Bulletin 515

DAIRY HERD MANAGEMENT

Ohio Cooperative Extension Service—The Ohio State University

DAIRY HERD MANAGEMENT

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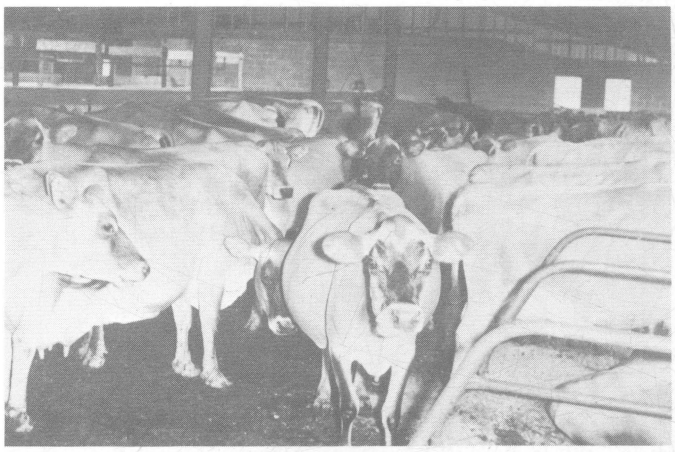


Free stall housing

Dairy farming is big business in Ohio. In 1968, nearly 20,000 Ohio dairymen sold over 245 million dollars worth of milk and dairy products. This constituted 20 percent of the state's total agricultural income. An estimated additional 28 million dollars were received from sale of cull cows, veal calves, and surplus cattle bringing total income from dairying to nearly 275 million dollars. Besides furnishing essential and economical food nutrients, Ohio's dairy industry generates more than 550 million dollars in economic activity annually.

Dairy products rank first as a source of farm income in 38 of Ohio's 88 counties and second in 16 counties.

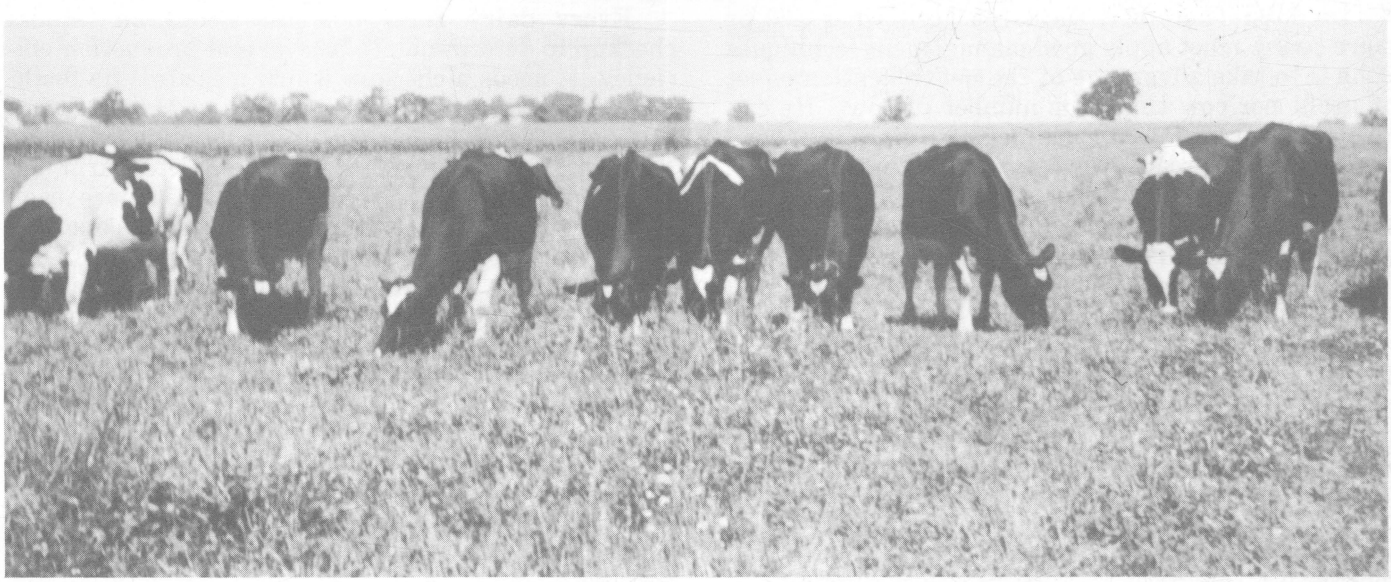
The trend toward fewer and larger dairy herds continues. Present size of Ohio herds reflects that dairying has been and continues to be largely a family enterprise. Size of herd is determined to a large extent by the care that can be provided by the family with only a limited supply of hired labor. Ten years ago, many family-sized herds in Ohio ranged in size from 20 to 30 cows. Today a majority of Ohio's cows are in herds that range in size from 30 to 50 cows with a significant number of family-operated herds of 60 to 100 cows. In the future, Ohio dairying will likely continue largely as a family enterprise with a further increase in size of herds.

Table I: Number of Herds and Cows Per Herd

Cows/Herd	Census Data		Predicted	
	1959	1964	1985	2000
1-9	42,000	21,000	0	0
10-19	14,000	8,000	0	0
20-29	6,400	5,000	500	0
30-49	3,000	4,200	5,000	1,000
50-99	750	1,200	2,000	1,600
100+	40	111	300	450

While per capita consumption of dairy products has experienced a decline from 740 pounds of milk equivalent in 1950 to 576 pounds in 1968, the future for Ohio's dairy industry appears bright. Decline in herd and cow numbers coupled with an ever-increasing human population for the most part have nullified the decline in per capita consumption. Ohio

Good management includes good pasture



is actually a deficit milk producing state. In 1968, the state's 450,000 dairy cows produced nearly 4.3 billion pounds of milk while the population of about 11 million people consumed nearly 6.3 billion pounds. Demand for dairy products in Ohio seems destined to outstrip supply in the immediate years ahead. Thus, the future for dairying in Ohio seems bright. However, higher consumer prices, further inroads of substitute products, and changing tastes and preferences are the 3 primary factors that will have a depressing influence on the demand for milk products.

Profit — A Primary Objective

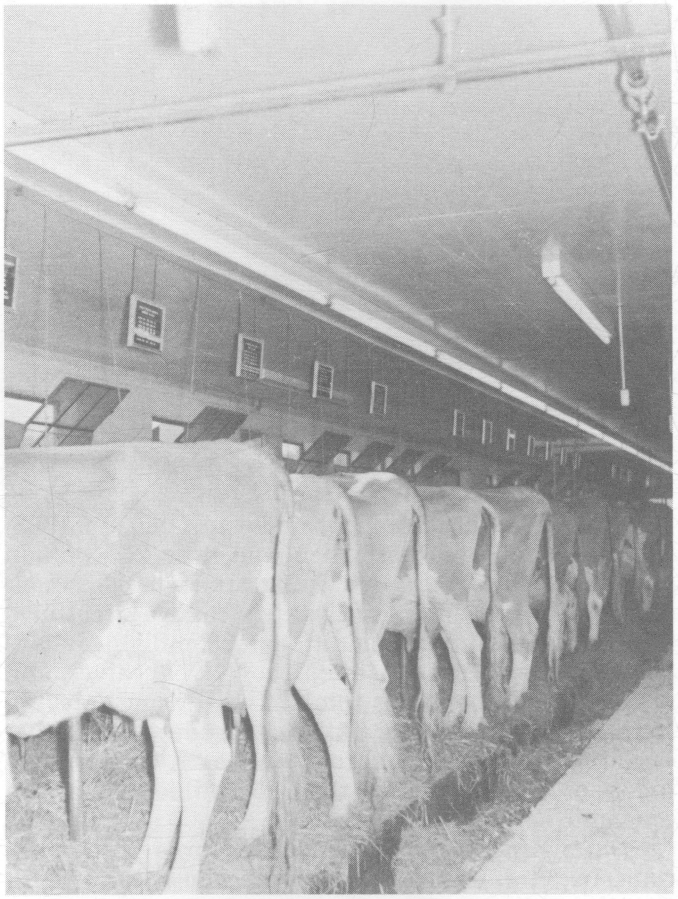
Profit is a primary objective of the dairyman in managing his dairy enterprise. To obtain maximum profit, dairymen must be able to identify and solve problems related to feeding, breeding, herd health, labor, capital outlay, expenses, and farm organization, particularly as the latter pertains to such items as size of herd, raising replacements, buildings, dairy farm layout, waste disposal, size of farm, and crop production.

Ultimately, it condenses to achieving unit efficiency with adequate volume including both high production per cow and high production per man.

Size is important to every dairy operation, but size alone will not solve low income problems. In the past, increasing herd size as a means for increasing net income has often been over-emphasized. The important thing to remember is to get **Better** before you get **Bigger.** High economical production per cow is the first step. To achieve this we must have cows with the **inheritance** for high milk production and then provide them with the proper **feed** and **environment** to get the job done.

Maximum net income is possible only when sufficient resources are teamed with capable management. Dairymen with large herds have greater opportunity for profit; but, just as scale increases the opportunity for gain, it also increases the opportunity for loss. Therefore, the large herdowner (60 or more cows) must apply good management techniques if he is to take advantage of the multiplication effect of profit per cow times the number of cows. He can also profit from lower costs per cow since overhead costs can be spread over larger numbers. Furthermore, in large herds, returns from labor more often exceed the expenses of labor hired; and, perhaps most important, increased size of the business permits the owner to function more as a manager and less as a farm laborer.

Ohio dairying is generally characterized by the production of forage crops and much of the grain by the same unit producing the milk. Therefore, dairying is basically a means of marketing the products of land, labor, and cows. With this system of farming, a dairyman must attain both a profitable dairy enterprise and a crop production program. The magnitude of the two must be sufficient to return the desired income.



Cows housed in stanchion barn

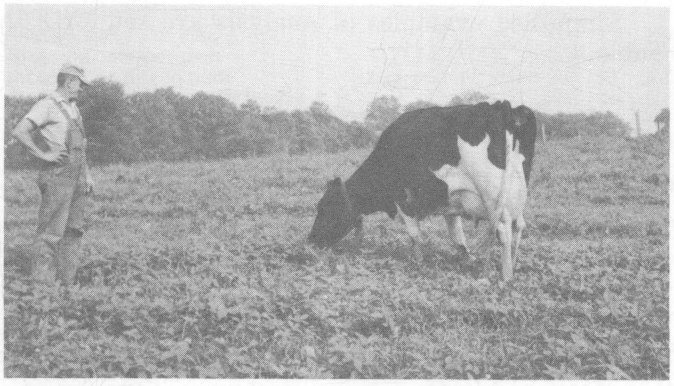
Replacements are normally raised as part of the Ohio Dairy Farm operation. The management, production of feed, housing, and labor requirements for young stock must, therefore, be given adequate consideration in developing a profitable dairy enterprise.

RECORDS IN MANAGEMENT

Farm Business Analysis Records

Every dairy farm business needs an annual checkup to determine profit level and production efficiency. It needs a checkup which measures its **financial health.** Records serve as a means for analyzing past actions and a basis for future decisions.

Many Ohio dairymen keep complete farm accounts and have their records analyzed once each year by the Department of Agricultural Economics by way of the county or area Extension offices. The 1968 summary, prepared by the department includes records of Ohio dairy farmers who kept complete farm accounts. Table 2 highlights information derived from the summary. The table includes data for the high (25%), low (25%), and medium (50%) income groups. Dairymen who are keeping complete records on their farm can use this table to make comparisons and analyze their own operations. Dairymen who are not presently enrolled in the program may do so by contacting their county or area Extension office.



Inheritance and good management enabled this 2-year-old to produce over 20,000 pounds milk

Table 2: Farm Business Analysis Summary (1968)

Items	High (25%)	Medium (50%)	Low (25%)
Gross Income	$ 57,600	$ 39,232	$ 28,448
Family Labor and Mgt. Income	$ 16,906	$ 10,328	$ 3,165
Labor and Mgt. Income per full-time operator	$ 15,461	$ 8,525	$ 2,719
Gross Income Per Man	$ 27,547	$ 21,881	$ 16,589
Number of cows per farm	63	47	39
Pounds 3.5% milk sold	839,756	592,557	457,222
Pounds 3.5% milk sold/cow	13,266	12,661	11,615
Cost per cwt. milk	$ 4.17	$ 4.58	$ 5.51
Value milk sales per cow	$ 684.	$ 646.	$ 580.
Returns per $1 feed fed	$ 2.19	$ 2.05	$ 1.84
Pounds milk sold per man	401,622	330,493	266,617
Crop acres	230	178	155
Value crops per acre	$ 99.	$ 96.	$ 83.
Number of men	2.1	1.7	1.8
Productive Man Work Units (PMWU)	670	503	428
P.M.W.U. per man	320	281	251
Capital Invested	$127,077	$ 99,356	$ 90,081
Gross per $1,000 Invested	$ 453.	$ 395.	$ 316.
Total overhead costs	$ 16,333	$ 12,488	$ 11,257
Percent Gross for Overhead	28.4	31.8	39.6
Percent Gross for Labor and Mgt. Return	29.3	26.3	11.1
Percent Gross for Operating Expense	42.3	41.9	49.3

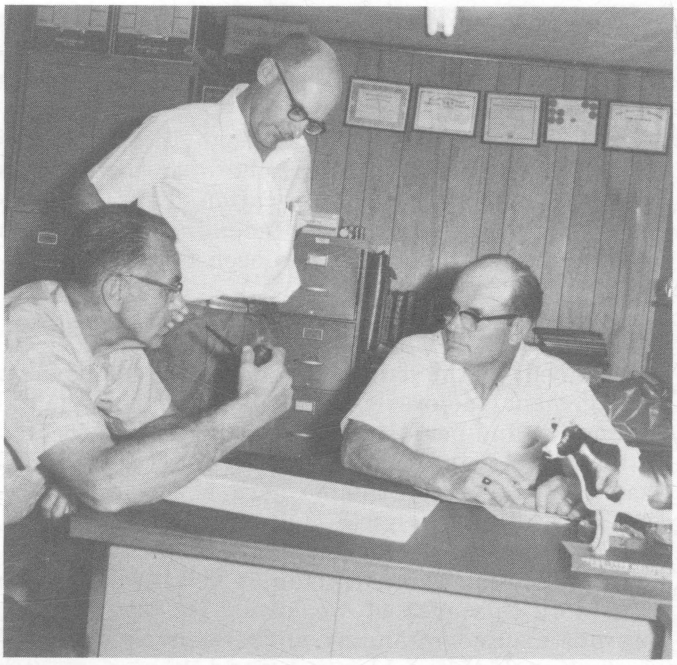
A brief summary of changes which have occurred in the dairy farm business from 1958 through 1968 are shown in Table 3.

Table 3: Trends in Ohio Farm Account Results

Efficiency Indicators	1958 High	1958 Low	1968 High	1968 Low
Labor & Mgt. Income per full-time operator	$ 7,860	$ 203.	$ 15,461	$ 2,719
Gross Income	$ 20,823	$ 6,907	$ 57,600	$ 28,448
Total Capital Investment	$ 48,397	$ 22,893	$127,077	$ 90,081
Man-Year Equivalents of Labor	1.8	1.2	2.1	1.8
Machinery Investment Per Acre	55.	$ 51.	$ 80.	$ 99.
Total Harvested Crop Acres	165	88	230	155
Number cows per farm	33	17	63	39
Lbs. 3.5% milk sold per man	196,975	112,427	401,622	266,617

Practical Farm Management Factors

Analysis of dairy farm operations can best be accomplished perhaps by use of several farm management factors or measures of performance which can help identify the strengths and weaknesses of a specific dairy operation. To do this, we must first establish a set of standards as a bench mark for making comparisons. The standards should represent attainable goals for a sizeable number of dairymen. The standards in Table 4 were developed based upon farm account records, DHIA records, and consultation with dairy and farm management specialists.



Keep both DHIA and farm account records

Table 4: Practical Farm Management Standards

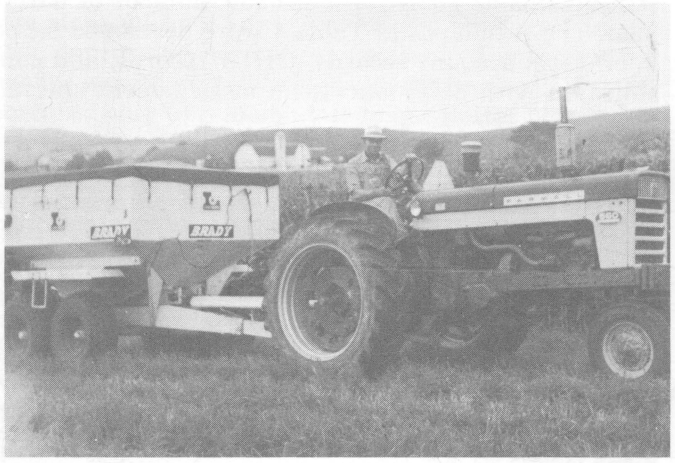
Farm Organization and Size	Standard
Tillable acres (100 bu. corn equivalent land)	200 - 300
Gross income per man	$ 25,000 - $ 30,000
Income per tillable acre	$ 200 - $ 300
Gross Income per $1,000 invested	$ 400 - $ 500
Machinery investment per tillable acre	$ 65 - $ 85
Family labor & management income per operator	$ 12,000 - $ 17,000
Cropping Program	
Hay, tons per acre	4 - 6
Corn silage, tons per acre	15 - 20
Corn (grain), bushels per acre	100 - 120
Wheat, bushels per acre	35 - 45
Oats, bushels per acre	80 - 100
Crop value per harvested acre	80 - 110
Fertilizer and lime expense per tillable acre	$ 15 - $ 20
Dairy Enterprise	
Cows per man	35 - 45
Milk sold per cow (large breeds) pounds	13,000 - 16,000
Milk sold per cow (small breeds) pounds	9,000 - 12,000
Milk sold per man pounds (3.5%)	350,000 - 500,000
Dairy sales per cow	$ 650 - $ 800
Dairy income per $100 Feed Expense	$ 175 - $ 250
Grain per cow, pounds (large breeds)	4,500 - 5,500
Grain per cow, pounds (small breeds)	3,500 - 4,500
Percent cows in milk	85 - 90
Expense	
Crop Expense (fertilizer, lime, seed, interest on operating capital) per tillable acre	$ 60 - $ 75
Crop labor expense per tillable acre	$ 15 - $ 20
Machinery expense per tillable acre (feed, depreciation, interest, and repairs)	$ 25 - $ 35
Investment per cow (housing, parlor, equipment)	$ 500 - $ 600
Total investment per cow including land, cow replacement	$ 1,850 - $ 2,100
Veterinary and medical expense per cow	$ 10 - $ 12
Breeding fee per cow	$ 6 - $ 8
Feed purchased per cow	$ 75 - $ 125

An understanding of various income terms is necessary if dairy farm analysis is to have full meaning. Table 5 includes a definition of income terms with examples.

Family labor and management income comes closest to pinpointing income the operator realizes from the total dairy farm operation. This is the income available after all costs including depreciation and interest on his equity has been covered.

Use of Farm Management Factors in Farm Analysis

Analysis of the dairy farm operation using farm management factors consists of comparing actual production and performance with currently accepted standards. As an example, should it be determined that crop value per tillable acre is low and more specifically that hay yield is only 2½ tons per acre, it becomes obvious that there are weaknesses in forage production. The dairyman is now in a position to explore this area of weakness. He may need to improve his understanding of the technology of hay production. If the problem is beyond the obvious such as late harvesting, one of needed lime, or low fertilizer application, he may wish to contact an expert in crop technology.



Management factors kept in balance

Simplified examples of analysis are set forth in Table 6.

Table 6: Use of Farm Management Factors in Farm Analysis

Management Factors	Standard	Farm X	Farm Y	Farm Z
Tillable acres/man (No.)	100 - 150	110	105	86
Cows/man (No.)	30 - 40	30	28	22
Pounds Milk/cow	13,000 - 16,000	13,266	12,661	11,615
Milk produced/man (lbs.)	350,000 - 500,000	401,622	330,493	266,617
Corn silage/acre (tons)	15 - 20	15	16	13
Family labor & mgt. Income	$10,000 - $ 17,000	$ 16,906	$ 10,328	$ 3,165
Value crops/tillable acre	$ 80 - $ 110	$ 99	$ 96	$ 83

In studying Table 6, it can be noted that farm "X" falls within the ranges of standards for all management factors, whereas farm "Z" fails to meet any of the standards except value of crops per tillable acre. Farm "Y" is within the established range of standards for all factors except cows per man and milk produced per man. Farm "X" has combined above average performance "across the board" rather than outstanding achievement in 2 or 3 areas. Farm "Y" exhibits average performance in most areas and is somewhat above in value of crops per tillable acre. Farm "Z" is well below average in nearly all areas and suggests the need for added emphasis on livestock performance and more efficient use of capital and labor.

The following examples illustrate one method by which dairymen can use farm account records to discover the strengths and weaknesses of their current dairy operations.

Dairy Farm Analysis

Owner: **John Doe, Anywhere, Ohio**

General Information

230 tillable acres
2.1 men

Age 40 years
Children and ages—Son, Senior and Daughter, Soph., High School

63 dairy cows
$127,077 total investment
$ 57,600 gross income
$ 15,461 labor and mgt. income/ full-time operator

Holstein herd
Land level to slightly rolling

Table 5: Definition of Income Terms with Illustrations

Gross Income	=	Total Cash Recpt.	—	feeder livestock	±	Inventory Change
$57,600	=	$53,760		purchase $828	+	$4668 (includes total capital gain or loss)
Net Cash Income	=	Total cash recpt.	—	total cash expense		
$22,511	=	$53,760	—	$31,249		
Net Farm Income	=	Net cash income	+	Inventory change	—	Depreciation
			±	Total capital gain		
$21,206	=	$22,511		$4,668	—	$5,973
Family Labor and Mgt. Income	=	Net Farm Income	—	Unpaid interest in owner's equity		
$16,906	=	$21,206		$4,300		
Labor & Mgt. Income per full-time operator	=	Family Labor & Mgt. Inc.	÷	Years of operator labor		
$15,461	=	$16,906	÷	1.092		

Farm Organization and Size	Farm	Standard
Tillable acres per man	110	100 - 150
Gross income per man	$ 27,547	$ 25,000 - $ 30,000
Income per tillabe acre	$ 250	$ 200 - $ 300
Gross income per $1,000 invested	$ 453	$ 400 - $ 500
Machinery investment per tillable acre	$ 80	$ 65 - $ 85
Total investment per cow including land, buildings and equipment	$ 2,000	$ 1,850 - $ 2,100
Cropping Program		
Hay, tons per acre (alf.)	4.3	4 - 6
Corn silage, tons per acre	15	15 - 20
Corn (grain) bu. per acre	95	100 - 120
Wheat, bu. per acre	37	35 - 45
Oats, bu. per acre	78	80 - 100
Crop value per harvested acre	$ 99	$ 80 - $ 100
Fertilizer & lime expense per tillable acre	$ 13.50	$ 12 - $ 15
Dairy Enterprise	**Farm**	**Standard**
Cows per man	30	30 - 40
Milk sold per cow, lbs.	13,266	13,000 - 16,000
Milk sold per man, lbs.	401,622	350,000 - 500,000
Dairy sales per cow	$ 684	$ 650 - $ 800
Returns per $1 feed fed	$ 2.19	$ 1.75 - $ 2.50
Cattle sales per cow ($)	$ 98.50	$ 60 - $ 80
Grain per cow, lbs.	4,400	4,500 - 5,500
Percent cows in milk	88	87 - 90
Expenses	**Farm**	**Standard**
Machinery expense per tillable acre	$ 40	$ 25 - $ 35
Vet. and Medical expenses per cow	$ 10.50	$ 10 - $ 12
Breeding fees per cow	$ 7.00	$ 6 - $ 8

Outstanding Features

1. Labor Efficiency:
   a. $27,547 Gross income per man
   b. 401,622 pounds milk sold per man
   c. $684 dairy sales per cow
   d. Labor and management income per full time operator $15,461
2. Cropping program
   a. $99 crop value per harvested acre

Weaknesses

1. Dairy enterprise
   a. 4,400 pounds grain per cow
2. Cropping program
   a. Borderline on hay yield (4.3 tons) and yield corn silage (15 tons)
   b. 95 bu. corn per acre
   c. $40 machinery cost per tillable acre

Comments

Cropping program is good though not exceptional. Production per cow and per man is within the standards but could be further improved. Labor supply seems adequate.

Recommendations

The first step in improving net farm income would appear to be that of increasing production per cow. This could entail either producing and feeding more high quality forage or feeding an additional 1,000 or more pounds of grain per cow. Most Holstein herds that use high production sires have the potential for producing 15,000 to 16,000 pounds of milk per cow with good management. Feeding an additional 1,000 pounds of grain per cow to cows presently being underfed during their lactations could result in 2,000 pounds more milk per cow per year. With grain at 3 cents per pound and milk at 5.5 cents per pound, this would mean an additional investment of $30 per cow in feed for a return of $110 worth of milk. An additional profit of $80 per cow on a 50-cow herd could increase net farm income by $4,000, since feed for the most part would be the only added expense.

John Q. Dairyman, Somewhere, Ohio

General Information

155 tillable acres	Age—40 2 children
1.8 men	Son Sr. in High School
39 dairy cows	Dau. in 8th grade
$90,081 total investment	Holstein herd
$28,448 gross income	Stanchion barn
$3,165 family labor & mgt. income	Soil reasonably productive

Farm Organization	Farm	Standard
Tillable acres per man	86	100 - 150
Gross income per man	$ 16,589	$ 25,000 - $ 30,000
Income per tillable acre	$ 184	$ 200 - $ 300
Gross income per $1,000 invested	$ 316	$ 400 - $ 500
Machinery investment per tillable acre	$ 99	$ 65 - $ 85
Total investment per cow	$ 2,310	$ 1,850 - $ 2,100
Cropping Program		
Hay, tons per acre (alf.)	3.4	4 - 6
Corn silage, tons per acre	13.0	15 - 20
Corn (grain) bushels per acre	84	100 - 120
Wheat, bushels per acre	36	35 - 45
Oats, bushels per acre	74	80 - 100
Crop value per harvested acre	$ 85	$ 80 - $ 100
Fertilizer and lime expense per tillable acre	$ 12	$ 12 - $ 15
Dairy Enterprise	**Farm**	**Standard**
Cows per man	22	30 - 40
Milk sold per cow (lbs.)	11,615	13,000 - 16,000
Milk sold per man (lbs.)	266,617	350,000 - 500,000
Dairy sales per cow	$ 580	$ 650 - $ 800
Return per $1 feed fed	$ 1.84	$ 1.75 - $ 2.50
Cattle sales per cow (cull, veal, dairy)	$ 70	$ 60 - $ 80
Grain per cow	3,800	4,500 - 5,500
Percent cows in milk	80	87 - 90
Expense		
Machinery expense per tillable acre	$ 44	$ 25 - $ 35
Veterinary, medical expense per cow	$ 10	$ 10 - $ 12
Breeding fee per cow	$ 6	$ 6 - $ 8
Feed purchased per cow	$ 108	$ 75 - $ 125

Outstanding Features

1. Cropping program
   a. $85 crop value per harvested acre
2. Dairy Enterprise
   a. $1.84 return per $1 feed fed

Weaknesses

1. Farm Organization
   a. Income per man and per tillable acre too low
   b. Machinery investment and investment per cow too high
2. Cropping program
   a. Yields of most crops fail to meet standards in most instances
3. Dairy Enterprise
   a. Production per cow, per man and dollar sales per cow too low
   b. Pounds grain fed per cow low
   c. Percent cows in milk low

Comments

This farm seems to be carrying too much overhead both from the standpoint of production of crops and milk. Both crop production and milk production, for the most part, are substandard.

Recommendations

Size of farm (155 tillable acres) does not seem to be a major factor limiting higher income.

Attention should first be given to improving crop yields, especially forage and corn. The best advice on soils and crop production should be sought.

Once the cropping program has been improved, the next step is to increase production per cow. Perhaps even before an improved cropping program can be initiated, it may be necessary to purchase extra feed, especially grain, to aid in increasing production per cow.

Liberal feeding of grain early in lactation should aid production of cows with high production potential. Extra grain feeding from an average of 3,800 pounds per cow up to 5,000 pounds per cow (1,200 additional pounds) could increase average production per cow by as much as 2,500 pounds. This would mean an additional investment per cow of only $36 (3¢/lb.) for a return of $137.50 (5.5¢/lb. milk) or an additional return per cow of over $100. In this herd, it could mean $3,900 more net.

Dairy Production Records

To obtain high and economical production, the dairyman needs production records on each individual cow for guidance in feeding, breeding, and culling. Complete dairy production records (EDPM) provide the basis required to develop and maintain a top producing herd.

High milk production per cow is an important step in attaining a profitable dairy enterprise. Increased production per cow results in a gross income figure which will normally far exceed the additional expenses associated with obtaining such production. The assumption, however, of constant relationship

between level of production and profits is erroneous. Milk production per cow is one of the most important factors influencing income, but it is only one of many factors.

High milk production per cow has been the subject of many studies and the goal of even more dairymen. In brief, 7 steps can be listed as basic to the attainment of this goal. These are:

1. **Develop cows with high genetic potential**
   Use the best sires available and allow a large number of heifers to freshen, thereby increasing selectivity in culling.
2. **Provide adequate amounts of good feed**
   Strive for high quality roughage with high nutrient content and palatability.
3. **Feed cows in accord with inheritance**
   Challenge cows to top production by feeding high level of concentrates early in lactation.
4. **Keep production records (EDPM)** Use these records to feed, breed, and manage the herd and to cull unprofitable cows.
5. **Maintain herd health**
   Follow a disease prevention program in cooperation with the veterinarian; control mastitis and other diseases and strive for a 12- to 13-month calving interval.
6. **Follow good milking techniques**
7. **Develop a sound replacement program**
   Provide adequate facilities for raising and developing replacements that will bring them into production at 24 to 26 months.

It Pays to Keep Production Records

Production tested herds do out-produce non-tested herds. The 1968 average of Ohio cows on test (DHIA-DHIR) was 12,050 pounds of milk. The average for cows in non-tested herds was 8,580 pounds of milk or a difference of 3,470 pounds of milk in favor of cows in tested herds. Applying a price of $5 per cwt. results in an additional $187.50 gross income per cow, or $9,175 in a 50-cow herd. Thus, for a cost of approximately $425 per year (cost of EDPM records), it is possible to realize an additional $8,000 to $10,000 in gross income for this size herd. This is not to say that records alone do the job, but keeping records and using them can provide the framework for achieving this kind of improvement.

Six large silos provide year-round source of forage for over 130 cows

Perhaps the only thing worse than having a low-producing herd is having one and not doing anything to improve it. Enrolling in a dairy record keeping program can get improvement started now. It's the one good way to establish who's who in the dairy herd. See your county Extension agent for information on dairy testing.

Use of Records to Feed

Production records provide a basis for feeding cows according to production. Since feed cost comprises 40 to 50 percent of the cost of producing milk, herd owners should give special attention to feeding adequate amounts of economical and well-balanced concentrate rations. The cost of homegrown feeds depends to a large extent upon the owner's performance as a producer of crops.

You don't reduce feed costs by being skimpy when feeding dairy cows. You reduce feed costs by putting more feed through better cows—by feeding grain according to production, body condition, and age.

Milk production records are needed to better determine which cows leave, which cows stay, and how much grain to feed. In general, the better the cow, the lower the feed cost per 100 pounds of milk, even though better cows eat more feed.

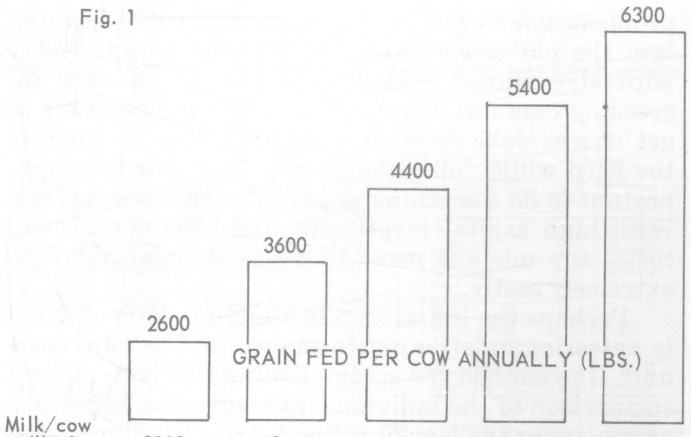
Surely you would invest $30 in additional feed to make nearly $150. Who wouldn't?

That's about the way it adds up when you get higher production per cow and reduce the cost per hundred pounds of milk produced. Of course, it would be a losing proposition to feed a poor cow the same amount of grain as the high producer.

Figure 1 illustrates how return over feed cost and production climbs (Ohio DHIA results—1968) as concentrate feeding is increased from an average of 2,600 to 6,300 pounds per cow.

Dairy cows often fail to express their true inheritance because they receive too little energy early in lactation. In general, cows should receive a 50 to 60-day dry period. They should be in good condition but not fat at time of calving. During the last 2 to 3 weeks before calving, cows should be receiving 1 to 1½ pounds of concentrates per 100 pounds of body weight (12 to 18 pounds for a 1,200-pound cow). This helps establish the necessary micro flora in the rumen so cows can be gotten on full feeding of concentrates 7 to 10 days following calving. You can accomplish this by increasing concentrate feeding 2 pounds per day following calving.

Fig. 1



Milk/cow (lbs.)	9180	10,458	12,131	13,011	13,535
Feed Cost ($)	184	220	254	282	302
Return over Feed cost ($)	367	395	432	447	451

Most cows will reach their true **peak** in production and maintain a **high** level of production over a **longer** period of time when fed adequate amounts of concentrates along with good quality forage. In herds where cows are being underfed early in lactation (first four months), it is not unusual with increased concentrate feeding to get an annual added response of up to 2,000 pounds of milk per cow.

In herds where cows are milked in a parlor, this means feeding extra concentrates to the high producers. Some dairymen sort their high producers and feed extra grain—a practice more dairymen should be doing and must do if they expect to attain production averages much above the 12,000-pound level.

Your dairy production records can help locate the high producers and provide a guide for feeding concentrates. Remember, if you have good cows, it can mean higher production per cow, lower cost of producing a hundred weight of milk, and **higher net income.**

Use of Records to Cull

Every Ohio dairyman's objective is a herd of **profit makers.** If his herd is already enrolled in a dairy record keeping program, better use of the records is the answer. If he isn't enrolled, he can do so now and begin his profit-making project. To achieve the objective, **profit takers** must be identified and removed. A good set of records helps locate these animals.

Ohio DHIA results show that cows vary as much as $500 or more in value of product for a single lactation. In some of the higher producing herds, value of product exceeded $1,000 per cow in 1968.

Dairy records can give dairymen an estimate of what his cows will produce for their entire lactation in as little as 60 days after calving. This enables the dairyman to find the culls or profit takers early in lactation.

Even profit-takers can be converted to profit-makers if culled at the right time (generally during first 120 to 180 days of their lactations). Since a good estimate of a cow's production can be obtained in the first 60 days of lactation, cows that rank near the bottom of the herd in production should not be bred again. Save the breeding fee and milk her for approximately 150 days and sell her for beef. This way you get nearly 60 percent of her total production and you don't have to board her during the period of lowest production or when she is dry.

Each profit-taker occupies the same amount of space, the same milking machine, and the same man hours to milk and feed as a profit-maker. Assuming your cows are your employees, and they are, and you were paying each an identical hourly wage, yet some were doing twice the work of others, wouldn't you immediately make an adjustment in pay or have some "ex-employees"? Sure you would! Then why not use this method for culling cows.

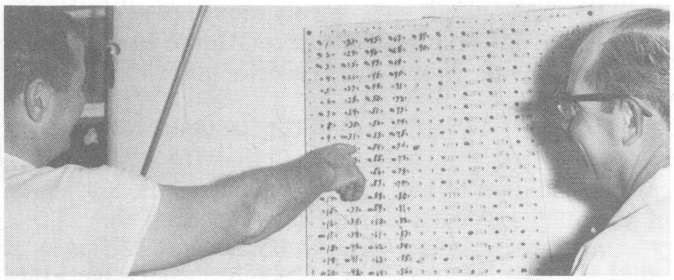
Culling must be a continuous process. As new animals enter the herd as replacements, they are compared with the others. The good ones stay and the poor ones leave. Over a period of time, even the poorest cows in the herd aren't too bad—provided, of course, you use good bulls, do a good job of feeding, and keep on keeping records.

Use of Records to Breed

Dairymen milk cows to make a profit and they must constantly try to improve production through breeding. This can be done in large measure by

Herd owner and wife achieve high production per cow with 7 basic steps

DHIA records helped herd owner and wife develop one of Ohio's top producing herds



Production records used in feeding extra grain to high producers

selecting and using bulls that sire a high proportion of above average daughters and by culling those daughters that don't measure up to the standards established by the herdowner.

Very little can be done to improve cattle without production records as a guide. A production record serves as a basis for the national sire proving program and helps identify the top sires. These sires are then available for use by all dairymen through the A. I. industry.

Dairy Herd Improvement records also provide dairymen with information on items which affect breeding efficiency. For example, they include suggestions on when to breed, when to turn cows dry, number of days in previous dry period, and the percent cow-days in milk.

For greater profit, dairymen should aim for 85 to 90 percent cow-days in milk (in milk 85 to 90 percent of the time each year). High breeding efficiency and a proper dry period are the best means of achieving this objective.

A management routine which permits a 305-day lactation, a 60-day dry period, and provides a calf a year generally results in greater lifetime production. This is seldom achieved in practice because of poor breeding efficiency and/or management errors but should continue to be the ultimate objective for all dairymen.

Table 7 illustrates how percent days in milk can affect income over feed cost.

Table 7: Affect of Percent Cow Days in Milk on Production Value

Product and Income Over Feed Costs (1968-69 DHIA)

Percent Cow-Days in Milk	Milk lbs.	Value Product($)	Income over Feed Cost($)
70-75	8,391	$484	$237
75-80	9,895	$570	$336
80-85	11,193	$639	$391
85-90	12,382	$702	$440
90-95	12,617	$716	$460

With production records as a guide, you can keep percent cow-days in milk at the recommended level—avoid the sudden discovery that a cow has been in milk 100 days or longer but has not been bred.

Analyzing Herd Records

One big problem of herd owners today is finding enough time to study and analyze their records. Dairymen of years gone by solved many a problem while parked on the milk stool leaning into the old cow's flank and tugging away. Today with streamlined milking procedures, an ever increasing quota of cows per man, and the pressure to get chores done earlier, leave little time to analyze the herd while doing the chores. Yet, it is more important to do something about this than ever before. With high capital investment and high operational costs, any mistake made today by dairymen can be extremely costly.

Perhaps the initial step in studying dairy records is assessing relative performance of the herd as a unit. One method for accomplishing this is to make a comparison of the individual averages of a herd with averages for the low 20 percent, the high 20 percent, and the averages for all herds on test by breed. Comparisons related to level of production, feeding, income and expense, and efficiency factors could reveal a number of the strengths and weaknesses in herd management. Table 8 illustrates how dairymen can use their own herd data for making such comparisons.

A further measure of progress in individual herds could be made by comparing current herd information with that made 12 months previous. Table 9 includes an illustration of comparisons which could be made on an annual basis. In addition, it includes a suggested formula for computing an annual herd improvement goal for milk production. Table 9 is

Table 8: Compare Your Dairy Records 1968-69 DHIA Records—October, 1969

Production	Low 20%	Average	High 20%	My Herd
1. Average No. cow years	46.9	45.8	42.5	
2. Milk per cow (lbs.)	10,502	12,786	15,081	
3. Butterfat per cow (lbs.)	386	470	555	
4. Test (%)	3.7	3.7	3.7	
Feed Used				
5. Concentrates lbs.)	4,300	4,900	5,500	
6. Energy from concentrates (%)	44	45	48	
7. Silage (lbs.)	14,600	14,600	13,700	
8. Energy from silage (%)	28	26	23	
9. Hay (lbs.)	3,000	3,300	3,600	
10. Energy from Hay (%)	16	17	17	
11. Pasture (days)	92	96	101	
12. Energy pasture (%)	12	12	12	
13. Feeding Index	125	119	114	
14. Rate of roughage feeding	2.30	2.30	2.30	
Per Cow Income and Expense				
15. Income per cow	$584	$710	$835	
16. Cost Conc./cow	$115	$131	$149	
17. Cost Conc./100 lbs.	$ 2.67	$ 2.67	$ 2.70	
18. Feed Cost/cow	$247	$269	$289	
19. Income over feed cost	$337	$441	$546	
20. Overhead*	$123	$134	$144	
21. Labor & Mgt. return/cow	$214	$307	$402	
Efficiency Factors				
22. Cows required for $10,000 labor & mgt. return	46.70	32.60	24.90	
23. Feed cost/100 lb. milk	$ 2.35	$ 2.10	$ 1.92	
24. Lbs. milk/per lb. conc.	2.44	2.61	2.74	
25. Percent days in milk	84	86	88	

* Overhead cost estimated as one-half as much as feed cost
Milk production costs (approximate): Feed-40%; Labor-40%; Other-20%
No. 17 is No. 16 divided by No. 5
No. 20 is ½ of No. 18
No. 21 is No. 19 minus No. 20
No. 22 is 10,000 divided by No. 21
No. 24 is No. 2 divided by No. 5

Table 9: DHI Annual Herd Report Review
(Holstein Herd)

Herd Performance

A. Comparison yearly herd totals

Items	54.2 Cow Yrs. Current 12-Month Total	52.5 Cow Yrs. 12-Month Total 1 yr. Previous	+ 1.7 Change + or —
Total milk (lbs.)	825,400	690,100	+ 135,300
Total butterfat (lbs.)	29,530	25,770	+ 3,760
Total feed cost ($)	15,140	14,020	+ 1,120
Total income over feed cost	29,110	23,630	+ 5,480

B. Comparison 12-months Rolling Herd Averages

Items	Current Rolling Ave.	Rolling Ave. 1 yr. Previous	Change + or —
% days in milk	86	86	0
Ave. Milk (lbs.)	15,229	13,145	+ 2,084
Ave. B. F. (lbs.)	545	491	+ 54
Ave. Concen. (lbs.)	4,700	4,000	+ 700
Rate Roughage	2.7	2.3	+ .4
Ave. Feed Cost ($)	279	267	+ 12
Ave. Inc. Over Feed Cost ($)	537	450	+ 87
Feed Cost/Cwt. Milk ($)	1.83	2.03	— .20

If the above items for the current Rolling average are significantly different from the Rolling average 1 year previous, study the monthly herd test data. It is suggested that monthly herd test data for each month be checked with the corresponding monthly data of the previous year in determining reasons for major changes.

C. Suggested Annual Herd Improvement for Milk Production 1970

$$\frac{\text{18,000 lbs. (Practical Level)} - \text{15,229 lbs. (Present Herd Ave.)}}{\text{15,229 (Present Herd Ave.)}} \times 25\% \; (693) = \text{15,922 (Annual Goal 1969)}$$

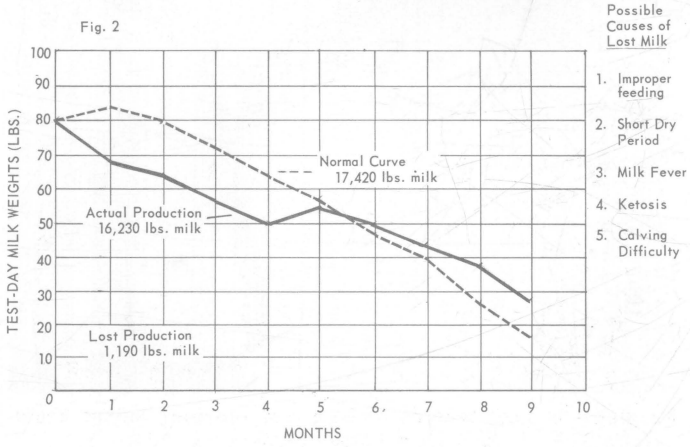
included for use by herd owners enrolled in dairy record keeping programs.

A number of considerations can be made concerning individual cows. These include persistency of production, labor and management return, level of production in relation to other cows in the herd, health, age, ease of milking, disposition, and type.

To assess persistency of production, the lactation curve of a cow, using test-day milk weights, can be plotted against a normal curve for a cow beginning her lactation at the same level of production. When the cow's lactation curve departs widely from the normal curve, it may indicate inadequate feeding, short-time producers, too short of a dry period, and health problems such as mastitis or poor milking practices.

The normal curve for a mature cow shows her reaching peak production at 30 to 40 days following calving and then a gradual and somewhat uniform decline throughout the fifth month of pregnancy. Following this stage in lactation, the decline is more pronounced due to the effect of pregnancy.

Fig. 2



The DHIA nurse cow table (Table 10) may be used for plotting normal curves for cows starting their lactation at production levels ranging from 20 to 125 pounds of milk per day.

Figure 2 illustrates how plotting lactation curves can be helpful in improving dairy management. By plotting as few as 8 lactation curves for any given herd, it should be possible to establish a herd pattern as to how and why individual cows respond as they do.

Another approach to analyzing individual cows records is by computing their labor and management return, or a dollars and cents approach.

Labor and management income may be considered as that remaining after all feed and overhead costs have been met, including interest on your own equity. It is not possible to designate a production level that would be adequate for returning a good labor and management income for all herd owners. Differences in investment costs, feeding programs, milk prices, and other items vary from farm to farm. Thus, culling is mainly an individual herd owner problem.

The following formula may be used to calculate the approximate annual labor and management return per cow:

Income over feed costs — overhead cost = labor and management return

Of the total costs of milk production, feed costs are approximately 40 percent of the total; labor and management, 40 percent; and overhead (all other costs), 20 percent of the total. In applying the formula, it is suggested that the overhead cost figure represents one-half the average feed cost per cow for the herd. This suggestion is made because overhead cost (20 percent) is approximately half of the feed costs (40 percent) and within individual herds, feed costs are highly variable among individual cows whereas overhead cost should approximate the same for each cow.

To illustrate, let us assume that the average feed cost per cow for a herd is $250 and that income over feed cost for Cow A is $600. When applying the formula we get $600 — $125 = $475 (labor and management income for Cow A).

Father-son team checks records for culls

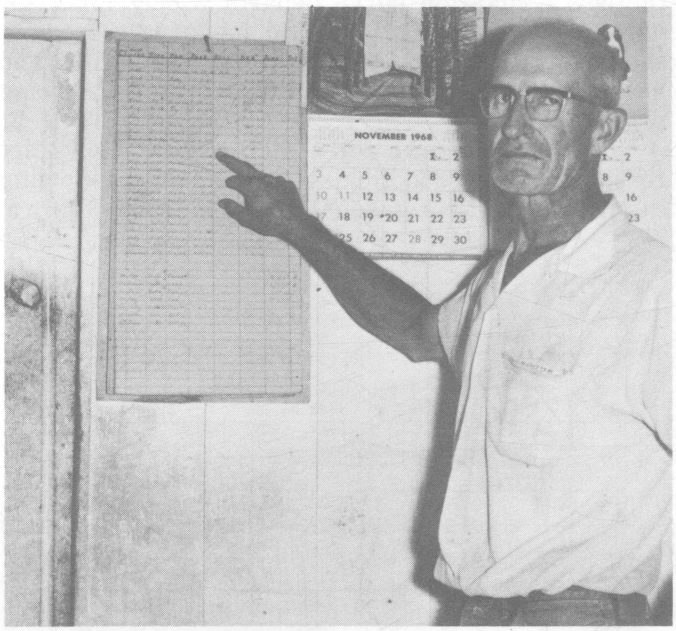
Table 10: Nurse Cow Table

Estimated 305-day production	Estimated daily production for each testing period									
	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
4,360	20	21	20	18	16	15*	12	10*	6.6	4.1
4,550	21	22	21	19	17	15	13	10	7.0	4.3
4,790	22	23	22*	20*	18*	16*	14*	11*	7.2	4.5
5,030	23	24	23	21*	19*	17*	14	11	7.6	4.7
5,250	24	25	24*	22*	20*	17	15*	12*	7.9	4.9
5,430	25	26	25	23*	21*	18	16*	12	8.3	5.1
5,680	26	27	26*	24*	21	19*	16	13*	8.6	5.3
5,920	27	28	27	25*	22	20*	17*	13	9.0	5.6
6,070	28	29	28*	25	23*	20	17	14*	9.2	5.7
6,290	29	31*	29	26	24*	21	18	14	9.6	6.0
6,560	30	32*	30*	27	25*	22*	19*	15*	9.9	6.1
6,740	31	33*	31	28*	25	22	19	15	10.2	6.3
7,010	32	34*	32	29*	26	23	20*	16*	10.6	6.6
7,200	33	35*	33	30	27	24	20	16	10.9	6.8
7,440	34	36*	34*	31*	28*	25*	21	17*	11.3	7.0
7,630	35	37*	35	32*	29*	26*	22*	17	11.7	7.3
7,840	36	38*	36*	33*	29	26	22	18*	11.9	7.4
8,080	37	39*	37	34*	30	27	23	18	12.3	7.6
8,330	38	40*	38*	35*	31	28*	24*	19*	12.6	7.8
8,480	39	41	39	36*	32	29*	24	19	13.0	8.1
8,720	40	42	40*	36	33*	29	25*	20*	13.3	8.2
8,900	41	43	41*	37	34*	30*	25	20	13.5	8.4
9,180	42	44	42*	38	34	31*	26*	21*	13.9	8.6
9,400	43	45	43*	39	35	31	27*	21	14.2	8.8
9,610	44	46	44*	40*	36*	32*	27	22*	14.4	8.9
9,820	45	47	45*	41*	37*	33*	28*	22	14.8	9.2
10,030	46	48	46*	42*	38*	34*	29*	23*	15.3	9.5
10,250	47	49	47*	43*	38	34	29	23	15.6	9.7
10,490	48	50	48*	44*	39	35*	30*	24*	15.9	9.9
10,650	49	52*	49*	45*	40	36*	30	24	16.2	10.0
10,920	50	53*	50*	45	41*	36	31*	25*	16.5	10.2
11,170	51	54*	51*	46	42*	37	32*	25	16.9	10.5
11,350	52	55*	52*	47	43*	38*	32	26*	17.2	10.7
11,590	53	56*	53*	48	43	39*	33*	26	17.6	10.9
11,780	54	57*	54*	49	44	39	33	27*	17.8	11.0
11,990	55	58*	55*	50	45	40	34	27	18.3	11.3
12,290	56	59*	56*	51*	46*	41*	35*	28*	18.6	11.5
12,440	57	60*	57*	52*	47*	42*	35	28	18.9	11.7
12,660	58	61*	58*	53*	47	42	36*	29*	19.2	11.9
12,870	59	62	59*	54*	48	43*	37*	29	19.6	12.2
13,120	60	63	60*	55*	49	44*	37	30*	19.9	12.3
13,300	61	64	61*	55	50*	44	38*	30	20.2	12.5
13,540	62	65	62*	56	51*	45	38	31*	20.5	12.7
13,730	63	66	63*	57	52*	46*	39*	31	20.8	12.9
13,970	64	67	64*	58	52	47*	40*	32*	21.2	13.1

Carrying this evaluation a step further, we could determine the approximate return per hour. Supposing the dairyman averages 70 hours chore time per cow per year. By dividing $475 by 70 we find that Cow A contributed a labor and management return of $6.78 per hour. Though this evaluation will not be entirely accurate, it will provide a good analysis of the relative merit of each cow in the herd.

Cows that show a low return for labor and management should, in most cases, be regarded as good culling prospects. Before making the final decision on whether to cull or not, perhaps a few additional items should be checked. Table 11 can be used for this purpose.

Few dairymen, if any, are satisfied with their current level of production and other items which help to improve net income. Table 12 offers some suggested goals for herd owners. Where these goals have already been surpassed, set higher ones. Make the goals you set attainable but ones that require some extra effort to achieve. By all means, set goals and strive to achieve them.



Keeping complete records of heat and breeding helped maintain good breeding efficiency

Table 10: Nurse Cow Table (continued)

Estimated 305-day production	Estimated daily production for each testing period									
	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
14,150	65	68	65*	59	53	47	40	32	21.6	13.4
14,430	66	69	66*	60*	54*	48	41*	33*	21.8	13.5
14,610	67	70	67*	61*	55*	49*	42*	33	22.2	13.8
14,850	68	71	68*	62*	56*	49	42	34*	22.5	14.0
15,040	69	73*	69*	63*	56	50	43*	34	22.9	14.2
15,280	70	74*	70*	64*	57	51*	43	35*	23.2	14.4
15,560	71	75*	71*	65*	58	52*	44*	35	23.5	14.6
15,710	72	76*	72*	65	59*	52	45*	36*	23.9	14.8
15,920	73	77*	73*	66	60*	53	45	36	24.2	15.0
16,170	74	78*	74*	67	61*	54*	46*	37*	24.5	15.2
16,350	75	79*	75*	68	61	55*	46	37	24.9	15.4
16,590	76	80*	76*	69	62	55	47	38*	25.2	15.6
16,840	77	81*	77*	70	63	56	48*	38	25.6	15.9
17,050	78	82*	78*	71*	64*	57*	48	39*	25.9	16.1
17,230	79	83	79*	72*	65*	58*	49*	39	26.2	16.2
17,420	80	84	80*	73*	65	58	49	40*	26.5	16.4
17,690	81	85	81*	74*	66	59*	50	40	26.9	16.7
17,900	82	86	82*	74	67	60*	51*	41*	27.2	16.9
18,090	83	87	83*	75	68*	60	51	41	27.5	17.1
18,330	84	88	84*	76	69*	61	52*	42*	27.8	17.2
18,540	85	89	85*	77	70*	62*	53*	42	28.2	17.5
18,790	86	90	86	78	70	63*	53	43*	28.5	17.7
18,970	87	91	87*	79	71	63*	54	43*	28.8	17.9
19,180	88	92	88*	80*	72*	64	54	44*	29.1	18.0
19,430	89	94*	89*	81*	73*	65*	55	44	29.5	18.3
19,670	90	95*	90*	82*	74*	65	56*	45*	29.8	18.5
19,860	91	96*	91*	83*	74	66	56	45	30.2	18.7
20,130	92	97*	92*	84*	75	67*	57*	46*	30.5	18.9
20,280	93	98*	93*	84	76	68*	57	46	30.8	19.1
20,500	94	99*	94*	85	77*	68	58	47*	31.2	19.3
20,770	95	100*	95*	86	78*	69	59*	47	31.5	19.5
20,950	96	101*	96*	87	78	70*	59	48*	31.8	19.7
21,170	97	102*	97*	88	79	71*	60	48	32.2	20.0
21,410	98	103*	98*	89	80	71	61*	49*	32.5	20.2
21,590	99	104*	99	90*	81*	72	61	49	32.8	20.3
21,840	100	105	100*	91*	82*	73*	62*	50*	33.1	20.5
22,910	105	110	105*	95	86	76	65	52	34.8	21.6
24,000	110	116	110*	100*	90*	80*	68*	54	36.4	22.6
25,100	115	121*	115*	104	94	84*	71	57*	38.1	23.6
26,170	120	126	120*	109*	98	87	74	59	39.7	24.6
27,270	125	131	125*	113	102	91	77	62*	41.5	25.7

Factors used for this table were developed by Dr. L. D. Van Vleck and Dr. C. R. Henderson, Cornell University, Ithaca, New York.
* Raised to nearest whole number.

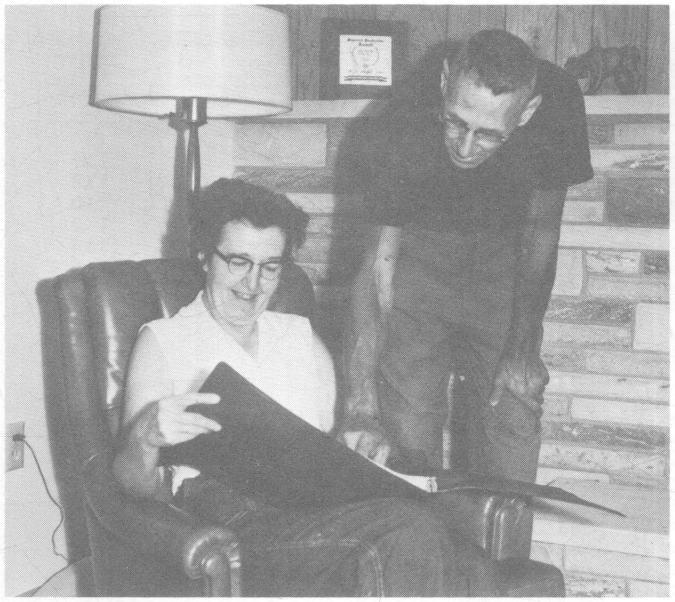
Table 11: A 10-Point Culling Guide

Guide for Culling Cows with Low Labor and Management Return

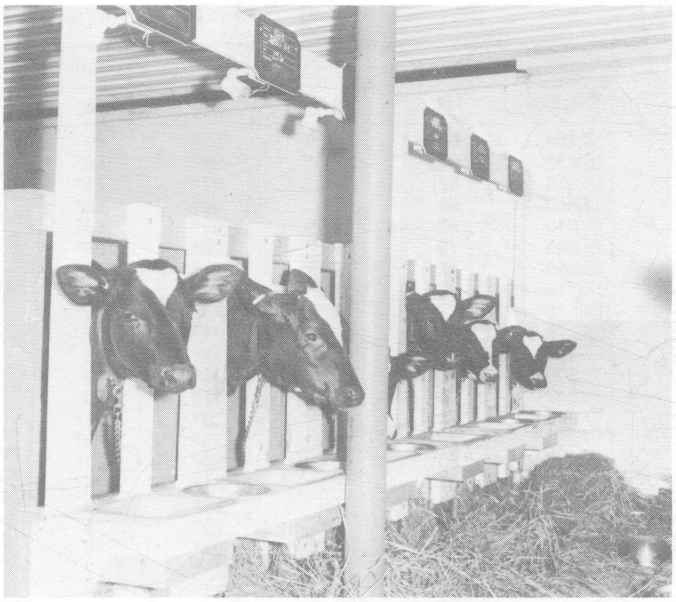
Cows Name or Number

Items to Consider	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
1. Is production 25% or more below herd ave.?										
2. Is she a chronic mastitis case?										
3. Will she be dry 4 months or more?										
4. Is she a hard milker?										
5. Does she have a nervous disposition?										
6. Are good replacements available?										
7. Is she below average type of herd?										
8. Is she timid?										
9. Is price of beef good?										
10. Is space needed for fresh heifers?										

If four or more of the questions are answered "yes" for any cow, it would strongly indicate that she should be culled.



Winter evening study of records and herd performance



Young calves off to good start in clean, dry, draft-free quarters

There are 3 dairy record keeping programs available to dairymen in Ohio. If your herd isn't on test, see your county Extension agent about enrolling in one of the programs. He can explain the program and cite the current test fees.

Table 12: Suggested Goals for Herd Owners

		Suggested Goals
1. Percent days in milk		85 - 90
2. Average lbs. milk per cow per year		
	High Herds 1968 Milk	(Ave. Top 20%)
Ayrshire	13,648	12,221 lbs.
Brown Swiss	15,100	13,449 lbs.
Guernsey	12,809	10,880 lbs.
Holstein	19,265	15,081 lbs.
Jersey	10,872	9,622 lbs.
3. Average lbs. butterfat per cow per year		
	High Herd 1968 Fat	(Ave. Top 20%)
Ayrshire	559	485 lbs.
Brown Swiss	623	561 lbs.
Guernsey	620	517 lbs.
Holstein	673	555 lbs.
Jersey	578	498 lbs.
4. Feeding Index		110 - 115
5. Rate of Roughage Feeding (Max. Forage Intake) 2.5 lbs. or more per cwt.		
6. Income over feed cost		1½ × Feed Cost
7. Feed Cost per Cwt. Milk		$2.00
8. Total Milk Per Worker (35 cows)		(Based upon ave. prod. of high 20% of herds.)
Ayrshire		425,000 lbs.
Brown Swiss		470,000 lbs.
Guernsey		380,000 lbs.
Holstein		525,000 lbs.
Jersey		335,000 lbs.
9. Return above feed cost per worker		$15,000 - $20,000
10. Age at first calving		24 - 26 months
11. Number days dry		50 - 60 days
12. Date bred following calving		60 - 90 days

Proposed formula for use in setting annual milk production goal for herd.
Possible Level—Present herd average × 25% + Present Herd Average = Milk Production Goal
Possible Level by Breed:

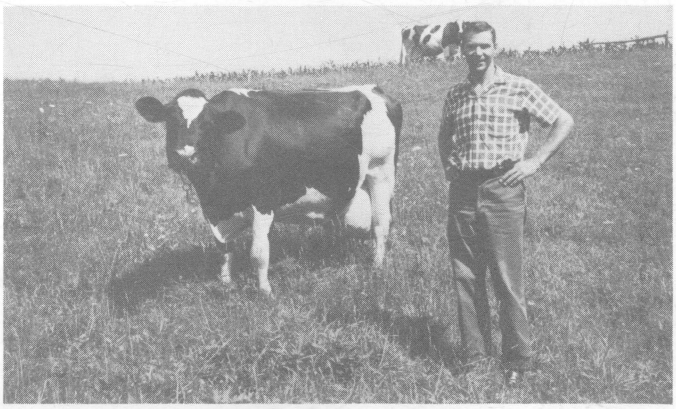
Ayrshire	13,00	Holstein	18,000
Brown Swiss	14,000	Jersey	11,000
	Guernsey	12,000	

RAISING HERD REPLACEMENTS

Raising herd replacements is a neglected phase of the dairy operation on many Ohio farms. An increase in calf losses often accompanies an increase in herd size. In a Michigan study involving 281 herds, calf losses from birth to weaning ranged from 12 percent in herds of less than 30 cows to over 18 percent in herds of 100 or more cows. Though the reasons are not entirely clear as to why calf losses climb with increase in herd size, one can speculate that less attention to the cow at calving time coupled with inadequate calving and calf rearing facilities could all be heavy contributors.

High calf losses can and usually do impede progress in replacing the less productive cows or in expanding herd size. Death losses can also mean a sizeable reduction of marketable income from sale of surplus dairy stock.

On farms where calf losses are high, herd owners should re-evaluate their calf raising procedures and facilities and take the necessary steps to reduce



This cow grossed $1235 and returned $858 over feed cost in 302 days

losses. A good replacement program is a must for a profitable dairy operation.

Housing Calves and Heifers

The dairy calf is often the most neglected animal on the dairy farm—found in out-of-the-way corners in dark, damp, drafty pens. Calves require clean, dry, well-ventilated quarters free from drafts with enough light and space for the calves to be comfortable.

With continued increase in herd size, most dairy barns do not have enough space for calves. A practical solution to the calf raising problem is to get the calves out of the dairy barn into a separate barn of their own.

Housing for young calves should be designed for calf comfort and arranged for efficient use of labor. It can be a tight, fully insulated building equipped with an adequate forced-air ventilation system, or it can be an open, cold-type barn that is draft free.

Good insulation and mechanical vetilation are needed to control the environment inside a warm, closed calf barn. Supplemental heat may be needed in cold weather to remove the moisture. Good fan ventilation is essential to maintain calf health in a closed building. Some ventilation should be provided even in cold weather. Whatever the ventilation system, it must be designed to provide uniform air distribution without drafts.

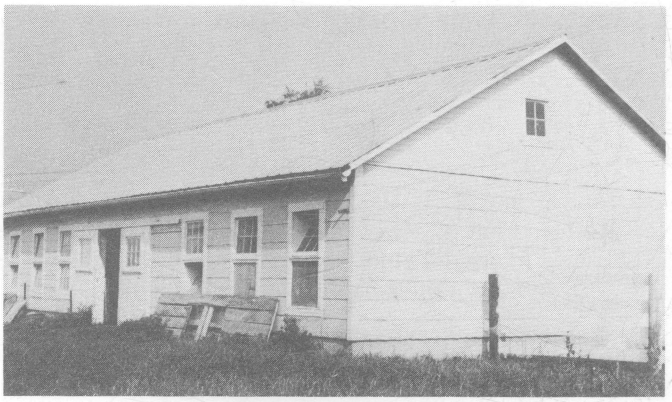
Calves can be raised in open buildings—even during very cold weather—if they are protected from drafts and have a clean, dry pen. Open front buildings work well that have individual pens with an outside run for each pen. The open front should face the east with the other 3 sides enclosed to eliminate drafts. The cold building with pens is usually less expensive to build than the insulated, ventilated building. Unused poultry or hog houses can sometimes be converted into very satisfactory cold-type calf barns. For more information on calf structures, consult your county Extension agent.

Young calves until weaning age should be housed in individual pens or stalls. Following weaning, they can be grouped according to size and housed in pens or in free stalls. Slotted floors may be used in calf barns but should be used only in tight, insulated, warm buildings. Drafts are a problem if slotted floors are used in other-type calf structures.

Management Recommendations

About 1 out of every 3 or 4 dairy cows in the milking herd must be replaced each year. When a good job of calf raising is done, it is usually more economical to raise the needed replacements than to purchase them.

In general, the cost of raising dairy calves from birth until they are two years of age ranges from about $250 to $350 per animal, or 25 to 30 cents per pound of gain. For dairymen who raise as many as 20 calves annually, this means an investment of $5,000 to $7,000 over a 2 year period. An investment



Remodeled chicken houses make excellent calf raising quarters

of this magnitude suggests that good management principles be applied to obtain the most from it.

Following are recommendations that have proven helpful in keeping down calf losses and in promoting the necessary growth and health so heifers can be bred to calve at 2 years of age.

1. Provide a clean, dry, disinfected maternity stall for cow at time of calving.
2. Make sure the newborn calf is up and nursing within 20 to 30 minutes.
3. Paint the calf's navel with tincture of iodine.
4. Make certain the calf receives colostrum milk for the first 3 days.
5. Raise calves in individual pens or stalls until they are weaned.
6. Make sure the calf quarters are clean, dry, well-bedded, and properly ventilated.
7. Keep feeding utensils and boxes clean.
8. Feed adequate amounts of whole-milk or a good milk replacer-feed regularly.
9. Start calves on good quality mixed hay the first week.
10. Feed a grain mixture that will adequately supplement the forage.
11. Do not turn calves under 6 months of age on pasture.
12. Do not feed calves silage until they are 4 to 6 months of age.
13. Vaccinate for brucellosis from 3 to 6 months of age.
14. Remove extra teats while calf is under 1 year of age.
15. Dehorn calves before they are a year old. This can be done as early as 2 weeks of age.
16. Provide an adequate supply of clean, fresh water.
17. Check growth of calves periodically to see if they are gaining properly.
18. Identify calves by ear tag, tattoo, sketch, or photo soon after birth.
19. Grow heifers so they are big enough to breed at 15 months of age.

Table 13 lists the average daily gain to expect under good management from birth to 2 years of age by breed.

Table 13: Average Daily Gain-Birth to Two Years

Breed	Lbs./Day
Ayrshire	1.2
Brown Swiss	1.4
Guernsey	1.1
Holstein	1.4
Jersey	1.0

Heifers that are well-grown can be bred to calve at 2 years of age. Table 14 includes the approximate size and age at which heifers can be bred.

Table 14: Approximate Size and Age to Breed

Breed	Size (Lbs.)	Age (Months)
Ayrshire	600	15-18
Brown Swiss	750	15-18
Guernsey	550	15-17
Holstein	750	15-18
Jersey	500	15-17

For more complete information on raising dairy herd replacements you may refer to Bulletin 514. A copy of this bulletin is available through your county Extension office.

FEEDING FOR ECONOMICAL PRODUCTION

The dairy cow is a ruminant (has a 4-compartment stomach) and has the ability to consume and utilize large quantities of high quality forage. The fact she can consume feeds not suitable for human consumption and efficiently convert them into edible and highly nutritious foods for use by humans makes her one of the most important of domestic animals.

The Dairy Cow Needs

The needs of the dairy cow are maintenance, milk production, growth (immature cows), and reproduction (development of the unborn calf). Essential nutrients to meet these needs are energy (carbohydrates and fat), protein, minerals, vitamins, and water.

Most nutrient needs, other than water, can be supplied by concentrates and forages (hay, silage, pasture, green chop). The principal minerals needed by the dairy cow are calcium, phosphorous, and salt. Including 1 percent of iodized salt and 1 percent of either di-calcium phosphate or steamed bone meal in the feed plus free access to these minerals in the barn or lot should meet mineral needs for most herds.

Other trace minerals such as cobalt, magnesium, iron, copper, zinc, and sulfur are needed by dairy cattle but are usually present in adequate amounts in normal rations. However, use of an iodized trace mineralized salt should insure cattle against any deficiency.

The 2 vitamins of most concern in dairy cattle feeding are vitamins A and D. Vitamin A is necessary for growth and reproduction and aids in disease resistance. Vitamin D is essential for efficient use of calcium and phosphorous in bone growth. Most rations which include good quality forage (silage and sun cured leafy hay) will provide sufficient amounts of these vitamins. If forage quality is poor, some supplementation may be advisable during the late winter months (January, February, and March). This can be done by adding a good vitamin pre-mix to the concentrate ration.

Feeding Balanced Rations

A dairy cow requires nearly 10 times the amount of energy that she does of protein. Energy is the nutrient most often limiting high levels of milk production; however, unless a cow also receives an adequate supply of protein, milk production will be reduced.

In balancing the protein content of the concentrate ration, the first consideration is to determine the kind, quality, and quantity of forage or forages being fed. Forages of excellent quality are readily acceptable and cows will eat up to 3 pounds of hay equivalent per 100 pounds of body weight. Those eating average quality forage will consume 2.0 to 2.2 pounds and those fed fair quality forage will eat only 1.5 pounds or less of hay equivalent per 100 pounds of body weight.

Table 15 illustrates how to convert silage or haylage to a hay equivalent basis.

Table 15: Silage or Haylage—Hay Equivalent

	Ratio of Silage to Hay
1. Hay 90% dry matter (D.M.) 100 lbs. contains 90 lbs. D.M.	1:1
2. Haylage 45% dry matter 200 lbs. contain 90 lbs. D.M.	2:1
3. Corn silage 30% dry matter 300 lbs. contain 90 lbs. D.M.	3:1
4. Direct cut silage 22% dry matter 400 lbs. contain 90 lbs. D.M.	4:1

For a good estimate on determining the protein needs in the concentrate, refer to Table 16.

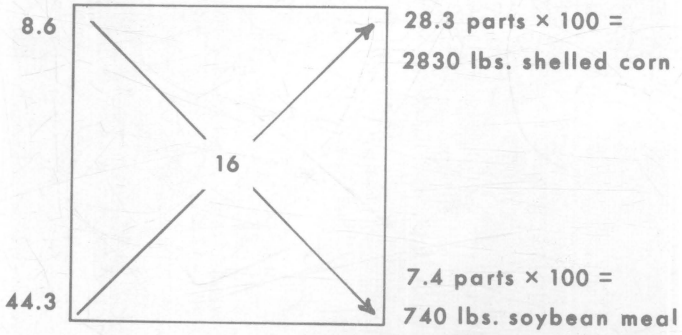
Table 16: Percent Crude Protein Needed in Concentrate Ration When Different Kinds and Qualities of Forages are Fed

Kind of Forage	Quality of Forage		
	Excellent	Average	Fair
Legume (alfalfa, clover)	10	11	12
Mixed (legume-grass)	13	14	15
Grass (timothy, brome, orchard)	16	17	18
Corn Silage	19		
Urea-treated corn silage	15		

Most dairymen feed more than one kind of forage. If, for example, a dairyman is feeding 2 parts hay equivalent in the form of corn silage (60 lbs. corn silage) and 1 part in the form of excellent quality alfalfa hay (10 lbs. alfalfa hay), he would need to formulate a 16 percent digestible crude protein concentrate ration for his herd. To arrive at this percentage, see Table 16. You simply add $19 + 19$ (2 parts corn silage) $+ 10$ (1 part excellent alfalfa hay) and divide by 3 or $(48 \div 3 = 16)$.

To make up a 16 percent mixture using ground shelled corn (8.6 % total crude protein) and soybean oil meal (44.3 % total crude protein), you may do so by using Pearson's Square. See Figure 3.

Fig. 3



In the center of the square insert the figure 16. In the upper left hand corner place the figure 8.6 and at the bottom left 44.3. By substracting each of the figures diagonally (always subtracting the smaller figure from the larger one) you can determine the parts of shelled corn and soybean oil meal needed for a 16 percent ration.

When using more than one source of home-grown grains and/or high protein supplements, you must first determine the proportion of each to be used, then compute the average protein content for the homegrown grains and protein supplements before using Pearson's Square. After doing this, follow the same procedure to determine parts of each ingredient needed as shown in the illustration. If you are using 2 parts of corn to 1 of oats for homegrown grains, you would divide the parts of homegrown grains needed by 3 to determine the number of parts of oats. Subtract this figure from the total parts of homegrown grains needed and this will give you the number of parts of corn to be included in the concentrate ration. Follow the same procedure if using more than one source of high protein supplement.

Feeding Enough Concentrates and At The Right Time

Underfeeding is still the major profit-limiting factor among our dairy herds today—just as it has been since the beginning of commercial dairying. In feeding, not only the quantity of feed fed is important but also feeding at the correct time in lactation. Most cows do not produce according to their inherited potential because they have not had an opportunity to express it. This is due primarily to underfeeding in early lactation, the first 100 to 120 days. Underfeeding during this period can mean a loss of 1,500 to 2,000 pounds of milk per cow in one lactation. For cows that are being underfed in the early months of lactation, an extra pound of grain should produce an extra 2 to 2½ pounds of milk per day. Thus, with grain at 3 cents per pound and milk at 5½ cents per pound, for every pound of grain a cow is being underfed, the dairyman is losing 8 to 10 cents. Applying these figures to a complete lactation where a dairy cow could produce an additional 2,000 pounds of milk if she received an extra 1,000 pounds of grain could mean an investment of only $30 for an additional return of $110. For a herd of 50 cows responding in this manner means an additional gross of $5,500 or an extra $4,000 in return over feed costs.

Heifers grouped by size and age after weaning

Dairymen who milk and feed grain only in parlors find it difficult, if not impossible, to feed enough grain to their high producing cows. Table 17 shows approximate time spent and concentrate consumption in various types of milking parlors. On the average, cows consume dry concentrate at the rate of 0.5 to 0.6 pounds per minute and since most cows spend only 20 to 30 minutes daily in the parlor, their consumption of concentrates is limited to 10 to 18 pounds a day. Many of our higher producing cows produce 90 to 100 pounds of milk per day at their peak. This means they need up to 30 to 40 pounds of concentrates daily in addition to good quality forage to meet requirements. It is impractical to keep cows in the parlor long enough to consume this amount of concentrates.

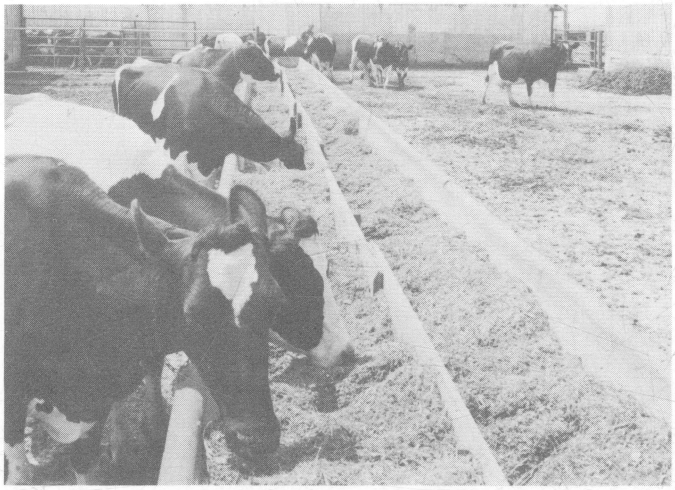
As someone has stated, we must devise some means to prevent "parlor starvation." Perhaps the best method is to group and feed the herd according to level of production and/or stage of lactation. This method of feeding extra grain does cause certain housing problems involving the handling and movement of more than one group of cows. Most dairy set-ups in Ohio today were not designed for a divided herd. But with careful thought, minor innovations could be made on many farms so cows can be grouped and fed according to production. A movable electric fence as a divider at the feed bunk has been used on some farms. Other dairymen have used the holding area to feed high producers extra grain.

Table 17: Feed Consumption in Milking Parlors

Parlor Type	Approx. No. Minutes/cow/day	Approx. pounds Concen. Consumed per cow/day
Double - 4 herringbone	28	14-17
Double - 5 herringbone	30	15-18
Double - 8 herringbone	34	17-20
Double 3 - Walk through	20	10-12
3-in-line side opening	16	8-10

Estimates based upon Kentucky—Michigan Data

Heifers bred at 750 pounds and will freshen at about 2 years of age



Parlor-milked cows grouped by production level; higher producers fed extra grain with silage

Looking to the future, dairymen may not only want to consider the concept of handling cows in groups but also feeding both concentrate and forage on a group basis rather than an individual, thereby eliminating parlor feeding of grain altogether.

Research results at a number of stations indicate complete-feed silage has practical and economic advantages for mechanized group feeding. The silage and grain should be stored in separate units and be combined at time of feeding. Studies at Michigan State University give some indication that labor requirements can be reduced as much as 10 percent by eliminating grain feeding in the parlor.

For dairymen who do not choose to group and feed cows according to production, the next best alternative is to feed all cows extra grain in the feed lot. For those who plan to sort and feed cows grain according to production, the following suggestions for grouping are offered:

1. Cows producing at high levels—60 pounds or more per day (large breeds), 45 pounds or more (small breeds)
2. Cows producing at medium levels—40 to 60 pounds (large breeds), 30 to 45 pounds (small breeds)
3. Cows producing low levels—feed grain only in the parlor
4. Dry cows—feed enough grain to get cows in good condition (125 to 150 pounds of extra weight over normally good condition) 1 to 1½ pounds grain per 100 pounds body weight 2 to 3 weeks before calving.

Each dairyman has a different set of problems and, therefore, different solutions are required. The important thing is to make certain that the high producers get enough to eat of the right kind of feed when they need it. Don't let your high potential profit cows remain undiscovered because of inadequate feeding.

For more detailed information on dairy cattle feeding, refer to Bulletin 72.

MANAGEMENT IN MILKING

One of the most strategic factors in good management is the job of milking. We can do everything else correctly but if we slip here, many of our other gains are lost.

Well-fed and well-bred cows can lose the race for profits by incorrect milking practices—losing out to such things as low production, high bacteria counts, off-flavored milk, and mastitis. Research supports the idea that proper milking methods not only increase milk production but cows can also be milked in less time, cleaner milk results, and mastitis is reduced.

Before discussing recommended milking practices, let us first consider the structures of the udder and how milk is secreted.

The mammary gland consists of 4 separate and distinct quarters. The main supports of the udder are the skin, the median suspensory ligament, and the lateral ligaments which help to form a sling-like support for the udder. The udder consists of 50 to 60 pounds of tissue (alveolar-milk secreting, and connective—supportive) and when filled wtih blood and milk may weigh from 100 to 250 pounds. This helps explain why some cows suffer udder breakdown and must be prematurely culled.

Milk is actually secreted in the cells lining the tiny structure called an alveolus (See Figure 4).

There are billions of these tiny structures in the udder of high producing cows. Surrounding each alveolus is a network of blood vessels and muscle fibers. Cells lining the inside make milk from nutrients carried in the blood stream. The secretory cells (alveoli) work at a relatively constant rate 24 hours a day. The muscles surrounding the alveoli are necessary for milk let down (squeeze out).

The teat which is the outlet for the milk is supplied with a fine network of nerves and blood vessels which are important at time of milk let down. The opening of the teat is controlled by the teat sphincter (See Fig. 5).

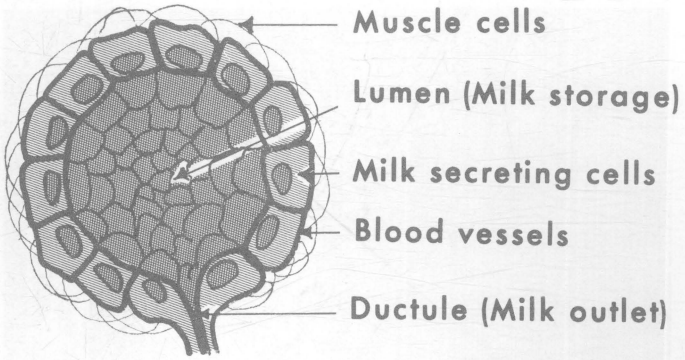


Fig. 4 Alveolus

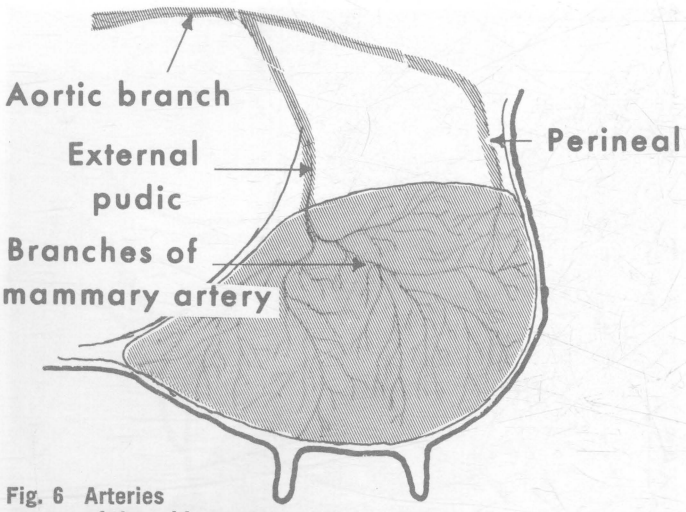


Fig. 6 Arteries of the udder

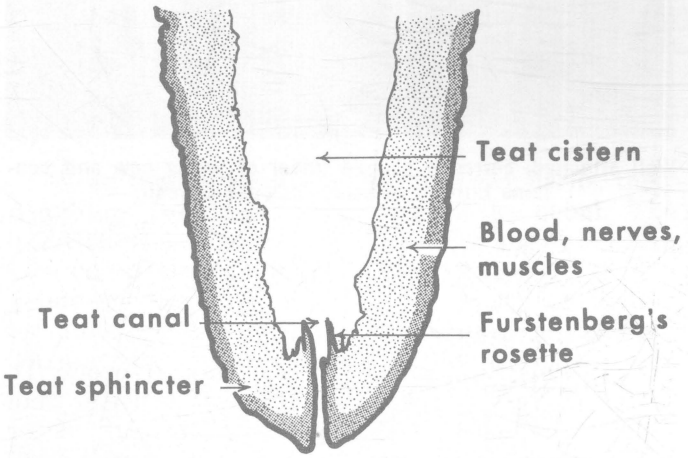


Fig. 5 The teat

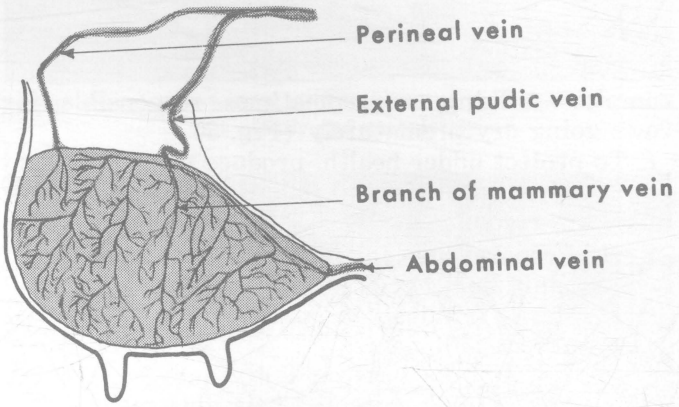


Fig. 7 Veins of the udder

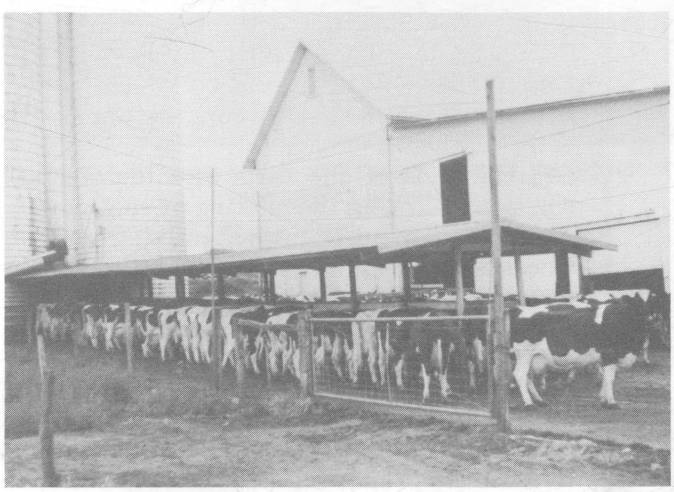
When the milker is left on too long, the delicate inner lining of the teat is often irritated and can set up an ideal condition for bacteria to invade the area. Removal of the milking machine as soon as milk has ceased flowing can help prevent damage to these delicate membranes (Fig. 6).

Estimates are that 400 pounds of blood must be pumped through the udder for each pound of milk produced. This means a cow producing 100 pounds of milk daily must pump 20 tons of blood to and from her udder (Fig. 7).

There are a number of hormones related to udder development, milk secretion, and milk let down. We shall only mention 3 in this publication. The hormone **prolactin** produced by the pituitary gland is the one that causes the secretory cells to begin functioning at time of freshening.

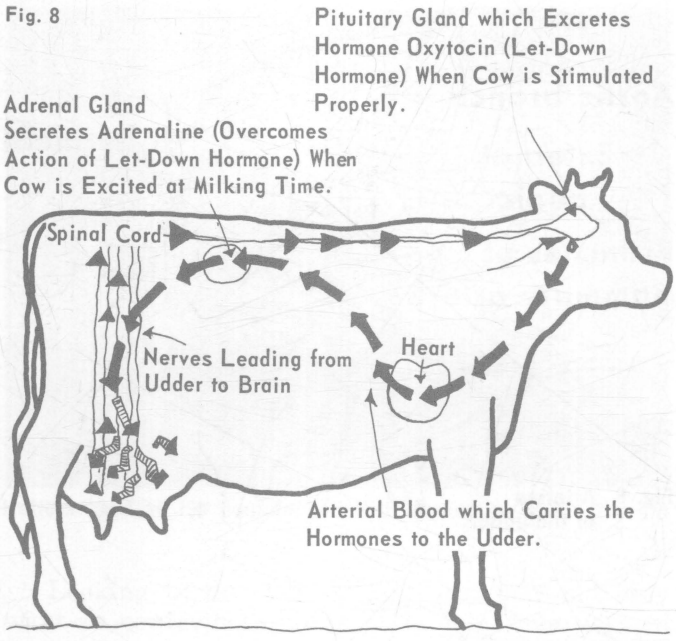
As the cow is prepared for milking by massaging and washing the udder, the nerves of the teat send a message to the pituitary gland at the base of the brain and the let down hormone (oxytocin) is released. **Oxytocin** reaches the udder by way of the blood supply in about 1 minute following stimulation. This causes the muscle fibers surrounding the alveoli to contract and force or squeeze out the milk. The effects of oxytocin begin to diminish in about 7 minutes. Most cows, after proper stimulation, will milk out in 3 to 5 minutes.

It is important that cows not be excited or disturbed at milking time. If they are, the adrenal cortex will release the hormone **adrenaline** which counteracts the effect of oxytocin and prevents milk let down. Excitement at milking time, as well as in-



These cows are fed extra grain with silage plus all they can eat in a double-7 herringbone parlor

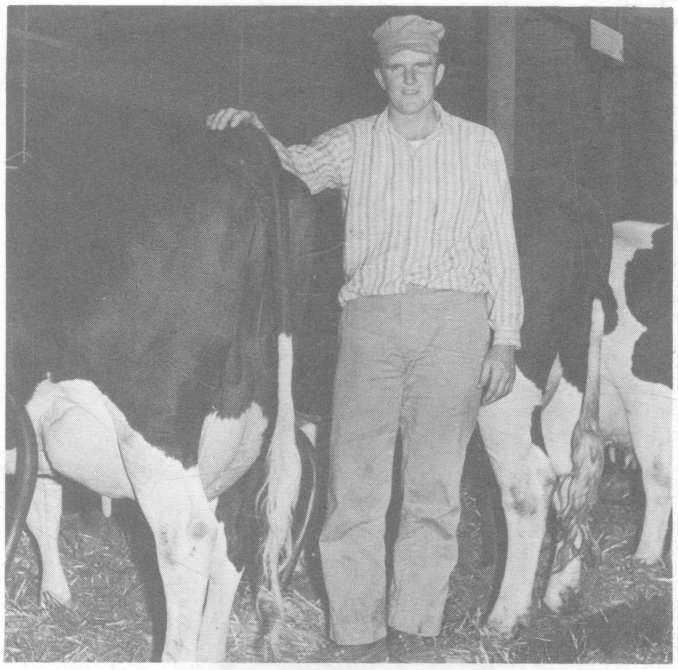
Fig. 8



complete milking, are sometimes responsible for cows going dry prematurely (Fig. 8).

To protect udder health, produce more milk, and help prevent mastitis, the following milking procedures are recommended:

1. Prepare cow for milking by washing and sanitizing the udder and teats with individual sterile towels and massage and stimulate for at least 30 seconds.
2. Use a strip plate on every quarter of every cow at each milking. This aids in detection of mastitis and removes first milk which may have a high bacterial count.
3. Attach teat cups approximately 1 minute after stimulating cow for let down. This permits taking advantage of the let down hormone which begins to lose its effectiveness after 7 minutes.
4. Machine strip by applying downward pressure to the teat cups assembly and by massaging each quarter.
5. Remove the milker gently as soon as the cow is milked dry.
6. Rinse and disinfect teat cups between each cow.
7. Dip the ends of the teats in a disinfectant solution following the milking of each cow.
8. Avoid excitement of cows at milking time.
9. Operate milking machine according to the manufacturer's directions.
10. Check milking machine periodically for correct vacuum, pulsation rate, and condition of rubber parts.
11. Milk cows regularly, rapidly (training and proper stimulation can aid), and completely.
12. Remember, proper milk procedures can help you produce more milk, keep down mastitis, and increase net income.



Well attached, correctly shaped udder of young cow and contains billions of secretory cells (alveoli)

MANAGEMENT IN BREEDING

Genetic Improvement

The dairyman milks cows to make a profit. To make progress, tomorrow's cows must be better than today's. Increased output per cow, through better breeding and management, requires very little additional investment beyond that already required.

To increase the inherited potential for milk production, dairymen should breed their herds to the best sires available. The sires best identified for high milk production can be obtained through the A. I. industry.

The sire, of course, does not give milk, but his transmitting ability is expressed in the milk and butterfat production of his daughters.

Early in the development of proved sire programs, the **average production of a sire's daughters** made in a single herd was used as an indication of a sire's merit. This method proved that the daughter average was closely related to the production level of the herd in which the sire was used. For example, daughters of the same sire in 3 Ohio herds had the following milk production averages: 10,846 pounds, 13,804 pounds, and 16,997 pounds indicating a big difference in the feeding and management in the herds in which he was used.

The next improvement in sire proving was use of the **daughter-dam comparison.** But this, too, had its shortcomings because most of the dams made their records in years previous to the daughter's production records. This often caused feeding and management changes to be interpreted as genetic superiority or inferiority of the daughters.

A further refinement in sire proving came with what was known as the **herdmate comparison.** This comparison involved comparison of the daughters of a sire with the daughters of all other sires in the same herd freshening in the same season and year. Accuracy of a sire proof was enhanced by establishing that information derived from many herd proofs (AI proof) was superior to that obtained from a one-herd proof (natural proof). This helped remove the bias inherent in a one-herd proof which could result when the dairyman who milked the daughters also owned the sire and could profit from his sale if the daughters proved superior to the daughters of other bulls.

Current sire summaries include two additional tools, namely **Predicted Difference** and **Repeatability.** The Predicted Difference gives us the best estimate known today of the transmitting ability of a bull. It is an indication of what future daughters of a sire would be expected to do in relation to herdmates in herds where herdmates were of breed average ability.

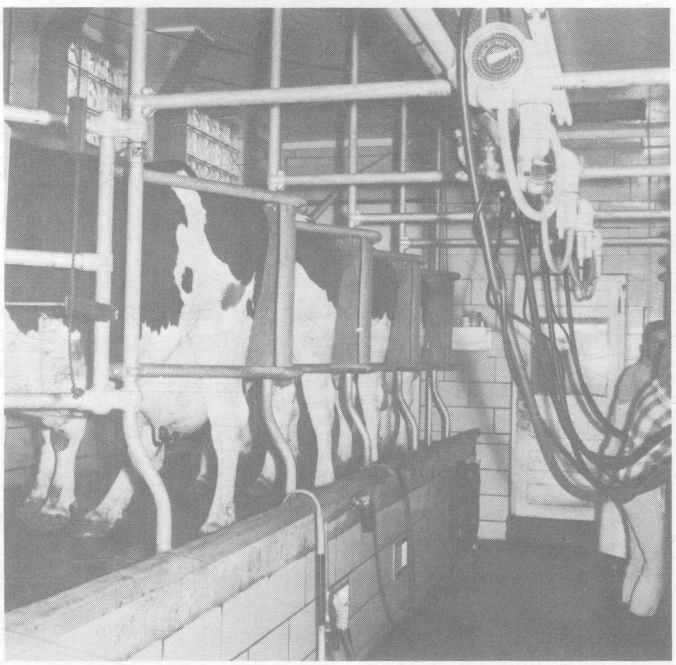
Even though sires are used in many herds, their daughters' herdmates will not all be equal. The question naturally arises, "How much better is a sire who raises production by 1,000 pounds over 13,000-pound herdmates than a sire who raises production by 1,000 pounds over 11,000-pound herdmates?" This adjustment can be made since it is known that only 10 percent of the difference between the daughters of a sire is caused by the genetic difference between herds.

This application of the 10 percent genetic difference is made by crediting the bull with an additional 100-pound increase over herdmates for every 1,000 pounds the herdmates exceed the breed average. For example, a sire that raised production at the 14,000-pound level by 200 pounds of milk (breed average 13,000 pounds) would be expected to raise it by 300 pounds at breed average. Thus, the bull with the highest predicted difference has the highest probability of raising production in any herd.

Repeatability tells us how much faith to put in a bull proof. It is a numerical way of expressing confidence. Repeatability will usually range from 29 to 99 percent. Bulls proven in only 1 or 2 herds will have a low repeatability (20-30 percent), whereas an A. I. proved sire with daughters in many herds may be as high as 99 percent. The more information available, the more accurate the proof is and the more confidence we can place in it. A proof with a high repeatability won't normally change much, but one with a low repeatability is subject to change upward or downward as more information accumulates.

The true genetic ability of an animal is never known, but by using modern breeding tools in selection, we can arrive at a reliable estimate of breeding value.

Proper stimulation before applying teat cups helps cow milk out rapidly and completely

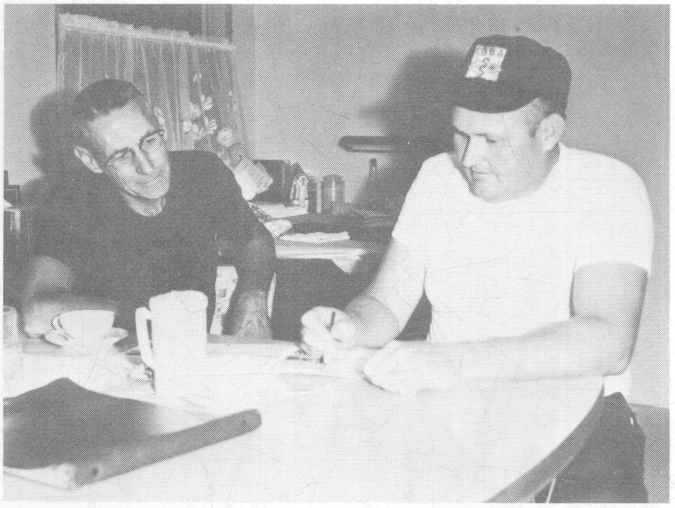


Cleanliness of cows, parlor, and equipment aids production of high quality product

Reproductive Performance

Greater profit can be obtained by most Ohio dairymen by shortening the calving interval. Too many herds have an average calving interval of 13 to 14 months.

For ideal reproductive performance, each cow in a dairy herd should produce a calf a year. Regular calving means more milk, more herd replacements, and less time and money wasted in prolonged dry periods.



Dairymen and A.I. technicians often plan a year's breeding program together

Use of herd sires with high predicted difference aided dairyman in developing high producing herd

To obtain this, each cow must be safely in calf within 90 days after calving. If we recommend breeding cows 60 to 70 days after calving, all cows would have to conceive at first service in order to approach this goal. This, of course, is unrealistic since all cows don't settle on first service. The question arises, "How soon should cows be bred following calving?" and "Does a cow need a 60-day rest period after calving?" A review of 5 studies by New York workers including their own data indicated that uterine involution (return to normal) is generally completed within 20 to 30 days following calving. On the average, the first estrous cycle after calving occurs in 43 days.

A study of 5,801 calving intervals from Kentucky DHIA records demonstrated that calving intervals can be shortened by as much as 25 days by breeding sooner after calving (average time from calving to first service was 82 days in this study) without any ill effects. Conception rate is usually lower than if a minimum of 60 days is allowed. However, the evidence suggests that we can effectively shorten the calving interval by breeding as early as 40 to 50 days after calving (if the uterus has returned to normal) and by making greater effort not to miss heat periods. Rectal palpation of a cow's uterus 30 to 45 days after calving will help determine if the uterus has returned to normal. Thus, by breeding earlier after calving, even if it takes more services per conception, most cows can be gotten safely in calf within 60 to 80 days after calving, thereby permitting a calf a cow a year.

Timing in Breeding

The length of a cow's heat period is usually about 18 hours (it may vary from 12 to 24 hours). Research has shown that cows bred from mid-heat to 6 hours after the end of heat have the highest conception rate. A good rule of thumb is: Cows found in heat in the morning, breed that afternoon; and cows in heat in the evening, breed the next morning. This allows the cow time to reach mid to late heat before breeding.

Some of the main signs of heat are:

1. Cows stand for other cows to mount.
2. Clear, transparent mucus flows from the vulva.
3. Cow appears restless and bawls.
4. Cow may attempt to ride other cows.

Suggestions for Improving Reproductive Performance

1. Keep accurate and complete records of heat, breeding, and calving dates.
2. Observe cows twice daily for signs of heat.
3. Have cows checked 30-45 days after calving to determine if the uterus has returned to normal.
4. If uterus has returned to normal, cows may be bred 40-50 days after calving.
5. Use high conception sires.
6. Breed during the latter part of the heat period.
7. Use services of veterinarian in all cases of difficult calving, retained placenta, and where there is evidence of infection.
8. Provide good sanitation for cow at calving time.
9. Provide an adequate supply of phosphorus (a lack of this mineral may cause silent heat).
10. Breed heifers that are well grown so they will calve at 24 months or earlier.

For more detailed information on dairy cattle breeding, refer to OSU Extension Bulletin 485, *Developing a Modern Dairy Breeding Program.*

DAIRY HERD MANAGEMENT FOR HEALTH

A good disease prevention program is the best method for controlling disease and maintaining a healthy dairy herd. Prevention means day-in and day-out good herd management, proper nutrition, good sanitation, and comfortable housing.

There are many dairy cattle diseases that interfere with production and shorten a cow's productive life. Mastitis heads the list as the most costly disease of the dairy industry. Tuberculosis and brucellosis, once extremely costly to dairymen, are no longer a serious economic problem, because the publicly supported eradication efforts have progressed so well in the past 20 years. Dairymen who use artificial insemination experience very little if any difficulty with infectious diseases like vibriosis and trichomoniasis which are spread chiefly through sexual contact. New findings in the area of bloat prevention and control through the use of a compound known as Poloxalene have done much to alleviate this loss.

Other disease problems not yet completely controlled or eradicated are: leptospirosis, milk fever, ketosis (acetonemia), winter dysentery, grass tetany, nitrate poisoning, internal (worms) and external parasites (mange, lice, flies, cattle grubs and ringworm), infectious bovine rhinotracheitis (I.B.R. also known as red nose disease), bovine virus diarrhea (B.V.D.), and para-influenza 3 virus (PI 3).

Mastitis, the Number One Problem

Mastitis means inflammation of the udder. It is a disease complex and can result from any condition or combination of things which leads to injury of the internal structures of a cow's udder. The most common cause of mastitis is bacteria and their toxins. Estimates are that more than 95 percent of the mastitis cases are caused by streptococcal and staphlococcal microorganisms.

A reasonable estimate of the prevalence of the disease today is that 50 percent of the dairy cows in the nation are infected with mastitis organisms in about 2 quarters per cow. An estimate of its cost to dairymen in the U.S. in reduced milk production, loss of saleable milk, death loss, cost of treatment, and culled diseased cows ranges from 225 to 500 million dollars. Loss in milk production alone from chronic mastitis amounts to about a 10 percent loss in production per cow. This means for every 10 cows infected in a herd, the equivalent of one cow would return no income.

The bacteria that cause mastitis usually gain access to the udder through the teat. This occurs most often as a result of unsanitary milking conditions, and is sometimes enhanced by injury. Most streptococcal infections can be eliminated from a herd through proper sanitation and good management procedures, whereas the staphlococcal infections are more difficult to control.

Vaccines for possible cure and control of mastitis have been developed and used by a number of investigators, but to date they have proven of little value.

Treatment of both acute and chronic cases of mastitis should be done by or under the supervision of a veterinarian. He can assist in determining the type of bacteria involved and can recommend the use of the proper antibiotic or combination of antibiotics and therapeutic agents that are most effective in controlling or eliminating the infection.

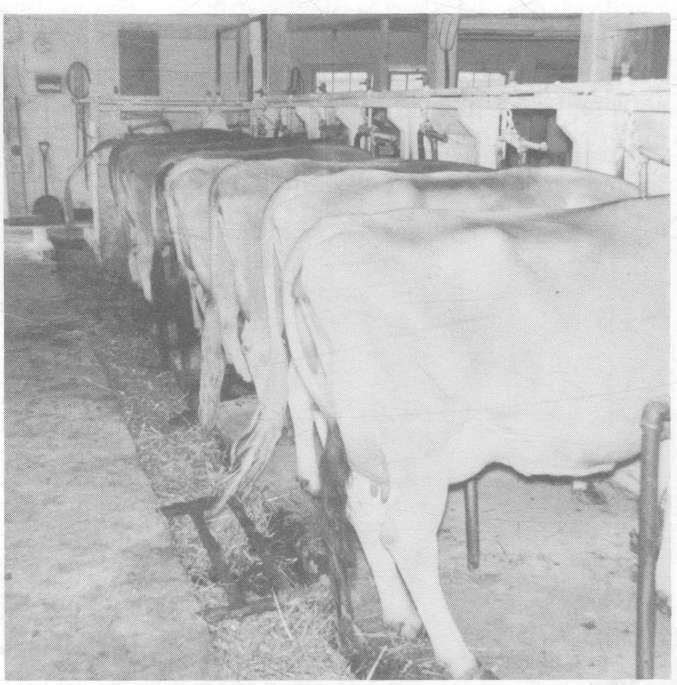
The best treatment for mastitis is preventing its occurrence. The management of this problem can be divided into two areas; namely, by preventing invasion of clean udders with microorganisms and by reducing mastitis symptoms in udders which have already been invaded.

To prevent invasion of clean udders with microorganisms, set up a severe sanitation barrier between cows.

1. Dip teats in disinfectant after each milking.
2. Use individual sterile towels for washing udders.
3. Flush and dinsinfect teat cups between cows.
4. Prevent injury to teat ends and avoid use of teat dilators.
5. Use milking order if practical.
6. Prevent young calves from nursing each other.

Following are suggestions for reducing mastitis symptoms in udders already invaded with organisms.

1. Keep stalls or loafing areas well-bedded and dry.
2. Make sure the barn is well-ventilated—helps remove stale air and moisture.
3. Provide an adequate amount of paved area—mud can be a source of disease.
4. House cows in structures that are free of drafts. Drafts increase stress and lower an animal's resistance to disease.
5. At calving time, place cows in a clean well-bedded box stall.
6. Cull infected animals that don't respond to treatment.



A 60-day wait after calving before breeding helped herd maintain good breeding efficiency

With our present knowledge mastitis cannot be entirely eliminated, but it can be controlled and in most cases prevented by following good management practices.

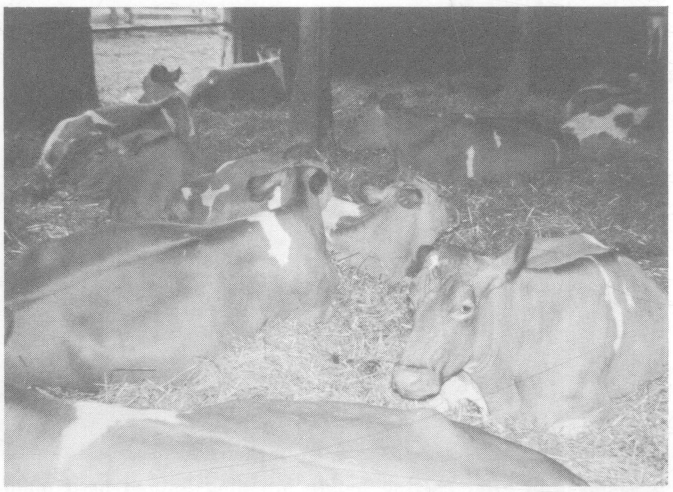
Milk Fever

Milk fever is one of the most common diseases for which veterinarians are called upon to provide treatment. It is a physiological disease (not contagious) resulting from a calcium phosphorus imbalance. All preventive efforts have been aimed at helping cows maintain normal blood calcium levels during and after calving. Although low blood phosphorus indicates that phosphorus imbalance is involved, its replacement in the blood during a milk fever attack does not relieve the symptoms. The immediate cause of the symptoms is the low blood calcium associated with elevated blood magnesium.

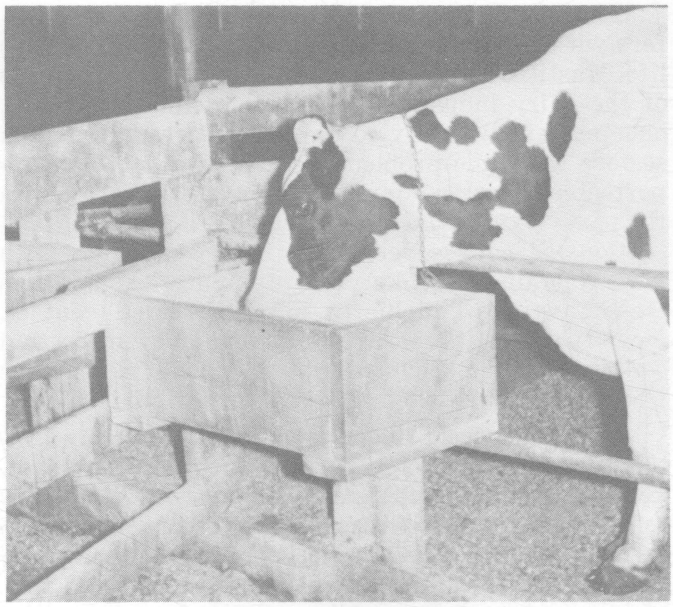
Keeping the calcium and phosphorus in balance in the feed fed during the dry period can provide help to cows in meeting the added stress on calcium and phosphorus metabolism in early lactation. Workers at the University of California showed that a ration low in calcium and high in phosphorus, fed during the dry period, lowered milk fever incidence.

Research conducted by Hibbs and Conrad at the Ohio Agricultural Research and Development Center showed that milk fever can be prevented in large measure by feeding 20 to 30 million units of vitamin D daily for 3 to 7 days before the predicted date of calving. This level of vitamin D should not be fed more than 7 days because of possible harmful effects. If used to prevent milk fever, it should be fed to those cows that have had a previous case. Vitamin D aids in the absorption of calcium and phosphorus from the intestinal tract. Vitamin D will not, however, increase calcium absorption unless there is sufficient phosphorus in the ration.

Cows that have milk fever should be treated promptly by a veterinarian.



Clean, well-bedded loafing areas help control mastitis



Good mineral mixture fed free choice helps 1 percent in concentrate ration helps prevent milk fever

Grass Tetany (Hypomagnesemia)

Grass tetany can be fatal. This disease is caused by a magnesium deficiency and is accompanied by a low serum calcium level. It occurs primarily in lactating cows during the winter and early spring. This disease is becoming more widespread in Ohio. The disease occurs more frequently on farms that have highly productive pasture and cropland. It also occurs more frequently in herds that are fed small amounts of grain.

Factors which appear to contribute to the problem are extensive use of limestone that is low or lacking in magnesium and excessive availability of potassium in the soil.

Tetany symptoms vary. In general tetany starts with incoordination, excitability, animals go off feed and milk production drops in lactating cows. Later, animals may show viciousness, excessive salivation, irritability, and muscular twitching. The onset of tetany is marked by spasms which develop rapidly into convulsions, coma, and often death within an hour.

It is imperative that herds with current or recent history of grass tetany be fed supplemental magnesium. The disease is acute and the affected animals may not recover even when calcium-magnesium gluconate is administered promptly after the animal becomes ill. Feeding grade magnesium oxide (Mg0) is recommended as an economical product in which the Mg is readily available. Current recommendations are directed toward insuring intake of 1/10 pound per cow per day from late fall until spring pasture has passed the lush stage. The magnesium oxide may be fed with grain or on silage. Adding 10 pounds per ton (½ percent) in the concentrate mixture should give adequate protection from the disease.

Ketosis

Ketosis is an ailment characterized by low blood sugar and high ketone levels in the blood. The symptoms of ketosis in its advanced stage are somewhat comparable to those for milk fever except that the onset is generally 3 to 6 weeks following calving rather than the first day or two following as is the case with milk fever. Treatment of clinical cases is also similar to that given for milk fever.

Most clinical and even sub-clinical cases of ketosis can be prevented by adequate feeding before and following calving. The condition develops largely from a shortage of energy. High producing cows should be conditioned to heavier grain feeding prior to calving and if practical brought to full feed in 7 to 10 days after calving.

Nitrate Poisoning

Nitrate poisoning may have been a problem in a limited number of herds in Ohio but has not caused a serious economic loss.

Nitrates accumulate during time of drought and high temperature. They are found in greatest concentration in plants during rapid vegetative growth. Green chop feeding system (soilage) is the most dangerous method to feed high nitrate forages. The same crop is seldom dangerous if fed as silage. In silage, up to 80 percent of the nitrate is dissipated or lost during the fermentation period.

The maximum safe level for nitrates in the total ration (concentrate and forage) is 1.0 percent or 1,000 parts per million.

The following precautions should be taken if nitrate poisoning becomes a problem:

1. Test hay and/or silage suspected of being high in nitrate.
2. Dilute the toxic forage by feeding other forages with it. Dilution should be based upon analysis of the forage in question.
3. High energy rations (concentrates) will help offset production losses.
4. Avoid sudden changes in the grain ration and eliminate urea as a protein supplement.
5. Supplement the grain ration with Vitamin A so cows will receive approximately 3,000 International Units (I.U.) per 100 pounds of body weight (1200-pound cow should get 36,000 I.U.'s) daily.

Winter Dysentery (Winter Scours)

This is a highly contagious disease of dairy animals and when the problem arises, it usually affects all animals in a herd. Winter dysentery is caused by the organism Vibrio jejuni and is eliminated in the feces of infected cows. From 3 to 6 days following ingestion of the organisms, animals usually come down with the disease. Milk production drops rapidly at the onset of the disease. Most cows recover but should receive early treatment by a veterinarian.

Some suggested preventive measures are:

1. Avoid visiting farms known to have, or that have had, the disease recently.
2. Don't use contaminated or second-hand feed bags.
3. Use a foot bath with disinfectant in it for folks visiting your farm.
4. Don't permit visitors to walk in feed alleys.
5. Don't purchase the disease.

Pinkeye (Infectious Keratitis)

Pinkeye usually occurs in late summer or early fall. Cows affected may drop as much as 25 percent in milk production. It is a contagious disease and can be transmitted by contact (rubbing heads) with infected animals and by flies.

The symptoms of the disease include swollen eyelids, a watery discharge at first, and possibly pus later. The linings of the lids become red and congested and a pink or red ring may encircle the white portion of the eyeballs. The eye often becomes cloudy and in severe cases blindness occurs.

Control measures consist mainly of good management. Infected cattle should be housed in darkened stalls and treated under the supervision of a veterinarian.

B.V.D., I.B.R., and PI 3

Bovine virus diarrhea (B.V.D.) and infectious bovine rhinotracheitis (I.B.R., known also as red nose disease) resemble each other and generally can only be differentiated by blood serum tests. They are both viral diseases. The viruses may be found in eye and nasal discharges, and in the saliva and feces of infected animals. They enter the body of an animal through ingestion of contaminated feed and water. Major means of spread are through movement of infected animals, people going from an infected to a non-infected herd without properly sanitizing footwear.

Cattle of all ages may be affected. Both diseases may be accompanied by high temperature (up to 106°), loss of appetite, lowered milk production, and rapid loss of weight. Respiratory symptoms may include discharges from the eyes and nose, labored and rapid breathing, coughing, and a red rose. Severe diarrhea and dehydration may also occur. Sometimes pustules will develop in the vulva and vagina causing severe pain. Pregnant animals may abort, especially during the latter part of pregnancy. Sometimes inflammation of the eyes result and is often mistaken for pinkeye.

While I.B.R. tends to involve the upper part of the respiratory tract and B.V.D. is more an infection of the digestive tract, symptoms of both are similar. Death losses are low but when an outbreak occurs, it may approach 100 percent in a herd.

For prevention and control of these diseases the following suggestions should prove helpful.

1. Isolate all purchased animals for 30 days before introducing them into the herd.

2. Practice good sanitation measures; use of foot bath for disinfecting footwear of visitors.
3. Vaccines for both diseases are available but should be administered only upon the advice of the veterinarian. Don't vaccinate cows in calf—it could cause abortion.

The para-influenza 3 virus (PI 3) is often associated with I.B.R. and B.V.D. as well as shipping fever. Vaccines are also available for this disease and can be administered along with those for I.B.R. and B.V.D.

Bloat

Bloat in cattle is the result of an overaccumulation of gas in the rumen. The primary cause of legume bloat is excessive foaming of the rumen contents.

Pastures containing less than 50 percent legumes (alfalfas and clover) seldom give trouble. A new product, Poloxalene (an antifoaming agent) which effectively controls bloat was developed by workers at Kansas State University in 1964. This product fed at the rate of 10 grams per feeding per 1,000 pounds of body weight controls legume bloat nearly 100 percent of the time. For heifers and yearlings on legume pasture and receiving no grain, this product under the trade name "Bloat Guard" can be purchased and used in block form (mixed with molasses and salt).

Other suggestions which may give some help in controlling bloat are:

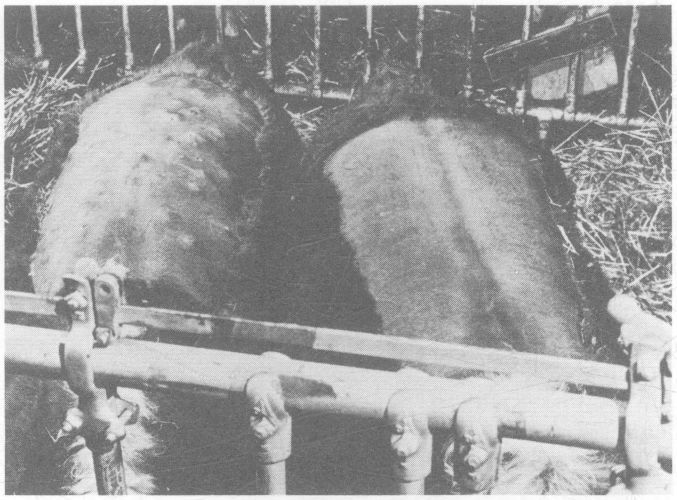
1. Make sure cows are full before turning them on good legume pasture.
2. Feed some dry hay to animals grazing legume pasture—use a hay rack in the pasture.
3. Observe cows closely for bloat symptoms up to an hour after turning on legume pasture—if cows show signs of bloating remove them immediately.

Leptospirosis (Lepto)

Leptospirosis was first recognized in Ohio in 1951. Most cases are caused by a bacteria called *Leptospira pomona*. This disease can also affect swine, horses, sheep, wild animals, and man.

The disease may show a variety of symptoms and in some cases no visible evidence at all. Some of the more common symptoms are loss of appetite, an abrupt drop in milk production, a soft flabby udder with thick, stringy milk, and in some cases blood-tinged. The infected animal may pass dark, red-colored urine. The last symptom is usually present only if the animal is severely sick. The disease can be diagnosed by blood test similar to that used in testing for brucellosis.

Abortion is one of the important clinical symptoms of "Lepto." It is not uncommon for a pregnant cow to lose her calf 2 to 3 weeks after she has become infected.



Heel flies reduce milk flow; note difference in treated and untreated animals

Leptospirosis is spread from one animal to another by way of urine. The organism causing the disease tends to localize in the kidneys of infected animals and may be passed in the urine for as long as 3 months. The "Lepto" organism is readily killed upon drying but may remain alive for some time in a moist area or in surface water. Small streams can play a role in spreading the disease from farm to farm.

If an outbreak of leptospirosis occurs in a herd or in an area, most veterinarians recommend vaccination. Properly immunized animals are protected from the disease for about 12 months. Herd owners who suspect the presence of this disease should consult with their veterinarian concerning treatment. Few animals die, but milk production loss can be heavy if infected cows go untreated.

Parasitism in Dairy Animals
Internal Parasites

Internal parasitism (stomach worms) is responsible mainly for causing problems in young animals. It is an insidious, costly disease and can cause hidden economic loss to herd owners.

Often, too little attention is given to control and treatment of internal parasites. The problem of control has increased in recent years with herd expansion and a great concentration of dairy animals confined merely to exercise yards.

Internal parasites cause much of their damage in the stomach by sucking blood. The adult worm lives in the stomach where one worm can lay as many as 3,000 eggs per day. The eggs are passed through the feces. Eggs can survive heat and cold for long periods until conditions are favorable for hatching. The larvae become infective in about 5 days after hatching. When the larvae are eaten, they quickly develop and lay eggs in about 3 weeks.

Symptoms of internal parasitism are:

1. Young heifers fail to make satisfactory growth.

2. Digestive disturbances as noted by "on" and "off" appetite.
3. Persistent diarrhea.
4. Unthrifty and/or "pot-bellied" animals.
5. Long dull hair coats.
6. Anemia as shown by pale mucus membranes (lower surface of eyelids, gums, and tongue).

Microscopic examination of the feces for presence of eggs is the best method for diagnosis.

Some suggestions for prevention include:

1. Be sure that the housing and surrounding area for heifers has adequate drainage.
2. Don't pasture young heifers with the milking herd.
3. Use hard-surface flooring for easy cleaning and disinfection.
4. Don't feed hay on the ground—feed in properly constructed racks.
5. Keep manure out of grain boxes and water recepticles.
6. Don't overcrowd animals—keep animals clean, well-bedded, etc.
7. If infection is suspected, contact your veterinarian for advice on treatment and control.

External Parasitism

There are a number of external parasites which annoy cattle and affect production and growth. Among the more common ones are flies (house, face, barn, and heel), ringworm, lice, and mange.

Flies, particularly face and heel flies (cause of cattle grubs) are the most difficult to control and may cause the most damage from a milk production standpoint. Information on effective agents for their control can be obtained through the county Extension office.

More dairymen are using milking specialists including women

Ringworm, which is a fungus, usually shows up in late winter or early spring. It generally appears as a circular patch on the skin of the head, around the eyes, neck, shoulders, or on other body parts. The area becomes crusty and scabby.

To treat, scrub the infected area with soap and water using a stiff brush. Apply tincture of iodine or an iodine ointment to the areas periodically until healing takes place.

Lice are most troublesome during fall, winter, and early spring. The little red louse and the long-nosed blue louse are the most troublesome ones.

Mange is a winter disease that can cause severe loss of flesh and milk production. The mites cause skin lesions, and cattle that are affected become restless and often rub and scratch the affected areas until they become bloody and infected.

For treatment of both lice and mange, consult your veterinarian or the county Extension office for methods and chemicals to use in treatment.

LABOR IN DAIRY HERD MANAGEMENT

As Ohio herds continue to grow larger, it is obvious that more and more dairymen will need to get off the tractor, out from under the cow, and spend most of their time as a manager. In many dairy setups, labor is often the limiting factor and top-quality labor is becoming harder to find and more expensive.

The day of the $200-a-month-hired-man is long past. Our attitude toward hired labor is due for some change. Wages must go higher to obtain and keep good hired help. To pay higher wages, we must increase our opportunity for profit. Perhaps labor specialization is a step in this direction. We may need to think in terms of specialists for milking, feeding, calf and heifer raising and the growing and harvesting of crops. We may also need to consider such things as enlarged fringe benefits, incentive payments, regular working hours, and paid vacations.

The trend in California is to go to a labor-management unit. A labor unit often consists of 90 to 125 cows with some as high as 180 cows. The labor-management unit generally includes 300 to 400 cows with 4 men assigned to the unit. Three serve as milkers and 1 as the unit manager and relief milker. In most cases, the milkers feed the concentrates but forage is fed by outside labor. Forage feeding is often a full-time job. Most farms are now striving for 70 to 75 cows for each man employed. (This does not include crop production nor raising replacements.)

Herds in California are often maintained in units of 50 to 100 cows and moved from corrals or lots to the milking area. Two hours is considered long enough for cows to wait and be milked and string size (number of cows) may depend on the milking program.

This dairyman scrapes alleys and feeding area in his free-stall barn daily and handles manure as a liquid

Employees get 1 day off per week and from 1 to 3 weeks paid vacation depending on length of service. Pay scale for many of the dairies in California ranges from $400 to $800 per month including bonuses.

Labor Incentives

A low-paid worker on a dairy farm or one who dislikes his job can cost far more money in lost milk production, injured cows, and damaged equipment than the cost of a well-trained, well-paid individual. Yet, the same costly worker with the proper training and incentive could often achieve top performance with a good dairy herd.

Every worker, within the bounds of reason and practicability, should be rewarded in proportion to his contribution to the business. This means not only money but also status and public recognition of the workers contribution.

An incentive program must be a two-way street. It can yield satisfaction in the form of greater net profit and happiness to both workers and owners alike. The worker must have the desire to do a better job and the owner must show him how to do the job better to receive the extra money, satisfaction, and prestige from the incentive program.

An incentive program should be attractive to both the worker and the owner, easy to interpret, easy to evaluate, in writing, and subject to modification periodically.

Incentives that cause the least amount of misunderstanding and are most workable are those in which a third party is involved. For example, the DHIA supervisor (for herd production goals), the co-op manager (for monthly milk shipped), and the veterinarian or A. I. technician (for reproductive performance).

Most incentive programs should be paid as a supplement to the regular salary. Payment should be prompt following performance and based upon the results of the employee's efforts. Also, incentive plans should avoid encouragement of uneconomic practices and be easy to compute.

Liquid manure transported to field in 800 gallon tank

WASTE DISPOSAL ON THE DAIRY FARM

Waste disposal could well become one of the most serious problems of large scale dairy operations in Ohio. Certainly, when planning to enlarge present facilities or when planning a completely new setup, waste disposal should receive major consideration.

To gain some idea of the magnitude of the problem, it has been estimated that the daily manure and waste from a 100-cow milking herd is equivalent to that from a village of 1,600 people.

Every farm presents a different situation; therefore, solution to the problem may differ from farm to farm. Some of the management factors to consider in dairy waste disposal are: (1) number of cows per acre of land; (2) crop rotation followed, since this affects the acreage on which manure can be spread each month; (3) the topography of the land; (4) possibility of stream pollution; and (5) the nearness of the farm to towns and/or suburban areas.

Confinement of large numbers of cows in a small area not only contributes to greater efficiency but also creates problems, especially in the area of sanitation.

Of all the materials handled in a dairy operation, animal waste is the largest single item. For years manure has been handled as a solid primarily because of housing which relied on use of bedding to keep cows clean and to sponge up the liquids. Recent changes in dairy housing have placed more of our cows on unbedded paved lots, feeding areas, holding pens, milking parlors, alleyways, slats, and rubber mats, thus gradually eliminating bedding in the manure and substituting water as the main ingredient and carrier. In this type of dairy setup, the dairyman is faced with the problem of handling manure which is more liquid than solid. If it isn't liquid enough, water must be added to make it pumpable, or where it will flow by gravity. One of the big

problems in handling liquid manure is the clogging of equipment caused by too much solid material such as hay or bedding.

Changing to liquid manure handling is not an inexpensive move. Estimated cost is from $50 to $100 per animal initially, even when the system is used to capacity.

Most of the manure on Ohio dairy farms for some time to come will probably be handled as a solid instead of a liquid. Bedding in free-stalls, maternity pens, and calf pens generally will still be handled as solid, even though the manure from unbedded areas is handled in liquid form. Thus, on many farms both systems will be used.

Slatted floors and rubber mats show the most promise as a means of housing cattle without using bedding and, thereby, permitting the use of equipment which will tolerate only small amounts of bedding.

There are several ways of handling and transporting animal waste. The chopper pump is a piece of equipment that tolerates a considerable amount of coarse material in the manure because of its ability to reduce particle size before pumping it. This type of equipment serves to agitate the contents of the storage tank and keeps the solids in suspension for pumping.

Liquid manure is usually transported to the field in tanks ranging in capacity from 700 to 2,000 gallons.

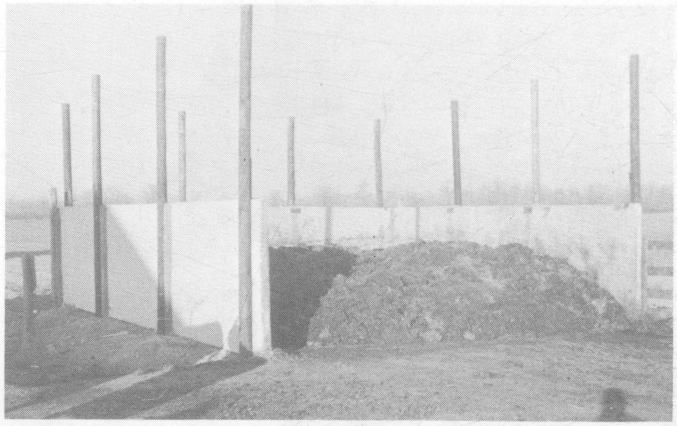
Flail type spreaders are dual purpose outfits that handle either solid or liquid manure. They may be loaded with pumps or tractor mounted buckets.

Most solid manure is still handled in conventional spreaders. It is generally placed in the spreader with a tractor mounted loader and, in some instances, with a gutter cleaner.

The manure loading ramp is being used on a number of dairy farms. The ramp permits pushing the manure directly into the spreading equipment from the lot or collection area.

Provision for stockpiling manure for later disposal is an essential part of most manure handling systems. The size of the stockpiling area depends on whether the system is to handle solid or liquid material, the number and size of the animals, and the length of time the manure is to be stored. Storage capacities for liquid manure tanks should provide for 2 or more cubic feet per cow per day. Most liquid manure tanks should have storage capacity for 30 or more days to allow for periods when it is inconvenient to haul.

Some dairymen are using an above ground pit for manure storage. The storage area should be paved and fenced, and provide 15 or more square feet of well-drained storage area per cow. When possible, it should be constructed so manure can be removed from outside the barnyard and surface water drained away from the storage area. It may be a fenced area outside the lot resembling a low-sided horizontal silo with the floor sloping from front to back. Manure



Some dairymen with free-stall housing use above-ground storage such as the above

is shoved to the farthest end each time the lot is scraped. When manure is stored in this manner it is usually handled in a flail-type or bucket-type spreader and loaded with a tractor mounted hydraulic bucket.

From a public health standpoint, we must manage animal waste in such a manner that it will not contribute to water and air pollution and fly and rodent problems.

Solutions to the animal waste problems have not all been solved, but through proper management most dairymen can satisfactorily cope with the problem until better answers are found.

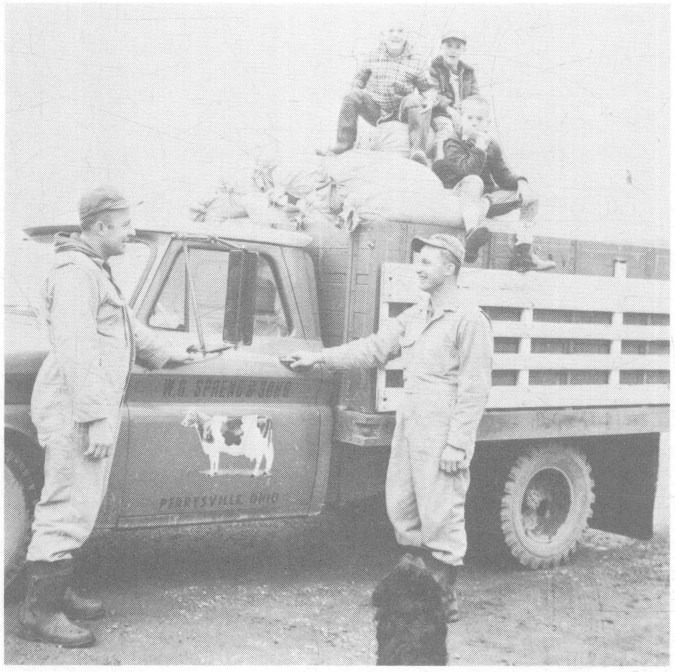
PLANNING HERD EXPANSION

All types of farming operations have been increasing in size during the past several years, and we can expect this trend to increase at an accelerated rate in the future.

Economic forces and technological advances will continue to favor larger dairy farm operations (60 or more cows). A high percentage of Ohio dairy farms are too small in size and volume of production to provide high enough levels of income to attract young farmers.

This is not to imply that every dairyman should expand herd size to 100 or more cows. However, many Ohio dairymen have the managerial ability to handle larger herds than they are handling at the present time. Many dairymen have demonstrated that return per cow in large herds can be comparable to that per cow in smaller herds, and, consequently, income for family living can be much higher.

The dairy farmer today, as well as those in the future, must remain competitive. The so-called "family farm" as we have known it in the past has undergone many changes and the changes will be even more drastic in the future. At one time "family farm" referred primarily to a one-man operation with the aid of family labor. Today and in the future, this type of farm will include more hired labor as it expands in size.



These 2 young brothers farm 750 acres and milk 130 cows—all handled as a "family farm" operation

So-called "corporate farms," 90 percent of the time, are actually farm-family businesses which have been incorporated to achieve certain advantages. Thus, many of our corporation farms today are similar to the "family farms." In Ohio less than 4/10 of 1 percent of these farms are farming less than 2 percent of the land area.

The "family farm" of the future can compete, but to do so it must, in most instances, be a well organized 2 or 3 man farm operation incorporating modern technology and top level management. These are the kinds of operations that will be most likely to provide sufficient income for a high standard of living.

In planning for future changes, there are at least 4 alternatives that deserve consideration:

1. Quit dairying—if you aren't making money now, perhaps your chances are slim for doing so in the future.
2. Plan minor or no expansion, if you expect to discontinue dairying in the next 5 to 10 years.
3. Plan for moderate expansion—move from a 1-man unit to 2 or more.
4. Plan for major expansion—complete modernization with a 3 to 5 or more man unit.

As we look to the future then, there are a number of factors which demand consideration. Dairymen who have obsolete facilities and are now operating unprofitable businesses should ease out of dairying as soon as possible. Those nearing retirement age with no sons or others to assume control of the business should seldom consider large scale expansion.

Dairymen who expect to remain in dairying for another 10 years or longer have a number of alternatives to consider. The direction a dairyman goes depends largely on:

1. Where he is now and his goals. If young, or if he has someone to assume the role as manager, he should not hesitate to make the necessary investments to expand. If the decision is to expand, then new investments should be such that they can be recovered preferably in 5 years but not more than 8 or 10 years.
2. With large scale expansion (up to 100 or more cows), one cannot afford serious mistakes in expansion. Keep investments as low as possible and make mistakes on paper first.
3. Remember that expansion will not pay off unless the dairyman has:
   (a) High crop yields and low feed cost.
   (b) Enough cows to keep overhead cost down and enable him to pay good wages for labor.
   (c) Milk sales per cow of 13,000 pounds (3.5 percent milk) or higher.
   (d) The ability to manage and adjust rapidly to technological change and cost-price relationships. Dairymen who have difficulty in handling a 30 to 50-cow herd should not attempt expansion —at least, they should get good before they get bigger.
   (e) An adequate supply of well-trained labor and is willing to pay competitive wages with other industries.
   (f) A complete set of records to use as a guide. No man is smart enough to manage a large herd without them.

Assuming that a dairyman is planning a major expansion of his dairy operation, perhaps the following problems identified in a Michigan State study of 19 dairymen that doubled their herds in a 6-year period would be helpful:

1. Planning Problems
   (a) Selection of physical layout
   (b) Family agreement
   (c) Location of feeding and loafing facilities
2. Financial Problems
   (a) Cost of expansion greater than anticipated
   (b) Securing adequate financing
   (c) Insufficient income shortly after expansion to meet financial commitments
   (d) Credit needs increased 3 to 5 fold
3. Organizational Problems
   (a) Completing new construction while keeping abreast of regular work
   (b) Purchasing additional replacements and pressure to keep all heifers during expansion

(c) Obtaining good labor and high cost of labor
(d) High death losses with baby calves
(e) More time needed for record keeping

4. Production Problems
   (a) Getting good quality replacements
   (b) Additional feed needs
   (c) Adjusting cows to new set-up
   (d) Maintaining and improving production per cow
   (e) Need for more farm machinery

Most dairymen in this study were pleased with their expanded operations. They did, however, offer the following precautions to other dairymen planning to expand:

1. Plan carefully for feed needs—grow as much as you can.
2. Seek competent help in planning new construction and farmstead layout. Visit other farms for ideas.
3. Plan the new setup so further expansion can be made if desirable.
4. Keep machinery costs down. If possible, use custom operators for specialty jobs.
5. Don't expand unless you can obtain a dependable source of good, hired labor.
6. Use credit cautiously—rely heavily on long-term rather than short-term loans. Careless use of capital can cause financial trouble.
7. Equity in the operation should be at least 50 percent.
8. If most lenders are hesitant to loan the amount needed, better re-think your plans.
9. Keep complete farm accounts.
10. Don't adopt a new practice until the possible effect upon net income has been determined.

Profitable dairy farming requires a balance of all of the factors of production; namely land, labor, and capital under the control of highly skilled management. A surplus or deficiency of any one can reduce potential earnings. Someone has said, "All it takes for profit is proper information, proper calculation, and proper application."

"ALERT TODAY, ALIVE TOMORROW IN THE DAIRY BUSINESS"

In order to stay competitive in the dairy business as in any other business, a method of keeping close tab on your unit costs and unit productivities is basic. Next in importance is a continuous increase in volume of output per man as new innovations are adapted. In other words, strive continually to "Get Better, Before You Get Bigger." More attention to production and business records is the key to keeping "alert."

We can't overlook the logic of increasing the size of the business to gain the economics of the modern mechanization and automation. A farm organization where two or more operators are in a partnership or in some form of multi-farming arrangement could assist in lowering fixed cost by intensifying the use of machinery and facilities; provide more competent and continuous labor; aid in more specialization; and make families of the operators happier by having more scheduled time off.

Incorporation of the business is another example of multi-farming arrangement and even though you have an additional tax to pay annually (State Franchise Tax), there may be enough advantages to consider this as a future farm organization for your farming unit. Regardless of the farm organization pattern followed, the important measure of size or volume is the amount of products produced per man.

High labor productivity generally means high net income. Labor input is a critical resource and will become even more critical as competition from nearby non-farm industries grow in Ohio. Skilled dairy labor needs to be paid comparable to skilled labor in other industries. However, pay is only one of the several ingredients in establishing and maintaining a successful labor relationship. We must develop more skill and understanding in this area of labor management. Vocational training is needed for the future dairy labor supply. Employer education would probably aid in labor supervision. Research is needed to determine the factors that are most important in increasing dairy labor tenure and productivity.

As the business grows larger, financial backing becomes more difficult. Dairymen are gradually changing their philosophy from the total ownership concept to using other methods of control of sources. We have mentioned one method of gaining control without total ownership through joint-ownership or partnership. Other methods of control without total ownership are: 1. Custom hire (either one operation or total crop operation). 2. Lease or rent resources. 3. Exchange work with another dairyman (each owning a different piece of equipment needed in both farm operations).

Specialization will continue in the dairy business with crop production becoming more of a separate function from the milking operations. The growing of replacements is being contracted out to make more time and space available for the specialized milking program.

Price is important for net income in any business, but looking to this side of the profit equation alone to pull us through the next decade in dairying could be disappointing. The consumer is the final boss and dairymen will need to be more and more **market oriented** with continued attention on quality and promotion of our product.

Competition for land and location by the non-farm segment of the economy will grow. Less patience will be shown by the non-farm public toward odor and other forms of nuisance generated by farm neighbors. Thus, planning the location of the expanded dairy set-up is very critical.

The alert dairyman of today will meet the competition of tomorrow when planning ahead and considering the above pointers along with many others we have not listed here. Sound judgement, applied to the best records available, using an adequate amount of resources (land, labor, capital) will assure success in the 1970's.