MOSCOW April 1947 EXTENSION BULLETIN NO. 167

UNIVERSITY OF IDAHO
COLLEGE OF AGRICULTURE
EXTENSION DIVISION

D. R. Theophilus
Director

4-H Club Dairy Bulletin

Division III

Cooperative Extension Service in Agriculture and Home Economics of the State of Idaho, University of Idaho, College of Agriculture, and United States Department of Agriculture Cooperating

BOYS' AND GIRLS' CLUBS

Printed and distributed in furtherance of the purposes of the Cooperative Agricultural Extension Service provided for in Act of Congress May 8, 1914.

4-H Dairy Club Bulletin

Division III

G. C. ANDERSON*

INTRODUCTION

IN this phase of your 4-H dairy program you study and practice the approved methods of feeding, caring for, and managing the producing dairy cow. When you have completed this division you should have a good working knowledge of the fundamentals of dairy herd management.

High-producing cows are more profitable to keep than low-producing cows. High-producing profitable cows are the result of combining good breeding and good feeding with good care and management. Cows of poor breeding seldom prove profitable, even with good feed and care. Well-bred cows may be unprofitable with poor feed and care. Good dairymen select good cows and give them the best feed and care so they will produce at their best and be most profitable.

Feeding the Producing Cow

THE dairy cow uses feed to maintain her body, to produce milk, to develop the unborn calf, to build body reserves or gain in weight, and to grow if she is immature or young.

To meet these requirements she needs the following ingredients in her ration:

1. **Protein** is the part of the feed which builds new tissues and repairs worn tissues. It makes the casein and albumen in the milk. Protein is necessary to maintain life.

2. **Carbohydrates** and **fats** are the energy-producing constituents such as starches, sugars, fats, or oils, etc. They keep the body warm and furnish fuel for work.

3. **Vitamins** are compounds which have important parts in regulating the various body functions. There are numerous vitamins known and new ones are sometimes discovered. These vitamins all perform certain functions and are necessary. Under normal conditions natural feeds furnish all of the vitamins needed by dairy cattle.

Important Vitamins

Vitamin A is necessary for growth, body maintenance, resistance to disease, nerve development, reproduction and milk production. It is especially important for young calves. When Vitamin A is lacking, calves are more likely to catch such diseases as scours and pneumonia. Many calves die with these diseases. Cows fed poor quality hay produce milk which is low in Vitamin A. Cows that are fed on good pasture or bright green alfalfa hay get plenty of carotene and Vitamin A for all their needs and produce milk which is high

* Extension Dairyman, Idaho Agricultural Extension Service.

in Vitamin A.

The green color of feed such as pasture grasses and alfalfa hay indicates the amounts of carotene in them. Carotene is the substance in plants from which Vitamin A is made. The green color of a feed is a good guide for judging its Vitamin A content. Dairymen should harvest and store their hay so it will stay nice and green.

When it is necessary to feed hay that has lost most of its green color in curing or stack burning, extra Vitamin A should be fed. Timothy hay, grain hays, or other grass hays are usually low in carotene and should be supplemented with Vitamin A. Pasture and hay crops that get too old or mature before grazing or harvesting are low in carotene.

Good sources of extra Vitamin A are carrots, dehydrated alfalfa meal and fish oils such as shark liver oil. Green colored peas and yellow corn are better sources of Vitamin A than the other grains.

Vitamin D, the "antirachitic" or "sunshine" vitamin, is necessary because it enables animals to use the minerals in their feeds. Lack of Vitamin D may cause rickets in growing animals. Dairy cattle that are on good pasture get plenty of Vitamin D. Hay that is cured in good haying weather has plenty of Vitamin D. Dairy cattle do not need as much Vitamin D in their feed when they are out in the sunshine as they do in cloudy weather or when they are kept in the barn.

Irradiated yeast is the best source of supplemental Vitamin D. Cod liver oil is a good source of Vitamin D for calves, but should not be fed to milking cows because it lowers the butterfat test in the milk.

Other Vitamins

Other vitamins such as the B complex, C, E and K are very rarely lacking in feeds commonly used for dairy cattle. Extra vitamins in this group need not be fed except on advice from a veterinarian or your club leader.

Minerals for Dairy Cattle

4. **Minerals** are necessary for the health of animals and even to life itself. Minerals are not only an important part of the tissues of the body but they play an important part in regulating many body functions, such as heart beat. There are a great number of mineral elements which are necessary but we will deal only with those which are likely to be lacking in Idaho.

Normal feeds grown on fertile soils supply all the mineral elements needed by the dairy cow with the exception of sodium and chlorine, or common salt, and iodine. Dairy cows require 1 ounce or more of salt each day and should be given free access to a box of stabilized iodized crystal salt at all times. It is a common practice to mix 1 percent salt in the grain, (1 pound salt to 100 pounds of grain). Block salt is not satisfactory for dairy cattle because it takes too much work for the cow to get enough salt.

Iodine is lacking in most communities in Idaho. Iodine deficiencies cause goiter in calves and may have a bearing on the general health and efficiency of dairy cattle of all ages. Lack of iodine causes improper functioning of the thyroid gland, which in turn affects the pituitary gland. Unless both of these glands function normally, health, production and reproduction may be affected. The easiest, cheapest and most practical way to be sure that dairy cows get enough iodine is to feed "stabilized" iodized salt. This can be purchased at most feed stores. You can make iodized salt by the following formula which was developed by the Wisconsin Agricultural Experiment Station:

Crystal stock salt	2,000	pounds
Sodium thiosulphate	2	"
Sodium carbonate	2	"
Starch	2	"
Potassium iodide	0.4	"

The potassium iodide should be white, indicating that it has not lost its strength. If it is mixed with some harmless colored substance like powdered charcoal before it is added to the salt, it is easier to tell when it is thoroughly mixed in the salt.

Phosphorus. In many parts of Idaho, phosporus is deficient in the soil. In many soils the lime present reacts with the phosphorus and makes it insoluble in water so that plants cannot use it. Hay and pasture grown on such soils are usually low in phosphorus content. Animals which eat these feeds become unthrifty and do not produce well. In extreme cases of phosphorus deficiency, cows chew bones, leather, wood, etc. Their bones become brittle and break easily. When phosphorus deficiency is suspected, the crops or soils should be checked with the assistance of the County Extension Agent. Phosphorus deficiencies in feeds can be corrected by applying phosphorus fertilizer to hay and pasture lands according to recommendations of the County Extension Agent.

Another way to supply phosphorus to the rations of dairy cattle is to feed steam-sterilized bone meal which is light in color and free from odor. This can be mixed with salt, 1 pound salt to 1 pound bone meal, and fed free choice by placing the mixture in a box in the loafing shed. Another box containing stabilized iodized salt should be provided also. It is good practice to put 1 percent bone meal and 1 percent salt in the grain mixture in addition to that given free access.

Mineral mixtures high in calcium or lime or other elements which are plentiful in Idaho feeds should not be fed indiscriminately. Cattle should never be forced to eat them as harm may be done to their health.

Suggested Feeding Practices

THE first thing to remember in making up a ration for dairy cows is that their natural feeds are the roughages . These are feeds high in crude fiber, the woody indigestible part of feeds. Roughages are comparatively low in digestible nutrients. Such feeds as pasture grasses, hay, silage, beet pulp and straws are called roughages. The cow's ability to eat large amounts of roughages and convert them into milk, one of our best human foods, makes her one of the most useful and profitable farm animals. Roughages are the cheapest feeds for dairy cows because they are bulky and unmarketable for human food.

The grains have smaller amounts of crude fiber than the roughages and a greater percentage of digestible nutrients. For this reason grains are called concentrates. Grains are used to enrich the rations of high producing cows that need more digestible nutrients than they get in the amount of roughages they can eat. Table 1 shows the comparative feed value of the more common feeds in Idaho.

TABLE 1—Average digestible nutrients and minerals in various feeds.

FEED	Dry Matter	Crude Fiber	Dig. Protein	Tot. Dig. nutrients	Calcium	Phos-phorus
	Percent	Percent	Percent	Percent	Percent	Percent
Roughages						
Alfalfa hay	90.4	29.0	10.6	50.3	1.43	0.21
Clover hay	88.8	27.4	6.8	53.9	1.21	0.18
Timothy hay	88.7	30.1	2.9	46.9	0.27	0.16
Corn silage	28.3	6.9	1.3	18.7	0.07	0.06
Wet beet pulp	11.6	3.9	0.8	8.9	0.09	0.01
Potatoes	21.2	0.4	1.1	17.3	0.01	0.05
Blue grass (green)	31.8	8.7	2.4	21.0	0.16	0.08
Brome grass (green)	33.8	9.7	2.9	19.7	0.07	0.09
Orchard grass (green)	29.1	9.8	1.7	16.0	0.12	0.09
Clover (alsike) (green)	22.2	5.8	2.4	13.2	0.34	0.05
Beet tops	11.4	1.2	1.9	7.4	0.15	0.04
Carrots	11.9	1.1	0.8	9.6	0.06	0.06
Concentrates						
Oats	91.1	10.6	9.4	71.5	0.09	0.33
Barley	90.4	5.7	9.3	78.7	0.05	0.38
Wheat	89.3	3.0	11.3	83.6	0.03	0.43
Corn No. 1	87.2	2.3	7.3	82.5	0.01	0.28
Wheat bran	90.6	9.5	13.1	70.2	0.12	1.32
Dried beet pulp	91.8	15.9	6.1	74.3	0.52	0.07
Molasses (beet)	80.6	0.0	2.5	58.8	0.05	0.02
Linseed meal (old process)	91.3	8.0	30.6	78.2	0.33	0.86
Cottonseed meal 41% protein	92.8	10.8	33.9	73.6	0.20	1.19
Soybean meal (Exp. Proc.)	91.7	5.6	37.7	82.2	0.28	0.66
Field peas	90.5	6.2	20.2	79.6	0.07	0.40
Beans (field)	88.2	3.5	19.9	75.6	0.14	0.45

Taken with special permission of the Morrison Publishing Co., Ithaca, N. Y. from "Feeds and Feeding" 20th Edition by F. B. Morrison.

Figuring Dairy Rations

IN determining just how much and what kind of feeds a cow needs, it is necessary to know how much digestible nutrients she needs for the various purposes. The term "digestible nutrients" means the part of the feeds eaten that is digested in the stomach and intestines and absorbed into the blood for actual use by the various body tissues and glands. Table 2 shows the amount of the various nutrients required each day for milk production and maintenance of the body. Exact requirements for growth, body reserves and producing the unborn calf are not available, but these needs are easily taken care of by allowing extra feed above the requirements for maintenance and milk production.

TABLE 2.—Morrison feeding standard
Daily requirements for dairy cows

	Digestible protein	Total digestible nutrients	Phosphorus
	Pounds	Pounds	Ounces
For body maintenance			
1000 lb. cow	0.650	7.93	0.35
1200 " "	0.762	9.29	0.42
1400 " "	0.872	10.63	0.49
1600 " "	0.979	11.94	0.56
For milk production per lb. of milk (to be added to allowance for maintenance.)			
3.0% milk	0.043	0.276	0.026
3.5% "	0.046	0.300	0.026
4.0% "	0.049	0.324	0.026
4.5% "	0.052	0.349	0.026
5.0% "	0.056	0.373	0.026
5.5% "	0.059	0.397	0.026
6.0% "	0.062	0.422	0.026

Taken with special permission of the Morrison Publishing Co., Ithaca, N. Y. from "Feeds and Feeding" 20th Edition by F. B. Morrison.

The cow's daily requirements can be readily determined from Table 2. For example, a cow weighing 1,000 pounds and producing 40 pounds of milk testing 5 percent butterfat would reguire the amounts of protein, total digestible nutrients and phosphorus given in Table 3. The requirements for maintenance are read directly from Table 2. The requirements for milk production are determined by multiplying the requirement for each pound of 5-percent milk by 40 as follows: 0.056 pounds digestible protein per pound of 5-percent milk x 40 = 2.24 pounds. The requirement for milk production is then added to the maintenance requirement of .65 pounds to get the total daily requirement of 2.89 pounds digestible protein. The daily requirement for total digestible nutrients is secured in a similar manner. Example: 0.373 total digestible nutrients per pound of 5 percent milk x 40 = 14.92 pounds of total digestible nutrients for milk production. 14.92 + 7.93 pounds required for maintenance gives 22.85 pounds total digestible nutrients as the total daily requirements. Each pound of milk requires 0.026 ounces of phosphorus. .026 x 40 = 1.04 ounces of phosphorus for milk production. By adding .35 ounces of phosphorus required for maintenance, the total daily phosphorus requirement is shown to be 1.39 ounces. Since Morrison states the calcium requirements as 0.2 percent of the total ration, the amount of calcium required is not calculated in this table.

TABLE 3.—Daily requirements for 1,000-pound dairy cow producing 40 pounds of milk testing 5 percent butterfat.

	Digestible protein	Total digestible nutrients	Phosphorus
	Pounds	Pounds	Ounces
For maintenance	0.650	7.93	0.35
40 pounds 5-percent milk	2.240	14.92	1.04
Total requirements	2.890	22.85	1.39

Amounts of Feed Needed

In determining the amounts of feed needed by this cow we can use a typical Idaho ration of either pasture or alfalfa hay and grain. According to recommended feeding practices this cow would be fed about 3 pounds of alfalfa hay or its equivalent in grass for each 100 pounds of live weight, or 30 pounds of hay per day. In addition she should have at least 1 pound of a good grain mixture for each 4 pounds of 5-percent milk, or 10 pounds of grain per day. To make the calculations easy, we can use one common grain such as barley. By referring to Table 3 we will find that 30 pounds of hay and 10 pounds of barley supply the nutrients given in Table 4.

TABLE 4.—Amount of nutrients and minerals supplied by a ration of alfalfa and barley.

FEED	Amt. in pounds	Digestible protein	Tot. digest. nutrients	Calcium	Phosphorus
		Pounds	Pounds	Pounds	Pounds
Alfalfa	30	3.18	15.09	0.429	0.063
Barley	10	.93	7.87	0.005	0.038
Total	40	4.11	22.96	0.434	0.101

The amount of digestible protein supplied by this ration is calculated by referring to Table 1 to find the percentage protein contained in alfalfa and barley. Since alfalfa contains 10.6 percent digestible protein, 30 pounds of alfalfa would have 30 x 10.6 percent or 3.18 pounds. Barley has 9.3 percent digestible protein, therefore 10 pounds would contain .93 pounds of digestible protein. The daily ration would supply 3.18 pounds from the alfalfa and .93 pounds from the barley making a total of 4.11 pounds of digestible protein. Table 3 shows that only 2.89 pounds are needed.

The total digestible nutrients in alfalfa are given in Table 1 as 50.3 percent. When 30 pounds of alfalfa is multiplied by 50.3 percent, the daily total is found to be 15.09 pounds of total digestible nutrients. Table 1 shows that barley has 78.7 percent total digestible nutrients which gives 7.87 pounds total digestible nutrients when multiulied by 10. The barley and alfalfa then furnish 15.09 plus 7.87 or 22.96 pounds of total digestible nutrients. Table 3 shows that 22.85 pounds are needed.

The amount of calcium furnished by this ration is determined in the same manner as used to find the amount of digestible protein and total digestible nutrients. Table 1 shows that alfalfa contains 1.43 percent calcium and that barley contains .05 percent calcium. Thirty pounds of alfalfa has 0.429 pounds of calcium and 10 pounds of barley has 0.005, making a total daily feed of 0.434 pounds of calcium. The percentage of calcium in the ration is determined by dividing 0.434 pounds of calcium by 40, which is the total amount of feed, and multiplying by 100 as follows: $0.434 \div 40 = .0108 \times 100 = 1.08$ percent. Since the Morrison Feeding Standard states that 0.2 percent calcium is enough, this ration furnishes 5 times as much as is needed.

The amount of phosphorus contained in the ration is found in the same manner. The alfalfa has 0.21 percent phosphorus or 0.063 pounds in 30 pounds of alfalfa. Barley has 0.38 percent or 0.038 pounds in 10 pounds. The total daily feed of phosphorus would be 0.101 pounds or 1.616 ounces, which is more than the 1.39 ounces required as shown in Table 3.

This ration consisting of alfalfa hay and barley meets all of this cow's requirements for protein, total digestible nutrients, calcium and phosphorus.

Mixed Grain Rations

It is generally recommended, however, that two or more grains be mixed to feed dairy cows because it makes the grain more palatable and adds variety to the feed. Cows do not get tired of a grain mixture as quickly as they do a single grain. A mixed feed can be figured very easily in the manner given in Table 5. The average composition is found by dividing the total pounds of each nutrient in the mixture by the total pounds of feed and is used in the same way that barley was figured in Table 4.

TABLE 5.—This table shows the method used in computing the average composition of a mixed grain ration.

FEED	Amt. in pounds	Digestible protein	Tot. digest. nutrients	Calcium	Phosphorus
		Pounds	Pounds	Pounds	Pounds
Barley	200	18.6	157.4	0.10	0.76
Oats	200	18.8	143.0	0.18	0.66
Wheat	100	11.3	83.6	0.03	0.43
Total	500	48.7	384.0	0.31	1.85
Average percentages in mix		9.74 percent	76.8 percent	.06 percent	.37 percent

There is no particular formula for mixing grains, but it is well to have a mixture that weighs about 1 pound per quart. Oats, bran and dried beet pulp weigh less than 1 pound per quart while wheat, corn, barley and the high protein concentrates such as linseed meal, soybean meal and cottonseed meal weigh more than 1 pound per quart. A mixture of barley, oats and wheat similiar to the example in Table 5 would weigh approximately 1 pound per quart.

A good ration for dairy cows should meet the following requirements:

1. The ration should be palatable. Cows eat more feed when they like it and do better when fed liberally.

2. The ration should be bulky. The ration should be based around all the good quality roughage that the cow will eat. A good mixed grain ration weighing about 1 pound per quart should be used to supplement the roughage for high producing cows. A good guide to follow is to feed 1 pound of grain for each 3 to 4 pounds of 5-percent milk

or 1 pound of grain for each 5 to 6 pounds of 3.5-percent milk produced per day.

3. The ration should be complete. It should furnish enough protein, energy, minerals and vitamins to supply all the cow's needs.

4. The ration should be cheap. Home-grown feeds are usually the lowest in cost per pound of digestible nutrients. Expensive supplements should not be used except when necessary to make the ration complete.

Summer Feeding

GOOD luxuriant grass is the natural feed for cattle. Since most areas in Idaho produce grass abundantly during the spring and summer months, pasture furnishes the best and cheapest feed for dairy cows.

The protein content of pasture grass and legume mixtures (as shown in Table 1) is not quite as high in proportion to total digestible nutrients as it is in alfalfa hay. Pasture is generally considered, however, to be a well-balanced roughage for milk cows and when supplemented with a grain mixture of oats, barley and wheat (similiar to the example given in the previous lesson) makes a very complete and adequate ration. When the pasture is abundant in the spring, cows do not eat their grain as readily as when on dry feed. It sometimes is necessary to limit the time the cows are allowed to graze in order to keep them from over-eating on pasture and to get them to eat enough grain. Most dairymen, however, prefer to cut down on the grain since it is more expensive. Milk production may not hold up as well, however, as when the cows are induced to eat some hay and grain along with the pasture. Cows on pasture should be fed about 1 pound of grain for each 4 pounds of 5-percent milk or about 1 pound of grain for each 5 pounds of 3.5-percent milk.

During the middle of the summer and early fall, pastures do not grow as much as they do in the spring. Unless cows are given more pasture or hay when the grass slows up, milk production will go down and stay down. Many times the summer drop in milk production is blamed on the hot weather and flies, when most of it is caused by lack of feed. Improved pasture with supplemental feeding is the best insurance against this summer slump in milk production. Some good fresh hay in the feed rack where the cows can get it when they want it will pay good dividends.

A good irrigated pasture, which has been well fertilized and well managed, should provide enough feed to carry 3 or 4 cows per acre in the early summer and 1½ to 2 cows per acre during the middle of the summer. If a pasture is going to produce that much feed, it must be made up of deep rooted grasses that grow all summer and a perennial clover. Experiments at the University of Idaho Branch Experiment Station at Caldwell and at the Utah Experiment Station show that pastures made up of brome grass, orchard grass, tall fescue and ladino clover produce at least twice as much forage as blue grass and white Dutch clover. The following pasture formula has proven very satisfactory in all irrigated sections of Idaho when properly managed and fertilized:

Tall fescue	8 pounds per acre
Orchard grass	6 pounds per acre
Smooth brome	4 pounds per acre
Ladino clover	2 pounds per acre

Studies have shown that pastures of this kind on irrigated land produce 200 or more pounds of butterfat per acre during the pasture season. On this basis pasture compares quite favorably to the returns from other farm crops.

Pasture Management

The most important factors in producing good profitable pasture are:

1. Choosing good soil.
2. Proper fertilization.
3. Preparing a good seed bed.
4. Choosing the best pasture crops.
5. Using good seeding methods.
6. Care of the new seeding.
7. Using the pasture to get the maximum returns from it.
8. Proper irrigation, (in irrigated sections).

The pasture should be near the barn so it will not be necessary to drive the cows long distances to and from pasture. The land should be of good productive capacity. If irrigated, it should be leveled to make watering easier, faster and more uniform because grasses require more frequent irrigation than most other crops. A good clay loam is the best kind of soil for pasture. Sandy soil is probably the poorest because it does not hold water well and the stock tramp the grasses out.

Fertilizing Pastures

A good application of barnyard manure should be plowed under before seeding to furnish plant food and to increase the water-holding capacity of the soil. In areas where phosphate fertilizer increases the yield or quality of alfalfa seeding or clover, a liberal application should be worked into the seed bed before seeding. In some areas of the state, sulphur or boron may be needed. Your County Extension Agent can advise you as to the kind and amount of fertilizer recommended for your community. A liberal supply of plant food in the soil at seeding time gives the pasture a better start and produces better pasture quicker than if the soil is run down.

A good application of barnyard manure every year in the fall or early spring will keep the pasture producing good nutritious grass abundantly. Commercial fertilizers containing the elements lacking in your soil can be used to advantage if the supply of barnyard manure is limited or if it can be used to better advantage on other crops.

Seeding New Pastures

A good firm seed bed which has plenty of moisture is essential to get a good stand. If the pasture is to be seeded in the spring, the ground should be plowed in the fall and worked down fine and firm in the early spring. If the pasture is to be seeded in the fall following another crop, the ground should be disced and worked down in good shape. The pasture should be seeded in early August in order that the plants will be well established before winter.

The seed can be drilled in or broadcast and should be placed about ½ to 1 inch deep, depending on the soil and its moisture-holding ability. The ground should be harrowed immediately after drilling. In irrigated sections the soil should be kept quite moist until the plants get established.

It is always best to seed pastures without a nurse crop. If weeds or volunteer grains come up thick they should be mowed and removed so they will not smother the small plants. The sickle bar should be set high. Thicker stands that produce more forage and last longer can be secured this way. A good stand of grasses helps to control weeds which cause off flavors in the milk. When cows have good pasture they are not as likely to eat weeds which cause "weedy" flavors in the milk.

Good Grazing Practices

A new pasture seeded in the spring will not be ready for use until August. It should not be grazed heavily until the second year. A fall seeding will be ready for use in June or July when the older pastures begin to slow down, and will give milk production a boost.

Cows eat pasture better when it is fresh and young. For that reason it is a good practice to divide the pasture into at least 3 to 5 or more sections. By doing this the cows can be put on new pasture every few days. Pasture will grow better, too, by giving it a rest between grazing periods.

Grazing should be delayed in the spring until the grass is at least 4 inches high. This lets the plants develop a stronger root system and produce the maximum forage. It is better to have too much grass than not enough. If the pasture gets too far ahead of the cows, part of it can be mowed for hay or silage.

Improving Old Pastures

Many old pastures are unproductive because they have not been well fertilized and given proper care. These pastures can be revived by heavy applications of barnyard manure or commercial fertilizers in the same way as described for new pastures. Other practices which will help old pastures are scattering manure clumps while they are moist from rain or irrigation with a harrow or brush drag, proper irrigation, rotational grazing, and delayed grazing in the spring. Pastures come up earlier and more luxuriant in the spring if they are not grazed too short in the fall.

Milking Practices

GOOD milking practices are necessary to profitable dairying. Cows that are milked properly produce more milk and are less susceptible to udder troubles.

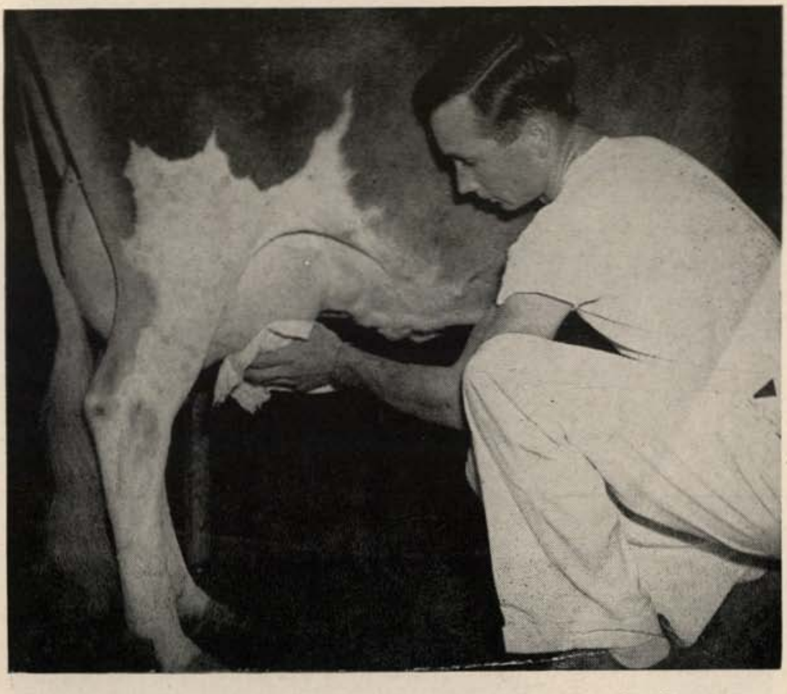
One of the most important factors in proper milking is regularity

Cows are creatures of habit and are easily upset by unusual happenings, strangers in the barn at milking time, irregular milking hours, or sudden changes in feeds. Special care should be taken to establish a regular routine in handling dairy cows. It should be followed diligently.

Rapid Milking

Rapid milking as developed by Dr. W. E. Peterson of the University of Minnesota has been quite widely adopted by dairymen throughout the United States. Rapid milking saves time. It helps to keep the cow's udder in good condition. The more important steps in this milking process are as follows:

1. **Stimulate the cow to "let down" her milk.** This can be done by washing and massaging the udder and teats with warm water (120° to 130°F.). For sanitary reasons, the water should have at least 100 parts per million of available chlorine. There are several commercial chlorine compounds on the market which will give this strength when used according to directions. Warm massage causes the udder muscles to contract and force the milk down into the milk cistern and teats where it can be milked out easily and quickly.



2. **Use a strip cup.** Milk a full stream or two of milk from each quarter into a cup covered with black cloth to detect cows that are giving flaky or stringy milk. Such cows should be milked last and should be treated for mastitis according to the recommendations of a veterinarian.

3. **Start milking 1 minute after washing the udder.** Whether milking is done by hand or machine, the milk should be removed from the udder as quickly and completely as possible as soon as the teats fill up or "strut" with milk. Most cows can be milked out completely in 2 to 4 minutes. The longer the process is delayed the more difficult it is to get all the milk. The stimulus to contract the udder muscles weakens and the milk is not forced out of the secretory glands which are in the upper part of the udder. Avoid rough milking and high vacuum on the milking machine guage. It is highly important also to run the milker at the pulsator speed recommended by the manufacturer. Running it too fast or too slowly may irritate the teats and udder and may cause mastitis.
4. **Strip thoroughly and quickly.** As soon as the lower part of the udder is soft, massage each quarter with one hand and strip with the other, or by pulling down on the teat cups. Stripping too hard or too long may set up udder irritations which result in mastitis. Too much stripping may cause cows to become strippers or slow milkers. Be sure the cow is milked completely, then quit.

First-calf heifers can be trained very easily to milk out quickly and completely with little or no hand stripping by following the above procedure. Older cows can usually be milked by this procedure if they are started out this way at freshening time. Most cows can be changed to this system with good results at any time, but there are some that never respond favorably. These cows should either be milked last or eliminated from the herd. Cows that leak milk when they are put in the barn or when preparations for milking are started should be milked first, if they are not infected with mastitis. Nervous cows that "let down" their milk, but do not leak milk, should be milked as soon as possible.

Mastitis causes more loss among dairy cows than any other disease. Surveys in other states have shown 40 percent of the cows infected with mastitis. Proper milking, rigid sanitation, good feeding, careful handling and comfortable quarters which are dry and well bedded are all factors which reduce the spread of infectious mastitis among dairy cows. Periodic laboratory tests should be made to determine which cows are infected. Proper treatment by the veterinarian as soon as inflamation, swelling or other abnormal conditions of the udder are noticed is important.

Producing Top Quality Milk

TOP quality milk, butter, cheese, ice cream, dried and evaporated milk are generally recognized as being among our best and most popular foods. Good quality dairy products are rich in food nutrients and always in demand. The dairyman who produces clean, top quality milk always finds a ready market and highest prices. The careless, negligent dairyman is the first one to lose out when competition for markets is keen.

Any dairyman who observes reasonable precautions can produce clean milk. Clean milk has been defined as "milk of fine flavor from healthy cows, free from dirt, and containing a small number of bacteria, none of which are harmful".

The essential things to do in producing good milk are discussed briefly in the following paragraphs:

1. **Healthy Cows.** Diseases such as Bang's disease and tuberculosis affect the production of cows. These diseases may cause similar diseases among people who use the raw milk. Undulant fever may be transmitted by milk from cows having Bang's disease. Cows should be tested regularly for these diseases by a licensed veterinarian and reactors eliminated from the herd.

   Mastitis is a term applied to inflamed or infected udders. In severe cases the milk is stringy, flaky, ropey or watery. Such milk is very high in bacteria count and should not be used for human food or for feeding calves. It is best to destroy mastitis milk to avoid danger of spreading the infection to other cows or calves.

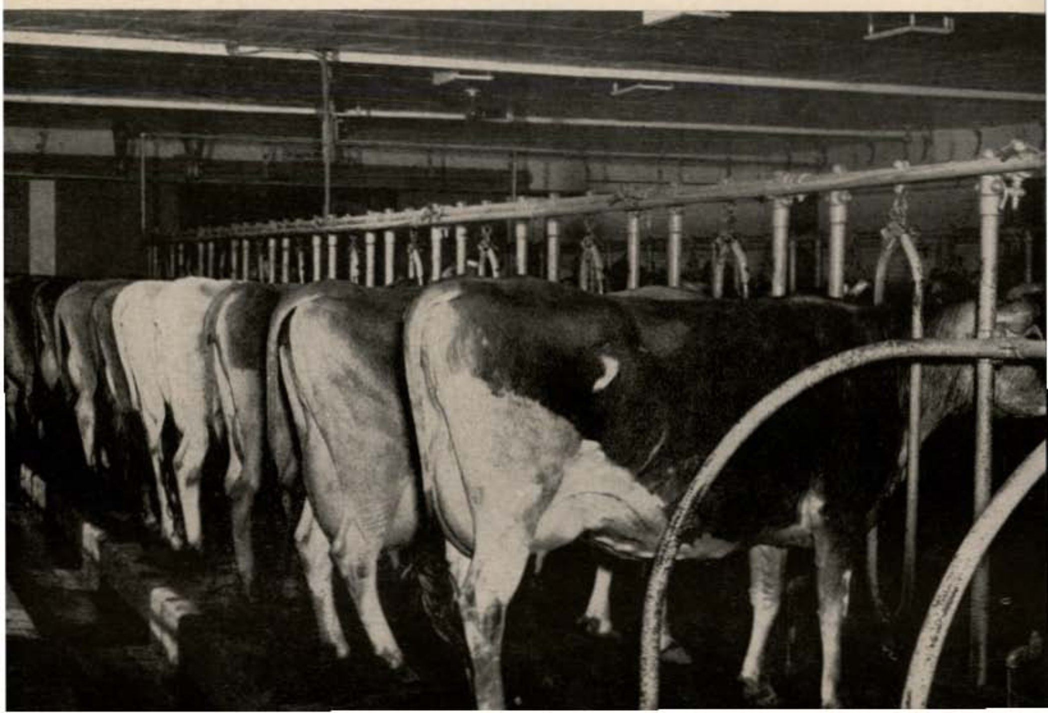
2. **Clean Cows.** Cows should be kept in clean quarters and should be cleaned thoroughly at each milking time. If the belly, flanks and udder are clipped they do not collect much dirt and are more easily cleaned. Cows should be brushed clean every day. Before milking, the udder and teats should be washed with

warm chlorinated water as described in the lesson on rapid milking. Strainers take out only the dirt that has not dissolved in the milk. If milk is to be clean, dirt must be kept out of it.

3. **Clean Barn.** The barn should be cleaned out thoroughly each day. At milking time it should be free from dust and undesirable odors. Milk is a human food and should be produced in a clean well-lighted and ventilated barn. Tight, waterproof floors, smooth tight walls and ceilings make cleaning the barn easier. Plenty of window space brightens up the barn and makes a clean barn look clean.

4. **Clean Utensils.** Every pail, can, milking machine, strainer or other container used to handle milk should be washed and cleaned thoroughly after every milking. Dirty utensils contaminate milk quicker than any other factor. All utensils should be rinsed in clean water immediately after they are used, then washed with hot water and a good alkali washing powder containing a wetting agent which cuts the milk. Wash with a fiber brush. It cuts the milk. A rag and soap smear the milk around and leave a film which prevents good sterilization. Utensils should then be rinsed in clean hot water.

5. **Sterile Utensils.** As soon as the utensils are cleaned they should be sterilized by one of the following methods approved by the U. S. Public Health Service: (1) exposed to live steam in a steam cabinet for at least 15 minutes at 170° F. or 5 minutes at 200° F.; (2) exposed to a jet of steam 1 minute; (3) exposed to a chlorine solution of approved strength (100 parts per mil-



lion of available chlorine) for at least 2 minutes; or (4) immersed in hot water at least 170° F. for at least 2 minutes. Place them upside down on a rack in a clean room free from flies so they will be ready for use at the next milking time.

6. **Clean Healthy Milkers.** The milkers and the method they follow are important in producing good milk. Milkers should be healthy and free from any infectious diseases. Human diseases may be carried and transmitted through the milk. Workers should wear clean clothing and have their hands clean and dry. It is impossible to produce good milk with wet-hand milking. Milk stools should be kept clean to prevent their soiling the milker's hands. If milking machines are used, the same sanitary precautions should be observed. The milking machine is not foolproof. Just as much care must be exercised to produce good milk by machine as when milking by hand. In no way does a milking machine eliminate the need for personal cleanliness.

7. **Prevent Off Flavors and Odors.** Foreign odors and flavors get into milk easily either before or after milking. If a cow eats feeds with strong odors such as garlic, silage, cabbage, wet beet pulp, etc., just before milking time, her milk will carry an odor and taste like that feed. Cows should not be fed strong flavored feeds within 3 to 4 hours before milking time. Such feeds can be fed immediately after milking, however, without danger of flavoring the milk. If there are strong weeds in the pasture, bring the cows in several hours before milking time.

   Milk also absorbs strong odors from the air and should never be put in a container which has been used for strong

flavored foods or other products. Always store milk in a well ventilated room free from undesirable odors. Avoid barn odors, food odors, or other odors such as kerosene.

8. **A Suitable Milk House.** As soon as milk is drawn from the cow, it should be removed from the barn to a clean, well-ventilated milk house or milk room for straining, cooling, and storage. The milk house should be located on a clean, well-drained site, away from any contaminating surroundings, such as manure piles, etc. It need not be more than a few feet from the barn. It may even be a part of the barn, if the entrance from the barn is through self-closing doors having a vestibule between them and so arranged that both doors will not be open at the same time. The milk house should be conveniently located and arranged so the milk can be kept clean easily, the floor should be water-tight and have good drainage. Tight smooth walls and ceilings are desirable. Windows and doors should be screened. Detailed plans for milk houses are given in Idaho Extension Bulletin No. 118, "Farm Dairy Structures", and U. S. Department of Agriculture Farmers' Bulletin No. 1212, "Farm Dairy Houses".

9. **Prompt, Proper Cooling.** Milk intended for sale or shipment should not be above 50° F. Prompt cooling to 50° F. or below, preferably to 40° F., retards the growth of bacteria and insures better quality milk and cream. Water is twenty-one times as efficient a cooling medium as air at the same temperature. An insulated concrete cooling and storage tank, arranged so that the cold water, as it passes through the tank, must circulate around the cans, is one of the most satisfactory devices for cooling milk. Stirring hastens the cooling of the milk. If cold running water is not available use ice either in the tank or to cool the water circulating through a surface type cooler over which the milk flows. Many dairies use mechanical refrigeration for cooling. Do not mix warm and cool milk or cream. Detailed plans for a cooling tank are given in Idaho Extension Bulletin No. 118, "Farm Dairy Structures", and mechanical cooling is discussed in U. S. Department of Agriculture Farmers' Bulletin No. 1818, "Mechanical Milk Cooling on Farms".

10. **Prompt, Proper Delivery.** Milk must be delivered to the processing or distributing plant daily. Cream should be delivered every two days. Before delivery, it is imperative to keep or store the milk and cream at as low a temperature as possible, preferably at 50° F. or below. In Idaho the state regulations for creameries require that all milk at the time it is received at the creamery should be at or below a temperature of 58° F. In order to insure delivery of a good product, it is necessary to properly protect the milk or cream in transit. Milk and cream trucks should be either of the enclosed type or afford protection for the cans by use of canvas or blanket covers. These arrangements reduce the possibility of rapid changes in temperature and protect the milk and cream from heat in the sum-

mer and from freezing in the winter. Trucks used for hauling milk and cream should be kept clean not only to help keep the milk and cream free from contamination, but also to remind the public that the milk and cream are being handled in the proper manner.

Production Testing

Value of Records

PRODUCTION records are the foundation for all improvement in modern dairy cattle. The original wild cow gave only enough milk to raise her calf, but the modern cow, through skillful breeding, feeding and management has been made to produce over 41,000 pounds of milk in 365 days, or enough to raise more than 20 calves. The average Idaho cow produces about 5600 pounds of milk and 225 pounds of butterfat in a year. The average Idaho cow in Dairy Herd Improvement Associations in 1945 produced 8,601 pounds of milk and 355 pounds of butterfat. This clearly shows the value of using production records in culling low producing cows, in feeding the remaining cows for economical production and in selecting animals for herd replacement from the higher producing and more profitable cows. It has been estimated that about one-third of the cows in the United States do not produce enough milk and butterfat to pay a profit over the feed and labor they require.

Kinds of Production Records

There are several ways production records can be kept: (1) private records, (2) Dairy Herd Improvement Association records, and (3) official records under the rules and regulations of the various dairy cattle breed organizations.

Private Records. Private records are kept by the dairyman himself. There is no definite system for keeping private records, each dairyman devises his own system, weighing and testing the milk from each cow 3 to 12 times per year. These records are of great value to the dairyman if they are kept accurately and up to date. The disadvantages of private records are that the dairyman is a busy man and frequently finds it necessary to neglect his records in favor of other work. Many times he gets so far behind with his records that he becomes discouraged and quits record keeping. Another great disadvantage of private records is that they do not increase the value of his cattle he wishes to sell as do records secured under publicly recognized systems of testing.

Dairy Herd Improvement Associations. Dairy Herd Improvement Associations are dairymen's organizations sponsored by the United States Department of Agriculture, Bureau of Dairy Industry, in cooperation with the State Agricultural Extension services. These associations employ full-time supervisors to keep systematic records for the dairymen. Uniform rules recommended by the American Dairy Science Association are used by all associations. The Bureau of Dairy Industry furnishes herd books and uniform report blanks so that the work will be uniform throughout the United States.

The supervisor, or tester, employed by the board of directors visits each member one day each month and determines the amount of milk and butterfat produced by each cow in the herd and the amount of feed eaten by each cow for a 24-hour period. The production figures and the feed consumption figures for each cow for the 24 hours are multiplied by the number of days in the month to get the monthly totals. At the end of the year the 12 monthly totals of each cow are added to determine her yearly production and the amount of feed eaten. By multiplying the milk by the price, its total value can be determined. By multiplying the total pounds of each feed by the price for it the total feed cost can be determined. The income above feed cost which the cow made is found by subtracting feed cost from the value of the product. The total feed cost and income for the herd can be determined by adding the totals for all the cows in the herd. The value of D. H. I. A. testing to the dairymen is shown by the fact that herds which have been on test a period of years have higher average production per cow than herds which have been on test only 1 or 2 years.

D. H. I. A. records are quite generally accepted among dairymen. Cows with D.H.I.A. records sell for higher prices than cattle with no production records. Their near relatives also bring higher prices.

More detailed information regarding Dairy Herd Improvement Associations is given in U. S. D. A. Farmers' Bulletin No. 1974 which is available through all County and State Extension offices.

Official Testing. Advanced Registry, Register of Merit and Herd improvement Registry records are made under the supervision of the Department of Dairy Husbandry of the College of Agriculture cooperating with each of the breed associations. Rules governing the conduct of official testing of all breeds of dairy cattle are published by the Purebred Dairy Cattle Association, Port Chester, New York. These rules can be obtained from the Superintendent of Official Testing at the University of Idaho, Moscow, Idaho.

Official records are published in the breed magazines and in permanent book form. They receive nation-wide publicity in this way.

REFERENCES

Material from the following Idaho Extension publications was used in the preparation of this bulletin:

EXTENSION BULLETINS

No. 145—**Minerals for Livestock**
No. 135—**Suggestions for Profitable Dairying in Idaho.**
No. 138—**Fertilizers for Idaho Farms.**

EXTENSION CIRCULARS

No. 66—**Essentials for Producing Good Milk and Cream.**
No. 68—**Home-grown Grains and Byproduct Feeds for Dairy Cattle.**
No. 84—**Rapid Milking.**
No. 98—**Idaho Livestock Minerals Guide.**

The above publications may be secured from your County Extension Agent, or from the College of Agriculture, University of Idaho, Moscow, Idaho, or from the Agricultural Extension Division, State House, Boise, Idaho.

COMMERCIAL PRINT -- LEWISTON, IDAHO