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LABOR AND CAPITAL NEEDED TO SWITCH TO LOOSE HOUSING

Earl Fuller and Harald Jensen

Are you thinking of switching your dairy set-up to loose housing? If so, the facts and figures in this article[1] can help you decide. You will see how labor and capital requirements change as you switch from a typical stanchion barn set-up to various loose housing systems.

System A: A Typical Stanchion Barn, Grade B Milk

This typical set-up has a herd of 20 cows and 20 young stock. The barn houses the cows in stanchion stalls, the young cattle in pens, and provides for hay storage in an overhead mow.

Hay is baled and fed twice a day during a winter-feeding season of 29 weeks. In addition, when pastures are short, hay is fed once a day in an outside rack; this supplemental feeding season lasts 8 weeks. In the winter, silage is fed from an upright silo by throwing it down by hand and feeding it with the use of a cart. The herd is pastured for a total of 23 weeks in the year. In this system, as in all others, grain is ground and mixed with the farmer's own hammer mill the year around. Milking is done by one man with two pail units and the milk is marketed as Grade B in cans. During most of the summer the younger cattle not with the herd are outdoors in lots where they must be watered by hand methods. The barn is cleaned by driving the spreader through the center alley.

This system requires 44 hours of chore time per week in the winter, 31 hours in the summer, and 32 hours in the fall for the 20-cow herd. These figures (tables 1 and 2) total to almost 2,000 hours a year or to an average of nearly 100 hours per cow. Each additional cow added to the 20-cow herd takes 60 hours per year.

System B: A Minimum Cost Parlor and Loose Housing Arrangement

This system outlines a method of moving from System A to loose housing with a minimum of added capital. Here new outdoor feed racks at a cost of $100 are set below openings into the mow. New feed bunks at a cost of $100 (without labor) are placed at the base of the silo for silage feeding. Hay and silage are fed once a day. A concrete feeding floor is constructed at a cost of $800 (without labor). A 48′ x 50′ loafing shed (cost $2,500 including some labor) is built to provide capacity for 40 head or to provide storage for hay in one end when herds are less than 40. In addition, a 4-stall-level-abreast walk-through milking parlor[2] is built in one corner of the stanchion area, freeing the remaining area for use as a milk room and/or for young cattle. Such a parlor could probably be built for less than $300 plus labor. The remainder of this plan corresponds to that of System A. The total added investment in dairy facilities is $3,800.

Summer[3] labor for a 20-cow herd will be the same as for System A (tables 3 and 4). But additional cows could be added with slightly less labor than in System A. Total hours per year are reduced by 230 and hours per cow for a 20-cow herd are lowered to 88 or 11 less than in System A (tables 1 and 2). Hence, System B saves some labor, even for 20-cow herds.

On the other hand, as pointed out earlier, the investment is higher than before, and if only 31 hours per week (System A's summer chore needs) are available, no more cows can be handled in this season; while the work might be less fatiguing, it requires as much time in this busy season. But production per cow might increase or if labor and capital for more cows could be found, herd size could be increased with less added labor. At 30 cows, this system takes less labor than System A per summer week, and in hours per cow per year it has a clear advantage—75 hours compared with 86. Thus, the main advantage of System B comes in labor savings for herds above 20 cows. Moreover, at these larger herd sizes, System B is at no particular disadvantage in capital requirements. This is true because adding capacity for 10 cows in **stanchions** could cost over $5,000 and in most cases at least $3,000.

Some Grade A and Larger Herd Plans

So far we have looked at one alternative to a stanchion barn system. In this comparison we assumed a Grade B milk market. But quality standards on milk are still increasing. Hence, if one looks ahead very far in the dairy business he perhaps should consider systems that meet Grade A requirements regardless of current markets. The next two systems are Grade A plans.

System C: Loose Housing with a Double 4-Herringbone Parlor

The husbandry practices and added investments of this plan are identical with System B except for the milking plant. Here, a double 4-herringbone parlor with a pipeline and bulk tank are added instead of the 4-stall-level-abreast. Such a milking plant would likely call for an investment of $9,000 including bulk tank and pipeline milkers, and some skilled labor to install the plant. In addition, System C requires the same extra capital as System B except for the $300 level-abreast-parlor

(Continued on page 2)

[1] The labor data in this article are based on time recordings during 1956-1959 by a group of Minnesota dairy farmers who, in cooperation with the Department of Agricultural Economics and the Agricultural Research Service, USDA, made this and the following report possible.

[2] This parlor would need an entrance from the rear, feed manger-doors for cow exits, work spaces between each of the pairs of cows, and walls and ceilings covered with asbestos cement board backed with lumber for strength.

[3] Summer chore time labor use was analyzed separately because of the heavy farm demand for labor in this season.

which in C has been replaced with a herringbone. Thus System C requires a total of $12,500 in added investment, a sum not likely to be returned in less than 10 years by an added 10 cows.

System C practically "breaks even" with System B in labor use at 20 cows, but it uses less labor for larger herds (tables 1-4) than A or B. At the same time it provides the capacity needed for herds of 40 or more cows. But in this system, the portion of the chore time that does not change with herd size is larger than it is in either System A or B. The reason for this difference is that System C requires more time for milking preparation and for clean-up, due in part to more milking equipment and Grade A milk production.

System D: Herringbone w/added Silage Space and Year-Round Storage Feeding

If herd size is expanded and milk is sold on a seasonally priced market, additional silage space is a likely consideration along with year-round storage feeding. System D adds this extra feed storage. It includes the herringbone, and silage is fed all year. Another silo is built and an unloader for use in both silos is also purchased. A fairly large silo, an unloader, and a mechanical bunk can be purchased for $4,300. This investment more than doubles silage storage space and hence it will supply feed storage for a 40-cow herd.

To keep summer labor down, this system also includes an automatically regulated water supply for all young cattle on pasture or in lots. This change, at a relatively nominal cost, saves almost 1½ hours per week in the summer. The other systems would also benefit in a similar way by this change. Here is an illustration of a small inexpensive change that saves labor at a critical time, and therefore is highly worthwhile. All labor savings do not come at high investment cost; if some do, but save time at a critical period, they still can be worthwhile.

Storage feeding under this system will increase the amount of manure that has to be hauled; hence more labor is required for this job.

Conclusions

The general conclusions drawn from analyzing these four systems also apply to most other ways of doing dairy chores.

First, the **size or scale of the enterprise** affects the economy of labor use. As the enterprise grows, total labor increases but average hours per cow decrease. Moreover, some systems fit the big herds best; others, the small.

Second, some buildings and types of equipment are better **substitutes for labor** than are others. Changes in costs and returns as well as labor used must be considered.

Third, the **husbandry practices and techniques** used in handling of feed, livestock, and milk affect labor needs. Some practices and techniques reduce while others increase labor needs.

Table 1. Total annual labor requirements for varying herd sizes and systems

System designation and description	No. cows in herd				
	10	20	30	40	60
			(hours)		
A: Stanchion barn	1,380	1,982	2,584	3,187	.....
B: Low-cost loose housing	.....	1,754	2,240	2,725	3,695
C: Herringbone and loose housing	.....	1,706	2,021	2,336	2,965
D: Storage feeding and loose Housing	.....	1,549	1,928	2,309	3,072

Table 2. Annual labor requirements per cow for varying herd sizes and systems

System designation and description	No. cows in herd				
	10	20	30	40	60
			(hours)		
A: Stanchion barn	138	99	86	80	.....
B: Low-cost loose housing	.....	88	75	68	62
C: Herringbone and loose housing	.....	85	67	58	49
D: Storage feeding and loose housing	.....	77	69	58	51

Table 3. Total hours required per summer week for varying herd sizes and systems

System designation and description	No. cows in herd				
	10	20	30	40	60
			(hours)		
A: Stanchion barn	21.5	30.6	39.7	48.8	.....
B: Low-cost loose housing	.....	30.7	38.9	47.0	63.4
C: Herringbone and loose housing	.....	29.9	35.0	40.2	50.5
D: Storage feeding and loose housing	.....	25.5	32.1	38.8	52.1

Table 4. Hours required per cow per summer week for varying herd sizes and systems

System designation and description	No. cows in herd				
	10	20	30	40	60
			(hours)		
A: Stanchion barn	2.15	1.5	1.3	1.2	.....
B: Low-cost loose housing	.....	1.5	1.3	1.2	1.1
C: Herringbone and loose housing	.....	1.5	1.2	1.0	.8
D: Storage feeding and loose housing	.....	1.3	1.1	1.0	.9

SOME MILKING SYSTEMS COMPARED

Earl Fuller and Harald Jensen

This report is based on the same study as the previous article. It compares the time needed to do the milking chore with different milking systems for herds of varying size. It also outlines some suggestions for improving the milking chore.

Labor requirements per summer week are reported in table 1 and figure 1. Summer labor needs are reported since this season is the most critical labor period. Winter season requirements are similar except that they show somewhat slower milking rates.

Milking takes the most time of any dairy chore. The time needed is closely related to herd size but varies with the way the task is done. The study disclosed a wide variety of milking procedures, milking equipment, and parlor or milking area arrangements. For this reason, we were unable to observe many farms with any one system, but the study did provide extensive data on a large number of systems. Comparisons of the results from this study with those from others showed close agreement, so close, in fact, that in some cases data from the other studies were used to expand this one.

Labor requirements per summer week for some of the more interesting milking systems can be examined in table 1. The table shows the hours of labor per week required under the different systems to milk various sized herds. The right hand column lists the number of cows that can be milked in a 2-hour period. Two hours is about as long as most farmers care to milk.

Table 1. Labor requirements per summer week for varying herd sizes and milking systems and cows milked in 2 hours with use of various milking systems and 1 man

Type of milking system used	Number of head milked					In 2 hours¶
	10	20	40	60	80	
	Hours required per week†					
Switch system housing						
Stanchion milking w/2 pail uints‡	9.4	18.9	37.9	.....	.....	30
Stanchion housing						
Stanchion milking w/2 pail units	8.8	15.3	28.4	.....	.....	39
Stanchion milking w/3 pail units	.....	12.1	27.1	.....	.....	42
Loose housing						
Level 4-stall parlor w/2 pail units§	8.4	15.6	30.1	44.5	.....	37
Level 6-stall parlor w/3 pipeline units§	.....	9.4	20.0	30.6	41.2	55
4-stall lane parlor w/2 pail units	.....	16.7	30.4	.....	.....	37
3-stall side opening parlor w/2 pail units	10.7	15.7	25.7	.....	.....	45
3-stall side opening parlor w/3 pipeline units	.....	13.8	23.3	.....	.....	50
4-stall side opening parlor w/4 pipeline units	.....	13.0	19.2	25.3	31.5	69
6-stall herringbone or lane parlor w/3 pipeline units§	.....	9.9	18.7	27.4	.....	61
8-stall herringbone parlor with 4 pipeline units§	.....	7.9	14.4	20.9	27.5	81
10-stall herringbone parlor with 5 pipeline units§	.....	7.7	13.8	20.0	26.1	86
12-stall herringbone parlor with 6 pipeline units§	.....	6.9	12.0	17.1	22.2	103

† These estimates do not include milking cleanup and preparation time. Parlor milking (depending upon units, stalls and equipment used, and the milk grade) uses from 4.7 to 11.4 hours per summer week for these tasks. The average for all methods was 8.9 hours per week. This is almost 1.3 hours per day. Under stanchion conditions these chores take from 3.7 to 5.5 hours per week.

‡ The labor for this system is actually a winter season estimate. Winter milking took more time than summer.

§ Labor requirements for these systems are actually estimates based on data without a summer-winter specification.

¶ This column shows the number of cows that can be milked in 2 hours with the various milking systems.

Suggestions for Improving the Milking Chore

Analysis of the data revealed a number of interesting observations for improving the milking chore. Some can best be termed "rules of thumb"—not true for every case but strong general tendencies. Some suggest ways of improving a milking system already in operation. Others offer advice to dairymen who are selecting a system.

These observations indicated that pipeline milkers, overhead grain feeders, follower gates in the holding areas, as well as other similar features commonly thought to save time, may save time only in parlors with sufficient stalls and units to pressure the operator to work quickly. In general, smaller operations did not use this type of equipment nor did the study suggest that they could benefit from its use. But if because of the lack of this equipment a man has difficulty in keeping the units busy or in getting them off the cows on time, then removing the "bottlenecks" to a faster operation may be advisable. Larger operations had usually removed the more important ones.

Cost and return comparisons are basic for making decisions on whether to remove "bottlenecks." Further, keep in mind that the amount of time you have for adjusting, checking, and removing the milking units is one of the key factors influencing the **quality** of your milking chore. The time for feeding cows and the time for moving them in and out of the parlor (two important time-users) do not directly affect milking chore quality.

The performance of the herringbone parlors provides a good example of a system that minimizes time for feeding and moving cows. But research on the herringbone has shown that the milking uints are likely to stay on the cows too long if a man handles 6 units, or for many workers, even 5 units.

Some operators attempted to increase the milking rate by having two men in the parlor. This practice usually reduces **elapsed milking time** but increases the **total labor time required,** unless the two workers are in separate pits or work areas. This means that two-man systems are inadvisable if: (1) emergencies arise where one must milk alone, (2) other productive work is available for one man to do, and (3) both are completely capable workers.

Time Needed to Milk Added Cow

Analysis suggests the following approximate formula for the time to milk an added cow under parlor type conditions: The **sum** of the average unit on-cow time **plus** the average time the milking units are idle between cows **divided by** the number of units used. This time per added cow equals or exceeds the average time the worker must spend per cow, letting her in, washing her, putting on, adjusting, checking, and detaching the unit plus the time for letting her out.

Rules for Improving Milking

The formula in the preceding paragraph can be used to simplify the previous discussion and to produce the following suggestions for improving milking chores:

1. Reduce average unit on-cow time by:
   a. developing a simple, quick, and easy to follow milking procedure. Then with any system, the worker has a maximum of time to increase milking dates and improve the quality of the job done.
   b. using no more milking units than can be handled without injuring the cows.
   c. practicing rapid milking.
   d. breeding and culling for a fast milking herd.
   e. installing worksavers like a special second exit for cows needing special care if worker time is limiting.
2. Reduce average unit idle time by:
   a. using a two-sided parlor so that cows can be ready to milk as soon as a unit is available.
   b. using a pipeline or an extra milker pail to reduce the time to service the units between cows.
   c. adding a helper if worker time per cow is great enough to make for high average unit idle time.
3. Add more units (or more stalls):
   a. provided the associated problems can be avoided or overcome.
   b. provided excessive fatigue will not result.

These appear to be good suggestions for any parlor system and for most other milking arrangements also.

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THE OUTLOOK CORNER

Size of Dairy Herds

The number of large dairy herds has increased sharply in the last few years. What are the causes and probable future developments?

Minnesota farmers built up their dairy herds to a peak of almost 1.9 million cows in 1934, and again in 1944. Since 1948, however, they have held near 1.5 million cows.

The proportion of the state's farmers who keep dairy cows has fallen since 1930, but the average size of herd has increased. According to the U. S. Census of Agriculture the proportion of farmers keeping one or more cows and the average number of cows per herd has been:

1920	81 percent	8.5 cows
1930	90 percent	8.6 cows
1940	88 percent	9.8 cows
1950	80 percent	9.4 cows
1954	74 percent	11.0 cows
1959	69 percent	12.0 cows

The number of herds with 1 to 9 cows decreased by one-third during this 4-year period, while the number with 10 to 19 cows decreased by almost one-fourth. This is an extremely sharp change in a 4-year period.

The number of herds with 30 or more cows doubled during this period. Although the number of such herds still is only 4,000 or a little more than 2 percent of all herds, they include 11 percent of all cows in the state. In 1955 only 5 percent of the cows in the state were in herds of 30 or more.

Several factors contribute to this sharp decline in the number of small herds.

1. The number of small farms (120 acres or less) has dropped sharply; these farms have been combined with others to make larger farms. Many of these farmers had small herds.

2. Some of the farmers who have gone into the soil bank have had small dairy herds.

3. The increased fixed investment that has gone with improvements of dairy production has been too large to be carried by some small herds. Many improvements in dairy facilities require fixed investments which are too large. Among such facilities are new or remodeled milk houses, bulk tanks, milking parlors, and gutter cleaners.

4. Modern forage-harvesting machinery also involves large investments, and frequently cannot be justified with small herds.

5. It also is possible that fewer people are willing to be tied down for two milkings a day, 7 days a week. This may be especially true on small farms where there are few workers to permit occasional days off.

Why have others found it desirable to expand their herds?

1. The relatively low labor requirements with the modern equipment, together with the high rates of production that can be obtained today, make dairying a profitable enterprise for farmers who have herds sufficiently large to handle the overhead. Frequently the decision to build or to buy equipment is made jointly with the decision to expand the herd.

2. Once this equipment has been installed, the extra labor or cash outlay for extra cows is quite low. Many farmers expand their herds even farther than they had originally intended.

3. Modern forage production and harvesting methods increase both the quality and the quantity of forage, making it possible to have larger herds. These methods, also, require rather large initial investments.

What of the future?

The forces listed above still continue. New types of buildings and equipment are constantly being developed. It is likely that this will increase further the fixed costs in dairying. It may also decrease the cost of adding cows to the herds, once the investment has been made.

It is impossible to forecast the future for such events as this, but it is probable that the number of dairy herds will decline. It is possible that upward of 50 percent of the dairy cows in Minnesota could be in herds of 30 or more by 1970. Many of these would probably have more than 50 cows. Many of the larger herds will be on farms with two or more workers.

Table 1. Number of farms reporting milk cows by size of herd, Minnesota 1955-59

	Total farms	Number of farms reporting milk cows and heifers 2 years old and over-kept for milk				
		1-9 Cows	10-19 Cows	20-29 Cows	30 or more	Total
				(thousands)		
1955	154	54	49	11	2.1	116
1956	150	48	47	12	2.6	110
1957	146	41	44	14	3.4	102
1958	141	38	41	13	3.7	96
1959	138	35	38	13	4.0	90

Source: *Minnesota State Farm Census* 1955-1959 (Data gathered by township or county assessors) (Due to differences in definitions and procedures, these totals differ from the U. S. Census of Agriculture.)

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