally troublesome at whatever season the valuation is taken, occurred on one farm. There, big lots of feed were occasionally bought and paid for when prices were advantageous, and left at the vendor's premises until required, but omitted from the valuation. Such an error would affect feed costs, net output, margin, and all the calculations based on feed consumption. Again, expenditure on manures in any accounting year may be greatly affected if applications are late at the beginning of the year and early at the end of the year, or vice versa. A corresponding difficulty occurs on farms selling considerable proportions of their dairy stock. Here, numbers at inventory may be temporarily affected by a sale just completed or by the building up of a group of cows ready for sale. The effect is that the number of cows used as divisor in "Per cow" calculations and for the calculations of feed requirements etc. is upset.

Efficiency in the Use of Resources: Efficiency Index Because other expenditure was not ascertained, a comparison of output with all the expenses that go to produce it cannot be made. Instead, the ratio of gross output to expenditure of seeds, feed, hired grazing, manures and labour, expressed as a percentage, has been used as an indicator of economic efficiency. It was impracticable to include realistic entries for rental value and capital employed in this computation. The allowance of 0.48 points per cow in this Efficiency Index is derived from the examination of the 1958/59 accounts of 76 dairy farms in the College area with more than 28 cows. The coefficient of determination, 0.23, is relatively high for this sort of work.

The examination of financial results in 1958-59 on 150 dairy farms in the College area suggests that, as a group, the control farms are at a slight disadvantage against the selected farms in that the control farms were chosen in such a way as to exclude farms that had large numbers of pigs or poultry or a notable output of potatoes, whereas, on the other hand, the selected farms include one farm which had both pigs and poultry output exceeding 10% of the total gross output, and potato output exceeding 5% of total gross output; another had more potatoes than 5% of output; and three others had pigs or poultry exceeding 10% of output.

In 1958-59, dairy farms which had more than these quantities of potatoes showed Gross Output as a percentage of Total Listed Expenditure, (excluding pigs and poultry expenditure and revenue), some 5 to 54 points higher than on correspondingly sized farms with less than the above-mentioned quantities of pigs, poultry or potatoes. For the farms with more than these quantities of pigs or poultry, but without as many potatoes, the index stood at about the same level as the rest.

It may well be that the higher efficiency in this sense is to be found on farms capable of growing potatoes than on those that either cannot or do not grow potatoes, and it may well be, too, that in general those who turn to pigs or poultry do so with a view to pushing up their profits after they have first done all that appears possible to improve the general efficiency of their main enterprises.

Margin A term used in this department for the difference between gross output and the listed expenditure, viz. expenditure on feed, hired grazing, seed, manures and labour.

Estimation of Surplus Examination of the control farms in 1956-57 indicates that the Other Expenditure increased by about £8.1s. for each additional cow and £3.14s. for each additional acre, and vice versa.

Labour Index (p. 8) The adjustment for size is based on an admittedly weak relationship on the control farms (r = 0.31) between the labour index and the total labour requirements as calculated.

Stability of Margin The calculation of stability has involved making estimates for some missing years. The difference between the variability in the two groups is statistically significant at the 1% level.

Correlation of U.S.E. from grass, Manures per acre, Concentrates fed per gallon, and Milk output per cow. Multiple linear regression methods applied to the 29 farms (i.e. excluding the four farms mentioned on p.5) after eliminating manures for potatoes, result in the following equation:

U.S.E.from grass, cwt per acre = 26.33 - 0.016 x gals per cow
- 0.99 x concentrates, lbs per gallon + 1.67 x manures, £ per acre.

Correlation of Margin and Manures In the linear correlation for the seven farms, the coefficient of determination (p.7) is 0.59.

Correlation of Margin, Manures, Size of Farm, and Output of milk per acre After eliminating items connected with sheep and potatoes on all the 29 farms, multiple linear regression methods result in the following equation:-

Margin, £ per acre = 2.30 x manures, £ per acre + 0.03 x no.of acres
+ 0.31 x milk, £ per acre - 8.17.

Similar calculations for the 12 farms exceeding 145 acres have given:-

Margin, £ per acre = 1.86 x manures, £ per acre + 0.50 x milk, £ per acre
- 8.35 (Standard error = 3.6)

Correlations in general The statistical methods experimentally employed in this study would have been more appropriate had the number of farms been larger.

APPENDIX IV

OTHER WORK ON GRASSLAND BY THIS DEPARTMENT

(a) In 1952, twelve dairy farms, in Ayrshire, Lanarkshire, Kirkcudbrightshire and Wigtownshire recorded detailed expenditure, stocking and output connected with 92 fields. There could be no general conclusions from the enquiry; but the results were reproduced in Economics Department Report No.12 (Dec.1953) as a record of facts and method.

(b) In successive reports on the Milk Costs Investigation, tables of expenditure on cow pastures are given, and in several (No.22 relating to 1952/53 and 1953/54 and No.33 relating to 1954/55) estimates and comments appear about output of S.E. from grazing and its cost. Report 56, relating to 1957/58, gives acreages of pasture per cow. An article based on the 1954/55 work appeared in the S.M.M.B. News Bulletin of May, 1956.

(c) In successive reports on financial results on dairy farms, acreages of grass and numbers of cows are reported.

(d) The records from demonstrations of intensive management of pastures in the years 1954, 1955 and 1956 were analysed in Economics Department Report 41 (May 1957), also called Research Bulletin No.18.

(e) Unpublished records, similar to that of 1952, have been made on some farms in Kirkcudbrightshire and worked up for discussion between the farmers and advisers concerned.

(f) Unpublished estimates of U.S.E. on the grassland of the College Farm at Auchincruive have been made.

(g) Similar estimates for Lessnessock were made for 1956 and 1957 and appear in the Journal of the British Grassland Society (Dec.1958).

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