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Milk Testing in Practice

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MILK TESTING IN PRACTICE



DAIRY HUSBANDRY DEPARTMENT
AGRICULTURAL EXPERIMENT STATION
BROOKINGS, SOUTH DAKOTA

DIGEST

There is a great variation in the producing ability of different cows. Testing eliminates the unprofitable cow and enables one to select the very best animals for breeding stock. Page 419.

There are six plans or systems for determining the production of each cow. All of these plans are feasible. It is very important that an accurate sample of milk be secured and that it be properly preserved until tested. Page 420-421.

Occasional farmers are keeping private records of the production of their cows. Page 422.

Boys' milk testing clubs have been organized for the purpose of testing individual cows. Page 422.

Creamery and cream station operators cooperate to the extent of testing samples from individual cows once a month. Page 422.

The cow testing association is an excellent means of determining production. Page 422-423.

Official and semi-official testing is used only in the case of purebred cows. This method is absolutely accurate and forms the basis for world's records. Page 423, 426.

The Babcock test for butterfat has become universal. Page 427.

The important steps in testing milk are sampling, measuring (17.6cc), adding acid (17.5cc), centrifuging, successive additions of hot water, tempering and reading. Pages 427-430.

The important steps in testing cream are sampling, weighing, (9 or 18 grams), adding acid, adding water if necessary, centrifuging, tempering and reading. Page 430.

The testing of skimmilk is similar to that of milk except that it calls for greater speed and length of time in centrifuging. Page 430-431.

Defective tests are caused by specific conditions which can be corrected. Page 431.

Cow testing eliminates the cow kept at a loss, raises the average production of the herd and increases the profits from dairying. Page 431.

MILK TESTING IN PRACTICE

By

H. M. Jones

T. H. Wright

WHY TEST?

There is a great variation in the producing ability of different cows. Some cows will produce over 300 pounds of butterfat a year while others will often fail to produce as much as 100 pounds a year. The ability of a cow to produce milk and butterfat is largely an inherited characteristic, although it is influenced to some extent by feed and care.

Testing differentiates between cows kept at a profit and those kept at a loss. Even though a herd of dairy cows is known to produce a profit, there may be a few individuals in the herd which produce no profit at all and thus detract from that produced by the others. The following data taken at random from cows in the State College herd, of which records have been kept for many years, shows the great variation which exists:

Cow No.	Pounds Milk	Pounds Butterfat	Income over Cost of Feed
13	14,243.5	511.22	\$111.33
57	3,752.0	164.14	8.98
24	9,190.1	320.94	74.78
21	7,884.5	274.76	30.78
199	10,006.1	360.16	101.69

Aside from the fact that testing eliminates the unprofitable cow from the herd, it is also of great value in selecting only the very best animals for breeding stock. By raising the calves of the highest producing cows, the average production of the herd is greatly increased from generation to generation. Testing is a method of finding out which animals in the herd are worthy of forming the foundation stock for the future herd.

PLANS FOR TESTING

The information needed in determining the production of each cow is not difficult to secure. To be sure, it requires some time and attention but the time is well spent.

Two factors must be known in order to discard or retain cows on the basis of their performance: (1) the approximate amount of milk which each cow produces in a year; (2) the average test of each cow.

There are several different plans for securing this information. They vary only in the methods employed, not in the results obtained. Table I outlines briefly the various methods and how they operate.

Table 1

Showing the various methods of testing and how they operate.

Plan	Frequency of weighing milk	Frequency of testing milk	Duration of test	Tested by Whom
Individual	2 consecutive days per month	At least monthly	2 days	Self
Boys' Club	At least 1 day per month	At least monthly	1 day	Members of boys' club
Creamery or Cream Station	2 consecutive days per month	At least monthly	2 days	Operator
Association	Daily	At least monthly	1 day	Man employed for that purpose
Semi-official	Daily	At least monthly	2 days	State supervisor
Official	Daily	Daily	365 days	State supervisor

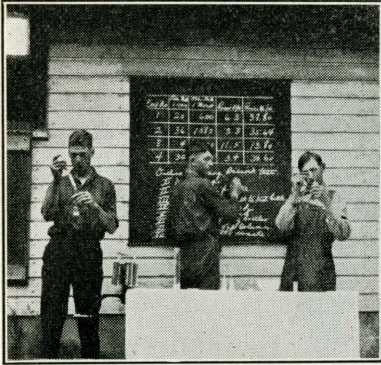


Fig. 1. The Babcock test for butterfat is simple enough to be operated by boys. Testing clubs are formed.

of milk several days until tested. Corrosive sublimate is poison and great care should be exercised in handling it.

Great importance is attached to the securing of representative samples of milk for testing. Unless samples are carefully and accurately taken, the test is of no value whatever. Each cow is to be milked dry, and all of her milk thoroughly mixed, either by pouring from one container to another, by vigorous stirring, or by both methods.

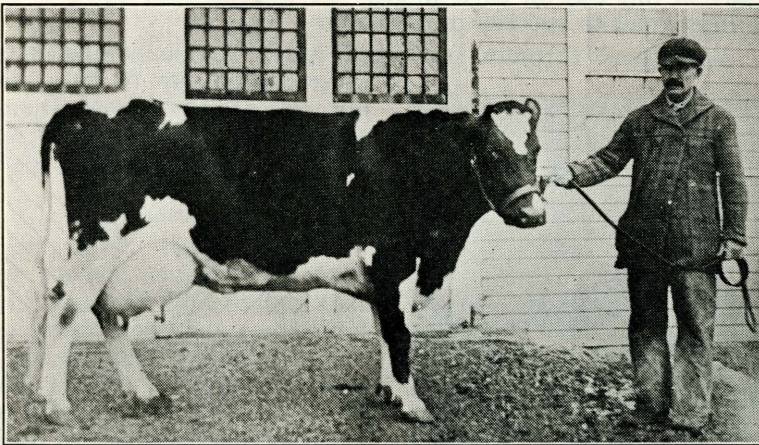


Fig. 2. College Belle Wayne 2d owned by South Dakota State College has the highest yearly record in the state, 27,896.1 pounds of milk and 1145.6 pounds of butter. She was tested under the semi-official plan.

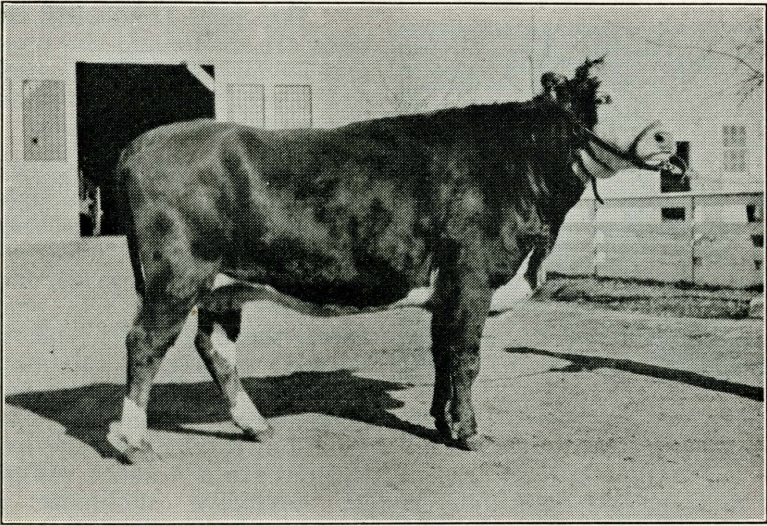


Fig. 3. Muley 3d, No. 185 produced in one year 2973 pounds of milk and 172.4 pounds of butter. She was tested under the individual plan.

Individual Records

Record keeping is not so difficult as is often imagined, and many farmers have found it possible to weigh and test the milk themselves. The man who will devote a few minutes a day to weighing the milk of each cow and who will set aside a part of one day in each month for testing that milk, is on the high road to success in dairying.

Occasional farmers test their herds regularly and keep their records up to date, doing all of the work themselves. This plan of testing is feasible but not very generally practiced.

Boys' Testing Clubs

In localities where boys have been given school instruction in milk testing, they sometimes become interested to the extent of organizing a milk testing club. Under this plan a boy tests the milk of each cow in a herd for at least one day a month. Upon multiplying his results by the number of days in the month,

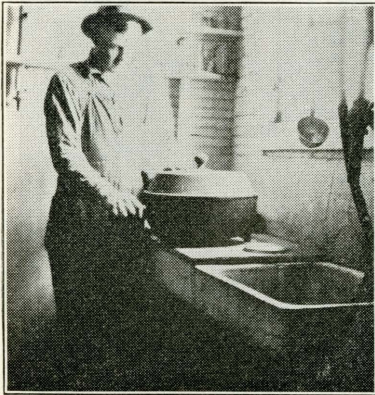


Fig. 4. A South Dakota farmer testing out his cows.

he arrives at a very close calculation of the monthly production of each cow. Upon making 12 such tests he is able to summarize the production for the year. This plan is coming into favor.

Testing by the Creameries

In some instances, enterprising operators of creameries and cream stations test milk for their patrons free of charge. Dairymen who take advantage of this generous offer are able to determine quite closely the yearly production of their cows by weighing the milk for 2 days a month, securing samples of each cow's milk, and taking the samples to the creamery or cream station each month. This plan has proven more

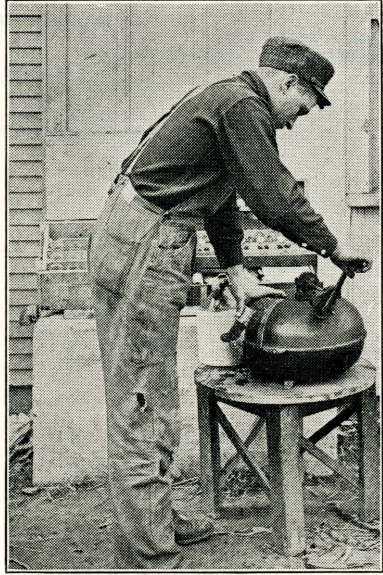


Fig. 5. A cow testing association tester in action. (Courtesy Ia. Exp. Sta.)

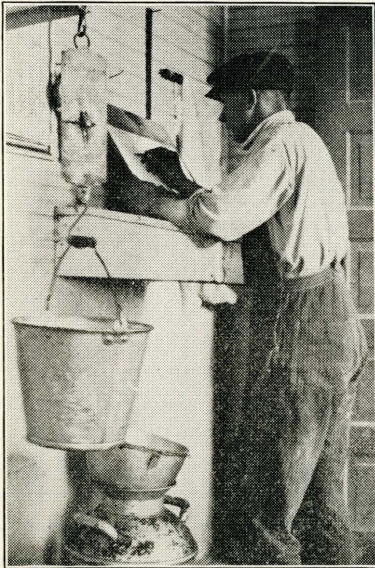


Fig. 6. "Write it down at the time," using the scales and daily milk record.

popular than any other in South Dakota. More complete details and the necessary blanks may be secured upon application to the Extension Service.

The Cow Testing Association

For many localities the most satisfactory method of keeping records of dairy production is by means of the cow testing association. A cow testing association is an organization of 25 to 30 dairy farmers who weigh the milk of each cow at every milking and employ a tester to visit their farms one day each month. This tester is present at both morning and evening milkings, takes samples and weighs the milk for each cow, tests it for but-

DAILY MILK RECORD

Dairy Herd of Month of 19.....
 Address County S. Dak.

Day	Names or Numbers of Cows							
	a.m.	p.m.	a.m.	p.m.	a.m.	p.m.	a.m.	p.m.
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								
21								
22								
23								
24								
25								
26								
27								
28								
29								
30								
31								
Totals								
Total for Mo.								
Av. Test								
Lbs. B. F.								

terfat and calculates, on that basis, the milk and butterfat production of each cow for the month. By repeating this process each month and making a summary at the end of the year, a fairly accurate record of the production of each cow is secured.

The cost of such an association is about \$3.00 per member per month. The cost per cow depends upon the size and number of herds in the association. The members furnish the tester with board and room while at their farm, and furnish him with transportation from one farm to the next. This is probably the most satisfactory method of keeping records even though it may cost more than the other plans. The results are so much more complete that the extra expense is justified.

Official Testing

The various dairy breed associations in cooperation with the state agricultural colleges conduct official and semi-official tests. Cows coming up to certain standards are admitted to a special registration within their breed.

Official tests include those wherein a supervisor representing a state agricultural college weighs and tests the milk of each milking. These tests are usually of short duration, 2, 7 or 30 days, but may be carried on for an entire year.

Semi-official is more common than strictly official testing. When carrying on semi-official testing, the owner keeps a record of the daily milk production of each cow. For 2

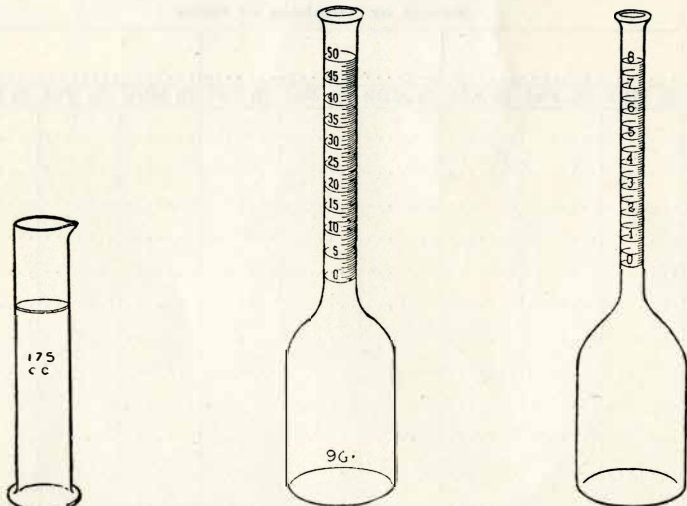


Fig. 7. Acid measure, also Babcock test bottles for cream and milk. (After Shaw.)

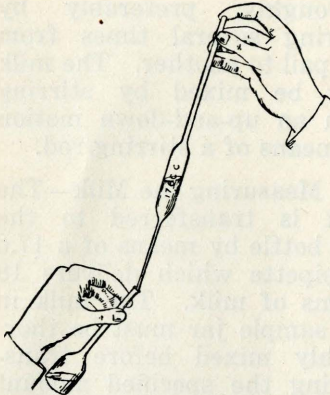


Fig. 8. Milk must be added carefully in this manner unless bottle will permit the insertion of the pipette. (After Sammis).

days a month a representative of a state agricultural college conducts a 2-day official test. The average percent of butterfat for the 2 days is applied to the milk production for the month.

Rules of the various breed associations vary somewhat in details. The main points of all are about as follows: the supervisor must be present at the milking of each cow while on official test; samples of milk are to be carefully taken and kept under lock and key until tested; tests are to be made in duplicate, that is, each sample is to be tested twice; composite samples from each cow are to be sent to the agricultural college upon completion of an official test, or every 10 days, when tests are of longer duration than that; retests are required in cases of exceptionally high production; the owner pays the costs of the test.

The cost of official testing is usually about \$3.00 a day plus the transportation and expenses of the supervisor. Where several farmers cooperate a great saving may be effected in the item of expense. The Department of Dairy Husbandry supervises this work in South Dakota.

Official and semi-official testing are used only in the case of registered cows. The world's records are compiled from official test reports.

THE TEST ITSELF

Dr. S. M. Babcock of the Wisconsin Agricultural Experiment Station invented the first reliable commercial test for butterfat in milk. It was described in a bulletin published in July, 1890, but because of its simplicity and reliability is now known in all the dairy countries. Brief directions for making the test are given below.

Testing Milk

Sampling—Milk must be sampled properly in order to get an accurate test. When testing the milk from an individual cow the entire milking must be sampled as the last milk drawn is considerably richer than that drawn first. Before filling the sample jar the milk must be mixed

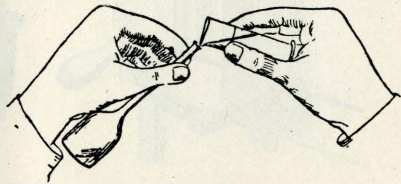


Fig. 9. Add acid slowly as shown. (After Sammis).

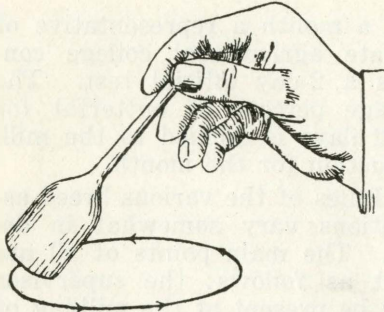


Fig. 10. Mix slowly and carefully but thoroughly as indicated. (After Sammis.)

thoroughly, preferably by pouring several times from one pail to another. The milk may be mixed by stirring with an up-and-down motion by means of a stirring rod.

Measuring the Milk—The milk is transferred to the test bottle by means of a 17.6 cc pipette which delivers 18 grams of milk. The milk in the sample jar must be thoroughly mixed before transferring the specified amount

to the test bottle. The temperature of the milk should be around 60-70 degrees F.

The milk is sucked up into the pipette until above the 17.6 cc mark when the lips are removed and the forefinger quickly placed over the top of the pipette. The milk is allowed to run down slowly to the mark and the correct amount is then transferred to the test bottle.

If the newer types of pipettes and bottles are used which permit the lower stem of the pipette to be inserted into the bottle, the milk may be added in this manner. Otherwise the pipette and bottle must be held as shown in figure 8.

Adding acid—Commercial sulfuric acid having a specific gravity of 1.82 or 1.83 is measured out in an acid measure or cylinder graduated to 17.5 cc. The temperature of the acid should be about 60-70 degrees F. The acid should be poured slowly down the neck of the test bottle. The bottle is held at an angle of about 45 degrees and is rotated slowly so the acid will rinse down any milk adhering to the neck. After

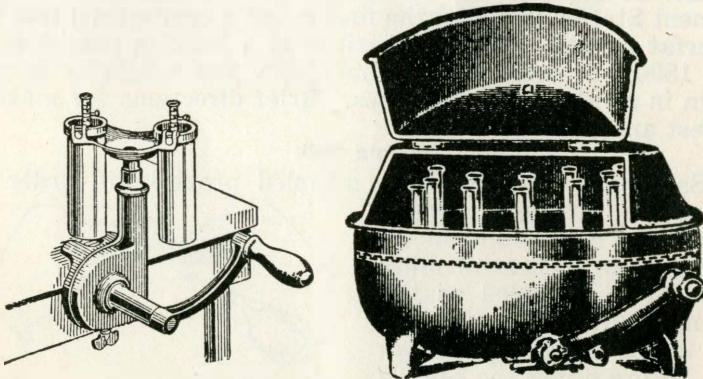


Fig. 11. Open and closed types of testers.

all the acid is added the milk and acid should be mixed rapidly and thoroughly as indicated in figure 10. Care should be taken not to spill or splatter the acid as it will burn the hands and destroy the clothes.

Centrifuging—The test bottles are then placed in the Babcock tester using an even number of bottles and placing them so that the machine is balanced. The bottles are then whirled for 5 minutes at the proper speed which is usually indicated on the handle of the machine.

Water (preferably soft or rain water) heated to about 80 degrees F. is then added to the test bottles until the fat reaches the base of the neck. They are then whirled for 2

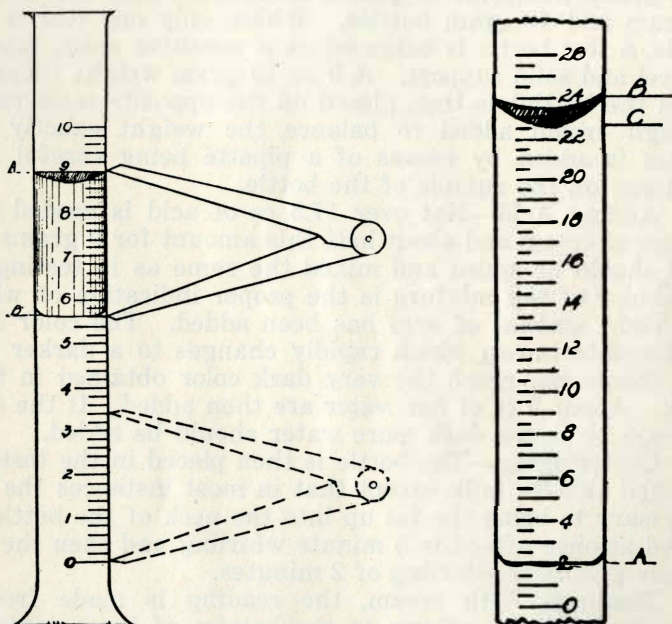


Fig. 12. How to use the dividers. Read milk test from A to B and cream test from A to C. (After Mortensen.)

minutes, after which enough hot water is added to bring the fat column up into the graduated part of the neck. The bottles are given a final whirling of 2 minutes and then placed in water at a temperature of 130-140 degrees F. for about 5 minutes. This is to get the fat at the proper temperature for reading and therefore the water must come up far enough on the necks of the bottles to surround the fat column.

Reading—It is best to use a pair of dividers for reading the tests. Measure from the extreme bottom of the fat column to extreme top as shown in figure 12. Then, without

changing the angle of the dividers, move them so that the lower point comes at zero on the scale. The top point will then indicate the percent of fat in the milk.

Testing Cream

Sampling—Cream is much more difficult to sample than milk and must be stirred very thoroughly.

Weighing—Before transferring from the sample bottle to the test bottle the cream must be mixed well. If at all thick or lumpy it should be placed in warm water so that it can be thoroughly mixed. Cream must be weighed instead of measured into the test bottles. Some bottles require the use of 9 grams and some 18 grams of cream. They are known as 9 gram and 18 gram bottles. Where only one test is being made, a test bottle is balanced on a sensitive scale, placed on a level and solid support. A 9 or 18 gram weight (depending upon the bottle) is then placed on the opposite scale pan and enough cream added to balance the weight exactly. The cream is added by means of a pipette being careful not to spill any on the outside of the bottle.

Adding Acid—Not over 17.5 cc of acid is needed for 18 grams of cream and about half this amount for 9 grams. The acid should be added and mixed the same as in testing milk. The color of the mixture is the proper indication of whether the right amount of acid has been added. The color is first a chocolate brown which rapidly changes to a darker brown but should not reach the very dark color obtained in testing milk. About 9 cc of hot water are then added. If the sample appears to be too dark more water should be added.

Centrifuging—The bottle is then placed in the tester and finished as with milk except that in most instances the water necessary to bring the fat up into the neck of the bottle is all added at once after the 5 minute whirling and then the bottle is only given one whirling of 2 minutes.

Reading—With cream, the reading is made from the bottom of the fat column to the bottom of the top meniscus instead of to the extreme top as with milk. See figure 12. The best method is to put a little separator oil on the top of the fat column. This does away with the meniscus and makes reading easier. The separator oil used for this purpose may be colored by suspending in a quart of the oil one ounce of alkanet root wrapped up in cheese cloth.

Testing Skimmilk

The sample for this test must be taken properly and measured with a 17.6 cc pipette the same as in the case of milk. A special double-necked bottle graduated in hundredths of 1 per cent is used. At least 25 cc of acid should be used

or as much as can be gotten in the bottle and mixed with the milk. The bottles should be whirled 10 minutes, 2 minutes, and 1 minute. The tester and tests should be kept as hot as possible. The speed of the tester should be about twice that required for the milk test, providing the tester is strong enough to stand this speed. The increase in speed is not as essential as the increase in acid, time and temperature.

Defects in Tests

1. White undissolved particles of curd at bottom of fat column, caused by:—
 - a—Too cold, too weak, or not enough acid
 - b—Temperature of milk too low. When the acid is added the milk should be from 60-70 degrees F.
 - c—Insufficient mixing of acid and milk
2. Dark burned test showing charred particles of curd, caused by:—
 - a—Too warm, too strong or too much acid
 - b—Temperature of milk too high
 - c—Insufficient mixing of acid and milk.
3. White foam on top of fat column caused by the use of hard water.
4. Insufficient speed sometimes fails to expel all the water and possibly some curd from the butterfat column giving too high a reading.

BENEFITS FROM COW TESTING

Cow testing increases the average production of the dairy herd, first, by eliminating all low producing cows, and second, by enabling one to select the foundation animals for his herd on the basis of performance.

In the first cow testing association organized in the United States, the average production for butterfat for the first year was 215 pounds; the sixth year this average was 270 pounds; and the tenth year it was 276 pounds. Practically every cow testing association shows a decided increase in the average production per cow.

With the knowledge of what the cows are producing a farmer is able to feed more intelligently and thus more economically than he could otherwise. Any irregularities in feed or production are quickly detected. Cow testing eliminates the cow kept at a loss, raises the average production of the herd and increases the profits from dairying.