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KNOW YOUR COWS

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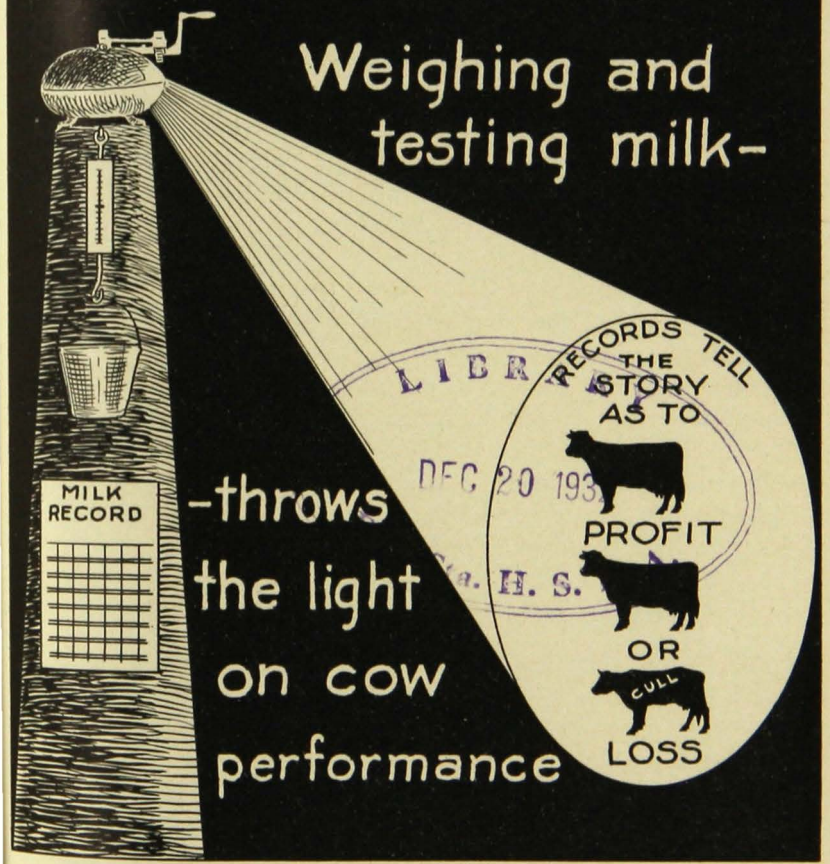

UNIVERSITY OF MINNESOTA
AGRICULTURAL EXTENSION DIVISION
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DAIRYMEN who make a careful study of their herds, especially the problem of establishing a high level of butterfat production per cow, usually obtain a fair income even in times of low butter prices. Low-producing cows make low returns when butter prices are high, and fail to pay for feed consumed when prices are low. Two or three poor-producing cows in the herd will easily wipe out the profit made by several good cows.

By culling closely a dairyman who tested his herd in a Minnesota Dairy Herd Improvement Association during 1931 reduced the labor requirement by nearly one-half and feed costs by approximately one-third. This herd originally consisted of 21 cows. At the close of the testing year, nine culls were disposed of, because of low production and failure to return a satisfactory income over feed cost. Before culling, the yearly butterfat production per cow was 235 pounds, with a total income over feed cost of $379. After the nine poor cows were removed, the remaining 12 cows produced 290 pounds of butterfat each, with a total yearly income of $330 over feed cost. During the testing year, the nine culled cows consumed $388 worth of feed, for which they returned $437 worth of butterfat, leaving an income of only $49 over feed cost for the year.

In the original herd of 21 cows, the best 12 consumed only 64 per cent of the feed provided, but returned 87 per cent of the income over feed cost; the nine cows culled out consumed 36 per cent of the feed, but returned only 13 per cent of the income over feed cost. In the preceding calculations, 30-cent butterfat was used. When butterfat prices fall to 25 cents a pound, the 12 cows consuming 64 per cent of the feed would return 100 per cent of the income over feed, while the nine poor cows consumed 36 per cent of the feed provided and failed to produce enough to cover feed cost at prevailing feed prices.

PRODUCTION AND DAIRY INCOME

The relation of butterfat production to income is shown in Tables 1 and 2, when butterfat is high and low in price. A glance at the figures reveals that regardless of the price of butterfat, the high-producing cow returns the largest income over feed cost. The figures in these tables are from records of the Minnesota Dairy Herd Improvement Association.

These tables illustrate two fundamental factors in the success of a dairy herd—one, that the feed cost to produce a pound of butterfat decreases rapidly with each 100-pound yearly increase of butterfat per cow; the other, from Table 2, that the average dairy cow, producing about 200 pounds of butterfat yearly, returns a very small income over feed cost when economic conditions force the price

of butterfat to 25 cents. No one, therefore, who aims to secure the major portion of his income from the dairy herd can possibly hope to succeed with cows whose production does not exceed 200 pounds of fat yearly. These tables indicate that 300 pounds of fat yearly is a desirable goal and one that will pay for feed and return a fair income for labor and other expenses.

Table 1

Relation of Butterfat Production to Income When Butterfat is 50 cents a Pound, and Feed Prices Are as of 1924 to 1929

Yearly fat per cow, lb.	Feed cost	Income over feed cost	Feed cost per lb. butterfat, cents	Returns over feed cost from 10-cow herd
100	$40	$10	40	$100
200	48	52	24	520
300	58	92	19.3	920
400	70	130	17.5	1,300
500	80	170	16.0	1,700

Table 2

Relation of Butterfat Production to Income When Butterfat is 25 Cents a Pound and Feed Costs Are as of March, 1932

Yearly fat per cow, lb	Feed cost	Income over feed cost	Feed cost per lb. butterfat, cents	Returns over feed cost from 10-cow herd
100	$36	$11*	36	$110*
200	41	9	20.5	90
300	48	27	16.0	270
400	56	44	14.0	440
500	62	63	12.4	630

* Loss

HOW HERD RECORDS MAY BE OBTAINED

There are three sources of herd records: (1) The Standard Cow Testing Association; (2) the State-Wide Testing Association; (3) private or home-kept records, kept by the dairyman himself. Under the standard association plan a tester is employed to do the work and the cost to each member is from $30 to $40 for a year's testing. A high-producing herd returning a fair income may be established without loss of time or income while the readjustments are being made by: (1) Culling out undesirable and low-producing cows, (2) developing a breeding program through careful selection of purebred herd sires that will insure a gradual improvement in the young dairy stock raised, (3) feeding home-grown feeds to a larger extent, which should include an abundance of legume hay such as alfalfa, clover, or sweet clover, and either silage or roots to supply succulence during the winter months.

Dairy herd records secured through the Standard Cow Testing Association, when the testing and records are made by a disinterested person

(the cow tester) have been popular among well established dairymen whose herds may be either high grade or purebred. The particular advantages of the Standard Testing Association are: Regularity of testing, complete feed and production costs, and the added interest in herd improvement inspired by the cow tester's visit to the farm each month.

The State-Wide Testing Association, Plan 2, recently organized, offers private herd tests at a reasonable cost. This plan has many attractive features, especially to dairymen who for various reasons may not be in a position to join a Standard Testing Association. Following is a brief outline of the State-Wide Testing Plan and how it works.

COST OF TESTING

For a herd of 10 cows or less, $1.25 per month and 8⅓ cents per month for each cow in the herd of more than ten.

What The Farmer Does

He starts his herd on test at any time.

He weighs the milk from each cow one day each month.

He samples the milk from each cow one day each month and sends it to the laboratory at University Farm in a box provided for the purpose.

What He Gets

An individual cow record of milk and butterfat produced each month.

An individual cow record of production for the year in a herd book.

A monthly feeding schedule for each cow.

This is a practical check on the herd production, and provides information upon which he can build his dairy business with confidence and with ultimate profit. For further information on either of these types of testing associations, write the Agricultural Extension Division, University Farm, St. Paul, Minnesota.

There will always be a large number who like to keep a private or home-made record. This bulletin is prepared especially for dairymen who, for various reasons, are unable to test their herds under Plan 1 or Plan 2. Brief suggestions are given for keeping simple records of production that will furnish the information necessary to cull the herd and also serve as a guide to better feeding. These records can be kept by any one willing to devote a few hours to it each month. A certain date designated as "testing day" should be set aside. This may be either the first or the fifteenth of the month, whichever suits the dairyman the best.

NECESSARY RECORD-KEEPING MATERIAL

1. A 20-cow size record book can be secured from the Book Store, University Farm, St. Paul, Minnesota, for 50 cents. For those who wish to provide their own home-made record books, suggestions are given on page 8.

2. A barn record notebook for recording milk weights on testing day, when a milk sheet is not used. A barn book, 4x7 inches in size, may be purchased at any drug store (see page 7) for an outline to use in making up a barn book.

3. A spring balance milk scale to register weights of 30 to 40 pounds and the dial graduated to read to tenths of a pound rather than ounces.

4. A sample dipper, a large stirring spoon or preferably an all-metal soup ladle that can be used for stirring the milk and taking the sample.

5. Any small jar or bottle with a tight cover will serve as a milk sample bottle. For convenience in sampling milk and keeping the samples properly identified a two-ounce, screw-top bottle made for the purpose is recommended. These bottles can be secured through the local creamery.

6. Milk sheets add to the interest and value of record keeping. Hang the milk sheet near the scale so that weights can be recorded conveniently.

IMPORTANCE OF DAILY MILK WEIGHING

The first and most important step in keeping herd records is the daily weighing of milk from each cow. After the practice is once started it soon becomes a habit that pays big dividends in proportion to the time required. The variation in milk yield between cows is from three to five times as great as that of the fat percentage, yet many mistakenly believe that a few butterfat tests made at random will tell the whole story of a cow's production. The best cow is not always the one with the highest test. Culling on the basis of test alone may send cows to slaughter that should be kept. Fairly accurate culling can be done from milk weights and yearly yields without a butterfat test, but as butterfat tests can be taken easily for each cow and applied to her milk yield, it should by all means be done so as to have a complete and accurate record. There are five good reasons for daily weighing of milk:

1. It provides an accurate guide for feeding grain.

2. Any abnormal condition in the cow, such as approaching illness, off feed, or a sudden drop in milk flow is shown on the milk sheet.

3. Daily weighing creates an interest in the cows that can not be secured in any other way.

4. It shows at a glance how persistent each cow is in keeping up a uniform heavy milk flow over a long period of time.

5. The milk sheet serves as an excellent guide in culling cows.

A rapid, yet fairly accurate, method for getting the record of milk for each cow from the milk sheet is to take the milk weights found on the 5th, 15th, and 25th of each month. Add these and divide by three to get an average day's yield; then multiply this weight by the number of days in the month to get the month's milk produced by each cow. By experience this method has been found to be very close to the actual yield, as the days selected are distributed through the month. Those who attempt to total the milk sheet without the use of an adding machine may find the job tedious and inaccurate, hence the method described is suggested.

When it is not convenient to keep a daily milk record, weighing once a month provides a record that gives fairly accurate information for feeding and culling.

Milk record sheets may be purchased from the Book Store, University Farm, St. Paul, for 50 cents for twelve—a year's supply.

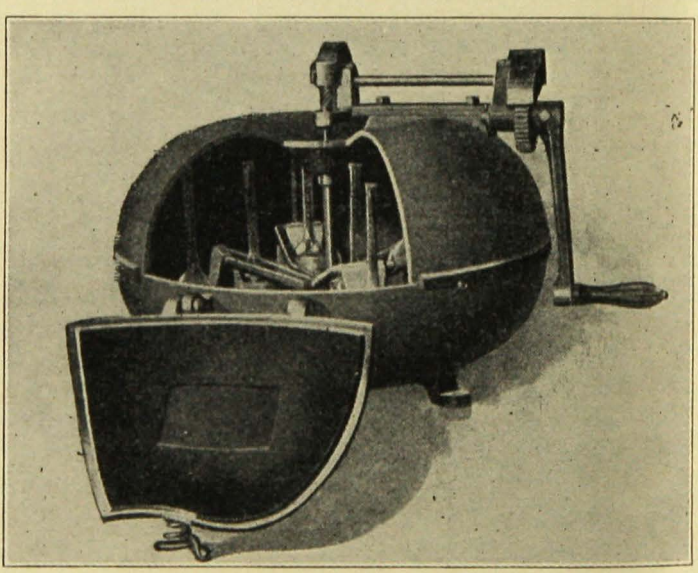

Fig. 1. A Babcock Tester

BABCOCK MILK TESTING EQUIPMENT

For those who wish to do their testing at home, the following equipment will be required.

One four- or eight-bottle Babcock tester; one dozen 8 per cent milk test bottles, 2 skimmilk test bottles, 2 acid measures, 1 thermometer, 1 pair dividers, 2 pipettes for measuring the sample, 2 brushes for clean-

ing test bottles, commercial sulfuric acid. Those who do their own testing should get their acid from the creamery. One quart of acid will test from 50 to 60 samples. The above equipment will cost approximately $22 with a four-bottle tester, and $25 with an eight-bottle machine.

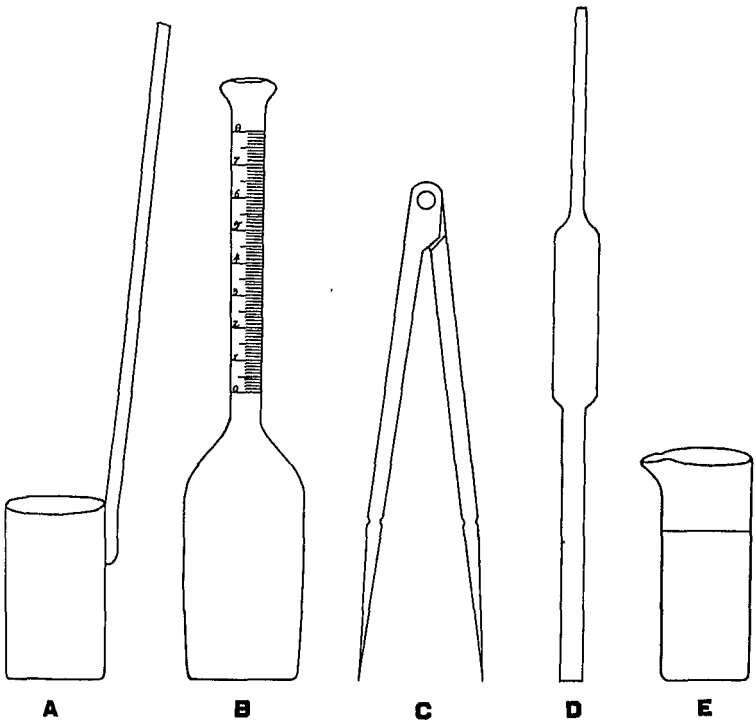

Fig. 2. Part of the Apparatus Needed for Milk Testing
A Sample dipper (a larger dipper that can be used for stirring is more satisfactory), B Test bottle, C Dividers, D Pipette, E Acid measure.

BARN RECORD NOTEBOOK

For a barn record a 4x7 inch notebook will do. When the daily milk record sheet is used, this notebook is not necessary. The following outline is suggested, for convenience, in entering the weights for each cow's milk on testing day. Do not start a new page for each cow each month, as there is space enough on a page for several month's record. With a ruler and pencil fill out a page for each cow, like the following outline.

Cow's name or number_____
Sample bottle, No._____

Month	Day's milk, lbs.		Total day's milk, lbs.
	p. m.	a. m.	
Jan.	16.5	14.7	31.2
Feb. etc.			

THE HERD BOOK

Use either a purchased herd book, or a home-made one using an 8x10 inch notebook, opening at the side. The following heading is suggested for the home-made herd book. Allow a full page for each cow.

Cow's name_____ Age___ Date of last calving_____

Month	Day's milk lb.	Month's milk lb.	Test per cent	Butterfat lb.
Jan.	31.2	967.2	4.2	40.6
Feb. etc.				

How to Proceed

1. Identify your cows by name or number.

2. Number milk sample jars 1, 2, 3, etc. with a lead pencil on cover or cork.

3. Hang the milk scale convenient to the milk can and the milk sheet, and near the window or lantern.

4. Weighing—Hang pail on scale, take total weight, subtract weight of pail, record actual weight of milk in its proper place in notebook (see page 7) or milk sheet. Repeat this procedure the next morning.

5. Sampling—Mark the number of a sample bottle on the cow's page in the notebook. Mix milk by pouring from one pail to another twice or three times, or stir with sample dipper. Now fill sample jar half full. Repeat this procedure the next morning and fill the sample jar with a sample of the morning's milk. When a milking machine is used, be sure to pour in the strippings before the sample is taken.

6. Preservatives—During hot weather the milk samples will turn sour in a short time. Formaldehyde or corrosive sublimate tablets are used to prevent souring. When using formaldehyde, add 5 to 10 drops to each sample bottle. Corrosive sublimate tablets (**poison**) may be obtained from the creamery. Use one-fourth of a tablet for each sample bottle. After the milk is in the bottle, shake gently to dissolve and distribute the preservative in the milk sample.

Testing the Milk

It is often convenient to take the samples to the creamery to have them tested. At many creameries this service is free for patrons. Directions for operating the Babcock test is given for those who wish to do their own testing. Generally time is saved and the record more likely to be continued if the samples are tested at the creamery.

INSTRUCTIONS FOR OPERATING THE BABCOCK TEST

Milk Samples.—Keep sample jars tightly covered or corked and in a cool place until ready to test. Avoid freezing. When ready to test, place milk samples in warm water at 100 degrees Fahrenheit so

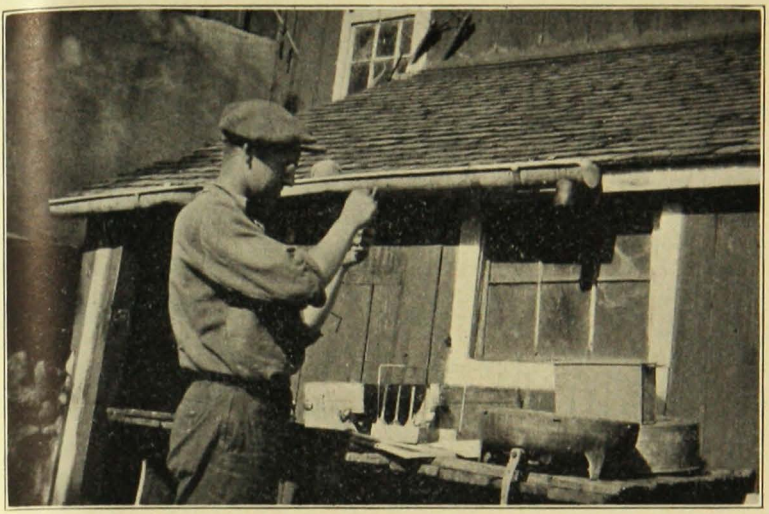

Fig. 3. Reading the Test

that cream that has risen will mix thoroly with the milk of the sample. Mix by pouring from 5 to 8 times from one bottle to another. Do not mix by shaking, as air bubbles will form and result in an inaccurate test. Immediately take the required amount of milk in a 17.6 cc. pipette by inserting the slender end into the milk and the other end in the mouth. Then by sucking draw milk into the pipette until it rises above the mark on the upper stem. Quickly place the forefinger, which should be dry, over the upper end holding the milk in the tube. Gently release the pressure on the forefinger until the upper surface of the milk is level with the mark. Now transfer the milk to the test bottle by inserting the pipette into the neck of the bottle and allow the milk to flow into the bottle. Blow gently into the pipette to remove the last drop of milk into the sample just taken. If any milk is lost, the process must be repeated. Number the test bottle on the ground-glass surface with the same number as that of the sample bottle from which the sample was taken. Measure all milk samples to be tested before adding acid. Place the test bottles containing milk in cold water to reduce the temperature. If this is not done, burned tests may result.

When both milk samples and acid are at the right temperature (acid should be 60 to 70 degrees F.) measure carefully 17.5 cc. of sulfuric acid in the measure provided for the acid. Add it to the test bottle by pouring slowly. Hold the test bottle at an angle so that the acid will not "slug" in the bottle neck. Rotate the bottle while putting in the acid. Immediately shake the test bottle with a rotating motion until the contents have turned to the color of strong coffee. When all test bottles have been filled and treated as described, place them in the Bab-

cock tester, whirl for 5, 2, and 1 minutes, respectively, filling the bottles with hot (not boiling) soft water to the bottom of the neck after the first 5-minute whirl, and to near the top graduation after the second 2-minute whirl. After the last addition of water, whirl for one minute. Remove the bottles from the tester, place them in a warm water bath, 130 to 140 degrees F., for 3 minutes, the water covering the fat column. Use a deep vessel, such as a one-gallon sirup pail, for the bath. Remove the bottles one by one and read the test, using the dividers. Measure the length of the fat column with the dividers from the lowest point to the top edge of the upper end of the fat column. Now place a point of the dividers on 0 at the bottom of the graduations (see Fig. 4) and read at the point on the neck of the bottle where the upper point of the dividers falls. Enter the reading in the record book for the cow corresponding to the number on the test and the sample bottle.

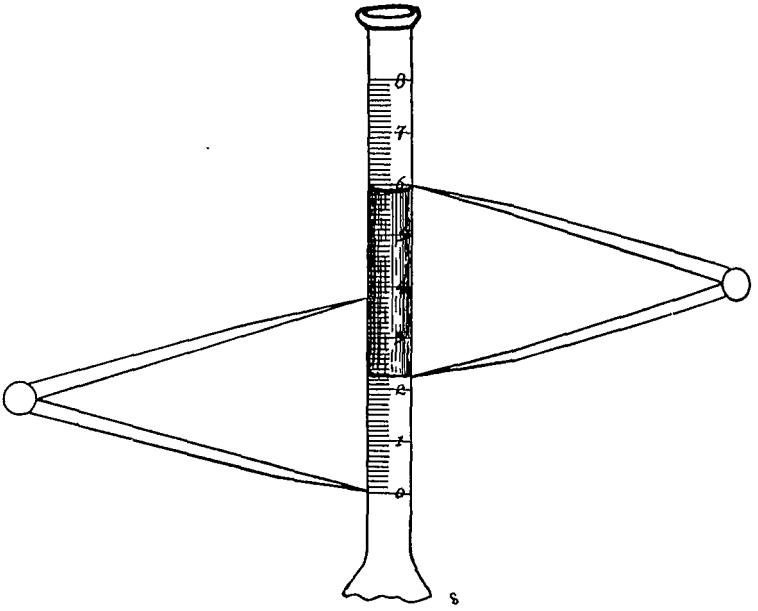

Fig. 4. The Proper Way to Measure the Fat

The fat column should be measured from the bottom of the fat column to the extreme top of the curved surface as shown by the divider on the right. To read the test, place one point of the divider at the 0 mark and make reading at the mark on the bottle where the upper point of the dividers falls. Always keep dividers sufficiently tight at the joint that a little pressure is required to spread or close them.

Testing skimmilk.—Use the same amounts of milk and acid as for whole milk. A special double-necked bottle is used for testing skimmilk. Take a sample (at least a pint) of skimmilk from the separator from both night and morning skimming. Take a sample with the pipette as for whole milk. Be sure to wash the pipette before sampling skimmilk,

if it was just used for whole milk. Skimmilk from a separator should test less than 0.05. When it tests higher, check up on the separator. Too much butterfat is lost. Pour tested samples on the ground in an out-of-the-way place where its destructive properties will do no harm. Wash all glassware at once, using a strong washing solution. Handle sulfuric acid with care. If spilled on the hands, table, floor, or clothing, at once splash generous amounts of cold water on parts covered with acid. Keep acid jug or bottle out of reach of children.

CAUSES OF FAILURE IN TESTING MILK

1. Bubbles on top of the fat column: Hard water is usually the cause. Use soft water or add ¼ measureful (see Fig. 2, E) of acid to ½ gallon of water, and add from this treated water to samples while testing.

2. Dark, charred, or black particles in fat column:
   (a) Acid too strong; (b) too much acid; (c) acid too warm; (d) milk too warm; (e) allowing acid and milk sample to stand too long before mixing; (f) incomplete mixing.

3. Light-colored or curdy fat column:
   (a) Acid too weak; (b) acid too cold; (d) milk too cold when acid was added; (e) mixing not completely done, leaving undissolved curd.

4. It is important to operate the Babcock testing machine at the proper speed. Most hand testers require from 60 to 70 revolutions of the crank per minute unless otherwise specified in the instructions that come with the machine. Owing to the high speed of the testing machine, the bottles must be placed so the reel is balanced. Do not leave one bottle cage empty when the cage opposite on the reel is filled. Use another milk sample or a test bottle filled with water to balance the reel. Always keep the machine bearings and gears well oiled.

CALCULATING THE RECORD

When the butterfat test for each cow's milk has been made, either at home or at the creamery, proceed as follows to complete the monthly herd record.

1. Calculate the amount of milk for the month for each cow by multiplying the day's weight of milk by the number of days in the month (see page 8) 31.2 pounds × 31 = 967.2 pounds (31 days in January). To get the pounds of butterfat, multiply the month's milk, 967.2 pounds, by the test 4.2 per cent = 40.6 pounds, which is the month's production of butterfat. When daily milk weights are kept, add them or use the short-cut method described on page 6 for the month's total milk. Record the calculated figures in their proper places in the herd book and your job is done until the next testing day. It is an easy and simple job, requiring very little time, and yet it

furnishes much information on which to build a profitable dairy herd. When a year of testing has been completed, total the milk and butterfat yield as found in the herd book for each cow, to complete the record of production.

MAKING USE OF THE RECORDS

One test or even two or three tests do not tell the whole story of a cow's production. Her test may vary from month to month and her milk yield may drop suddenly or remain persistent for a long time. The yearly test is the only reliable method of getting the facts on the performance of one cow or of the herd. The information is worth many times the effort and time required to get the weights, test the milk, and calculate the records. Keeping herd records should interest the boys as well as the father and the mother. Often the matter of keeping the records makes an enjoyable as well an instructive hour's work, in an evening, for John or Mary, who may have an interest in the herd through 4-H club work.

CULLING COWS

When the year's testing is done and each cow's production totalled, you are ready to decide as to her real worth as a producer. Turn to Tables 1 and 2 and see into which groups of production your cows fall. Those that have not made at least 200 pounds of butterfat should be sold for slaughter, if you feel they had a fair chance by being well fed in both winter and summer. Sometimes you would give a heifer that made only 200 pounds of butterfat another chance, if her dam was a good cow, and her sire a well bred animal. Cows that make 300 pounds of butterfat are fairly profitable when butterfat and feed are low in price. Cows that produce 400 pounds of fat yearly are excellent and yield a good return at any time. Strive to save heifers for your herd from the highest producing cows. Choose a purebred sire to head the herd whose immediate ancestors have demonstrated their ability as milk producers. The best insurance that a sire will be a transmitter of high production is to select one sired by a proven sire and out of a cow with a good record and by a proven sire.

Feeding and management are important factors in securing maximum returns from a dairy herd. Many valuable and timely suggestions that will be helpful in working out rations and making the best use of home-grown feeds, can be found in a bulletin that may be had free by writing a postal card to the Mailing Room, University Farm, St. Paul, Minnesota, asking for Bulletin 218 "Feeding the Dairy Herd," by C. H. Eckles. Any one interested in other bulletins and circulars relating to dairying should send for Circular 2, Valuable Sources of Information for the Dairy Farmer, by the same author.