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FARM LABOUR STUDIES - No. 1.

THE LABOUR SAVING PROBLEM IN DAIRY  
BYRES.

A Preliminary Survey.

by -

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March, 1950.

## INTRODUCTION

To-day, on the average dairy farm in this area, the labour bill accounts for one-third of farm expenditure and is the largest single item of cash outgoings.

Dairy farming has many technical difficulties and problems but it is true to say that the labour problem - that of obtaining and keeping workers and of using their working hours to the best advantage - is the most immediate concern of very many dairy farmers. From the view-point of workers, byre work has certain disadvantages in comparison with work in the field. Even on the family farm, the desire to minimise the exacting tasks of stock attendance and milking is evident.

Rising labour costs, difficulties in labour supply and the pressing need to make the work speedier, lighter and in general, more attractive, have been, to some extent, met by field and steading mechanisation and by greater attention to organisation and management, but the problem has lost none of its urgency and there is still a need for methods of management, work routines and machinery which will help towards a solution.

In very few ways can the farm be compared to manufacturing industry, where labour organisation and use have increasingly been made the subjects of close and detailed study; but, recognising at the outset certain limitations peculiar to farming, a more intensive examination of labour use within the farm presents an approach which has not been developed to any great extent in Britain.

This report deals with a preliminary attempt to investigate, in a broad and general way, the problem of byre and dairy work in this College area. A survey was made with the object of ascertaining some basic facts and of viewing the problem as seen by the dairy farmer himself. The facts and opinions presented were obtained in the first place as background for future work but it is hoped that they may also prove to be of interest to those engaged in dairying.

### The Object and Scope of the Survey.

In the South-West of Scotland, dairying is the most important type of farming; in fact, over much of the low-ground area, the production of milk and dairy stock is the only type of farming encountered. As a preliminary to the investigation of labour problems on the dairy farm, a survey was made of about 100 farms with four main objects in view.

- (1) To obtain information on the number of workers at present employed in dairy stock attendance.
- (2) To gather farmers opinions as to which jobs in the byre and dairy they considered should be classed as the "longest" and the "hardest or most distasteful".
- (3) To note the methods of labour use in relation to milking, feeding and dairy work generally.
- (4) To observe devices and routines at present in use for saving labour or making work easier and speedier to perform.

During the Spring of 1949, visits were paid to 103 dairy farms, almost all of which are located in a traditional dairying area where court and bail methods of housing are almost entirely absent and "parlour" methods of milking are relatively uncommon. The survey relates to the winter months when cows are housed and fed in the byre, and the labour requirements of stock attendance are at their maximum.

No attempt has been made, at this stage, to study in detail, or record accurately, the time taken for any of the operations in the byre and dairy. As the productive results of farm labour are linked to many factors - system of payment of labour, mechanisation, steading layout, the capital available to renovate and remodel, and the competing needs of the various branches and enterprises of the farm - reference has been made to many points considered as likely to be of interest to those concerned with dairy farming or of importance /

importance at a later stage of investigation.

The primary aim of labour saving is to reduce the amount of work which has to be done without decreasing the output, but this is not the only aim. It is equally important to make the work easier, so that the same jobs can be efficiently performed with less effort on the part of the worker. This reduces fatigue and makes the work more pleasant. This aspect was held in mind in all the questions addressed to the farmers visited.

Again, it was not the purpose of the investigation to ascertain the money cost of the methods and equipment described. It was concerned with the labour requirements in a currency of "man-hours" rather than of pounds sterling. As a rule, saving of labour results in saving of cost but this does not always follow. Sometimes the introduction of machinery is profitable because it enables an operation to be performed at the proper time, which would not otherwise be possible, owing to shortage of labour.

The report is addressed primarily to those engaged in dairy farming. Farmers do not all possess equal technical knowledge, so that no apology is made for referring to matters which, though they may be well known to some, are likely to be unfamiliar to others. In the course of the report a number of Scottish terms are used which are described below for the benefit of any readers to whom they are unfamiliar.

"Byre"	-	Cowshed.
"Grip"	-	Dung channel in Cowshed.
"Trevise"	-	The division between stalls.
"Byre-walk"	-	Passage in byre behind cows, in the cowshed.
"Food Cooler"	-	Food barrow.
"Calf Box"	-	Calf pen.
"Graip"	-	Dung fork.

#### The Number of Farms and the Size of Herds.

Ayrshire was chosen as the main centre for the investigation partly on account of its proximity to the College, and partly because of its importance as a dairying county. The farms visited in the other counties were chosen chiefly to provide some contrast, the herd size being generally larger and the family labour element less important.

The number of farms visited in each county is shown below.

<u>County.</u>	<u>Number of farms visited.</u>
Ayrshire	70
Dumfriesshire	7
Kirkcudbrightshire	10
Wigtownshire	13
Lanarkshire	<u>3</u>
Total	<u>103</u>

The farms are shown in the statement below grouped according to the size of the herd.

<u>Number of Cows in Herd.</u>	<u>Number of Farms in Group.</u>
Under 30	10
30 - 49	36
50 - 69	29
70 and over	28

The average number of cows per herd in the South-West of Scotland is approximately 40. The sample taken in the present study shows, therefore, rather a high proportion of large herds. These were chosen because the larger farms employing paid labour were expected to have labour saving devices more highly developed than smaller farms and, accordingly, seemed to offer greater scope for investigation.

THE LABOUR REQUIREMENTS OF THE WHOLE DAIRY HERD.

Work in the byre and dairy has to be considered in relation to other work on the farm. On the larger farms with large herds, byre and dairy workers are usually fully employed on these duties, but among the smaller herds many of the workers are employed only part time in the byre, the remainder of the day being spent on outside work. The form of organisation is greatly influenced by the needs of milking, which, as an operation, regularly day by day, requires a greater concentration of workers than any other, and takes from one to two hours each morning and evening. In the larger herds, where the dairymen are fully employed on the herd, some additional help may be given at milking time by outside workers. On the smaller family farms, it is usual for three or four workers to be engaged at the milking-time peak, while one or two are sufficient to complete the remainder of the byre and dairy work during the day. On other farms three or four workers may carry out all the dairy work during the morning and evening, so that they are free for outside duties throughout the forenoon and early afternoon. If labour can be saved in the byre, more time is made available for outside work on these farms, or, ultimately, possibilities may arise for using a smaller farm staff.

On the 103 farms covered by this survey, the average size of herd was 55 cows. On an average, on these farms,  $3\frac{1}{2}$  persons were found to be employed, for at least part of their time, on byre and dairy work. This figure includes looking after young stock housed indoors.

In order to gain a clearer picture of the amount of labour actually used in the byre and dairy, an estimate was obtained of the proportion of each worker's time spent there and from this the labour requirements of the herd, in terms of Man-Hours per Day, was calculated. For all farms in the survey, the average labour requirement was 21 man-hours per day. The number of hours per day which each worker spends in the byre and dairy varies on different farms but the figure of man-hours per herd per day gives a basis on which the labour used on different farms can be compared.

It should be emphasised that the figures given are not based on accurately timed data but on the farmers' estimates of the time spent on the work by themselves and their employees.

An analysis is given below of the labour requirements of the herds studied, grouped according to the size of herd.

Herd-Size group.	Average No. of cows in group.	Average No. of workers per herd.	No. of Man-Hours worked per herd per day.		
			Average.	Herd with smallest No.	Herd with greatest No.
10 - 29 cows	23	3.2	15	8	20
30 - 49 "	39	3.25	17	6	28
50 - 69 "	58	3.6	21	10	30
70 cows and over	83	4.0	28	16	48

The average number of workers per herd employed on byre and dairy work, increased only a little from the small to the large herd-size groups and practically the same number of workers were employed on herds of 30 to 49 cows as on herds of 10 to 29 cows. The number of man-hours per day, however, increased from the small herds to the large. It seems therefore, that the smaller herds required practically as many workers as the medium sized ones, but, on the former, more of the workers' time was spent on duties outside the byre and dairy. Milking time has the peak labour requirement of the day and the figures suggest that in order to meet the needs of this operation, a minimum of three workers was required on herds of up to about 50 cows. The last two columns show the range of man-hours worked per day in each herd-size group. The difference between the farms requiring the smallest and the greatest number of man-hours per day is sufficiently striking to invite an investigation into the causes, at a later date.

Number of Stock per Worker.

The average number of cows and young stock which one worker looked after is 15 to 16 cows plus 13 calves, young stock and bulls. The numbers of stock tended in each of the four herd-size groups are shown below.

<u>Herd Size Group.</u>	<u>No. of Stock Attended per Worker.</u>		
	<u>Cows.</u>		<u>Other Dairy Stock.</u>
10 - 29 cows	7.4	+	8.1
30 - 49 "	12.0	+	13.3
50 - 69 "	16.2	+	14.6
70 cows and over	21.0	+	12.4

The figures in the last column refer only to young stock and bulls housed on the farms and do not include young stock wintered out, as outwintered stock are usually tended by the outside workers on the farm. Many of the larger herds visited are on farms situated in the southern part of the area, where young stock are often outwintered. Consequently, the proportion of the young stock housed in the steading on these farms is less than on the smaller farms visited, which are situated for the most part in North Ayrshire where soil and climate are not favourable to outwintering.

The number of cows tended per worker increases from the small to the large herds. To some extent this may reflect greater efficiency of labour management in the large herds, but it is also affected by the fact that relatively more of the workers in the small herds are employed only part time on the herd, and because, in the small herds, a larger proportion of young stock is kept indoors than is the case in the larger herds studied.

A Measure of Efficiency

The figures quoted give no indication of the efficiency of the labour used on the herd. This depends on the number of man-hours employed per day and the number of stock attended in one man-day. In order to measure this by a single figure, it is necessary first to bring the labour requirements of cows and young stock to a common denominator. It has, therefore, been assumed that, on an average, three bulls, calves, or young stock require the same labour as one cow, and the term "cow equivalent" has been adopted to represent the total number of stock in terms of one cow. This figure may not be correct for every farm, but it gives a useful approximation. The "cow equivalent" of bulls, calves and young stock is found by adding together the numbers of each and dividing this by three. The result added to the number of cows gives the total "cow equivalent" per herd. The number of "cow equivalents per man day", therefore, gives a measure whereby the labour required on one farm can be compared with that used on another. For all farms the number of cow equivalents per man day (C.E.M.D.) is 27.0: in other words, one worker daily attended to 27 cows or their equivalent in cows and other dairy stock. The average C.E.M.D. for the various herd size groups, together with the highest and lowest C.E.M.D. in each group, is given below.

<u>Herd Size Group.</u>	<u>"Cow Equivalents" per Man Day.</u>		
	<u>Average.</u>	<u>Lowest.</u>	<u>Highest.</u>
10 - 29 cows	17.7	11.5	25
30 - 49 "	24.8	15.3	43.2
50 - 69 "	29.3	18.2	60.8
70 cows and over	28.9	20	51.6

The most striking aspect of these figures is the wide difference in C.E.M.D. between the highest and the lowest herds. If the C.E.M.D. is regarded as a joint measure of the skill in management, efficiency of labour, and convenience of buildings, then these differences may be taken to indicate the wide range which occurs in these factors.

### Organisation of Work.

On a number of farms the work in the byre is finished by 9 or 10 o'clock each morning and does not begin again until the cows are fed in the afternoon, which varies on different farms from 2-30 to 4 p.m. This practice gives the cows a chance to rest and farmers consider that it has a good effect on the milk yield. It also leaves the byre workers free for a long period to do work outside the byre itself.

One farm reported a considerable saving of labour by feeding roots in the field instead of in the byre. The cows run, during the day, in a field near the byre, and the roots are carted to them once daily. Two fields are available, so on Saturdays, the Sunday's supply of roots is carted to an adjacent field, thus obviating the necessity for carting on Sundays.

### Week-end Labour.

The labour requirements of the dairy herd remain fairly steady throughout the week but it is at the week-ends, when workers require time off, that the difficulty of obtaining sufficient labour is most acute. One or two special arrangements have been made by farmers for easing the labour situation and ensuring their workers a reasonable amount of leisure.

On one farm the workers have the choice of two alternatives. They can either have Saturday afternoon and all Sunday free on alternate weeks, or they can be free from Friday night to Monday morning once a month, and work the remaining week-ends, being paid overtime for work during alternate week-ends.

In order to give their workers time off and vary the duties they have to perform, some farmers operate a shift system. On one farm where three workers are employed full time and one part time, on the dairy herd, the early shift works from 5 a.m. to 2:30 p.m. and the late shift from 9 a.m. to 6:30 p.m. One week, the byreman takes the early shift and is assisted by the ploughman who starts work at 5 a.m. and proceeds to other work about 9:30 a.m. when milking has finished. The assistant byreman together with a boy form the late shift and carry out the evening milking. The next week the assistant byreman and boy take the morning shift, while in the afternoon the byreman is again assisted at milking by the ploughman, who finished his outside work early for this purpose. On Saturdays the early shift finishes work at 9:30 a.m. and is free till Monday morning at 9 a.m. when it takes over the duties of the late shift. The late shift which comes on duty at 9 a.m. on Saturday takes over all the week-end duty and becomes the early shift on Monday morning.

On a larger farm where five workers are employed, the workers receive one day off per week and in addition one Sunday each month. By this arrangement, four workers are available on six days of the week and five one day a week.

### THE IMPORTANCE OF DIFFERENT JOBS.

From the point of view of their labour requirements, all operations in dairy stock attendance are not of equal importance. The jobs which require the greatest amount of labour are those which are most likely to offer the greatest opportunities for saving labour. Other operations, because of their tedious or unpleasant nature, are irksome and time and effort saved in these can help to ease the lot of the worker. It is, therefore, necessary to split up the work of attendance on stock into the various jobs which are performed. These can be roughly divided into milking, dairy work, feeding, cleaning byres and boxes, and grooming; and the opinions obtained from farmers on the relative importance of these must be considered.

### Longest Job.

In order to find out which operation in the byre requires most labour, farmers were asked which job in the byre and dairy they considered to take the longest time, having regard to the number of persons engaged in it. 93 farmers expressed an opinion on this, and in order of importance, their views were:-

<u>Job.</u>	<u>No. of farmers who considered this the longest job.</u>
Milking	60
Cleaning byre	14
Feeding cows	13
Grooming cows	4
Feeding Turnips	1
Tending Young Stock	1

Milking is therefore considered by most farmers to be the longest job. It usually takes from one to two hours twice daily and more staff are concentrated on this than on any other job in the byre.

#### Hardest Job.

Enquiries were made as to which job in the byre farmers considered the hardest and most unpleasant - the job which they would like to see shortened or made easier. A summary of the views obtained is given below:-

<u>Job.</u>	<u>No. of farmers regarding each as the hardest job.</u>
Cleaning byres	63
Feeding Turnips	10
Feeding	8
Grooming cows	7
Milking	3
Carrying Milk	2
Wet Feeding	2
Washing dairy dishes	1

Cleaning byres was by far the most unpopular job. It is hard and dirty work and it requires less skill than the other operations performed in the byre. It is more tedious and less interesting than jobs such as milking or feeding which need more knowledge and care to carry them out well. In Wigtownshire and Kirkcudbrightshire where considerable quantities of turnips are fed, and where herds are large, carrying turnips and feeding them was often considered the hardest and most disagreeable job. In general contrast, among the family farms, it was quite common to meet farmers to whom all the aspects of byre work gave interest and gratification in technical skill and who did not appear to find any of the duties irksome or tedious.

#### MILKING

Milking is generally considered to be the longest operation in the byre, and it is therefore in this we should expect to find the greatest opportunities of saving labour. Much has already been done by farmers and agricultural engineers to cut down the time spent in milking and probably the most important advance in this direction has been the invention of the milking machine.

#### The Importance of Method.

Many farmers stressed the importance of having a definite routine or method in carrying out byre work and this applies with special force to milking. The whole job of milking is made up of a sequence of small operations which have to be performed every day - bringing in the milking units, washing the cows' udders, attaching the teat cups, removing the teat cups from one cow and attaching to the next, carrying milk, and finally, returning the units to the wash house. The quickest and most efficient way of doing these can be established and then carried out as a daily routine. By performing the sequence of operations in the same regular fashion every day, workers become accustomed to the routine, and less time is wasted on unnecessary work or travel than when the job is done without planning.

As a corollary to this some farmers emphasised the importance of keeping tools and equipment at convenient spots. One farmer advocated the maxim of "A Place for Everything and Everything in its Place".



### Milking Machines.

Twenty years ago it was the exception rather than the rule to find a milking machine on a farm, now, few dairy farms are without them. Only two farms visited in the course of this survey had not installed one. A number of the farmers visited are still in favour of hand milking, as they maintain that the cows give more milk than when milked by machine; but they have been forced to adopt machine milking owing to the difficulty of obtaining skilled hand milkers.

A few farmers consider that there is still room for improvement in the design of milking machines. For example, it has been suggested that the method of assembling and dismantling the machine for cleaning should be simplified so as to take less time. Machine milking is regarded as being most efficient when the operator is highly skilled in the use of the machine, and the view has been expressed that there is need for more machine milkers with greater experience in order that the best results may be obtained from the machines - and the cows.

As a source of power for the milking machine, it is generally agreed that the electric motor requires less labour than the petrol or oil engine, since time is saved in starting and maintenance. Some farmers have the milking machine pump arranged so that it can be driven by a tractor in event of a failure of electricity, thus eliminating the laborious process of milking by hand during temporary stoppages.

### Number of Units Per Man.

There is some diversity of opinion as to the number of units which one man can operate efficiently. This is affected partly by the yield of the cows, as, with high yielding cows, the teat cups remain longer on the udder than on low yielding cows and it may then be possible for one man to work more units. If the milker has also to carry the milk to the dairy, he cannot operate so many units as when he is engaged solely on looking after the units. On 98 farms the average number of units operated by one milker was three.

On a few farms there were as many as five or six units to one milker, but two, three and four were more general. Very often one milker works three units and his assistant two units. One farmer maintained that it is just as quick to operate two units as three, while others gave it as their opinion that if more than three units are worked by one man, the teat cups stay on the cows too long and damage the udder. As a general conclusion, on the evidence available, it might be said that one milker can operate efficiently two or three units and four if he (or she) has someone to carry the milk.

### Number of Cows Per Unit.

The average, over 97 farms, of the number of cows milked by one unit, was  $8\frac{1}{2}$  but for individual farms the numbers varied between 4 and 14 cows per unit.

### The Time Spent in Milking.

In the majority of herds the time taken for each milking is about an hour to an hour and a half - often rather more in the morning, when the cows yield more owing to the longer interval since the last milking, and less in the evening milking. Naturally, it varies, even in the same herd, according to the number of cows in milk and their yield at any particular time. The variation in time between herds of different sizes is, however, remarkably small, because in the larger herds more machine units are employed so that the work can be completed in a reasonable time.

It seemed desirable to find some criterion whereby the time<sup>spent</sup> in milking on different farms could be compared, and a figure representing the total time taken per cow has been adopted. Farmers were asked for an estimate of the total time spent in milking, from the point when the units were brought to the byre until they were taken back for washing. As more than one unit was operated at a time, it was necessary to multiply the time taken by the number of units, before dividing by the number of cows in milk. The figure obtained shows the actual time spent in milking, together with the time spent per cow in changing over units and other operations connected with milking. It must be emphasised that this figure is only approximate because it is based on the farmers estimate of the time taken and/

and not on direct observation, but it will serve meantime as a simple standard of comparison.

The average time taken in 85 herds was 9.7 minutes per cow. The averages of four herd-size groups is shown below, together with the shortest and the longest times in each group.

<u>No. of cows in herd.</u>	<u>No. of Herds.</u>	<u>Milking time per cow. minutes.</u>	<u>Shortest time per cow. minutes.</u>	<u>Longest time per cow. minutes.</u>
10 - 29	5	9	5½	11
30 - 49	28	9	7	14
50 - 69	25	9¾	6	13
70 and over	27	9½	5	15½

There is a striking difference between the shortest and longest times taken per cow in all groups and further inquiry into the reasons for this will be a subject for future study.

### Quick Milking

It is clear that any routine which reduces the time taken for milking may be expected to save labour. In recent years a new technique of milking has been developed in U.S.A. Its best known advocate is Professor Peterson whose film on "Quick Milking" has been shown throughout this country. It aims at reducing the time taken to milk the cow without causing any diminution of the milk yield. It consists firstly of stimulating the hormones which cause milk secretion, by washing and massaging the udder with hot cloths. Secondly, the teat cups are put on the cow about a minute after washing, so that the milking may be completed before the stimulus has been lost. Thirdly, by removing the teat cups after about three to five minutes milking, the cow can be trained to let down all her milk in that time; and lastly, stripping is not carried out because once the cow learns to do without it, she will let down all her milk in the course of milking. It is claimed that this technique results in quicker milking and is better for the cows than the older methods.

A number of the farmers visited in the course of the survey have tried out this method either completely or in part and are satisfied that it is quicker and more efficient than the old way. One farmer who had a herd of 90 cows, stated that quick milking and the improvements in routine which it entailed, enabled his men to finish work twenty minutes earlier each day. This represents a saving of 4% of the total labour required daily.

Other farmers have tried the method, but found it difficult to carry out and consider it to be no better than their present methods. When one worker washes the cows while other two workers milk, either the washer tends to get ahead of the milkers, so that too much time elapses between washing and milking the cows, or else the washer has to stand idle until the milkers are just ready to milk the next cow - thereby wasting time. The system works best when each milker washes the cows he milks, but such an arrangement does not always fit in with the available labour staff. Another difficulty arises from the individuality of different cows. Some cows just cannot be trained to give all their milk in a short time, and while protagonists of quick milking would, no doubt, advise that such cows should be disposed of, this is not always practicable. Farmers agreed generally that heifers brought into the herd for the first time could easily learn the routine, but it is more difficult to teach cows which have become accustomed to a different routine, especially when they are in mid-lactation.

It seems, however, that the basic principles of the system were carried out before the quick milking technique was publicised in this country. A number of farmers who do not claim to practice quick milking, keep the cups on their best cows for three, four or five minutes only, by which time they are fully milked out. Other farmers emphasised the value of various stimuli in inducing cows to let down their milk - the rattle of milking cans as they are brought into the byre, feeding meal just before milking, and massaging the udder.

### Stripping.

The general practice in regard to stripping varies considerably, but it is clear/

clear that if stripping can be cut out, without reducing the milk yield, considerable time will be saved. Some farmers do not strip at all and thereby save time, without, in their opinion, lowering the milk yield. Others strip only when the cow is nearing the end of her lactation and the yield is beginning to fall, while others, again, consider it necessary to strip always. Machine stripping is practised by some, by placing the hand on the claw of the unit and pressing downwards so as to increase the suction, while, at the same time the udder may be massaged. One farmer has devised an easy means of increasing the suction by placing small pieces of lead on the claw just before the cow finishes milking.

#### Washing the Dairy Utensils.

Although only one farmer considered this as the hardest job, there are many others who dislike the task and find it tedious. It requires care and time to clean the milking machine properly. The commonest practice is to leave the milking machine to soak in water while the workers go to breakfast. One farmer finds that washing the machine immediately after milking has finished, takes only half an hour, whereas, if it is left till after breakfast, washing takes two hours, because the milk has hardened on the machine. Several farms have vacuum points in the wash house, to which the machine can be connected. This enables water to be drawn through the tubes and facilitates cleaning. One farmer washes the outside of his machine and removes extraneous dirt before putting the machine into clean water; and he claims that this makes the main washing easier and speedier and saves the inside of the machine from becoming contaminated with dust and dung in the course of washing.

#### Milking Parlour.

The earlier sections refer to milking with bucket machines in the byre, but it will be of interest to describe the experience of a farmer who has recently built a new byre and installed an auto-recorder milking parlour at the end of it. He considers this to be a great saving of labour as compared with milking by bucket in the byre. He used to have 62 cows, housed in four byres, with the dairy a long way distant. Now he has one byre with the dairy nearby, and with the parlour can handle 34 additional cows with the same labour.

At milking time, one man releases the cows in their stall and drives them up to the milking parlour, where two are engaged in milking. The milk passes to the auto-recorder and is not exposed to the air till it reaches the dairy. This enables the man who unfastens the cows, to spend the time between releasing each batch of cows, in cleaning the byre. Each cow takes, on an average,  $3\frac{1}{2}$  minutes to milk and as there are two stalls to one unit, the cows are in the stalls for 7 minutes.

Each stall in the parlour is fitted with a useful rubber brush for washing the udders. It is attached to the water supply by a rubber tube so that a constant supply of clean water is provided for washing, which obviates frequent journeys to the tap to change the washing water, and also ensures that it is always clean.

#### CLEANING BYRES.

##### The Bedding.

To some extent, the ease of cleaning the byre is affected by the type of bedding used, which may be straw, chaff or sawdust. A number of farmers prefer sawdust as they maintain that it keeps the cows cleaner than straw or chaff and is easier to remove when soiled. It is particularly favoured on farms where straw is scarce, but the disadvantages was said to be that the manure is not so good as when made with straw or chaff. Some farmers advocate using straw as litter in the grip as they maintain that it tends to hold up water less than chaff or sawdust. Many farmers bed cows with chaff in order to utilise available material, but, in general, chaff is not favoured, as it is so dusty and makes the cows and stall dirty. Straw is most commonly used for bedding, and some farmers consider it worth while to chop the straw, as it is easier to remove when soiled than long straw.

##### The Grip Wire.

A number of byres are fitted with a steel wire which passes from one end of/

of the byre to the other to keep the cows from standing in the grip, usually termed a "grip-wire". It is fixed to hooks on the byre wall at either end, at about 2 to 2½ feet from the floor, and can be released by unhooking it at one end. When fixed, it is taut and passes close behind the cows' tails, and prevents them from standing back and treading on their dung or making dung in the byrowalk. In a few very long byres the rope is supported at intervals on a tubular extension of a trovisse, which prevents it from sagging.

Farmers are not unanimous in their opinions of this device. Some find it very efficient and claim that all their cows stand in the stalls, while others who had installed it, have given up using it, as they say it does not prevent the cows from standing in the grip. It is possible that if more use were made of intervening supports to keep the wire taut, the device would be more efficient.

Some farmers say that although most of their cows stand normally in the stalls, a few habitually stand back in the grip. To prevent this they attach a rope to the hind leg of the offending cow, the other end of the rope being fixed to a ring at the front of the stall. They find this device most effective.

#### Removing the Dung.

The commonest method of cleaning the byre is to sweep any dung that may have fallen on the stalls into the grip, fill it into barrows with a graip or shovel and wheel it away to the dungstead. Some farmers consider that careful attention to the organisation of this operation enables them to complete this work in less time than if they allowed it to be done without planning. In one herd of 35 cows, the byre is cleaned by 3 men - 2 fill and push the barrows and 1 helps them to fill. On another farm where 55 cows are kept, the job is done with two barrows and 2 men. One man fills the barrows while the other wheels them away.

On one of the farms visited, in place of the common wheelbarrow, a long two-wheeled barrow is used, with low sides. It is well balanced, is easily tipped over a ramp and has a specially large capacity so that two loads remove all the manure from an 87 cow byre.

On a few farms the dung is put into carts and trailers in the byre and taken direct to the fields. This can only be done when the byre door is wide enough to admit a cart. A more common practice is to empty the wheelbarrows direct into a cart or trailer and remove the dung to the fields daily. Usually the cart stands in the dungstead against a bank or wall so that barrows can be wheeled on to it and tipped, and the tractor or horse is yoked when the cart is full. One of the farmers visited empties the barrows into a dung-spreader placed at a ramp near the byre door, and spreads the dung on the fields daily.

The practice of carting dung to the field daily is usually confined to the winter period. As the cows are in the byre only at milking time during the summer, less dung is produced and this is readily disposed of in the dungstead. Daily carting to the fields can only be carried out on farms where the land is firm and does not poach easily, and when weather permits.

Some farmers use special low-set carts for taking out the dung, because they require less labour for filling than the common high carts.

#### The Dungstead.

It is an advantage to have the dungstead at a lower level than the byre because by such an arrangement the barrows move down hill, when loaded. Where the route to the dungstead does not lie over a macadamised yard, on a number of farms, a cement walk, or path of smooth flagstones has been laid down between the byre and the dungstead. This lightens the work of pushing the barrow.

If the slope of the ground allows, it is an advantage to have the top of the dungstead wall level with the ground so that barrows can be tipped over the wall. Where this is not possible several farmers have built ramps at the end of the dungstead to facilitate tipping, and a cement bottom to the dungstead makes the final work of emptying easier.

#### Washing the Byre

On several farms, water troughs have been installed in the byre, and farmers/

farmers claim that this facilitates washing the byre, as the worker can scoop a pail of water out of the trough and does not need to wait for each pailful to be filled at a tap. On other farms a hose is used to wash down the byre. In a large modern byre an old cheese vat has been fitted with wheels and used for washing the byre. It is filled at a water tap and taken to the head of the byre-walk, where the tap in the vat is opened. The water flows with some force down the byre, which is then swept with brushes. Before this method was devised it took 9 minutes to wash the byre, using pails. After the new device had been installed, the operation was timed, and it was found that washing now took only 2 minutes.

For light sweeping of the yard and byre-walk, a leaf broom 24 inches wide was used on some farms. This is lighter and wider than the common byre brush and enables the job to be done more quickly. Sometimes a food cooler is employed for conveying used water from the milk cooler for washing the byre.

In order to facilitate the spring cleaning of the byre, one farmer used a high pressure hose, and found it most effective for cleaning the walls and roof.

#### Mechanical Byre Cleaning Machines.

Cleaning the byre is an operation which entails heavy manual labour and little skill, so that it is regarded as the most distasteful job in the byre. There is a lack of cheap and efficient machines for removing the manure and only two types were observed. Both have the disadvantage that they require a relatively high capital outlay - £500 or more at present prices - and consequently are seldom found on farms.

(a) Mechanical Byre Cleaner. This device, which was seen on only two farms, consists of a rubber conveyor belt which lies in the grip and carries the dung to the dungstead or into a waiting cart. The belt is of the same type as is used in collieries for coal conveyors. It rests on the bottom of the grip, which is fairly deep and which it fits exactly. At its lower end, the grip is continued through a hole in the byre wall and from there the belt runs along a short wooden platform passing out to the dungstead.

When byre cleaning begins, the dung from the stalls and byre-walk is swept into the grip. The lower motor is started and the conveyor is drawn down the grip taking all the dung with it. The conveyor belt passes over the drum pulley at the end of the wooden platform and as it turns back, the dung falls off into the dungstead or into a cart placed underneath the platform, the motor being stopped when the top end of the belt reaches the pulley. The belt is pulled back to its normal position by the motor at the top of the byre. While this is being done a stream of water is directed down the grip and washes it.

In a double byre the same motors drive the belts on either side. By an arrangement of pulleys and cables one motor can be made to clean the byre and return the belt. The belts appear to be durable, because the one seen had been in use since the machine was installed over five years ago and was in excellent condition. This type of machine is suitable for byres where there is a straight run out to the dungstead and where the latter is below the level of the byre. Other arrangements are possible but are complicated.

(b) Overhead Dung Carrier. This machine was found on only two farms. It consists of an overhead steel rail, passing from the byre to the dungstead, along which runs a bucket which contains the dung. The rail runs down the centre of the byre, where it is supported on the roof trusses. Outside, special supports are required to carry the rail. The metal bucket or dung container is attached by means of chains to the frame which runs along the rail. The chains can be wound up on a spindle to raise or lower the bucket. The bucket is brought into the byre, lowered for filling and when full, is raised and pushed by hand to the dungstead, where it is tipped and returned empty to the byre for another load.

The machine can be operated by one man and in byres where it is used, it is considered to save much labour. It is of greatest use in large byres where the dungstead is some distance away from the byre.

#### WATERING AND FEEDING.

Waterbowls./

Waterbowls.

Water bowls were considered by some farmers to be the greatest labour-saving device which recent years have seen adopted in the byre. They were fitted in all the cow byres visited. On many farms, water bowls were also fitted in young stock byres and calf boxes, and on farms where they were not provided for the young stock, most of the farmers stated that they would like to have them, as they considered that they would save a great deal of time.

Feeding.

Individual practices in feeding and the preparation of food seem to differ more than in the other operations. The opinions expressed by some farmers often conflict with the views put forward by others, and to some extent this is the result of differing conditions on different farms. Many different types and designs of equipment - barrows, food coolers and such like - are in use and the variety of individual opinions and practice gives rise to a variety of small labour saving devices designed by individuals to suit their particular circumstances.

The lay-out of buildings is particularly important in relation to feeding because so many of the farm buildings - hay-shed, barn, meal house - are concerned with the storage of foodstuffs and preparation of the food. A convenient arrangement of buildings can therefore effect a considerable saving in the time taken and the distance which has to be travelled in feeding the stock.

Dry versus Wet Feeding of Cows.

In the past, meal and concentrates were fed to the cows in the form of a slop or mash, but it is now more common to feed them dry. Opinions differ as to the value of this practice but nearly all farmers agree that dry feeding saves time and requires less labour than wet. While many farmers maintain that a ration of meal, if fed wet, will produce more milk than the same quantity fed dry, they state that they are forced to feed dry in order to save labour. Others claim, that, provided the cows have plenty of clean water available in water bowls, there is no advantage in wet feeding. Some carry out both wet and dry feeding.

One farmer, who believed that more milk was obtained by wet feeding, maintained that the saving in labour effected by dry feeding balanced the value of the milk lost. A farmer who feeds draff and meal mixed stated that this practice took half an hour a day longer than feeding dry, but he considered that the additional milk produced was worth the extra time spent.

Number of Feeds per Day.

The practice most commonly found was to feed the cows three times daily, but many farmers prefer to feed only twice daily. When feeding twice daily, the same quantity of food is given, but it is fed in two meals instead of three. It is claimed that this not only saves labour but is also better for the cows. In some herds, roots are fed three times daily and hay and meal twice; in others, meal is fed twice and fodder three times. Of those farmers who disagreed with feeding only twice daily, one believed that the cows milk better if fed three times. Another claimed that if the cows are given fodder twice a day, so much has to be given at a time that some of the fodder gets trampled and is wasted.

Baling Hay and Straw.

Now that pick-up balers are to be found on some of the larger farms and travelling balers accompany the threshing mill, the question of "to bale" or "not to bale" is of some importance.

The principal advantages of baling are that the fodder is easier to carry, takes less room in the store, causes less litter about the yards and buildings than when it is used loose, and in the opinion of many, makes the work of feeding easier. One farmer maintained that baled hay saved half the labour of foddering and many farmers claim that it saves a great deal of labour in feeding and in cleaning the yards. Others bale because they are short of storage space and wish to compress fodder into as small bulk as possible.

The chief argument against baling is the expense - a number of farmers maintaining that though it saves labour, it does not pay. Difficulty is sometimes experienced/

experienced in opening the bales and separating the fodder in such a way as to feed it in the necessary quantities. Baled hay requires a weatherproof shed to store it, so that, where there is no hay shed, stacking loose is preferred. Again, if the hay shed is near the byre, baling may save little labour. There is, however, a possible danger at feeding time from cut ends of baling wire which have fallen into the bale.

Quite a number of devices are in use to overcome these difficulties. A light axe is used by some farmers to open the bales, one blow being sufficient to sever the wire. One farmer maintains that if the bales are used, starting from the end at which baling finished, it is easy to separate the fodder. Another finds that the self-feeding pick-up baler packs hay more evenly than other types and makes it easier to separate for feeding. The light string-tied bales are favoured, as a lower pressure is used than with the wire tied ones, but one farmer prefers tight bales, 22 to the ton, which, he claims, retain moisture better so that the hay is more palatable to stock.

It seems that baling fodder is most useful when storage space is short or when the fodder has to be carried a long distance from the hay shed to the byre and calf boxes. It is also an advantage when feeding stock outwintered in the fields.

In handling straw, many farmers prefer to bunch rather than bale their straw, because the bunches are cheaper to produce, and they believe them to be easier to carry and feed, than bales.

### Barn Machinery

The amount of machinery it pays to use in preparing food for the dairy herd depends on the size of the farm, and on large farms appreciable saving of labour can be made by the use of machinery.

Moving Bags. On a number of farms a winch or crane is fitted for hauling sacks up to the loft, and these may be power or hand operated. One farmer has contrived a special fast and loose pulley hoist in the barn which can be operated from the loft floor a little distance away. Sack lifting barrows are found useful on several farms for carrying and lifting sacks when loading or stacking.

Another useful device seen was an arrangement for carrying bags from the loft to the mixing house situated further along the same building. It consists of a block and pulley running along a wire rope stretched between the loft and the mixing house. Attached to the block is a chain which is looped round a corner of each bag so that it is carried upside down and can be emptied simply by cutting the string when it arrives at the mixing house. The wire rope is inclined slightly towards the mixing house so that the full bags run downhill. When empty, the block with the empty bag attached is drawn back, by the operator in the loft pulling a string attached to the block.

Bruising & Grinding. Many farmers have installed either a bruiser or a hammer mill, or both. These are often fixed on the lower floor of a barn so that grain can be passed down a chute from the upper floor to feed them. This takes much less labour than filling them from bags on the floor below. Some farmers have fixed a large hopper on the upper floor into which 5 bags of grain or more can be emptied. The grain is passed down a chute to the mill below, and this arrangement makes it possible to leave the mill unattended for some time. A few farmers have self feeding hammer mills which can be left unattended for long periods. A number of hammer mills are fitted with forced draught which blows the meal to the upper floor into a cyclone, from which it can be bagged. One farmer claimed that the installation of a hammer mill with blower and chutes to deliver the grain, saved him one man's labour. One or two farmers had cup elevators which conveyed the meal up to the loft for bagging and storage. On farms where a built-in threshing mill is in use, conveyor belts and elevators are often used for taking grain direct to the hopper or to a grinding mill.

Mixing Feeding Stuffs. Some farmers have their home-grown feeding stuffs ground at the local mill, because/

because it saves labour on the farm. Many of these have their feeding stuff stored at the mill and collect supplies in the form of meal when required. Where the miller is also the local feedingstuffs merchant, some farmers take delivery of their meal ready mixed with purchased concentrates, so that they are saved the labour of mixing. In one district a farmer has his corn ground by a travelling contractor who visits the farm with a tractor and hammer mill.

Naturally, these services have to be paid for but some farmers consider that the cost is well worth the labour saved. Others consider that if they pay them to grind and mix their own corn. Several farmers prefer to purchase concentrates in the form of cubes to save the labour of mixing.

Some farmers mix the meal for each feed in a cooler, but many find that time is saved if they mix a few days' or weeks' supply at a time on the meal-house floor. One farmer used to spend ten minutes daily mixing meal, but he changed over to weekly mixing, and now mixes a week's supply in half-an-hour. In this way he saves 40 minutes in a week.

Where meal is mixed in the meal house, a concrete floor is a great asset, as it makes the work much easier. One farmer has closed in a part of his meal house by wooden partitions and a wooden roof so as to give a small mixing chamber. This saves labour in cleaning and mixing, because it prevents the meal from being blown about the building. Where meal is mixed in a loft, it is often passed down a chute into a cooler below, ready for feeding.

A few farmers have installed mechanical food mixing machines and have found them very satisfactory, not only because they save labour, but also because the food is more effectively mixed, than by hand.

#### Feeding Concentrates

On several farms meal is carried in pails from the meal-house, a pailful being fed to each cow. A few farmers maintain that as their meal-house is near the byre it is not worth while using coolers. A few cannot use coolers because the byre door is not wide enough to admit them. Most farmers, however, take the food into the byre in coolers and feed the cows from these. They consider that this saves a great deal of labour, as, when feeding direct by bucket, a journey to and from the meal-house is required for every two cows.

A wide variety of coolers are in use, suited to the individual requirements of different farms and the preferences of farmers. Some farmers prefer wooden coolers, because, they say, they are easy to clean; others put their faith in metal coolers - often for the same reason! Coolers with swivelling wheels, which can be turned in their own length, are favoured where the byre is narrow. One farmer was particularly satisfied with a three-wheeled rubber-tyred metal cooler, semi-circular in vertical cross section. He found that its shape made it easy to scoop out the food and to clean.

Several farmers advocated that the cooler should be of a size sufficient to hold all the concentrates for one feed. Another, whose practice was to mix the meal in a cooler, preferred to have a cooler large enough to hold two feeds, so that meal had to be mixed only once a day. In order to save labour in feeding during the weekend, one farmer has a number of coolers so that he can fill them all at the end of the week, and have the meal ready for feeding on Saturday and Sunday.

#### Feeding Turnips and Silage.

Only a few of the farms visited were provided with turnip sheds, but turnips are stored as near the byre as possible, so as to save labour in bringing them into the byre. Many farmers feed turnips from baskets filled at the storing point, while others use turnip barrows, which saves the labour involved in making many journeys to and from the place of storage. One farmer had made a serviceable turnip barrow out of old motor cycle wheels, while another had a large four wheeled barrow, from which all the cows could be fed in one load. When feeding from baskets, farmers find it convenient to have sufficient baskets to allow one for each cow so that they can all be filled ready before feeding begins.

Large barrows, or coolers are usually required for feeding silage. Instead of a cooler, one farmer uses large 26" potato baskets, which he finds contain sufficient for one feed for a cow. On a few farms, where the byre door is wide enough, silage or roots are taken into the byre in a cart or by tractor and trailer/



trailer, and this saves the double handling entailed in unloading the cart at the storage place and filling it again into barrows or baskets.

A number of farmers considered that feeding of turnips was especially laborious and they would have been glad of any suggestions for making it easier. Besides this, they were of the opinion that roots are expensive to grow and require much labour, which is not always easy to find at the right time. In an attempt to overcome these difficulties, several farmers have replaced some or all of their root acreage by silage, which, they maintain, is cheaper to produce, requires less labour, and is easier to feed than roots. There is, therefore, some strong opinion to show that the use of silage in place of roots can save labour in feeding stock and an enquiry into the economics of this practice in all its aspects seems to be required.

#### Feeding Hay and Straw.

Where loose hay is being fed, and the hayshed is close to the byre, it is common practice to carry the hay into the byre on a fork, but where the hay shed is some distance away, hay barrows are used. A few farmers have increased the capacity of their hay barrow by fixing vertical extensions to the sides and have found little difficulty in pushing the additional load. One such barrow on rubber tyred wheels takes  $5\frac{1}{2}$  to 6 cwts. of hay, while a large well balanced two wheeled hand cart on another farm can take 80 bundles of straw.

For carrying bales, a sack barrow is frequently used, while other farmers use various types of porters' trolleys, which can take up to eight bales at a time.

#### DAIRY WORK.

##### Carrying the Milk and Filling the Milk Cooler.

Two farmers regarded carrying milk as the hardest job they had to perform, and several others considered that too much time had to be spent on this work. The proximity of the dairy to the byre greatly affects the time taken, but even if the dairy is next to the byre, dairy byelaws prohibit direct access to it, which makes it necessary to carry the milk by a round about route.

In the dairy, the buckets have to be lifted up and the milk poured into the container of the milk cooler. The milk then flows down and collects in the trough at the bottom, from which it passes to a churn below. The height of a ten gallon churn is over 2 feet and the height of a small size of cooler is nearly 3 feet, so that, allowing for a gap between cooler and churn, the milk has to be poured from a height of over 5 feet, which requires considerable effort on the part of the person carrying the milk, especially in the case of the younger people. A number of dairies have concrete or wooden steps up to the cooler, and from the top of these the milk can be poured into the container by raising the bucket only to waist level. The effort required for this is less than that needed to empty the bucket from ground level, and a wider adoption of steps would help to reduce fatigue.

On a large farm with 130 milking cows a method was observed whereby the job is partly mechanised. The milk is poured into 10 gallon churns in the byre and when full, each is wheeled to the dairy in a churn barrow. The churn is emptied into a tank at ground level and the milk is pumped up into the cooler container by means of a small electric force pump. To facilitate emptying, the heavy churn is hoisted over the tank by means of a block and tackle to which is fixed an arm suspending two hooks which engage the handles of the churn. The bottom of the tank is raised a few inches above the level of the pump inlet so that the milk flows into the pump by gravity. The criticism may be made that the pump and piping would be troublesome to clean but no difficulty had been experienced in keeping the equipment clean, in the case observed.

##### Sterilisers.

The commonest type of steriliser uses steam raised in a coal fired boiler. A number of farmers have installed electrically operated sterilisers of various types and maintain that they save a considerable amount of labour. Compared with a coal boiler, the time spent in stoking is saved and they are much cleaner.

For sterilising milk churns a number of dairies are fitted with a steam jet, set/

set in a low stand, over which the churn is inverted and then steamed. Some farmers prefer to steam the churns in large sized sterilising chests. A chest of this kind seen in one dairy was fitted with a shelf and was capable of taking 20 churns at a time.

One farmer who had installed an immerser type steriliser and a steam jet for sterilising churns, claimed that the two together saved him an hour a day, as compared with the steam boiler which he had formerly used.

In one county, it is understood, local bye-laws make it obligatory to have a double doored steam chest, with one door opening into the wash house and the other into the dairy. In many dairies such a chest can save labour, as the dishes are washed in the wash-house, put into the chest, and steamed. After steaming the other door is opened and the dishes taken out direct to the dairy. This saves the labour of carrying them round from the wash-house to the dairy.

#### Carrying and Loading Churns.

For carrying the cooled milk away to be loaded, several farmers use churn barrows which take one can and are operated by one man. They require less labour than carrying the churns by hand, for which two men are needed. Other farmers use two or four wheeled trolleys which carry half a dozen churns or more. They are usually fitted with rubber tyres and are easy to wheel.

To facilitate loading churns on to the milk lorries, some farms are provided with loading platforms at approximately the same height from the ground as the lorries. The top of the platform is also level with the dairy floor or is approached by a ramp. The churns are brought to the platform for loading and the labour of lifting them off the ground up to the lorry is avoided.

#### Milk Coolers.

These were found to be fairly uniform in type but one adaptation is worthy of mention. Most coolers have a single outlet from the collecting tray at the foot of the cooler through which the milk flows into the churn. In one particular instance the collecting tray was fitted with three outlets so that three milk churns could be fitted at a time. This has the advantage that the churns need not be changed so frequently and less attention has to be paid to ensure that the churn does not overflow.

In another dairy a metal guard rail had been fixed round the milk container of the cooler which served to protect the container and provided a support on which the can would be rested when filling the cooler.

#### GROOMING COWS.

The majority of farmers would like to groom their cows every day, but owing to shortage of labour, few are able to do so. Many clean the cows every day whenever possible, but the majority groom them periodically when time permits.

A number of farmers do not groom their cows at all and believe that they are just as healthy as when they were cleaned daily. They find that stalls of the correct dimensions help to ensure that cows pass dung in the grip, while another useful aid to this is the grip wire, which prevents them from lying in their own dung.

One or two farmers believe that there is scope for the development of a brush attached to an electrically operated vacuum cleaner, for grooming cows, which would be operated in much the same way as an electric clippers. It is understood that such a machine was at one time produced but was not widely adopted. One farmer is experimenting with a hand vacuum cleaner to which a metal comb has been attached but no conclusion has yet been reached as to its usefulness. Another farmer uses a stable brush with the handle a foot and a half long, in place of a dandy brush. He claims that by its use the cows can be cleaned more quickly than with the dandy brush.

Electric clippers and vacuum clippers worked from the vacuum pipe of the milking machine have replaced geared hand clippers on many farms. They are easy to operate and save much labour compared with the hand machine.

### FARM BUILDINGS

A well laid out steading is regarded by many farmers as the most important factor in saving labour in the dairy herd, but to-day, on many farms, inconvenient and badly arranged buildings add greatly to the work of the staff. Unfortunately, at the present time, alteration of buildings presents greater difficulty than almost any other steps which can be taken to save labour. In Scotland, farm buildings are solidly constructed and expensive to dismantle, while the cost of new buildings is, at present, so high that farmers and landlords hesitate to incur the capital expenditure required to replace or renovate them.

Nethertheless, encouraged to some extent by relief of income tax, a few of the farmers visited were in progress of erecting new buildings, so that the improvements which farmers consider desirable may be of some interest.

#### The Layout of Buildings.

In Ayrshire and parts of Wigtownshire many of the steadings are more than 100 years old and were built at a time when farm labour was cheap and plentiful and saving of labour was of less consequence than it is to-day. They were substantially constructed - the walls in some cases being over two feet thick - so that as the necessity has arisen to adapt them to milk production under modern standards, high cost has made it undesirable to carry out more than the minimum of alteration necessary to comply with the regulations. As a result, many of the buildings are inconveniently situated for the purpose for which they are required to-day and much labour is wasted in travelling long distances between buildings which, in a modern steading, would be adjacent.

The convenience of having all the related buildings - milk-house, meal-house, turnip shed, hay shed and straw shed - as near the byre as practicable, and easy of access to it, is well appreciated. On a number of farms, the milk house or dairy is situated at the other side of the yard from the byre and much time is wasted carrying milk from the byre and returning with the empty cans. Some farmers have overcome this difficulty by adapting a suitable house nearer the byre as a dairy, but only a few farms have such a house available. On some farms the hay shed is close to the byre, but a number of farmers preferred to house the hay a little distance away owing to the risk of fire. It is not the intention at this stage to discuss the arrangement of dairy buildings, as so much depends on the size and circumstances of each farm, and no two farms are exactly alike. Some of the best laid out farms have all their dairy buildings under one roof, or, at least, connected by covered passages. This greatly adds to convenience and makes the work much more pleasant in winter.

The position of communicating doors between buildings is important, and they are not always placed so as to give the shortest distance of travel between one building and another. Some steadings were observed where, for example, access from the meal house to the byre is by a circuitous route, and altering the position of a door in a wall would give direct passage and shorten the distance to be travelled. Direct access from the byre to the dairy, however, is forbidden by clean milk production regulations and this sometimes prevents milk from being carried to the dairy by the shortest possible route. Where a hay shed or some other building runs parallel to the byre, or a dungstead is at the side of the byre, it is convenient to have a door in the centre of the byre giving easy access to it. Some farmers have even found it worth while to do away with a pair of stalls, in order to cut a door through to such a building.

A useful arrangement on farms where the hay shed is some distance away, is a smaller fodder shed near the byre which holds from a few days' to a week's supply. Fodder can be brought from the hay shed during the day time, or when the work has eased off, and this reduces the distance which has to be travelled during the busy hours when the cows are being fed. Further, a supply of fodder can be stored here for use during the week-end.

Most farmers prefer to have the calf pens as near the byre as possible, so as to shorten the distance which milk has to be carried to feed the calves. Some even advocated having a few calf pens at the end of the byre to house newly born calves, while others would like to have a loose box or two for calving cows at the end of the byre.

Some/

Some of the inconvenience now experienced with badly laid out steadings is due to buildings, in the past, having been erected in a haphazard manner, with little forethought for possible future requirements. In the course of the survey a farm was visited where the farmer has carefully thought out the alterations and additions he wishes to make to his buildings with a view to future expansion, and has had an architect's plan of these prepared. He intends to carry out his ideal plan over a period of years, adding a building in its planned site as circumstances permit, till all have been completed. The important point here is that the farmer has planned ahead what buildings he is likely to require, so that there is no danger of his putting a building in a certain place, only to find a few years later that it would have been better in a different position.

#### The Use of Slope.

Some of the farms visited are situated on a slope and advantage is taken of this to use gravity to make work easier. Meal shed, turnip shed and hay shed are sited on the upper part of the slope, while the byre lies below, so that meal and fodder and everything that has to be brought into the byre is carried downhill. The dungstead is below the byre and the work of wheeling out the dung is made easier by the downhill gradient. Where the slope continues to fall below the dungstead, it can be utilised to assist emptying the latter, by bringing carts in at the low level and filling them from above.

Some two storey barns are built into the side of a slope so that access to ground level is obtained from both floors. Corn is unloaded direct from carts in the upper storey and passes down chutes to the hopper of a bruiser or hammer mill on the floor below and in this way the labour of lifting up bags to be tipped into the hopper is obviated. On farms which have a threshing mill built in, the drum may be situated in the upper storey, which makes it unnecessary to fork the load upwards when unloading.

#### Yards.

A number of farmers have had their farmyard tar-macadamised and have found that the smooth surface is very much easier to keep clean than bare earth and stones. It is much easier to wheel barrows or trucks across it than over rough stony ground and the inconvenience of walking through a muddy yard in winter time is avoided. Farmers who have made this improvement were unanimous that it was well worth the expense.

#### Byres.

The design and construction of the byre affects the amount of labour needed to look after the stock. Many of the old byres have been altered to bring them as nearly as possible to modern standards of design, but in others, the defects of old fashioned byres still exist and create extra work.

Double row byres are generally preferred to single row ones as they are said to require less labour. For the same number of stalls the double row byre is more compact and consequently entails less walking and time in attending the cows.

#### Grips.

One of the most general complaints on the byres visited was that the grips or dung channels are too narrow. The width of grip which is recommended by farm building advisors is 30 inches. Narrow grips tend to become filled with dung and impede the passage of urine, causing extra work in cleaning. On the other hand, it has been pointed out that if the grips and byre-walk are too wide, more labour is required to clean them.

In some byres, the grip has a slight slope from the stall to the byre-walk. Where it is wide enough, most farmers prefer this to the level grip as it enables water to flow to the back of it and pass freely to the outlet drain.

Some farmers advocate a short steep bevel of 30 to 45 degrees from the rear edge of the stall to the grip in order to prevent the cows from standing in the grip and treading on their dung. This appears to act quite effectively but the opinion has been expressed that such a grip takes longer to clean as there are two surfaces to be brushed - the slope and the bottom - instead of one.

#### Width of Byre. /

Width of Byre.

The difficulty of making the best use of labour in some of the byres of older design is well exemplified in the trouble experienced in byres which are too narrow. In some of these the correct length of stall and width of grip for modern conditions have been obtained only at the expense of the byre-walk, which in some instances has been reduced to as little as two feet. This makes it impossible to use a food cooler in the byre and a wheelbarrow can be set down only with difficulty as the legs are liable to slip into the grip.

Walls.

In practically all the byres observed, the inside walls are smooth for the first five feet from the ground, but above that they are generally finished rough so that they collect a great deal of dust and dirt, and are hard to clean in the summer. Modern byres have the smooth cement surface carried up to the roof and are easy to clean. A number of farmers have had the rough upper surface of their byre walls cemented smooth and have found this to be a great advantage. There are no ledges or corners in which dust can lodge and this helps to keep the byre clean, as well as saving time during spring cleaning. Other farmers use oil paint or waterproof distemper for painting the byre walls and consider that this makes them easier to wash.

Trevises.

Opinion differs as to the best type of trevise or division between stalls. The commonest is the concrete one which is solid from the floor to the top. Some farmers favour tubular steel trevises because the stalls can be cleaned easily by sweeping right down the byre underneath each trevise, and it is claimed that this takes less time than sweeping out each pair of stalls separately, as must be done with the concrete trevises. The disadvantages of the tubular type, however, is that cows can easily turn and horn their neighbour through the trevise and several cases of this are known to have occurred. It does seem possible, however, that the front part could be fitted with sheet metal or slots to prevent the cow reaching her neighbour across the trevise, while still retaining the benefit of the open trevise at the back, with its ease of cleaning.

Roof.

In many of the older byres, the roof is supported by heavy wooden trusses placed close together. These reduce the light, and being rough-surfaced, collect a great deal of dust and cobwebs which adds to the work of cleaning. Some farmers have improved this by cutting out every alternate truss, thus letting in more light and reducing the amount of cleaning to be done. It has been found, too, that varnishing the woodwork of the roof saves time in the annual cleaning of the byre, and less dust collects on the woodwork.

Doors.

The importance of having doors placed in a convenient position has already been discussed. A common complaint about byre doors is that they are not wide enough. Some doors were too narrow to allow an ordinary meal cooler or hay barrow to pass, and many farmers have had to make special narrow coolers which will pass through their byre door. A number of farmers advocate having the byre door wide enough to allow a horse and cart to pass through for bringing turnips or silage direct to the byre and for taking out manure.

Sliding doors are found to be of considerable advantage because they are easy and quick to open. Ordinary hinged doors, if not secured by hooks, are liable to be blown to by a gust of wind as someone is coming out of the byre with a loaded barrow of dung. The sliding door obviates this. One farmer wished to have a door at the end of the byre which communicated with a smaller byre built on the end of it. There was no room for a sliding door as there were stalls on both sides of the wall. He devised a door sliding in a vertical direction and exactly balanced by a counterpoise weight suspended at the end of a rope passing over pulleys above the door. This was opened and shut easily like a sash window.

Number of Byres.

On/

On many farms extra work is caused because there are so many separate byres, situated some distance away from each other. It is quite common for farms to have three or four cow and heifer byres and up to seven are to be found. In such cases all the byres cannot be equally near the milk house and food stores, so that much extra walking is entailed in looking after the cows. Most farmers would like to have one large byre for all their milking cows, and another for heifers and dry cows, and this would save a considerable amount of time and labour.

#### Feeding Passages.

Only a few of the byres seen were provided with feeding passages, but a number of farmers would like to have them. There is some difference of opinion about their value as a means of saving labour. The advantage of the feeding passage is that the feeding is done from the front and the time spent in walking to and from the byre-walk to each trough is avoided. One farmer stated that he could feed six cows from the front passage in the time it took to feed two from the byre-walk. The feeding passage too, is sometimes used for the temporary storage of straw and hay for the week-end.

Some feeding passages are not wide enough for a meal cooler to pass down and this necessitates feeding from baskets carried from the meal house to each cow. In such a case feeding from the byre-walk from a cooler may be quicker than feeding from the head passage. Some farmers maintain that to be of full use the feeding passage should be wide enough to allow a tractor and waggon to pass.

The chief argument advanced against feeding passages is that they entail extra work in sweeping, amounting to more than the time saved on feeding. It is also said that the cows tend to push their food out of the trough into the passage, whereas with the troughs against the byre wall, the latter is used as an aid in eating the food. This applies particularly to turnips. It can be prevented by having a low wall at the back of the trough. Some farmers advocate two way flap doors to each trough, although with doors, extra work would be caused by opening and shutting them. Another objection to feeding passages is that with stalls of the normal length fitted with rails in front, the cows stand forward and pass dung on to the back of the stall instead of into the grip. This difficulty could possibly be overcome by having more rails in front set closer together. Where a byre is provided with feeding passages, the total width is greater than in a byre without them and the roof span is consequently greater. This adds considerably to the cost of the byre.

#### Ramps.

Where the byre is situated on a higher level than another building, say a turnip house or a straw house, or where it is above the level of the yard, a few farmers have laid down cement ramps in place of steps up to the byre. It requires less effort to walk up a ramp with a heavy load than it does to walk up steps, and where wheelbarrows are to be used, some such ramp is essential.

#### The Dairy.

The importance of having the dairy as near the byre as possible has already been discussed. Some farmers have the floor of the dairy sloping towards a drain so that washing water can flow away easily. In some dairies the floor is level and becomes so wet that water has to be pushed to the drain by brush and squeegee. This causes extra labour which can be avoided by having a sloping floor.

#### Calf Boxes and Young Stock Accommodation.

The accommodation for housing calves and young stock is not governed by dairy bye-laws, and consequently varies considerably. Calves are generally kept in groups in pens or boxes, while young stock over a year old, are tied up in byres. Opinion varies as to whether byres or boxes require the least labour, but some farmers who keep their young stock in semi-open yards consider that they require less labour than where young stock are tied up in byres. The amount of labour used seems to depend, to some extent, on whether the dung is removed daily, weekly, or at longer intervals. One set of calf boxes which was seen, is provided with windows at the back of each box through which the dung is thrown, and it can be removed directly to the dungstead, which is nearby, without the necessity of wheeling it by a round-about route through the calf boxes.

In the calf boxes which have a passage along the front, an appreciable amount of time is saved by having hakes and food troughs at the front of the boxes next to the passage. With this arrangement all food can be given from the passage and no time is wasted opening the doors and walking to the back of each box to fill the troughs or hakes. On some farms the hake or hay rack lies to the front between two boxes and serves them both, in place of two separate hakes. This reduces the time taken for foddering, as only half the number of hakes have to be filled. A few farms have troughs which clip on to the front of the calf box by means of metal hooks and this enables them to be moved easily for cleaning.

For bucket feeding, one farmer has partially sunk round tiles, 9 inches in diameter, end on into the floor of each calf box. The milk buckets are set into these so that they cannot easily be overturned. A number of calf boxes have fronts made of slatted wood or tubular steel. The slats or tubes are arranged vertically and some of them are movable, so that the calves' heads can be drawn in and held firm, as in a yoke, between two slats, while their milk ration is placed before them. They are released when they have finished their milk.

Another useful device is to have the doors of the boxes opening outwards and of the same width as the passage. By opening the doors, the passage can be blocked and the calves directed into the box which it is desired they should enter. In other boxes, the front consists of a gate which fits into grooves, so that the whole front can be lifted out to facilitate cleaning the box.

#### SOME LABOUR SAVING PRACTICES.

##### Outwintering Stock.

In parts of the area where the climate is not too severe and where the soil is not too wet, young stock may be run in the fields, day and night, during the winter. All the farmers visited who carried out this practice agreed that it saved labour, and one claimed that it saved as much as the time of one man.

On several farms, where the land is suitable, young stock and bulling heifers are put out in the fields all day in winter, if the weather is not too bad. The farmers consider that this practice saves bedding and labour, while some maintain that the stock thrive better and make quicker growth in the summer. Other farmers prefer to keep the young stock indoors all day in winter and believe that they do better and require less labour than when put out.

##### Service of Cows.

A number of farmers have built improved types of bull pens in which the bull is firmly held by a chain or other device, operated from the exterior, when the worker enters the pen. Such pens may not save time, but they make the work safer and pleasanter and contribute to the well-being and content of the worker.

A labour saving device which finds favour on some of the farms visited is the practice of keeping the cows indoors all day, as well as at night, throughout the winter months. Many farmers put their cows out for exercise daily and allow them to run with the bull so as to detect those which are in season. Others put out only those which are due to come on heat. In this way the cows actually on heat are easily detected and can be put to service. A number of farmers, however, consider that this practice is unnecessary as the cows keep perfectly healthy without exercise and those on heat can readily be detected by observation in the byre. They maintain that the latter method saves up to half-an-hour's labour a day, compared with the practice of putting the cows out.

#### CONCLUSION.

The report, up to this point, has presented the results of a survey which was essentially a preliminary attempt by the writer to view the problem of saving labour in dairy byres over a wide field - a field in which the farmer, the worker, the farm buildings expert, the dairy engineer and equipment supplier/

supplier, and the farm economist all have an interest - sometimes narrow, sometimes wide. On many aspects too, problems of farm labour organization are linked with technical problems and conflict may arise between the saving of labour and technical efficiency e.g. in the number of times a day cows are fed. It is, therefore, not sufficient to consider the labour aspect only, of the problem.

While it is true that most farmers have reduced the amount of labour used in byre work compared with, say 25 years ago, much of this has come about through the extended use of milking machines and waterbowls. On some farms considerable thought has been given to saving labour by other means, but the problem has scarcely yet been tackled from the aspect of reducing the time taken, or lessening the fatigue arising from work. The writer, as a detached observer, was impressed with the amount of walking to be done and with the constant sequence of "lift and carry" with burdens of varying weights and sizes.

The wide variations in the effectiveness of labour use between the different herds studied is seen in the differences in the number of stock attended by one worker, which vary from  $11\frac{1}{2}$  to  $60\frac{1}{2}$  "cow equivalents" per day. This variation may be due to differences in many factors, chief of which are, the milk yields of different herds, the convenience of layout of the buildings, the skill of management, and the efficiency of the labour. There seems therefore, to be a pressing need for study of the practices in different herds, with a view to discovering the reasons for such variations and to ascertain if the labour can be used more efficiently.

The study of the efficiency of labour has received relatively little attention in this country, but in the U.S.A., techniques have recently been developed for simplifying farm work. The time taken for different operations and the distance travelled in performing them have been measured, and from the study of these, more efficient ways of carrying out the operations have been devised, which have resulted in considerable saving of labour. In one example, a 25 cow dairy farm in Vermont, savings of  $1\frac{1}{4}$  hours of labour and  $\frac{3}{4}$  mile of walking per day were made by modifying the buildings, introducing better equipment and by the adoption of easier methods of carrying out the work. The cost of making these changes was only \$ 150 (approximately £54.) It is hoped that the development of such techniques in this country will indicate ways of

increasing the efficiency of labour and of putting such savings in working time to effective alternative use or providing a greater degree of leisure.

Even with the milking machine in operation on most farms, the survey figures show that milking is still the longest job. Expressed in terms of the number of cows milked, the approximate time spent on each milking in the herds studied varied from  $5\frac{1}{2}$  to  $15\frac{1}{2}$  minutes per cow. The milking operation is one in which care and intelligence in its performance repay the dairy farmer, but the variation in the above figures suggests that the study of labour routines is one likely direction in which to look for further saving of time.

The amount of time and effort spent in carrying milk from the byre and pouring it into the cooler seems to be out of proportion to the importance of such a relatively unskilled operation. On one farm it was calculated that a girl carried a ton of milk in the course of a day. A method of mechanising this operation on a large farm has been described. More use might perhaps be made of auto-recording machines which transfer the milk to the cooler by vacuum. It has been suggested also that the immersion type of milk cooler might be suitable for farms where only a small quantity of milk is produced. In this, the milk is poured direct into the churns and these are put in an enclosed tank of water which is cooled by electric refrigeration. By its use double handling of the milk is avoided.

There is a definite need for machines to clean the byre. The machines at present available are expensive and there is not sufficient data as to the amount of labour they save, to enable a farmer to judge whether the expenditure required to install them is justified. The need is for a cheap machine which is suitable for use in small byres. At the same time, one farmer pointed out that many farmers are prepared to pay £400 or £500 for an implement which they use only for a few weeks in the year, but are not prepared to pay this sum for a byre cleaning machine which is in use every day.

The/



The large farms visited were usually well equipped with food preparing machinery, but only a few food mixing machines were seen. Farmers who had these were very satisfied with them and this leads one to suggest that more farms might profitably use them. It is possible that a greater use might be made of food preparing machinery on medium and small farms, and if more knowledge were available of the economics of such machines and the amount of labour they save, farmers would be in a better position to decide if the expenditure on them was justified or not. Much labour is spent in the double handling of foodstuffs, and greater use of elevators and conveyor belts would help to lessen this.

The number of journeys made to and from the store to feed the cows, could, in many cases, be reduced. Many farmers still bring food into the byre in baskets or pails, thus necessitating a separate journey for each pair of cows; while in some cases this is unavoidable, the use of food coolers for bringing in concentrates, or large barrows for roots or silage, would reduce the labour required. It may be that baskets and pails are preferred so that the cows' individual rations can be put out in them, but there seems to be no difficulty in measuring individual rations direct from the food cooler. On many farms too, the small size of food cooler makes several journeys necessary, whereas if the cooler or barrow were large enough to hold the feed for all the cows in the byre, only one journey would be necessary. A number of farmers have had to design equipment for carrying food, suited to their own requirements, and this suggests that despite the wide range of such equipment already on the market, there is room for additional types carrying larger loads.

Now that labour costs have assumed such a high proportion of total expenses, the need to relate the design and layout of new buildings to economy of labour has become a matter of considerable importance. At the same time the provision of the most suitable equipment to reduce labour costs and fatigue in work has to be considered so that the buildings may be designed to suit the equipment. There is room, therefore, for a great deal of thought in the matter of byre design and layout of dairy buildings in order to achieve the greatest possible saving of labour.

Saving labour has been the theme of this survey, but some consideration must be given to the uses to be made of the time saved, so that it can be fitted into the general pattern of the work on the farm. On the farms where the staff employed in the byre and dairy are engaged solely in attendance on the herd, saving time may be of little interest to the farmer because there are no alternative uses for the labour; nevertheless it may be worth while if it makes the work easier, or more interesting, for the staff. On the other hand, it is possible that, in many cases, extra time could profitably be spent in giving greater individual attention to the feeding and care of the cows. Again, time saved in the daily routine may obviate the necessity for overtime on week-days. It is on the family farm, however, where saving labour is likely to be of the greatest immediate advantage. Here, the time saved in the daily routine, may be spent, not only in giving greater care and attention to the herd, but also may be used for other farming operations, or, what is also important, to afford the members of the family more leisure.

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