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# YOUNG DAIRY CALF HOUSING IN MISSOURI

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## ACKNOWLEDGEMENTS

This bulletin is a progress report on the preliminary phases of a dairy calf housing study. The field study herein reported was made during the summer of 1952. The project is a part of the North Central Regional Project NC-3 and was partially financed by funds authorized by Section 9b3 Title 1 of the Research and Marketing Act of 1946.

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## INTRODUCTION

For the successful operation of a dairy enterprise it is vitally important that young heifer calves be raised into healthy and high producing cows. Calves have been one of the most neglected classes of livestock on the farm. Consequently mortality has been high. An important cause of death in young calves is the scours-pneumonia complex. While infectious agents are generally considered to be the primary cause of losses, predisposing factors also appear important. Among these factors is improper housing, subject of research reported in this bulletin.

In diagnosing the cause of calf losses it is sometimes difficult to separate the effect of poor housing from that of poor management and nutritional deficiencies. Determination of the effect of inadequate housing on calf losses, however, has been attempted in this study.

Use of open-shed housing for adult cattle apparently has made closed-type calf housing harder to provide. Adult cows withstand low temperatures in open structures without ill results, but it has been maintained that young calves, with their low resistance to diseases and undeveloped homeothermic mechanisms, require somewhat better shelters. Many dairymen, in an attempt to provide this added protection, keep calves in closed, poorly ventilated buildings which actually promote diseases and retard growth.

Principal objective of this field study was to determine effectiveness and adequacy of calf housing and management as practiced on dairy farms in the state of Missouri. Particular attention has been given to the adequacy of various types of ventilation systems. Most plans for young stock buildings have some features of unknown value. This study is designed to gather information to measure their worth. The field study is the first step toward solving calf-housing problems. It indicates controlled laboratory research is needed.

## METHOD AND SCOPE OF INVESTIGATION

Approximately one hundred dairymen were chosen at random from a list of dairymen maintained by the Department of Dairy Husbandry for interviews during the summer of 1952. The list included mostly dairymen who were doing or had done some testing in herd improvement associa-

tions. Most were grade-A milk producers. Location of their dairy farms fell in the four areas outlined in Fig. 1. Other dairymen were contacted in the areas through county extension agents and other dairymen. Normally, not more than five or six dairymen were interviewed in any one county. Six interviews were usually a maximum day's work for one interviewer.

Because of climatic differences, separation of interviews into groups has been useful in analysis of findings.

Definite information on calf losses during the preceding year, particularly on those that might be attributed to poor or inadequate housing, was gathered along with general information on herd management and housing facilities. Calf losses were used as an index for evaluating success of any given calf raising enterprise. Accurate information proved elusive. Dairymen were hesitant about giving information on losses. Either they did not know the exact number and did not consider they had lost many unless one-fourth to half of their calves died, or they felt that giving information on

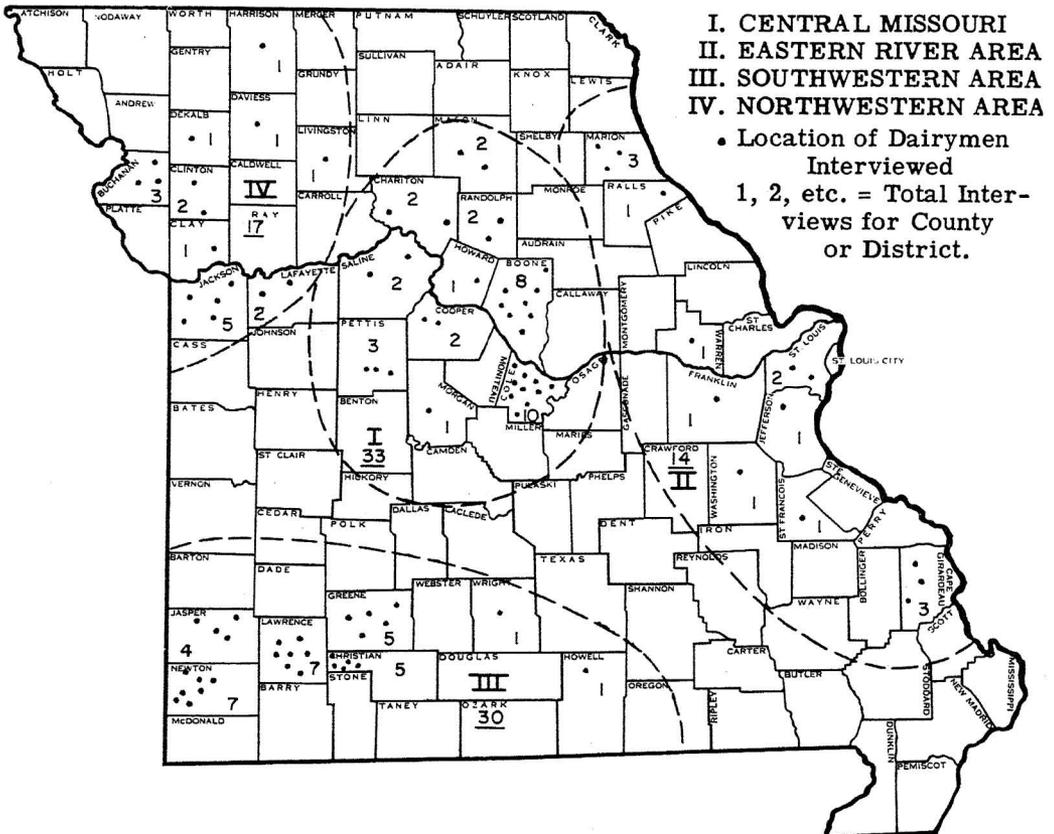


Fig. 1—Area coverage of calf housing survey. Summer, 1952.

such losses was a reflection on their managerial ability. Hesitation because of management factors was generally overcome when the dairymen clearly understood the purpose of gathering such information.

Discretion was used in recording losses. Mostly those which had been diagnosed as the scours-pneumonia complex, or the so-called "barn fever" disease, were recorded. This procedure mainly eliminated cases of abnormal birth and death resulting from accidents. In cases where calves got a normal start, then developed a sickness and died, but were not diagnosed by the owner as to the cause, the losses were recorded. Some losses are due to nutritional deficiencies and unsanitary feeding practices; but these causes, too, are interrelated with housing inadequacies.

Some information was gathered on calf feeding practices. Detailed information was gathered on the calf housing arrangement on each farm studied. This included a dimensional sketch showing space allocation, orientation, and construction details.

A copy of the interview schedule is included in the appendix.

## GENERAL HERD INFORMATION

The breed of dairy cattle in the herds studied is of importance for comparison with other studies and for checking possible relation between cattle breed and calf losses. It is interesting to note there are definite breed preferences in different areas of the state (See Fig. 2). Jerseys dominated in the southwest area; Holsteins made up the greater proportion in the other three areas. In no case, however, were Holsteins found to make up as great a proportion of all breeds as Jerseys in the southwest. In totaling all herds surveyed, it was found that the number of Jersey herds was the same as the number of Holstein herds. Each made up slightly more than one-third of the herds, with other breeds and mixed herds making up the remainder.

Of 94 herds studied, 4 contained more than 100 milking cows. These 4 herds were eliminated from size distribution analysis since they are not typical of dairy farm herds. Information on typical herds is desired for the purpose of planning building facilities on a statewide basis. The average number of milk cows and bred heifers was 14.0 per herd and the number of calves under one year was 15.6.

Some difference in herd size was observed in the four areas. The central area had the smallest average with 26.0 milk cows and the northwestern area around Kansas City and St. Joseph had the largest average with 32.7 cows per herd. All areas appeared to have good reserves of young stock for herd replacement. The northwestern area had the largest reserves. This may indicate a tendency for dairymen in this area to increase herd size.

Fig. 4 reveals that one-third of the herds are between 15 and 25 cows in size and that over two-thirds of all herds fall between 10 and 35 cows in size. The 9 herds of 50 cows or more increase the average figure for herd size up to 28.6.

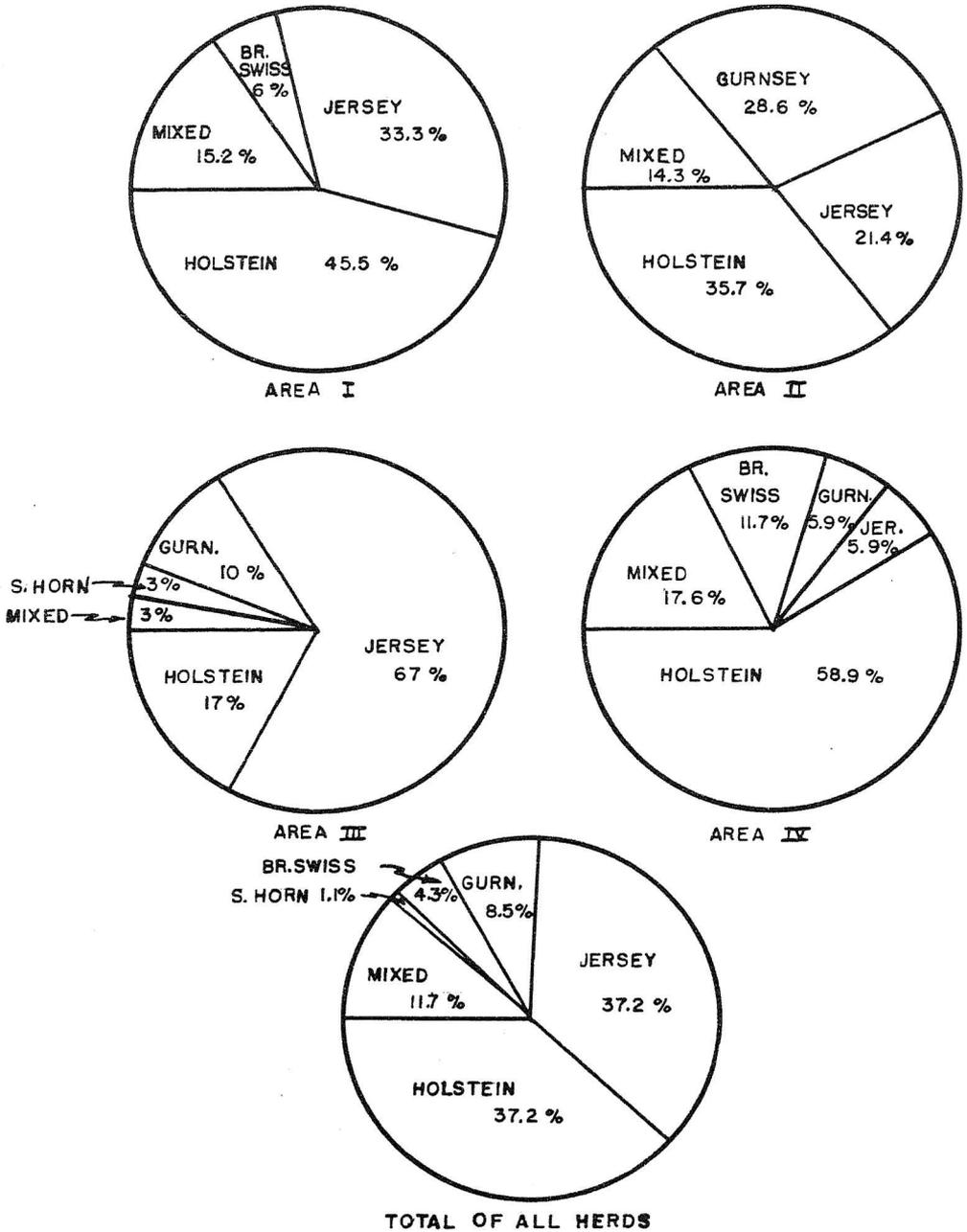


Fig. 2—Breeds of cattle. Percentage of distribution on herd basis.

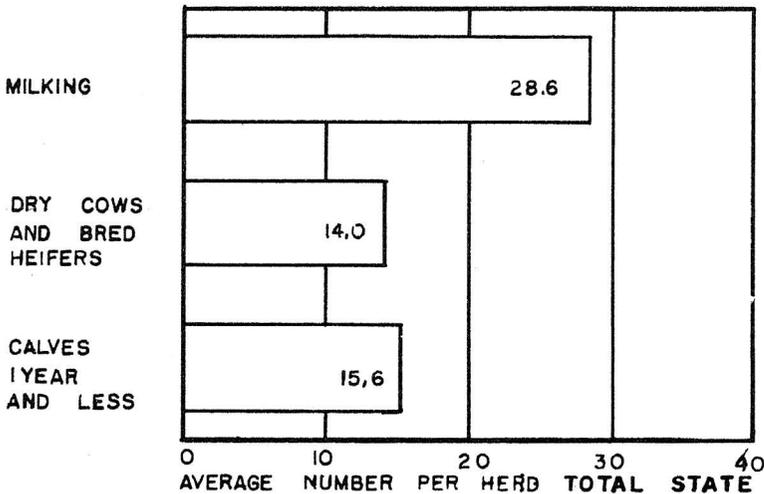
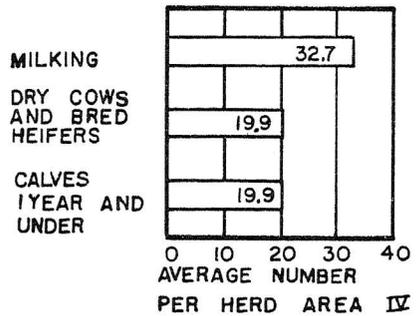
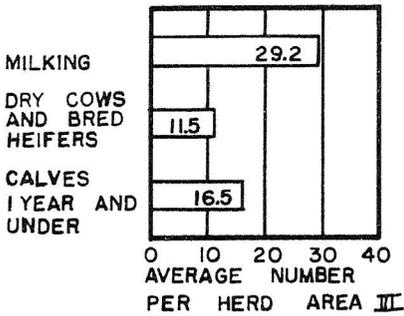
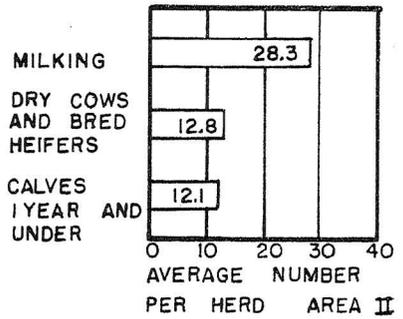
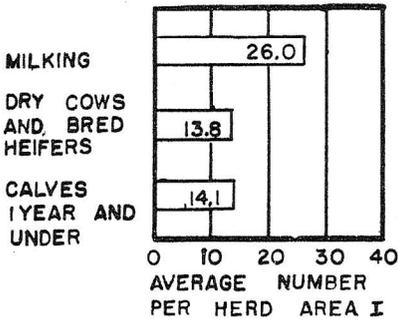


Fig.3—Average size of herd.

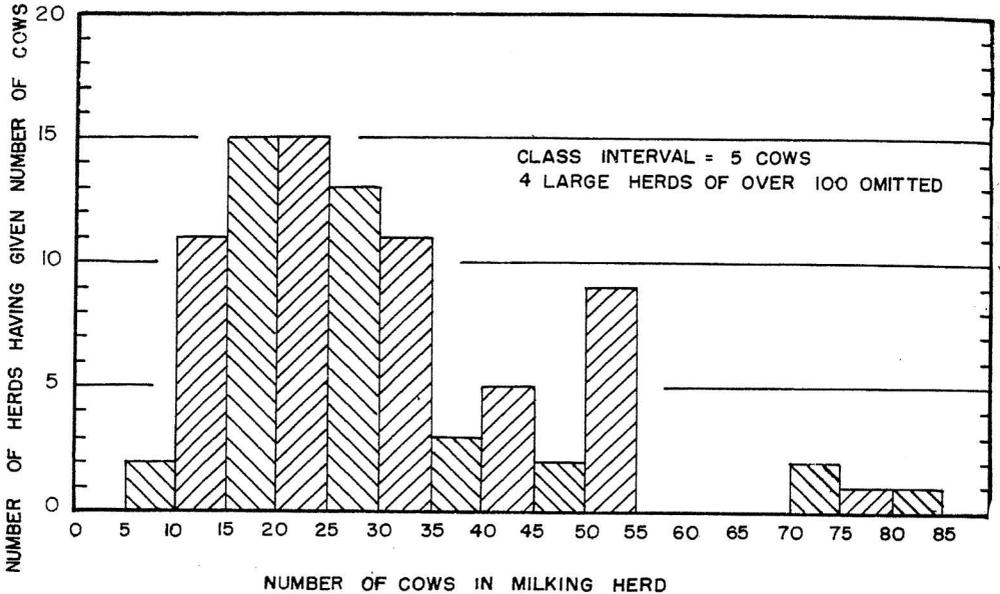


Fig. 4—Frequency distribution of herd sizes.

Figures 5 and 6 are similar frequency distribution graphs for dry cows and bred heifers and for calves under one year of age. More than one-third of the herds had between 5 and 10 dry cows and bred heifers per herd at the time of this survey in July and August of 1952. Over two-thirds of the herds had between 5 and 20 calves less than a year old.

In herds studied, the number of milking cows made up about one-half of the total herd size. These figures include very few bull calves. Most dairymen do not attempt to raise them for breeding purposes.

Over half of the dairymen used milking parlors and the loose housing system of management. Some dairymen with stanchion barns were using an equivalent of the loose housing system. Table 1 shows that about 7 percent

TABLE 1 -- MILKING FACILITIES

Area	Total number of dairy farms	Parlors		Milking Barns		Stanchion	
		No. of dairy farms	%	No. of dairy farms	%	No. of dairy farms	%
I Central	33	21	64	2	6	10	30
II Eastern	14	7	50	0	0	7	50
III Southwestern	30	10	33	5	17	15	50
IV Northwestern	17	12	71	0	0	5	29
<b>TOTALS</b>	<b>94</b>	<b>50</b>	<b>54</b>	<b>7</b>	<b>7</b>	<b>37</b>	<b>39</b>

of the milking facilities were what are classified as milking barns. These are stanchion barns sufficient in size to stanchion all cows. Cows are kept in

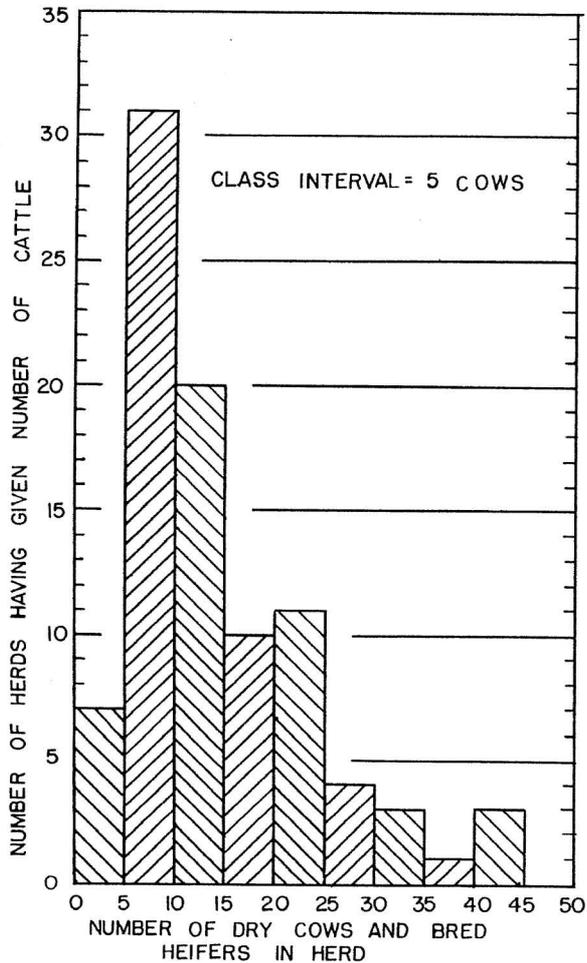


Fig. 5—Frequency distribution of herd sizes.

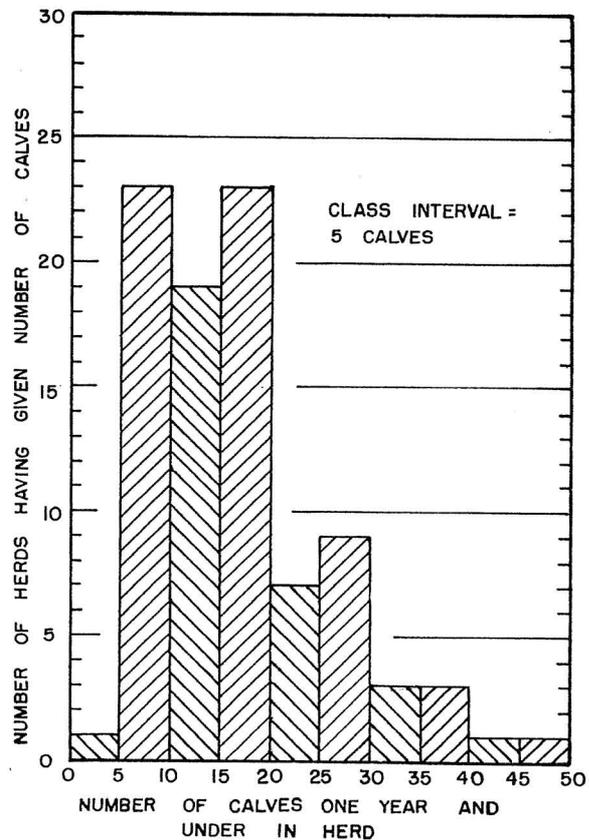


Fig. 6—Frequency distribution of herd sizes.

them only for milking and, possibly, feeding of concentrates. All roughages are fed outside. The herds are sheltered in open buildings. One herd of Jerseys was observed in southwest Missouri where adult cows were provided with no shelter, other than a grove of trees and the milking parlor while being milked. The operator seemed satisfied with the arrangement.

### CALF PEN ARRANGEMENT

Calf pens were classified as individual pens and group pens. On farms with group pens the young calves were placed in them immediately after removal from the dam, usually two or three days after birth. On farms with individual pens young calves were placed in separate pens for a period of 1 to 12 weeks. Of 92 herds analyzed, 52 used the individual pen management system. (See Table 2). The southwestern and eastern areas used this system in approximately 70 percent of the cases. The other two areas used it in little more than 50 percent of the herds.

No difference was found in the percent of calf losses between the two systems. Loss rate averaged 6.1 percent for all herds studied, also for both systems of management. Some differences in loss percentages were noted for the different areas but they are not significant.

### BUILDING TYPES AND EQUIPMENT

For the purposes of this study in determining success of open type calf houses, all of the calf shelters were classified as open or closed. The open classification includes all structures which have any permanently open sections, whether the size of a window or an entire open front. The closed classification includes those structures which could be closed tight with the exception of cracks. In the latter classification an attempt was made by the operator to maintain warm conditions throughout winter months. This was done by varying window openings to allow, in most cases, a bare minimum of ventilation.

Table 3 indicates that 37 or more than one-third of the calf housing units were of the open classification. During the winter of 1951-52, there were 518 calves born under the open type housing systems. Of these 518 calves, 17 (3 percent) died. In the closed structures where 1282 calves were born during the same period, 88 (6.7 percent) were lost through diseases attributable in part to inadequate housing conditions. This difference of 3.7 percent in calf losses between the two systems is statistically very significant, indicating a definite advantage of the open housing type over the closed.

The lower calf losses in open type housing suggest that calves may be housed successfully in the same type of structure, or in the same structure, used for loose housing of adult cows. Some of these 37 dairymen practicing open housing for calves were doing so because of lack of any other type of building; others because they apparently were not concerned whether it was the best system or not. In contrast, many were following the practice because they believed in it and had found it successful in raising calves.

TABLE 2--CALF PEN ARRANGEMENTS ON 92 DAIRY FARMS

Area	Total number of dairy farms	No. of herds	Individual pens				Group pens				Totals			Av. No. born	Av. No. lost
			Born	Lost		No. of herds	Born	Lost		Born	Lost				
				No.	%			No.	%		No.	%			
I Central	32	14	315	22	6.3	18	194	22	11.3	545	44	8.1	17	1.4	
II Eastern	13	9	167	10	6.0	4	173	12	6.9	340	22	6.5	26	1.7	
III Southwestern	30	22	418	29	6.9	8	101	1	1.0	519	30	5.8	17	1.0	
IV Northwestern	17	7	130	4	3.1	10	218	7	3.2	348	11	3.2	20	0.6	
<b>TOTALS</b>	<b>92</b>	<b>52</b>	<b>1066</b>	<b>65</b>	<b>6.1</b>	<b>40</b>	<b>686</b>	<b>42</b>	<b>6.1</b>	<b>1752</b>	<b>107</b>	<b>6.1</b>	<b>19</b>	<b>1.2</b>	

TABLE 3 -- TYPES OF CALF BUILDINGS AND MANAGEMENT SYSTEMS ON 94 DAIRY FARMS

Area	Total No. of Dairy farms	OPEN				CLOSED				Days in Pen	Area /pen Sq. ft.	PANEL			BUILDING Mas-			FLOOR		
		No.	Born	Lost	%	No.	Born	Lost	%			Solid	Slat	None	Wood	onry	Other	Conc.	Earth	Wood
I Central	33	19	264	16	6	14	335	26	8	53	42	6	14	13	29	4	-	13	20	-
II Eastern	14	2	32	0	0	12	302	22	7	56	36	4	8	2	9	2	3	5	7	2
III Southwestern	30	11	137	1	1	19	382	29	8	59	32	13	17	--	24	5	1	14	14	2
IV Northwestern	17	5	85	0	0	12	263	11	4	60	30	4	8	5	14	3	1	6	8	3
<b>TOTALS</b>	<b>94</b>	<b>37</b>	<b>518</b>	<b>17</b>	<b>3</b>	<b>57</b>	<b>1282</b>	<b>88</b>	<b>6.7</b>	<b>60</b>	<b>36</b>	<b>27</b>	<b>47</b>	<b>20</b>	<b>76</b>	<b>14</b>	<b>4</b>	<b>38</b>	<b>49</b>	<b>7</b>

Calves placed in individual pens were kept there for an average period of about 2 months. (See Table 3). The average space allowed for these calves was 36 square feet. The open slat-type partitions were used most commonly. Less than one-third or 27 of the pen arrangements had solid panels. Solid pen partitions have been recommended quite widely for protection against drafts and for isolation against contamination from adjoining pens and calves. The southwestern area used by far the highest proportion of the solid pen partitions.

Of the 94 dairy farms observed, 76 had calf housing structures made of wood frame, 14 were of masonry, while four were listed as "others" being either monolithic concrete or metal. The type of floor in calf pens and barns generally has been considered an important sanitation factor. Over half of the floors observed were earthen, while 38 or somewhat over one-third were concrete and 7 were wood.

### SEPARATE CALF BARNs

Approximately 38 percent of the dairy farms had separate buildings for young calves. (See Table 4). Buildings listed as separate calf buildings were separated completely from quarters for adult animals. The proportion of dairy farmers having separate calf housing facilities was about the same in all four areas of the state. Twelve percent of the dairymen had combination calf and maternity barns. In some cases these were predominantly calf buildings with only one or two maternity stalls in them. In the other cases, 50 percent of the total calves were kept in a part of the main dairy or general purpose barn. Arrangements in this group varied all the way from those where calves were merely penned off in one corner of a large unpartitioned barn, to ones where a portion of the main dairy barn was divided off and prepared specifically for the care of calves.

TABLE 4 -- CALF BUILDINGS FOR CALVES ONLY AND FOR CALVES AND ADULT STOCK

Area	Total number of dairy farms	Calves with Adults		Maternity and calf Buildings		Separate calf Buildings	
		No.	%	No.	%	No.	%
I Central	33	20	61	1	3	12	36
II Eastern	14	5	36	4	28	5	36
III Southwestern	30	13	43	5	17	12	40
IV Northwestern	17	9	53	1	6	7	41
<b>TOTALS</b>	<b>94</b>	<b>47</b>	<b>50</b>	<b>11</b>	<b>12</b>	<b>36</b>	<b>38</b>

### CALF FEEDING PRACTICES

Milk feeding practices were quite uniform, although varied opinions were discovered on how much milk should be fed, how it should be fed, whether colostrum is necessary, and how long it should be fed. The practice of leaving the calf with the dam for a period of only 2 or 3 days was found to prevail. The average number of days that calves were fed some mother's

milk was 15. (See Table 5). The practice differed somewhat in the north-western area where colostrum was made available to calves for an average period of 25 days.

TABLE 5 -- MANAGEMENT OF CALVES ON MILK

Area	Total number of dairy farms	Av. No. of days with the dam	Av. No. of days fed colostrum	Av. No. of days fed milk
I Central	30	2.5	12	64
II Eastern	12	2.7	13	84
III Southwestern	29	2.3	13	64
IV Northwestern	17	2.5	25	65
<b>TOTALS</b>	<b>88</b>	<b>2.5</b>	<b>15</b>	<b>67</b>

The average time that calves were kept on milk was 67 days. This length of time was fairly uniform in all areas except the eastern one, where the trend was to leave calves on milk for an average period of 84 days. Milk supplement was in general use among dairymen. The type and amounts of supplements used varied considerably between areas.

With few exceptions, the dairymen put hay and grain before calves as soon as they showed a tendency to nibble at it. Most dairymen did not practice putting calves on pasture until they were from 6 to 12 months old.

## OPEN VERSUS CLOSED TYPE BUILDINGS

Since calf losses were significantly lower in open type buildings, a more detailed study was made of them. Table 6 gives a comparison of calf losses in open and closed calf barns that were separate from other buildings. Of 36 separate calf barns, 13 were found to be of the open classification. There appears to be a substantial difference in loss rate of calves raised in these two types of buildings. The difference is not significant, however, because of the small number of calves involved.

TABLE 6 -- OPEN VERSUS CLOSED CALF BARNs (SEPARATE FROM OTHER BUILDINGS)

Area	Total number of dairy farms	Open buildings				Closed buildings				Totals		
		No. of herds	Born	Lost		No. of herds	Born	Lost		Born	Lost	
			No.	%			No.	%		No.	%	
I Central	12	5	41	4	9.8	7	262	16	6.1	303	20	6.6
II Eastern	5	0	0	0	0	5	80	7	8.8	80	7	8.8
III Southwestern	12	4	66	3	4.5	8	194	15	7.7	260	18	6.9
IV Northwestern	7	4	86	0	0	3	94	8	8.5	180	8	4.4
<b>TOTALS</b>	<b>36</b>	<b>13</b>	<b>193</b>	<b>7</b>	<b>3.6</b>	<b>23</b>	<b>630</b>	<b>46</b>	<b>7.3</b>	<b>823</b>	<b>53</b>	<b>6.4</b>

Table 7 presents similar data comparing open and closed calf quarters, but includes those where calves were not kept separate from adult cattle, as well as separate calf barns.

TABLE 7 -- CALF BUILDINGS; OPEN VERSUS CLOSE CALF QUARTERS (SEPARATE BUILDINGS AND THOSE COMBINED WITH ADULT STOCK QUARTERS)

Area	Total number of dairy farms	Open buildings					Closed buildings				Totals		
		No. of herds	Born	Lost		No. of herds	Born	Lost		Born	Lost		
				No.	%			No.	%		No.	%	
I Central	13	6	56	5	9.0	77	262	16	6.1	318	21	6.6	
II Eastern	9	2	42	0	0	7	220	19	8.6	262	19	7.3	
III Southwestern	17	4	56	2	3.6	13	279	18	6.4	335	20	6.0	
IV Northwestern	8	4	86	0	0	4	100	8	8.0	186	8	4.3	
<b>TOTALS</b>	<b>47</b>	<b>16</b>	<b>240</b>	<b>7</b>	<b>2.9</b>	<b>31</b>	<b>861</b>	<b>61</b>	<b>7.1</b>	<b>1101</b>	<b>68</b>	<b>6.2</b>	

This group showed even greater difference in calf losses in favor of the open buildings. The difference is not significant, statistically, although somewhat more than in the comparison of separate calf barns shown in Table 6. Comparison involving calf arrangements (See Table 3) was significant above the one percent level, and this latter comparison, involving only 47 buildings (See Table 7) was significant above the 5 percent level.

### CLEANING PRACTICES

The frequency of cleaning calf pens was of particular interest in this study, because of its possible relation to sanitation and to buildings and labor requirements. In the same light built-up litter systems were of interest. This system of management for calves is associated with the open shed housing of both young and adult stock. Table 8 shows that 14 of 36 separate calf housing arrangements used the built-up litter system. Dairymen who used the built-up litter packs were not the same ones, however, who used open shed housing.

Loss rate for the 14 built-up litter arrangements was 9.1 percent, compared to 5.5 percent for clean litter. This difference is not statistically significant. It indicates importance of other management factors, rather than undesirability of built-up litter. In a few cases where the built-up litter system was supposedly being used, it was apparent that insufficient bedding was being added.

### SEPARATE CALF BUILDINGS

Details of construction of the 36 separate calf buildings were studied comprehensively and tabulated in Table 9 and 10. The south sides of the buildings proved to be the most common location for windows, although 7 buildings had no windows. A variety of ventilation arrangements were discovered. No mechanically operated systems were observed. Adjustable windows and doors proved to be the most common method of ventilation. As noted previously, 13 of the 36 calf buildings were of the open front type and required no other ventilation system.

From Table 9, it will be noted that five calf barns were constructed with straw lofts. These straw lofts were designed for the natural exhausting of air from the main part of the building into the attic. From the attic it is

TABLE 8 -- CALF PEN CLEANING PRACTICES

Area	Total number of dairy farms	Regular cleaning								Litter pack				
		Month-			When		Total	Born	Lost		Total	Born	Lost	
		Daily	Weekly	ly	needed	No.			%	No.			%	
I Central	12	3	1	0	3	7	238	11	4.6	5	65	9	13.8	
II Eastern	5	1	0	0	1	2	23	2	8.7	3	57	5	8.8	
III Southwestern	12	2	3	4	0	9	225	17	7.6	3	35	1	2.9	
IV Northwestern	7	2	0	0	2	4	129	4	3.1	3	51	4	7.8	
<b>TOTALS</b>	<b>36</b>	<b>8</b>	<b>4</b>	<b>4</b>	<b>6</b>	<b>22</b>	<b>615</b>	<b>34</b>	<b>5.5</b>	<b>14</b>	<b>208</b>	<b>19</b>	<b>9.1</b>	

TABLE 9 -- LIGHTING AND VENTILATION OF CALF BUILDINGS

Area	Total number of dairy farms	Lighting						Ventilation					
		No		North		East		Window		Window		Straw	
		Win-dows	South only	East only	& South	& West	Three sides	Open window	Movable windows	Door	& doors	Open front	loft
I Central	12	4	4	0	3	1	0	1	2	2	3	5	3
II Eastern	5	0	4	0	0	1	0	0	2	2	1	0	0
III Southwestern	12	2	2	0	3	3	3	2	6	0	2	4	1
IV Northwestern	7	1	3	2	0	0	1	0	2	0	1	4	1
<b>TOTALS</b>	<b>36</b>	<b>7</b>	<b>13</b>	<b>2</b>	<b>5</b>	<b>5</b>	<b>4</b>	<b>3</b>	<b>12</b>	<b>4</b>	<b>7</b>	<b>13</b>	<b>5</b>

TABLE 10 -- CONSTRUCTION FEATURES USED IN 36 CALF BUILDINGS

Area	Total number of dairy farms	Loss Rate			Straw Lofts				Bldg. Materials			Floor Materials		
		Born	Lost	%	Total	Born	Lost	%	Wood	Conc.	Other	Conc.	Earth	Wood
I Central	12	303	20	6.6	3	176	8	4.5	10	2	0	5	7	0
II Eastern	5	80	7	8.8	0	0	0	0	3	1	1	3	1	1
III Southwestern	12	260	18	6.9	1	15	1	6.7	9	2	1	4	7	1
IV Northwestern	7	180	8	4.4	1	24	0	0	4	3	0	3	2	2
<b>TOTALS</b>	<b>36</b>	<b>823</b>	<b>53</b>	<b>6.4</b>	<b>5</b>	<b>215</b>	<b>9</b>	<b>4.2</b>	<b>26</b>	<b>8</b>	<b>2</b>	<b>15</b>	<b>17</b>	<b>4</b>

moved to the outside through roof ventilators or wall louvers. In these five straw loft buildings the air was taken in through windows. Air can be brought in through almost any type of opening, including specially constructed inlets. All of the straw lofts were giving satisfactory service according to the dairymen who owned them. Calf losses were lower in straw loft calf barns than in the group as a whole, being 4.2 percent compared to 6.4 percent (See Table 10). This difference is not significant statistically because of the small number of samples included in the study.

## SUMMARY

1. Jersey and Holstein herds each made up slightly more than one-third of the herds included in this study. Other breeds and mixed herds made up the remaining one-third.
2. Average herd size for this study was 28.6 milking cows, with 14.0 bred heifers and dry cows, and 15.6 calves under one year of age. The milking cows made up approximately one-half of the total number of animals in the herd.
3. Milking parlors were used by more than one-half of the dairymen. A number of other dairymen with stanchion barns were, for all practical purposes, using the loose-housing system of management.
4. Of 92 calf pen arrangements studied, 52 were of the individual pen type, and 40 were of the group pen type. The southwestern and eastern areas used individual pens in 70 percent of the cases as compared to 40 percent for the others. No difference was found in the rate of calf losses between individual pens and group pens.
5. Over one-third of the calf housing units studied were of the open type. Open-type structures showed loss rates significantly lower than closed ones, the average loss being 3.0 percent for the open type structures, and 6.7 percent for the closed ones.
6. Calves were placed in the individual pens an average of two months.
7. The young calves which were kept in individual pens were allowed an average of 36 square feet of space.
8. A little less than one-third of pen partitions were of solid panels while the rest were of the open-slat type.
9. Wood frame dominated in the type of construction although 18 were of masonry, concrete or other construction.
10. Some 38 percent of the calf arrangements studied had separate calf buildings. The calves in these were isolated entirely from adult stock.
11. The young calf was generally left with its dam for 2½ days, fed some colostrum for 15 days, and fed some milk for 67 days. Milk supplements were used quite generally.
12. Of the 36 separate calf buildings studied, 13 were found to be of the open type, and 23 of the closed type. The calf losses in the open buildings

averaged 3.6 percent and 7.3 percent in the closed buildings. This difference, however, is not statistically significant.

13. The built-up litter system was used in 14 of the 36 separate calf buildings. Loss rate was somewhat higher for built-up litter being 9.1 percent against 5.5 percent for those not using it. The difference, however, is not statistically significant.

14. Five straw-loft type calf buildings were observed. All were providing satisfactory service. Calf loss in these buildings averaged 4.2 percent against 6.4 percent for all buildings included in this study. This difference is not statistically significant.

15. The number of concrete and earth floors was about the same. Some wooden ones were observed. Where sufficient bedding was used, no major dissatisfaction was found for any one type. Some unsanitary arrangements were found with all types.

16. In Missouri there are four rather distinct types of calf housing management. First, there is the housing of calves in a part of the loafing barn. This often is used by beginning dairymen, or others who do not have capital to invest in more extensive buildings. Second, is the housing of calves in part of a stanchion barn formerly used for cows. Third, is the use of a separate building for calves, which may or may not have been built specifically for this purpose. Many poultry houses are being used successfully for housing calves. Fourth is the housing of calves in any space that may be available when they arrive.

17. Observations and data from this survey suggest that calves need a dry place, free from drafts but providing plenty of fresh air and sunshine. Both open and closed types of structures can be adapted to fill these needs.

18. A study of the data shows that some of the dairy farms which had elaborate buildings for calves also had the highest rate of calf losses. On the other hand, some of the places with simple, low-cost facilities had few or no calf losses from scours and pneumonia. This bears out to some extent the fact that calves can be raised successfully under many varied conditions with proper management.

19. While no conclusive requirements for calf housing can be established from this study, it was observed over and over again that calves do exceptionally well in open-type structures. Such structures are not particularly warm, but are dry when adequate bedding is provided, and they give protection against drafts. Solid panels and individual pens provide protection from drafts. On the other hand it was observed that calves were not generally doing well in the poorly ventilated, closed-type structures. These were often damp and drafty due to faulty ventilation and internal air currents in the large unpartitioned barns.

20. Calf losses observed in this survey are no doubt lower than would be found for dairymen as a whole, as those interviewed were doing some testing work in dairy herd improvement associations and many of them also had purebred herds.

21. The loss rate was doubtless somewhat lower than it would have been a few years earlier because of the increased use of antibiotics in recent years. Antibiotics were in general use among dairymen included in this study for treating calves which showed any symptoms of sickness. If a calf is treated promptly in case of scours it can usually be cured before pneumonia develops and the calf is lost. Although there is no doubt of the benefit of such drugs some dairymen have a tendency to depend on them too much and to become lax in the care of calves, particularly in the determination and removal of the causes of sickness.

APPENDIX  
Interview schedule used in the survey.

Report by: \_\_\_\_\_ Date: Day \_\_\_\_\_ Mo. \_\_\_\_\_ Yr. \_\_\_\_\_

CALF HOUSING SURVEY

1. Farm Operator \_\_\_\_\_ Post Office \_\_\_\_\_
  2. County \_\_\_\_\_ Township \_\_\_\_\_ Location \_\_\_\_\_
  3. Operation: (1) Owner Operator, (2) Partnership, (3) Father & Son
  4. Years of dairying under present system of operation \_\_\_\_\_
  5. Type of dairy product sales (grade, whole milk or cream) \_\_\_\_\_
  6. Breed of Cows: (1) Jersey, (2) Holstein, (3) Guernsey, (4) Shorthorn  
(5) other \_\_\_\_\_
  7. Size: Milking \_\_\_\_\_, dry cows and bred heifers \_\_\_\_\_ calves \_\_\_\_\_ bulls \_\_\_\_\_
  8. What proportion of heifer calves are raised for herd maintenance \_\_\_\_\_
  9. What proportion of bull calves are raised for breeding purposes \_\_\_\_\_
  10. How is calving time distributed over the year \_\_\_\_\_
  11. How many heifer calves were born during the last year \_\_\_\_\_
  12. How many were lost after birth \_\_\_\_\_
  13. Diagnosis as to losses \_\_\_\_\_
  14. Remarks as to frequency of losses and time of year \_\_\_\_\_
- 
15. Management of calves
    - (a) Time with dam \_\_\_\_\_ days \_\_\_\_\_
    - (b) Time on colostrum \_\_\_\_\_ days \_\_\_\_\_
    - (c) Time on milk \_\_\_\_\_ days \_\_\_\_\_
    - (d) Time until calves get grain and hay \_\_\_\_\_ days \_\_\_\_\_
    - (e) Do calves go out on pasture the 1st or 2nd spring \_\_\_\_\_
  16. Calf accommodations
    - (a) Are individual pens used \_\_\_\_\_ If so, Size \_\_\_\_\_ How long in pens \_\_\_\_\_  
 Solid panels \_\_\_\_\_ Type of floor \_\_\_\_\_ Type of bedding \_\_\_\_\_  
 Light arrangement \_\_\_\_\_ How often cleaned \_\_\_\_\_
    - (b) Group pens: What age calves \_\_\_\_\_ How many per pen \_\_\_\_\_  
 size \_\_\_\_\_  
 Solid panels \_\_\_\_\_, Type of floor \_\_\_\_\_ Type of bedding \_\_\_\_\_  
 Light arrangement \_\_\_\_\_ How often cleaned \_\_\_\_\_

(c) Are young calves separated from maternity stalls \_\_\_\_\_

(d) At what ages are calves turned out in the lots \_\_\_\_\_

17. Calf housing

(a) Building: (1) Barn with adult stock, (2) Maternity and calf barn  
(3) Calf barn, (4) Open shed, (5) Other \_\_\_\_\_

(b) Material: (1) Wood frame, (2) post frame, (3) pole type, (4) Metal  
(5) Masonry, (6) Other \_\_\_\_\_

(c) Ventilation: (1) Open shed, (2) Straw loft, (3) Windows, (4) Doors,  
(5) Slot Ventilators, (6) Flues, (7) Fan, (8) Other \_\_\_\_\_

(d) If a controlled system, give information on capacity, \_\_\_\_\_  
Type of control \_\_\_\_\_, dimension of flues \_\_\_\_\_, area of slot openings \_\_\_\_\_  
\_\_\_\_\_ details of straw loft \_\_\_\_\_ area and depth of  
straw \_\_\_\_\_ and how long between changes \_\_\_\_\_

18. Sketch building layout giving orientation, estimated overall dimensions,  
and internal layout with estimated allocation of space.