

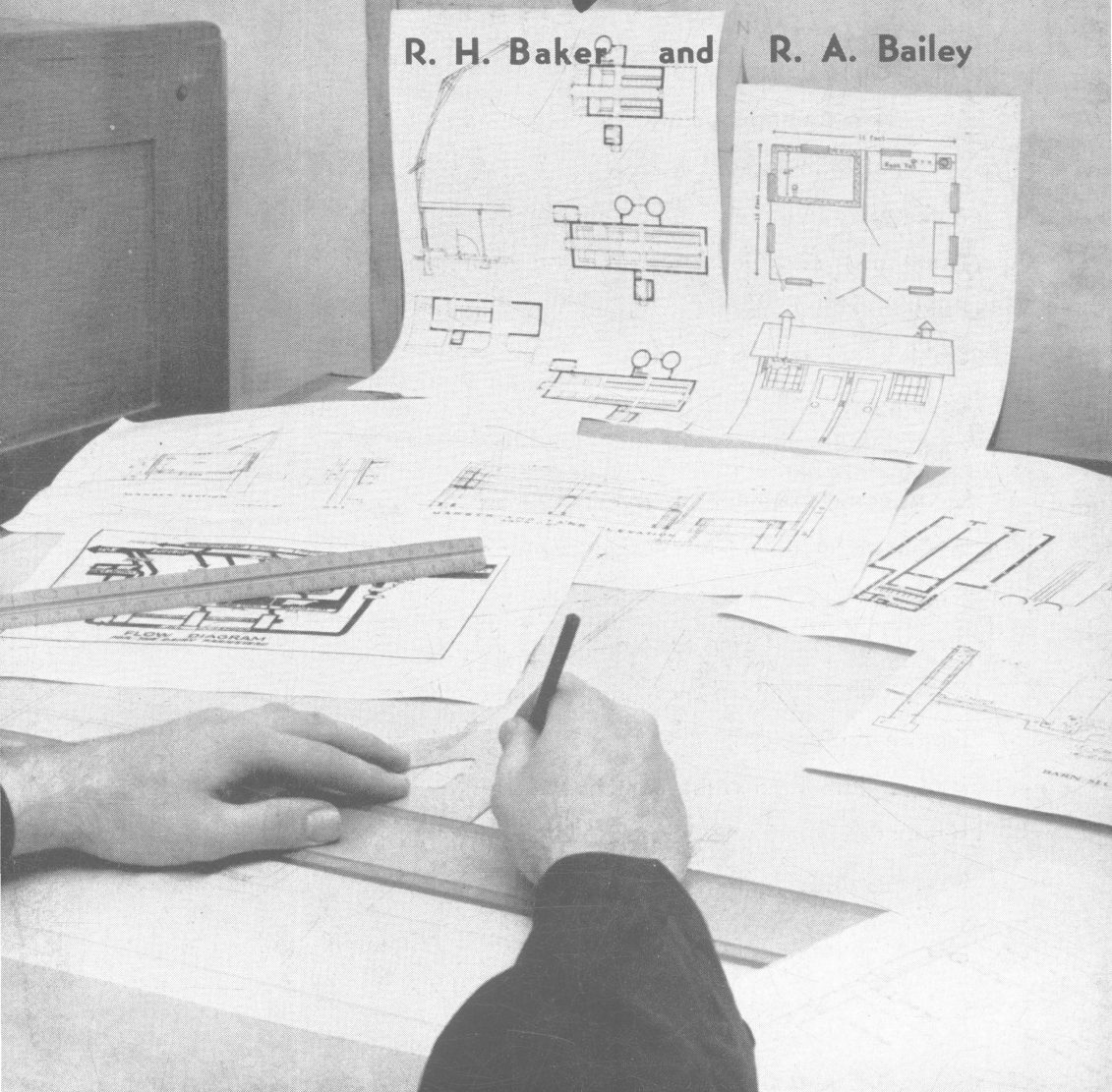
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Plan Dairy Chores

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**OHIO AGRICULTURAL EXPERIMENT STATION
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PLAN DAIRY CHORES

R. H. BAKER and R. A. BAILEY

PREFACE

Great strides have been made in reducing the time required to produce most of Ohio's field crops. Less attention has been directed to saving time and effort in caring for the livestock on Ohio farms. More recently, considerable interest has been shown by dairy farmers in new chore routines, labor saving devices and rearranging barns as means of reducing labor in the performance of dairy chores. Ohio cost studies have shown that the time spent doing dairy chores on many farms is sometimes more than 150 hours per cow each year. A milk cost study in 1946 revealed that the average time spent per cow in Ohio was 128 hours per year. One dairyman who was visited in this study had reduced his labor required to 44 hours per cow per year.

Within the last 20 years, milking machines have been put into use on large numbers of Ohio farms. Rather recently, a number of farms have installed milking parlors. These are rooms containing stanchions or stalls through which cows pass in shifts to be milked. During the winter the milking herd is turned loose in a loafing area where they have free access to water and hay.

PURPOSE

This study was undertaken to secure basic data on the usual dairy routines under different management patterns; to determine the average rates of accomplishing the various operations that are the elementary parts of dairy chores; to secure information on whether there is any difference in time required to do dairy chores in milking-parlor loafing-pen units and in conventional stanchion barns; to collect information on labor-saving devices and methods; and to acquaint dairymen with these labor-saving methods.

METHOD

Early in 1948 preliminary visits were made to a large number of dairy farms in central Ohio within 50 miles of Columbus. From this group 15 farms were selected for intensive study. These farms were not chosen to be representatives of all dairy farms. An attempt was made to select units having from 15 to 25 cows, using milking machines, feeding silage, having milk houses located fairly close to the stable, and having what appeared to be fairly efficient arrangements. Five of these farms

were conventional stanchion units, five were milking parlor-pen arrangements, and five were hybrids, that is, each had both a loafing pen and enough stanchions to accommodate the entire herd to be milked at one time. There were 289 cows on the 15 farms. The average size of herd on the stanchion, parlor-pen, and hybrid units was 22, 17 and 19 cows, respectively.

Direct observations of the time spent and distance traveled in doing dairy chores on these 15 individual farms were made. Operators were asked to perform each dairy job in the usual order and manner, not speeding up the operation, slowing down or stopping to talk to the observer, in order to obtain the normal rates of performance on each farm.

A detailed floor plan of the dairy chore area was drawn to scale before chores were observed. Two men made detailed stop-watch records of both morning and evening chores for two days during the barn feeding season and one day during the pasture season. A "continuous timing" method was used to determine the time elapse for each element of the various operations. The distance traveled for each job was determined by re-enacting the jobs and measuring them on a scale drawing with a "map reader". Information was secured on amounts of milk sold, used in the home, and fed to calves. Space used by the dairy herd was measured and the amount of bedding used was obtained. Data on periodic jobs of feed grinding and seasonal manure removal were gathered. The size of and distance to pastures were measured.

Records of time and distance were studied individually and in groups. From the results, usual rates of doing the various jobs were determined. Also efficient rates for these jobs were calculated for barns that were well arranged and well-equipped. Controlled examples were compared using these rates of accomplishment for the various jobs under different systems of management and with different sized herds.

At the same time dairy chores were being done, some operators also did other livestock chores. Time and distance on these other jobs were omitted in these comparisons.

In addition to the daily and seasonal jobs described and recorded in this study there are the types of necessary jobs connected with the dairy herd, performed at such infrequent intervals as to make them difficult to study. Some of these jobs are: (1) breeding cows, (2) observing cows coming into heat or by other irregularities, (3) clipping cows, (4) treating cows for lice, sore feet or minor ailments, (5) spraying for flies, (6) cleaning cows, (7) care at calving time, (8) cleaning drinking cups, (9) keeping salt and mineral boxes filled, (10) extra scrubbing and disinfecting, not ordinarily done each day, and (11) white washing stable.

Some factors were considered which influenced the rates of accomplishment of these men. Some men work at faster rates than do others for various reasons other than the building arrangement. They may walk faster, be stronger or more dextrous. They may also think about what they are going to do next and plan their work to better advantage.

The difference in the amounts of milk, feed, bedding and manure handled per cow may have some influence upon the time required to do the jobs of handling these items.

No effort was made to measure the difference in quality of milk produced. Whether the extra time taken in washing udders, brushing cows, or cleaning stables resulted in cleaner milk with lower bacteria count was not determined. It was assumed in all of the herds studied that the observed care resulted in a milk of sufficiently high quality to meet minimum sanitary standards of the City of Columbus.

It is difficult to tell how the bedding practices or manure removal policies affect the health and comfort of the herd. Due to the difficulty of measuring any of these differences it was assumed to be adequate as observed.

DAIRY CHORE JOBS

Chores for the milking herd were divided in job groups. These included milking and carrying milk, care and cleaning of milk equipment, feeding, bedding and cleaning stable, fastening and unfastening cows and getting cows to and from pasture. Considering the time spent in both pasture and barn-feeding seasons, it was found that milking and carrying milk took 47 percent of the time and 31 percent of the travel.

These jobs are especially important and warrant considerable attention because they take so much of the chore time. The manner in which they are done has a great influence upon the success of the dairy enterprise. The quality of work must not be sacrificed in effecting economies.

TABLE 1.—Distribution of Dairy Chores By Jobs, 15 Farms, Ohio, 1948

Jobs	Percent of chores	
	Time	Travel
Milk and carry milk	47	31
Care for and clean milking equipment	15	13
Feed	11	18
Bed and clean stable	10	13
Fasten and unfasten cows	6	11
Get cows to and from pasture	5	12
Other	6	2
Total	100	100

The feeding job for the year took 11 percent of the time and 18 percent of the travel. The winter-time feeding takes between 4.5 and 5 times as much time and walking as it does in the summer months. When getting cows to and from pasture is considered a part of feeding, the winter feeding time is over 50 percent greater than in summer.

Cleaning the stable and bedding the cows took 10 percent of the time and 13 percent of the travel for the year. Bedding accounted for about one-third of this total. Turning the cows in and out of the stable took 6 percent of the time and 11 percent of total dairy-chore travel for the year.

Differences Among Operators

Considerable variation in chore time and travel was observed among the 15 operators. The dairyman spending the most time per cow put in $3\frac{1}{2}$ times as many hours per cow as the man who spent the least time.

Since the winter months find dairymen performing more jobs with the herd because of silage and hay feeding, bedding, and more stable cleaning, a comparison was made of individual herds to determine which were most and least efficient at particular jobs during the winter or barn feeding season.



Fig. 1.—Getting the cows in and out of the stable varied from summer to winter but averaged about 6 percent of the time and 11 percent of the total travel during the entire year.

For the same jobs, many of the least efficient men spent three and four times as much time per cow as the most efficient operators. The points of most striking contrast were the waiting periods. The five least efficient men spent 20 times as much time per cow waiting for cows to finish milking and waiting between other jobs as did the five most efficient men. The contrast in time spent washing udders before milking was great because some men did not wash all cows milked. The least efficient men walked four times as far per cow carrying milk as did the most efficient men. The jobs of feeding, bedding, cleaning stable, and turning cows in and out of the stable were performed by the most efficient men in one-third to one-fourth the time and travel per cow as that used by the five least efficient operators.

Seasonal Differences

The regular everyday dairy chores for the milking herd on the 15 farms studied averaged for the year about 15 minutes and one-eighth of a mile per cow each day. In the winter months daily chores required about two minutes per cow longer than they did in the pasture period. Travel in doing the daily chores for the milking herd in the barn feeding season was 10 percent more than during the pasture season.

TABLE 2.—Winter Dairy Jobs: Most Efficient and Least Efficient Operators on 15 Central Ohio Farms, 1948

	Av. 15 farms		Av. low one-third		Av. high one-third	
	Minutes per cow per day	Feet per cow per day	Minutes per cow per day	Feet per cow per day	Minutes per cow per day	Feet per cow per day
Feed silage	1.34	82	.81	39	1.93	138
Feed hay	1.06	70	.42	32	1.80	108
Feed grain	.58	46	.34	23	.89	80
Other feeding	.20	25	—	—	.53	57
Cleaning stable	1.40	79	.65	36	2.22	127
Bedding	.81	38	.34	17	1.28	65
Turn cows in and fasten	.44	39	.22	18	.64	59
Turn cows out and unfasten	.32	27	.16	11	.51	42
Preparing milking equipment	.88	47	.60	28	1.13	70
Wash udders	.85	29	.26	8	1.34	51
Putting on surcingles	.25	15	—	—	.60	43
Putting milkers on	.78	34	.62	23	.98	42
Check and remove milkers and machine strip and empty milk	2.13	39	1.21	26	3.13	49
Hand stripping	.59	9	—	—	1.70	24
Carry milk to milk house	.90	75	.58	32	1.14	131
Cleaning milking equipment	1.61	36	1.06	22	2.19	55
Delay during milking	1.37	—	.14	—	3.10	—
Other delay	.42	—	.04	—	.87	—
Care of youngstock and bull	2.13	153	1.06	79	3.48	235
Total	18.06	843				

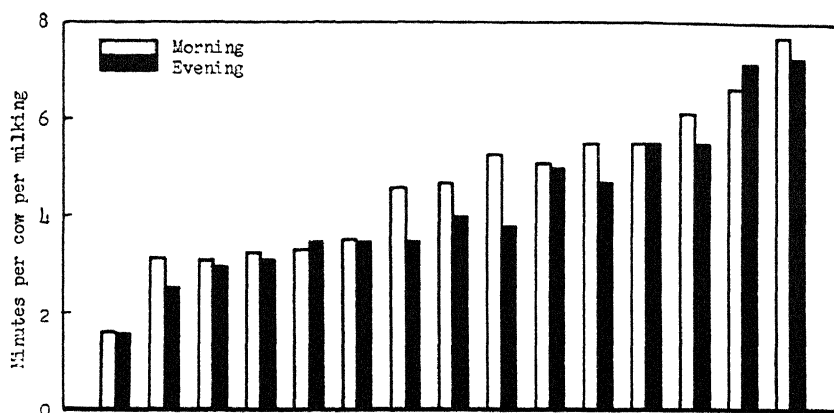


Fig. 2.—In a 20-cow herd, the average milking time was $4\frac{1}{5}$ minutes. This graph shows the variation between farms studied in making this survey.

Daily time and distance devoted to milking and care of milking equipment was about the same for summer and winter. In summer, the chore of getting cows to and from pasture was partially balanced by the omission of hay and silage feeding. The combined distance traveled was about the same, but there was a net reduction in time of one minute per cow per day in favor of summer operation.

Stable cleaning and bedding only required about one-third as much time and travel in the pasture season as during the barn feeding season.

MILKING

The task of milking is of major importance because of the large amount of skilled labor required at very definite periods twice each day. On these 15 farms the milking process took from 40 to 50 percent of the total time of caring for the cows. Another one-sixth of the time was spent in the care and cleaning of milking equipment. Since skilled help is not usually hired easily, the milking chore on most farms was done by the operator and his family.

In herds of 20 cows the operators spent an average of two hours and 20 minutes milking. This was an average of about $4\frac{1}{5}$ minutes per cow milked per milking or $3\frac{1}{2}$ minutes per cow in the herd (dry cows included). One dairy man operating three single milker units alone, took $1\frac{5}{8}$ minutes per cow while on another farm a father and son together used one double unit and spent $6\frac{5}{6}$ man minutes on each cow. The variation between farms is shown in Figure 3. Milking machines were used in all herds. The average length of time the milker was left on a cow was $5\frac{3}{4}$ minutes.

TABLE 3.—Distribution of Dairy Chore Time and Travel By Principal Jobs, Summer and Winter, 15 Farms, Central Ohio, 1948

Dairy jobs for milking herd	Minutes per cow per day		Feet per cow per day	
	Winter	Summer	Winter	Summer
Milking and carrying milk	7.3	7.5	207	210
Care of milking equipment	2.5	2.3	83	88
Feeding grain, hay and silage	3.0	.4	209	42
Stable cleaning and bedding	2.3	.8	127	45
Fastening and unfastening cows	.8	1.0	67	79
To and from pasture	—	1.6	—	154
Others	.4	.4	5	8
Total	16.3	14.0	698	626

Dairy jobs for milking herd	Percent of chore time		Percent of chore travel	
	Winter	Summer	Winter	Summer
Milking and carrying milk	43	54	29	33
Care of milking equipment	16	16	12	14
Feeding grain, hay and silage	19	3	30	7
Stable cleaning and bedding	14	6	18	7
Fastening and unfastening cows	5	7	10	13
To and from pasture	—	11	—	25
Others	3	3	1	1

Since milking is one of the most time-consuming jobs, it probably offers possibilities for improvement and resulting savings in time.

There is no evidence to indicate any relationship between the amount of milk produced by a cow and the length of time required to obtain it.

A new rapid milking procedure which reduces machine time and total milking time has been successfully adopted on many farms. The procedures are: (1) massage the udder with warm water and draw one stream of milk from each teat into a strip-cup one minute before application of the milking machine; (2) remove the machine as soon as the cow is milked out, usually in four minutes or less; (3) strip the cows out with full hand squeezes or by machine stripping. The latter is a process of manipulating the udder and pulling down on the teat cups just before removing the machine.

This rapid milking process is based upon the following fundamental facts: (1) cows must be milked out completely or drying will set in; (2) the let down of milk is a positive act involving a stimulus, the nervous system, the pituitary gland, the blood stream and the tiny muscle cells located around the alveoli; (3) adverse stimuli such as excitement,

TABLE 4.—Time and Distance in Milking Operations on 15 Farms,
Winter and Summer, Ohio, 1948

Operations	Time. Minutes per cow per milking		Distance. Feet per cow per milking	
	Winter	Summer	Winter	Summer
Washing udders	.4	.3	14	11
Putting milkers on	.4	.4	17	16
Checking and removing milkers'	.8	.9	19	20
Emptying milk	.3	.2		
Hand stripping	.3	.2	4	4
Carrying milk to milkhous	.5	.5	39	43
Waiting	.7	.9	—	—
Other	.2	.4	10	11
Total	3.6	3.8	103	105

*Machine stripping included

fright, etc., may interfere with the let down of milk; (4) if all milk is to be obtained, it must be removed rapidly once a cow has been stimulated to let down her milk (experiments have shown that if more than seven minutes are taken in milking a cow, the milking will not be complete); (5) cows respond to milking depending upon their previous training; and (6) the inside of the teat and the udder may be injured by severe milking practices.

Milking is a special task and the operator must give his full and uninterrupted attention to the details of milking. Introduction of rapid milking into a herd accustomed to a longer machine period must be made gradually. Sometimes it is necessary to cull out individual cows that are particularly hard milkers or have diseased udders.

Adoption of rapid milking practices can reduce the total milking time or the operator can milk more cows in the same time. If time is saved and the cows are not properly milked, other efforts to improve dairy chores may be nullified. If the pulsator lid can be changed to an extra milker pail, total milking time can be reduced considerably because the milk can be weighed and emptied while the machine is working on the next cow.

Order in Which Cows Are Milked Affects Distance

Whether cows face in or face out, the milking jobs require about the same time per animal when cows are milked in the order they are standing. Milking time is practically the same whether the order is one in which machines are on adjacent or alternate cows in a line or on cows on opposite sides of the center driveway of a face-out arrangement.

The order of milking affects the distance traveled. When machines are put on adjacent cows and they are milked in order, the minimum

travel in a face-out barn is about 50 feet per cow. This does not include carrying the milk. If milkers are placed on alternate cows, the milking travel is about three percent greater. Milking on opposite sides of the center driveway, increases travel about five percent. A 20-cow face-in barn with milkers placed on adjacent cows requires about 11 percent more travel than a face-out barn. The extra travel in the face-in barns is in the several trips around the end of the two rows of stanchions.

Carrying Milk

The distance from the milkhouse to the mid-point in the milking stable and the number of cows' milk carried each trip determines the amount of travel. The average distance carried was 78 feet. In the pen-parlor barns it was 50 feet while in the full stanchioned barns it was 88 feet.

There were 15 percent more trips made to the milk house in the summer than in the winter. This is largely due to a greater milk production and the need for rapid cooling of milk in summer.

Machine Milking Time

The time machines were left on cows varied greatly among herds and also among cows in each herd. Average time was $5\frac{3}{4}$ minutes per cow. The farm having had the shortest average time, $4\frac{1}{5}$ minutes, had the highest producing herd with 12,620 pounds of milk per cow for the year. The farm with the longest time, almost eight minutes per cow milked, produced 6,520 pounds of milk per cow. On nine of the farms the time average varied from five minutes to $6\frac{1}{10}$ minutes per cow.

The time milkers were left on individual cows varied from 1.6 minutes to 17 minutes. One-fourth of the cows were milked out in 4.3 minutes or less. One-fourth of the cows taking the longest time had the milkers on 6.75 minutes or more.

Hand Milking Time

In the 15 herds, 97 percent of the cows were milked with machines. In only two herds some cows were milked regularly by hand. In both cases an extra worker, not fully engaged during the period of milking, milked two cows, in addition to doing some hand stripping, to reduce the total chore period. In addition, a few fresh cows or cows being dried up were hand milked. The time spent in hand milking averaged seven minutes and 15 seconds per cow which was about two minutes longer than machine time.

Hand Stripping

Most of the herds were machine stripped. Only 24 percent of the cows were handstripped. The average time spent in hand stripping was one minute and 20 seconds per cow stripped.

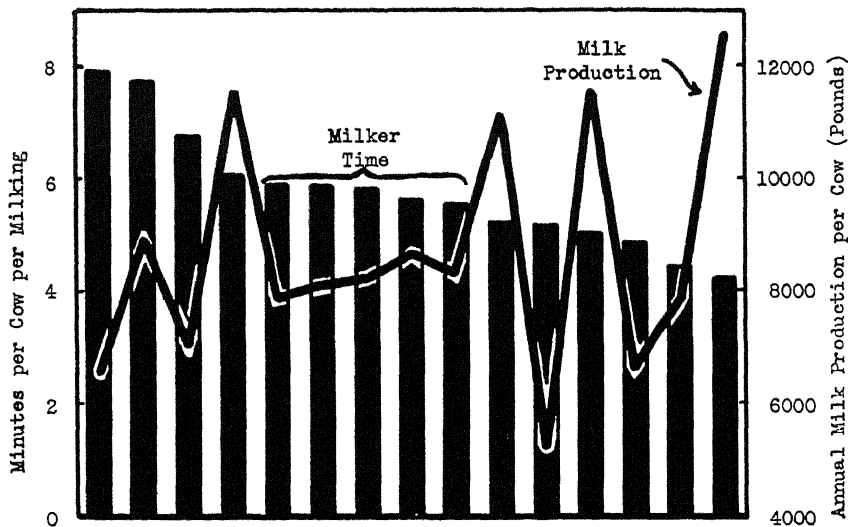


Fig. 3.—In this chart it can be observed that the farm where the longest time was consumed, the production was 6,520 pounds per cow while the shortest time was $4\frac{1}{5}$ minutes and the production was 12,620 pounds per cow.

Length of Time Cows Are in Milking Parlor

Interest is often expressed as to the length of time cows spend in the milking parlor and whether the cows have sufficient time to eat all of the feed placed before them. On all five pen barn farms the cows were fed ground feed in the milking parlor. At the time of the study one of the five men also fed silage in the parlor but has since changed his arrangement and feeds it in the loafing pen. On one farm the cows were usually in the parlor about nine minutes. Some shifts were only in seven minutes. Cows had ample time to eat all feed placed before them. Other operators report that cows will clean up all of their grain if only in the parlor five minutes.

Preparation and Cleaning of Milking Equipment

Part of the job of caring for the herd is done in the milk house. Care of the milking equipment consumes almost the same amount of time even if the herd varies from 10 to 25 cows. Milking machines require the same treatment and must be carried to and from the milking area before and after each milking regardless of the size of herd. The same is true of carrying-pails and strainers. One set of udder-washing and teat-cup rinsing solutions will usually serve either a large or small herd.

The average time spent in caring for milking equipment on these 15 farms was 45 minutes per day. This was one-seventh of the total time spent with the milking herd. The distance averaged 1,636 feet per day (three-tenths mile) or 113 miles per year.

Some people spend a great deal more time on the care and cleaning of milking equipment than do others. Differences in type of equipment and manufacturers' recommended care, facilities for cleaning, speed and ability of the person doing the job, and individual sanitary standard all influence the time spent. One man spent 26 minutes per day (161 hours per year) caring for his milking equipment while another spent $2\frac{1}{2}$ times that or 67 minutes per day (405 hours per year) doing the same job.

One man walked 742 feet per day (51 miles per year) in caring for his milking equipment while another traveled four times as far or 3,012 feet (208 miles) on the same task.

The one-third who were most efficient in preparing and cleaning equipment spent 33 minutes per day as compared to 58 minutes for the least efficient one-third. The one-third who traveled the longest distance walked 2,472 feet per day while the third with the shortest routes walked 911 feet per day.

The time and travel in caring for milking equipment are excellent examples of rather fixed items that do not vary as size of herd changes. There are many other spots in the dairy chores where the inputs are rather constant for herds of different sizes. Climbing up and down to throw down hay, silage, and bedding is the same whether four or forty cows are cared for. The following table illustrates how herd size affects requirements per cow for some fixed inputs such as the care of milking equipment in which 742 feet were traveled and 45 minutes were spent per day.

The larger herds have a proportionately smaller units requirement of time and travel per cow.

TABLE 5.—Requirements for Care of Milking Equipment per Cow per Day

Size of herd	Per cow per day	
	Minutes	Feet
8 cows	5.6	93
16 cows	2.8	46
24 cows	1.9	31
32 cows	1.4	23

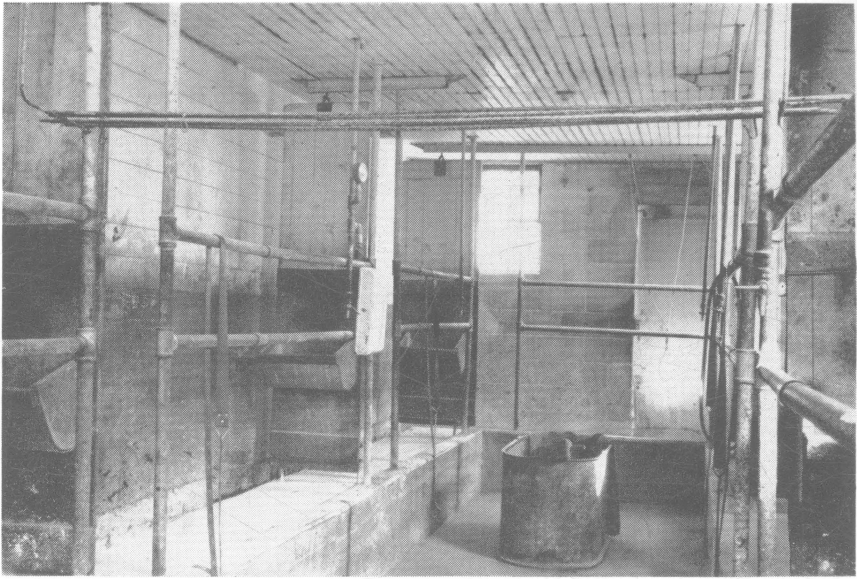


Fig. 4.—Milking parlors such as these are becoming more widely used. Some dairymen feed silage but all contacted fed some ground feed while the milking was being done.

FEEDING

Some dairymen fed minerals or molasses in addition to silage, hay, and grain. All operators fed ground feed. On three of the units all the grinding service and hauling was performed by a local elevator. The average time spent hauling, grinding and mixing the ground feed on the other twelve farms amounted to one-half minute per cow per day.

Grain Feeding

On all of the farms studied the ground feed was fed in the milking portion (stanchions or parlor) of the barn. Only three of the men used feed carts. In these herds it took a little less time to feed grain but the distance traveled was about half as far per cow as on the farms not using feed carts. As an average for the year, where carts were used, it took 21 seconds, and 20 feet of traveling per cow to feed grain. In one full-stanchioned herd not using a cart, each pair of cows was fed grain at about the same time their udders were washed, about one or two minutes before milkers were put on. This man spent 1.4 minutes and walked 187 feet per cow. The other 11 men who did not use carts spent 24 seconds, and walked 35 feet, per cow per day. In some cases a feed bin was located in the center of the alleyway in front of the cows. This reduced the number of steps grain had to be carried in feeding but it sometimes obstructed the aisle and prevented the use of a silage cart.

TABLE 6.—Feeding Chores on 15 Dairy Farms, Central Ohio, 1948

Feeding operations for milking herd	Minutes per day per cow for milking herd	Feet per day per cow for milking herd
Winter		
Feeding silage	1.3	83
Feeding hay	1.1	71
Feeding grain	.6	46
Grinding, etc.	.6	†
Other feeding	‡	9
Summer		
Feeding grain	.4	40
Grinding, etc.	.4	†
Other feeding	‡	2

† Such a wide variety of systems used, this figure not included

‡ Less than 0.1 minute per cow per day

Grain feeding in the five milking parlors took only 60 percent as much time and travel as in the five full-stanchioned units

If ground feed can be stored overhead in a bin with a sloping bottom and dropped by gravity into the cart, both time and energy can be saved. If this is not feasible, it should be stored in the sack as near the place it is to be fed as possible. If stacked on a platform, it may save some lifting when dumped into the feed cart.

Cart

Carts, used in feeding grain and silage, can aid materially in reducing travel and effort in dairy chores. To be used successfully, curbs and other obstructions must be removed or bridged. A cart should hold enough feed for an entire feeding in order to minimize backtracking and reloading, yet should be narrow enough to pass through the aisles conveniently.

Hay Feeding

Hay was fed in several different forms; baled, chopped and loose hay. The relative location of the hay storage area to the place where the hay was fed and the number of times it had to be handled seemed to have more influence upon the time spent and distance traveled than whether it was baled, chopped or loose.

The average time required to feed hay to a herd of 16 cows was 17 minutes per day during the barn feeding season. The travel to feed hay to these 16 cows averaged 1,116 feet per day. However, one man who had 17 cows spent seven minutes per day and traveled only 380 feet. Two other men, each having 14 cows, spent 22 and 26 minutes per day feeding hay and walked 1,342 and 1,402 feet each day.

One man with 26 cows in the winter of 1947-1948, feeding chopped hay in the stable, spent 73 minutes per day and traveled 3,938 feet doing the hay feeding. The following winter he was feeding chopped hay in a loafing pen using large hay self-feeders that were filled only once every three days. An average of 14 minutes and 482 feet per day were required for the same herd under the new management.

If long or baled hay can be thrown directly from the mow into feeding racks in the loafing area, some time and effort can be saved. In a stanchion barn, if possible, chutes should be located where hay can be dropped in front of the cows at convenient feeding points.



Fig. 5.—Carts similar to one shown in use here can save both travel time and actual effort while doing dairy chores. All obstructions must be removed so that the cart can be pushed easily around the barn.

Silage Feeding

Silage was fed to the dairy herd on all of the 15 farms visited. Only three of them used a silage cart in feeding. Others used a scoop, basket or tub.

An average of 750 pounds of silage were fed each day. Silage was removed from the silo at the rate of 100 pounds per minute including time getting to and from the job. Workers fed $2\frac{1}{2}$ cows per minute. They traveled 42 feet where no carts were used and nine feet per cow using carts. Silage was fed to both the milking herd, which averaged $19\frac{1}{4}$ cows on these farms and also to young stock and bulls.

The average time spent in feeding silage to the milking herd was seven minutes, 40 seconds per feeding. The distance averaged 772 feet. Men using carts did their silage feeding in about six percent less time per cow walking $\frac{2}{9}$ ths as far as those not using carts.

One man feeding silage to 28 cows by use of a scoop, walked 2,572 feet per feeding. The following winter he used a cart and reduced his travel to 330 feet. With an end cross aisle, he could have reduced this to 210 feet.

Some men reduce the time spent by feeding once each day, usually in the morning. If the cart is placed under the chute when silage is thrown down, it will save an extra handling of at least the first load. The cart should hold enough silage for a feeding and thus the worker would not have to backtrack to reload.

STABLE CLEANING AND LIMING

The task of removing manure, sweeping the aisles and mangers, and spreading lime or phosphate took 1.5 minutes and 79 feet per cow per day in the winter. In the summer months it was about one-half of that or .8 of a minute and 45 feet traveling.

Manure was removed from the stable with a litter carrier on one farm. Wheelbarrows were used on two others. Manure was thrown on a spreader that was driven through one face-out barn. The other eleven carried the manure out with shovels and forks. The method had very little affect upon time required. Using wheelbarrows and driving the spreader through the stable reduced travel 10 percent.

The time spent spreading manure on the fields is not included in these figures. Considerable variations were found in frequency of hauling, place spreader was stored, and source of power. To remove these variables in these chore comparisons only the time spent getting the manure out of the stable and into the spreader or manure pit was considered.

PERIODIC MANURE HANDLING

In addition to the daily stable cleaning, the manure produced by the milking herd in loafing pens, maternity pen, and exercise lots had to be removed periodically. On some farms this was done only once each year while on others it was done two, three to four times. Again the time spent in hauling and spreading manure is not included. Only loafing time is included. Operators using loafing areas spent nearly three hours per cow per year doing this job while those who followed a full stabling plan spent one-sixth as much time or less than one-half hour per cow.

BEDDING

On most of the farms studied, straw provided the principal bedding medium. Some shredded fodder was used on six farms. One stanchion barn used wood shavings.

Considerably less bedding per cow was used in the full stanchion barns than in either of the other types. In those only .93 ton of bedding per cow was used, in the parlor-pen units 1.65 tons, and on the combination stanchion and pen units 1.93 tons of bedding were used.

A closer relationship is found between the amount of bedding used and the floor area per cow than to the number of cattle in the herds. The 15 farms used an average of one ton of bedding each year for every 100 square feet of barn space used.

The job of bedding required .8 minute and 38 feet per cow per day.

SPACE

In comparing the groups of farms it was found that those farms following a parlor-pen system used $1\frac{1}{2}$ times as much barn space per cow as on the conventional full stanchion units. The hybrid units used over twice as much barn space as full-stanchioned units. One farm in the hybrid group had accommodated a much larger herd in the same barn a few years earlier.

The full stanchioned units used on the average 103 square feet of barn space per cow for the stable, maternity stalls, feeding area, milk house, and service area. The parlor-pen units providing space for the same functions plus the loafing area, averaged 157 square feet per cow. The loafing area averaged 106 square feet per cow. The hybrid units used 217 square feet per cow. The buildings necessary to provide the loafing pen space in both the parlor-pen barns and the hybrid units, can be of a lower-cost type construction than the full stanchion barn.

DRIVING COWS

The task of getting the herd to and from pasture is influenced by location of pasture in relation to the buildings, summer feeding policy,

regularity of milking time, temperament of the cows, and whether a good stock dog is used. One man with a herd of 26 cows and a very convenient pasture spent seven minutes per day while another man with 19 cows whose pasture was 50 rods down the road spent 70 minutes per day in the pasturing operation.

On an average they spent 1.6 minutes and walked 154 feet per cow per day getting the cows to and from pasture.

A LONGER PASTURE SEASON

More time is required during the barn feeding season to care for the dairy herd than during the pasture season. Even considering the time spent getting the cows to and from the pasture, it requires 12 percent less time to look after a herd when they are on pasture. This is possible because the cows harvest and feed themselves forage rather than have it handled by the dairyman.

If a pasture management program provides a supply of good forage from early spring to as late as possible in the fall, the barn feeding period is shortened. This results in less time required to care for the herd because they are on a barn feeding schedule for a shorter period. The milk per cow would probably be greater under longer pasture program reducing labor per unit of milk produced.

FASTENING AND UNFASTENING COWS

In the winter months the full stanchioned herds required only one-half as much time turning cows in and out of the stable as did the pen-parlor herds. In the summer time the jobs were more nearly equal. It took one minute and 77 feet per cow per day in the pen-parlor units in the winter as compared to .5 minute and 49 feet for the full stanchioned units. In the summer the pen-parlor operators spent .9 minute and 71 feet per cow per day while the men with full-stanchioned units spent 1.1 minutes and 98 feet per cow.

For the 15 farms the average for the year was .9 minute and 73 feet per cow to fasten the cows in their stalls and turn them out each day.

ADAPTED TOOLS

The selection of small tools such as shovels, brooms, forks, scrapers, etc., that are well adapted for various dairy jobs is one thing that is often neglected in otherwise efficient dairy barns. Size is an important consideration. Shovels adapted to gutter width reduce back-tracking in cleaning stable. Wide, stiff-bristled push brooms do a faster and more thorough job in sweeping aisles.

It is well to store tools near the area where they are to be used. Ideally they should be located where the job begins. It is desirable as one task is finished to be able to pick up the proper tool and start the next

job without wasted steps. A few extra small tools, stored at proper places may make this possible. Tools should be kept in good working condition.

WAITING

Idle time spent waiting for the milking machine to complete the milking process varied from none or less than one minute per day for the entire herd on some farms, to one extreme case where two men who worked with one double-unit milker spent 1½ man hours per day waiting for the machine to finish. Seven of the operators who spent the most time waiting for milkers to finish, spent one-third of their total milking time waiting while the seven who waited the least spent less than 5 percent of their total milking time standing and waiting that amounted to one-half minute per day per cow.

Some of this waiting is necessary but a portion of it on most farms could be reduced. It is difficult to plan any system so as to eliminate all delay but if the operations are carefully integrated, the total unnecessary delay should be reduced to one-half minute per cow per day.

Delay is often a habit rather than a necessity. The amount varies, depending on how badly the operator wants to finish the job.

ARRANGEMENT OF JOBS AND REDUCTION OF WAITING TIME

Any dairyman, attempting to reduce his chore labor requirements, could devote some time to planning the most efficient organization and sequence of doing the various jobs. Sizeable savings can often be made in this way with little or no expense.

When possible it is desirable to plan chores so that a series of jobs can be done with a minimum of backtracking. Usually circular travel, such as one trip around the barn sweeping or feeding grain from a cart, is most efficient.

Properly placed cross and end aisles make circular travel possible and save many steps. Doors and gates at the right places make routes shorter. Equipment can be taken to the milk house when the last few loads of milk are carried from the cows. Other opportunities for this type of change are found on most farms.

Reduction of waiting time between jobs is important. Particularly when milking, the operator often has to stand idle while he waits for cows to finish milking. On an efficient one-man farm, waiting time in milking 20 cows amounted to twenty seconds per milking. Considerably higher waiting times were found on farms where more than one man did the milking. The use of rapid milking and rearrangement of the order in which udders are washed, milk is carried and the other operations are

performed will reduce this idle waiting time. Only a few seconds may be saved per cow but small savings in often repeated operations add up to a substantial figure when 15 or 20 cows are milked.

CARE OF YOUNGSTOCK

There were 17 other dairy animals—calves, heifers, and bulls, in addition to 19 cows in the average herd visited in this study. During the barn feeding season the care of the youngstock and the bulls required 41 minutes and over one-half mile of travel, per day. This amounted to 2.1 minutes and 153 feet, per cow per day. In the pasture season dairymen spent only one-third as much time and about one-half the travel, or .7 minutes and 80 feet, per cow per day caring for these other dairy animals.

For the year this amounted to 8.7 hours and 8 miles per cow.

Five of the men housed at least some of their youngstock in barns apart from the main dairy barn. It required about 50 percent more time and travel to care for youngstock on those farms.

OUTSTANDING EFFICIENCY OBSERVED ON ONE FARM

One of the operators spent about 40 percent as much time doing his dairy chores as the average of the other 14 men. He spent only seven minutes per cow per day in winter and six minutes in summer caring for the milking herd. The average operator took $16\frac{1}{2}$ minutes per cow per day in winter and 14 minutes per cow in summer doing his dairy chores for the milking herd.

This man walked doing his chores as did the other 14 operators. He traveled 395 feet per cow per day in winter and 411 feet in summer as compared to averages of 720 feet in winter and 645 in summer for the other 14.

He had a 25-cow herd producing over 8,000 pounds of milk per cow in a milking-parlor, loafing-pen arrangement and took care of his herd without any other help.

He was not only more efficient at milking and feeding but also speedier on all of his operations. His results compared to the other 14 farms showed that he spent only one-third as much time per cow cleaning stable and bedding, and 60 percent as much time per cow in the care and cleaning of equipment.

His main labor saving was in the milking process. He spent $2\frac{3}{4}$ minutes per cow per day as compared to $7\frac{2}{3}$ minutes by the other 14 men. He traveled only 114 feet per cow per day while the other 14 men walked 209 feet.

This operator used three milker-units in a 6-stall, double-tandem pit-type milking parlor. There were three stalls on each side of the pit

and three cows were let into the parlor each shift. Doors with feed boxes attached rolled inward over the pit on overhead tracks. No special entrance and exit gates were available for individual stalls. The two back cows on each side would not be released until the corresponding front cow was through milking.

He machine stripped the cows. Milkers were left on the cows an average of five minutes as compared to 5-8/10 minutes by the 14 other men.

By using a parlor it was possible to do other tasks during the milking period such as turn cows in and out, feed grain, and do some calf feeding.

Each group of three cows spent from 7 to 9 minutes in the milking period. All ground feed placed before them was eaten in that time.

Although there were three milker units to wash and care for, the job was done in less time per cow than by any of the 14 other operators. It was 40 percent below the average of the others. Having a large herd helps to have a lower average per cow but speed, dexterity and well organized cleaning technique and workplace also contribute.

A scraper and broom of proper widths helped this operator to clean and sweep his milking-parlor in less than one-half the average time spent by the four other operators who had milking parlors.

In bedding the loafing area he let the cows do part of the straw scattering as they walked through the loafing-pen. He distributed the seven bales over the area, removed the ties, dropped the loosened bales from waist-height, kicked the bales apart a little after they fell but let the cows, as they walked back and forth, do the final scattering. This was different from many of the operators who shook out every slice of a bale and spread it at a uniform depth over the whole area.

A cart was used in feeding silage which was thrown from the silo into the cart. Silage was fed liberally only once a day, in the morning. Baled hay was carried only a few steps to racks after being thrown down from the mow above. Ground feed was available in a tank located in the pit. Only a few steps had to be taken to feed each shift of cows. Feeding as well as turning cows in and out was done while milkers were operating on other cows.

Work was planned so that jobs dove-tailed nicely. His equipment was well-adapted to the job and stored as near as possible at the point where work began. The operator anticipated the next operation and started it with little lost motion.

This dairyman by developing a carefully thought-through plan of his chores and putting it into operation is able to care for a milking herd of 25 cows in 44 hours per year per cow instead of 100 hours for the other 14 farms studied.

A CHANGE TO LOAFING-PEN MILKING-PARLOR ON ONE FARM

One father-son combination operated a 26-cow herd in a full stanchion barn. Study of their chore routines and physical facilities in caring for the herd showed their labor requirements were 25 percent higher than the average of the other full stanchion farms studied.

Several areas were indicated in which sizeable savings might be made. These possible savings plus the necessity of providing room for incoming heifers resulted in a change to a pen barn arrangement incorporating several labor-saving features, and a revision of their less efficient chore practices. A 22 percent reduction in time spent and 12 percent less travel resulted. More possibilities of savings in time and labor remained. Further savings nearly as great as those already made can be achieved by attention to areas which still require excessive labor.

In the original barn there were two rows of 12 stanchions each, facing a central feed alley opening into a feed room at the west end. Carts were used for feeding grain and silage. Pen space was provided in the barn for dry cows, bulls and young stock, centralizing the dairy chore area under one roof. Drinking fountains were used for water supply, chopped hay (cured with a barn drier) was fed and baled straw was used for bedding. Manure was removed daily with shovels and forks and hauled to the fields; a tractor loader was available for cleaning the pen.

No cross aisles were provided. Chutes for hay and straw were not located at the most convenient places. To get from the stable to the milkhouse an operator had to go through three doors. The stalls and aisles were a little too narrow.

The new arrangement has ten walk-in stanchions on one level. The remainder of the former stanchion area was added to the loafing area and a 36' × 66' post-free shed with an overhead mow for straw was added to the east side of the dairy barn. Chutes were built so that straw might be dropped in several spots in the pen, and wide doors were installed to permit convenient use of a tractor loader and manure spreaders in cleaning. Two self-feeding hay bunks were built with their open tops flush with the mow floor. These feed racks held enough hay for three days' feeding and fed down without clogging or wasting hay. More direct access to the milk house was made possible by cutting a new door.

CHORE ECONOMIES

These changes in buildings and method of managing the herd resulted in average daily savings of 1½ man hours and nearly one-half mile of travel.

Biggest time savings were made in bedding, stable cleaning and hay feeding. Bedding the loafing area took only about one-sixth as much time as bedding the stalls. The daily stable cleaning job, even though the milking parlor is scrubbed down and hosed each day the year around, takes about 70 percent as much time as was spent cleaning the 24-stall stable.

Chopped hay under the new plan was pushed from the mow directly into large self-feeding bunks which are filled every three days. The time on this job was one-fourteenth that when the herd was handfed in stalls.

A few chores took a little more time in the pen barn than under full stanchion management. In the winter a little more time was taken turning cows in and out of the milking parlor than when fully stabled because the jobs had to be done both morning and evening. The trips to feed grain to the three shifts of cows took a little more time than when it could all be done in one trip. More time was spent washing milking equipment but that is not due to type of housing.

There are still other points in the chore routine where savings could be made.

Savings in time were much greater during the winter months than during the pasture season. Nearly three man-hours per day were saved in winter and only about one-fourth hour in summer.

The first reaction to a reduction in time spent on chores during the winter may be that savings then are unimportant; that "there isn't much to do then anyway." There are one or two points to remember in this connection. First, an extra hour and a half in bed on a cold morning might be attractive at times. Second, one of the heaviest labor peaks of the year falls in the spring while the cows are still in the barn. With plowing, oats drilling, fencing, tilling and grass seeding demanding time, an extra three hours a day to spend in the field is to be considered.

"HYBRID" MANAGEMENT SYSTEM

One type of dairy herd management and building use has been referred to in this study as "hybrid". It has some features of both a stanchion system and a loafing pen plan. If it is a 20-cow herd, there are 20 or more stalls so all of the cows can be tied at milking time and the remainder of the time they are quartered under loose housing conditions.

This type is almost as common in central Ohio as full stanchion management where the cows are kept in the stalls in the winter months except for an exercise period on days that weather permits.

The principal advantage claimed by men following the "hybrid" system is the great reduction in the stable cleaning job. Over twice as much barn space per cow is used as under the full stanchion system, and about 40 percent more than under loafing-pen milking-parlor management. More than twice as much bedding per cow is used under the "hybrid" system as under full stanchion systems.

Not many of the men using the "hybrid" system had ideal arrangements for hay and silage feeding.

STANCHION AND PEN BARNES

One of the questions this study considered was the difference in time spent caring for cows between stanchion and pen-barn management. The average time spent on the five full stanchion arranged barns was 93 hours per cow per year as compared to 98 hours for the five pen barns. This difference is not large enough to be very significant. However, when variations in time spent per cow of from 66 to 105 hours for the stanchion barn herds and 44 to 150 hours for the pen barn is examined, it is seen that much greater differences existed among operators within each group than between the averages of the two groups.

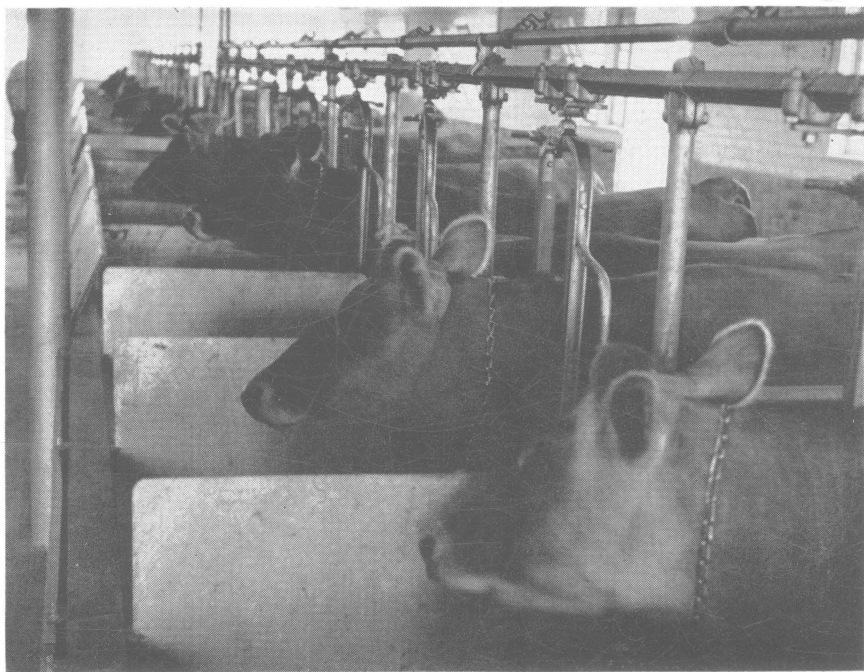


Fig. 6.—Stanchions, shown in use here, caused the operators to walk about 18 percent farther a year than the operators using pen barns. As in the case of all phases studied there was considerable variation within the groups.

In stanchion barns the operators traveled about 18 percent farther per cow doing chores than those using pen barns. In stanchion barns, they walked 46 miles per cow per year doing their dairy chores as compared to 39 miles in the pen barns. There was a considerable variation among operators in each group. They ranged from 35 to 55 miles per cow per year for stanchion barn herds and from 28 to 46 miles in the pen barn.

A comparison of the time spent and distance traveled doing the principal dairy jobs is shown in Table 7. There were two jobs influenced by factors other than the milking and housing facilities where men with stanchion barns spent less time than the pen barn operators. They were the care and cleaning of milking equipment and getting cows to and from pasture. When this extra five hours that was spent by pen barn operators is subtracted from 98 hours it is found that both groups averaged 93 hours per cow per year.

There were four jobs where the principal differences in the two systems were very noticeable. They were: carrying milk to the milk house, feeding, turning the cows in and out of the milking area, and cleaning the stable or milking area.

Because the cows themselves carry the milk closer to the milk house when a small milking parlor is used, the operators in pen barns (with one omitted) who strained his milk into 10 gallon cans in the milking parlor and carried them to the milk house at the end of the milking period walked 40 percent as far carrying milk to the milk house.

TABLE 7.—Time and Travel Spent Doing Principal Dairy Chores on 5-Stanchion and 5-Pen Barn Farms, 1948

	Time: minutes per day per cow		Travel: feet per day per cow	
	Stanchion	Pen	Stanchion	Pen
Winter				
Milking (excluding carrying milk)	6.6	6.6	132	126
Carrying milk to milkhouse	.9	.8	99	36
Care and cleaning of milking equipment	2.1	2.7	72	64
Feeding	3.1	3.0	234	178
Turning cows in and out of stable	.6	1.0	49	77
Stable cleaning	2.0	.9	120	48
Bedding	.7	.9	34	44
Summer				
Milking	6.2	7.0	125	121
Carrying milk to milkhouse	1.2	.9	117	45
Care and cleaning of milking equipment	1.9	2.4	72	75
Feeding	.6	.3	64	34
Turning cows in and out of stable	1.0	1.0	98	71
Stable cleaning	.6	.8	37	34
Getting cows to and from pasture	1.1	1.5	69	172

Hay and silage fed in bunks in the loafing pen required less travel than when individually fed to stanchioned cows. Hay in some instances was dropped directly from the mow into hay bunks in the loafing pen. The travel feeding grain in milking parlors averaged one-half to two-thirds of that in full-stanchioned barns.

Cows were turned out (and back in again) of stanchioned barns for exercise, sunshine, and sometimes water usually only once a day in winter. The time and travel involved was about 60 percent of that of the pen barns because in the pen barns the cows were turned in and out of parlors twice each day. In the summer time there was no difference in time per cow but it only took 70 percent as much travel in the pen barns as in the stanchion barns.

The winter-time jobs of cleaning the stable or milking parlor, sweeping the alleyways, and removing the manure each day only took 40 percent as much travel and 45 percent as much time in pen barns as in stanchion barns.

Given dairy barns with average facilities operators in pen barns were able to do their chores with some savings in travel when carrying milk to the milkhouse, feeding and cleaning stable or milking parlor as compared to operators in stanchion barns. There was a great deal of variation in time and travel spent among operators in barns of the same type. An attempt has been made to eliminate that type of variation by comparing examples of the two types, both well-arranged and operated by efficient dairymen using good methods and techniques.* (See page 38 for explanation of comparisons).

NORMAL RATES OF DOING THE USUAL DAIRY JOBS

A dairyman considering the desirability of any new plan of building layout or new method or order of doing the jobs included in dairy chores, needs to know not only the cost of making the necessary changes but also the comparative time and travel under various arrangements.

As an aid to those who want to compare their operations with those of other good dairymen or consider other choring methods, efficient rates of doing the usual dairy chores are presented for full-stanchioned and for parlor-pen arrangements.

These efficient rates for the various dairy jobs were made by several operators, with well-arranged stables and facilities, using good techniques. Rates are for both distance traveled and time spent per day for both winter and summer chores. The per day rates, rather than per milking, were selected because some jobs are done only once a day. A per day figure is convenient for use in comparing one's present achievement. The three things that have the most influence on how much time

and travel will be used in doing dairy chores in herds of the same size are the layout of buildings, chore routes, and the technique of doing dairy jobs.

Considerable variation is found in the speed of doing dairy chores among men all having the same general type of building layouts. It is admitted that any set of standard rates of doing dairy jobs used as a guide will not determine exactly the amount of time required to do the total chore jobs by any specific operator. It will provide a basis for comparing relative time requirements under the present plan and for the proposed new arrangement. By reason of individual differences in speed or skill, an operator may be some what faster or slower than the normal rate. The operator's age, ability, strength, and interest all influence rates of accomplishment.

Assuming that normal rates are used to calculate total time required for the present plan and a proposed new plan, results might total six hours per day for the present plan and four hours or one-third less time for the proposed new plan. An operator who adopts the new plan could expect to do his dairy chores in one-third less time than at present, whether his present time is five, six, seven, or eight hours per day. It is recognized that an operator's technique and skill will not change simply because he has changed his building layout.

A dairyman wanting to make a comparison of the minimum time and travel for his herd under stanchion and pen systems can multiply the number of cows in his herd times the rate for each job he does. Or if he does all of the jobs in the lists in Tables 8 and 9, he can multiply the number of cows times the sub totals.

To either of these he can add the amount of time shown at the bottom of the tables for the herd as a whole for cleaning equipment, and other operations, to get comparative time spent each day both winter and summer under the two systems.

CHORE COMPARISON IN WELL ARRANGED STANCHION AND PEN BARNs

From observations made in this study of the different dairy chore jobs, a set of efficient rates of doing the various dairy chore jobs was assembled. When these efficient rates (Table 8 and 9) are used to estimate the minimum chore requirement for herds of various sizes it is found that pen-barn time and travel requirements are lower than for stanchion barns for herds of 12 cows or more. For a 30-cow herd the chore travel in a pen barn is 30 percent shorter and chore time is $7\frac{1}{2}$ percent less than in a stanchion barn. For herds containing fewer cows the differences were not as pronounced.

TABLE 8.—Rates of Doing Dairy Chore Jobs With Good Barn Arrangement,
Using Good Equipment and With Efficient Operators
“Full Stanchion Unit”

	Time		Distance	
	Winter	Summer	Winter	Summer
	Minutes per day per cow		Feet per day per cow	
Feeding grain	.6	.6	20	20
Throw down silage	.4	—	6	—
Feeding silage	.7	—	20	—
Throw down hay	.25	—	20	—
Feeding hay	.3	—	21	—
Turning cows in and out	.6	1.2	50	100
Milking	4.5	4.5	100	100
Carrying milk	.7	.7	61	61
Stable cleaning and liming	.9	.4	45	20
Bedding	.5	—	30	—
Waiting	.5	.5	—	—
Periodic manure removal	.1	—	5	—
Periodic feed grinding	.6	.4	—	—
Care of youngstock and bulls	1.5	.5	110	55
Sub total	12.15	8.8	110	356
	Minutes per day for herd		Feet per day for herd	
Care and cleaning of milking equipment	38.0	38.0	1200	1200
Getting cows to and from pasture		15.0		1200

*No distance observations made

These chore economies in pen barns are due to small savings per cow when milking, carrying milk to milkhouse, and feeding grain and hay. In herds of over 20 cows the combined operations of stable cleaning, bedding, and periodic manure removal jobs in pen barns require less travel than the same functions in stanchion barns.

Although the parlor-pen arrangement permits more efficient work methods and less time and travel is required per cow, any person considering a change from conventional stanchion arrangement to parlor-pen “set-up” should understand that management of a dairy herd under the two systems is quite different. Both cows and operators must become accustomed to different routines. Some patience is needed until the cows become trained. In the cold winter days the milking parlor with only a few cows in at a time is not quite as warm as a stanchion barn full of cows.

HOW HERD SIZE AFFECTS CHORES

When the minimum chore requirements are studied, it is seen that as herd size increases the required time and travel *per cow* decreases. It takes a minimum of 80 hours per cow in a pen barn if there is a 12-cow

TABLE 9.—Rates of Doing Dairy Chore Jobs With Good Barn Arrangement,
Using Good Equipment and With Efficient Operators
“Parlor-Pen Unit”

	Time		Distance	
	Winter	Summer	Winter	Summer
	Minutes per day per cow		Feet per day per cow	
Feeding grain	.4	.4	12	12
Throw down silage	.4	—	6	—
Feeding silage	.7	—	20	—
Throw down hay	.25	—	20	—
Feeding hay	.05	—	4	—
Turning cows in and out	1.0	1.0	60	60
Milking	4.0	4.0	60	60
Carrying milk	.6	.6	30	30
Bedding	.5	—	36	—
Waiting	.5	.5	—	—
Periodic manure removal	.8	—	25	—
Periodic feed grinding	.6	.4	+	—
Care of youngstock and bulls	1.5	.5	110	55
Sub total	11.3	7.4	383	217
	Minutes per day for herd		Feet per day for herd	
Care and cleaning of milking equipment	38.0	38.0	1200	1200
Getting cows to and from pasture		15.0		1200
Stable cleaning and liming	12.0	12.0	400	400

*No distance observations made

herd, but if 24 cows are housed, it takes only 65 hours per cow per year. The travel required for a 24-cow herd is 21 miles per year per cow while with a 12-cow herd it is 27 miles. The total time caring for 24 cows is only 62 percent greater and the total travel is only 55 percent greater than for the 12-cow herd.

These economies, due to scale of operation, are possible because many jobs performed for the herd are the same whether 10 cows or 40 cows are kept. The washing and assembling of milking equipment are good examples because the time required for these operations is practically the same whether the herd is large or small. It takes one trip into silo or mow or to the pasture regardless of herd size.

FACE-IN OR FACE-OUT

Among the many problems in dairy barn arrangement is that of deciding whether a double row of stanchions should face in or face out. This problem can be partly answered by determining just where and on what jobs in and around the barn the chore work is done.

TABLE 10.—Comparison of Chore Requirements for 20-Cow Herds
in Well Arranged Stanchion and Pen Barns

	Minutes per day		Feet per day	
	Stanchion barn	Pen barn	Stanchion barn	Pen barn
Winter				
Feeding grain, hay and silage	45	36	1740	1240
Milking and carrying milk	104	92	3220	1880
Fastening and unfastening cows	12	20	1000	1200
Stable cleaning and bedding	28	22	1500	1120
Care and cleaning of milking equipment	38	38	1200	1200
Periodic cleaning of loafing pen		14		400
Other	24	24	100	100
Total	251	246	8760	7060
Summer				
Feeding grain	12	8	400	240
Milking and carrying milk	104	92	3220	1800
Fastening and unfastening cows	24	20	2000	1200
Stable cleaning	8	12	400	400
Care and cleaning of milking equipment	38	38	1200	1200
Pasture	15	15	1200	1200
Other	18	18		
Total	219	203	8420	6040

^aEquivalent of 14 minutes per day

A study of the five full stanchion barns reveals that, of the chores done in and near the stables, nearly 75 percent of the travel and over 80 percent of the time required was in the area behind the cows on milking, stable cleaning and bedding, turning cows in and out and carrying milk and equipment. Only a little over 25 percent of the travel and less than 20 percent of the time was required in front of the cows on feeding.

If a few more efficient practices, such as carts, are used, it is found that in the winter or barn feeding season five-sixths of the time and travel in the stable is behind the cows. In the summer or pasture season 95 percent of the time and travel in the stable is behind the cows.

TABLE 11.—Comparison of Chore Requirements in Stanchion and Pen-Type Barns Assuming Efficient Methods and Operators, and Good Arrangements of Barns

Size of herd	Hours per cow per year		Miles per cow per year	
	Stanchion	Pen	Stanchion	Pen
12 cows	81	80	34	37
16 cows	75	73	31	24
20 cows	71	68	30	22
24 cows	69	65	28	21
30 cows	67	62	27	19

These results still do not answer the question as to whether the face-in or the face-out arrangement is better. Examining each of the jobs indicates how the cow arrangement affects time and travel required. When cows face in and the mangers parallel an alleyway through the center of the barn (silo and feed room at one end) the travel in feeding grain, hay and silage is somewhat less than if cows face out (silo and feed room at any point around the stable) and the feeding route is around the outside of the stable area. The travel to feed 20 cows in a face-in arrangement would be 80, 80, and 190 feet *less* each day for grain, silage and hay respectively than in a face-out arrangement.

The operator travels a little shorter distance turning the cows in and out of the barn if the cows face in because he can walk down the center alleyway to both fasten and unfasten the stanchions. The travel in this operation for 20 cows in a face-in arrangement in the winter is nearly 250 feet *less* each day, than in a face-out barn.

The time spent in milking a herd of 20 cows will be very nearly the same whether they face out or face in. When the cows face in there is some extra travel as milkers, wash pails, and similar equipment are carried around from one side of the barn to the other. This extra travel will be about 400 feet per day more than in a face-out barn.

In a 20-cow, face-out barn, travel to the milkhous is less if the milk house is at one end of the barn. In a 20-cow, face-in barn it is less if the milk house is in the center of one side of the barn and a cross aisle is used. If stalls are all the same width, the presence of the cross aisle will mean that the barn will have to be four feet longer.

Milk from two cows is usually carried on each trip to the milk house. The travel carrying milk from 20 cows in a face-in arrangement is 145 feet *less* than from a face-in arrangement using a cross aisle. If no cross aisle is present and milk is carried to one end of the barn, the face-in arrangement will require 460 feet more travel than a face-out plan.

Bedding 20 stalls requires about 165 feet per day *less* travel if the cows face out and the bedding is all dropped in the central driveway than if the operator has to walk around the outside of the barn to bed two more widely separated areas when the cows face in.

Manure from the stable of a face-out barn can be thrown directly into a spreader driven through the barn in less time and with less travel than it can be removed from a face-in barn with wheelbarrow or litter carrier. The job of sweeping and spreading lime also requires less travel in the face-out arrangement. In doing these jobs in a 20-stall barn the distance traveled in a face-out barn could be at least 360 feet per day less than in a face-in barn in winter and 170 feet less in summer.

TABLE 12.—Face-out vs. Face-in: Chore Travel for 20 Cow
Under Ideal Conditions
(feet per day for herd)

Job	Face-Out barn		Face-In barn with center cross-aisle	
	Winter	Summer	Winter	Summer
Milking	2230	2230	2610	2610
Carrying milk	1175	1175	1320	1320
Fastening and unfastening cows	650	1300	400	800
Stable cleaning	810	320	1170	490
Bedding	475	—	640	—
Total behind cows	5340	5025	6140	5220
Feeding grain	290	290	210	210
Feeding silage	290	—	210	—
Feeding hay	480	—	290	—
Total in front of cows	1060	290	710	210
Other daily dairy chore travel, milk- house, pasture, silo, mow	1780	2400	1780	2400
Total	8180	7715	8630	7830
Average per cow	409	386	432	392

The other jobs connected with dairy chores are not necessarily affected by whether the two rows of cows face out or face in.

Considering that 80 to 95 percent of the chore work in the stable is done *behind* the cows, the face-out arrangement does not save as many steps as might be expected. From Table 12, the travel in a face-out barn is 450 feet less per day in the winter and 115 feet less per day in summer.

HOW TO SAVE TIME WITH YOUR CHORES

Some of the discussion presented earlier in this bulletin may have offered methods for a dairyman to save time and effort on his chores. The information should permit comparisons and indicate possible points to improve methods.

Many times jobs are done in a time-consuming, difficult way, because the operator has never thought of changing. Improvements in doing the various dairy chore jobs to save time and steps, can be made by analyzing present methods and studying proposed changes. The following four steps will aid in working out a plan.

Step 1. *Know how the job is done.* Analyze it. Record all details of the job exactly as it is done by the present method. Include travel between jobs. Include getting ready to do the job and cleaning up afterwards.

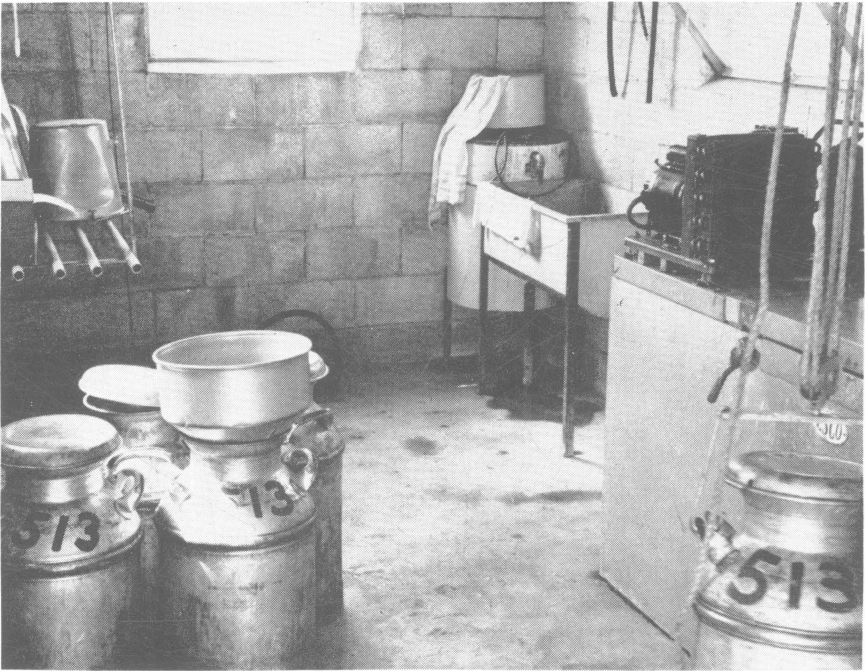


Fig. 7.—Regardless of the size of the herd, the cleaning up of the milking equipment remained about the same for either a large or small herd.

Step 2. *Question the way the job is done.* Why is each move made? Are they necessary? Can any portions of the operation be combined to advantage? Can any of it be eliminated or simplified; is every man in the labor force necessary? Is there the right combination of machines and men? Is there any better way of doing the job? Question every detail of the job to find ways and places to improve.

Step 3. *Develop the improved method.* Rearrange the work area if it will help. Plan to store tools and raw products (feed, bedding, etc.) at handiest points. Change doors where needed. Remove curbs if they interfere with use of carts. Use carts and wheelbarrows whose capacity is such that a minimum of trips are made. Choose tools of proper width and type.

Step 4. *Test and use the improved method.* Apply it.

The function of this process is to develop the easiest, most effective method and *order* for doing the necessary work. At the same time it should find the most convenient and *economical* tools, equipment and facilities to do the job most effectively.

Every 14½ feet saved in chore travel each day will make one mile difference over a year's time.

Every 1⅔ minutes saved each day in chore time will amount to the saving of a working day or 10 hours in a year.

With a 16-cow herd, a saving of one minute per cow per milking would result in a total saving equal to 19½ ten-hour days in a year.

GUIDE TO IMPROVED METHODS

Milking

One man should not try to use more than two single units.

Strip by machine. Omit hand stripping.

Remove machine as soon as milk flow stops.

Encourage faster machine time per cow.

Arrange cows for milking in consecutive order.

Use large milk carrying pails and fill to maximum practical level to reduce trips to minimum.

Locate milk house as near milking area as practical.

Two strainers may reduce waiting in milk house.

Care of Milking Equipment

Provide hot water in milk house for cleaning utensils.

Plan milk house arrangement to save steps in cleaning utensils.

Store equipment between milkings at point most convenient for cleaning and assembly.

Keep equipment in proper adjustment. Replace worn parts.

Well-adapted utensils can reduce cleaning and assembly time.

Feeding

Use carts of ample size for feeding grain and silage where practical.

Store ground feed overhead where possible so it flows by gravity into cart.

Provide automatic water supply.

Plan work so one operation follows another without unnecessary backtracking.

Have next job begin where last operation was finished. Follow circular route where possible.

Use enough, conveniently placed, hay chutes from mow to stable to save steps.

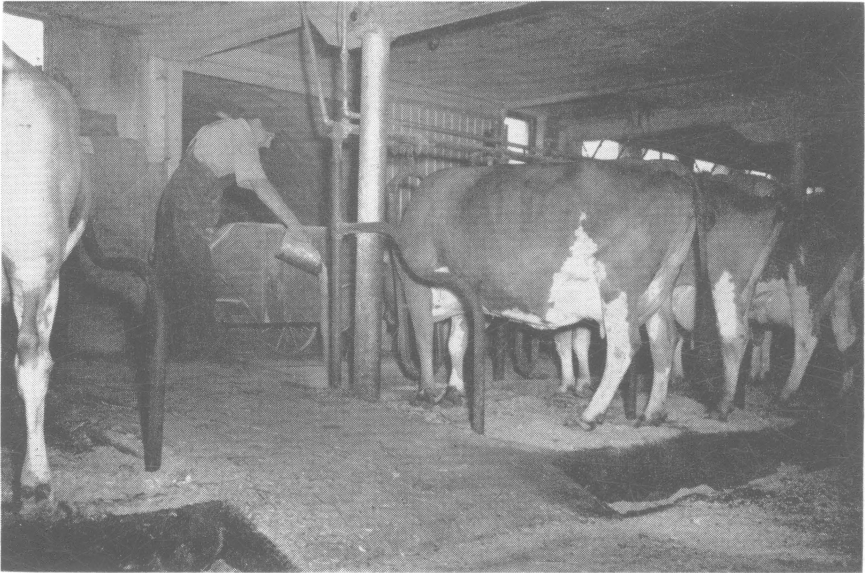


Fig. 8.—Having the cows on a face-in arrangement as shown here will result in about 250 less walking hours per day for a 20-cow herd.

In loafing pen, racks should be located so hay can be thrown in directly from mow. Large capacity racks holding enough hay for several days will help.

Silage can be fed liberally once a day.

For youngstock feeding, also apply above principles.

Cleaning Stable and Bedding

Do not carry manure long distances by hand. Use spreader, wheelbarrow, or litter carrier. Use large capacity wheelbarrow with rubber tires and wide sturdy ramp.

Use shovels and forks of best suited width and capacity.

Use wide push brooms to sweep down aisles.

Locate small tools convenient to point of use.

Locate bedding and bedding chutes for convenience.

Store lime or superphosphate near the point it is used.

SUMMARY

Chores on 15 commercial dairy farms in central Ohio were studied in 1948. In the barn feeding season these men spent $16\frac{1}{2}$ minutes and walked about 700 feet per cow each day doing dairy chores for the milking herd. During the pasture season it took 14 minutes and about 625 feet per cow each day.

Considerable variation in chore efficiency on farms having similar barn arrangements and equipment was observed. For most dairy jobs the one-third who were least efficient spent three and four times as much time and travel as the one-third who were most efficient.

The four principal jobs which took the most chore time were: (1) milking and carrying milk, 47 percent; (2) care and cleaning of milking equipment, 15 percent; (3) feeding, 11 percent; and (4) cleaning stable and bedding cows, 10 percent. The travel on these same four jobs was 31 percent, 13 percent, 18 percent, and 13 percent, respectively.

The dairymen in the five stanchion barns traveled 18 percent farther per cow doing dairy chores than did the five pen barn operators but both groups spent about the same amount of time per cow doing their dairy chores.

When comparisons were made of the two types of management in well-arranged barns operated by efficient men, chores for a 30-cow herd in a pen-type barn took 7 percent less time and 30 percent less travel than in a stanchion-type barn. For smaller herds there are some savings in time and travel in favor of pen barns.

The pen-barn arrangement makes these savings possible because in the milking process the job comes to the man rather than the man going to the job. The cow carries the milk closer to the milk house. Some jobs are combined in pen barns that are done separately in stanchion barns. Grain is fed while waiting for milkers to finish on other cows. Hay can be dropped directly from mow to feed bunks. The daily job of cleaning the milking parlor is usually a much smaller job than cleaning a full-stanchioned stable.

In the pen barns about 50 percent more area per cow was used, but the type of construction in much of this area was not as costly as the stanchion barns. The bedding used averaged one ton per 100 square feet of barn space used for the milking herd for both types of barns. The larger area used 50 percent more straw per cow in pen-type barns.

Building and equipment charges make up about 4 percent of the dairy production costs. Their type and arrangement can greatly affect the operator's efficiency. Although the direct building and equipment charges are small, the building design and use as it influences the work has a very great effect upon labor charges which make up about one-third of dairy production costs.

A few hours spent studying and planning the best way to do chores may be most profitable.

Time and effort can be saved by planning dairy chores. Analyze the way jobs are done now. Break them down into parts. Question why each move is necessary. Combine jobs where possible. Simplify procedures and eliminate the unnecessary. Develop, test, and apply new methods.

Some of the most promising time and labor saving suggestions include rapid milking, machine stripping, the use of carts, convenient placement of chutes so hay and bedding can be dropped near the point they are used, well-adapted tools stored where job begins, planning jobs so they dovetail without loss of time between jobs, and travel planned in a circular manner to reduce empty-handed "dead-heading" to next job.

Efficiency doesn't mean just walking faster or carrying bigger loads. It involves planning the same work with fewer steps. It doesn't necessarily mean new equipment. Better placement and more effective use of present equipment will help.

Saving in chore time means that more time can be spent in the field or that more units of livestock can be cared for in the same chore period or that one can stay in bed later each morning.

*In order to make comparisons of chore requirements under different barn layouts show more meaning, certain assumptions will be made as to equipment used, and the practices and routines followed. In the following comparisons of rectangular barns, it is assumed that the operators are using milking machines, practicing machine stripping and rapid milking, using carts for grain and silage, using wheelbarrows and spreaders to remove manure, that they have chutes conveniently located to drop hay and bedding near the points they are to be used; that silos, feed rooms and milk houses are located at the most desirable spots; that aisles are maintained at the ends of rows of stanchions; that jobs are so arranged that they dovetail; that some delay or waiting is unavoidable; that skilled operators are interested in doing chores in the most economic way; that water is available in drinking cups or a tank whose level is float controlled; that the same time and travel are spent in cleaning milking equipment and utensils in all cases; and that the milk from two cows is carried each trip to the milk house.