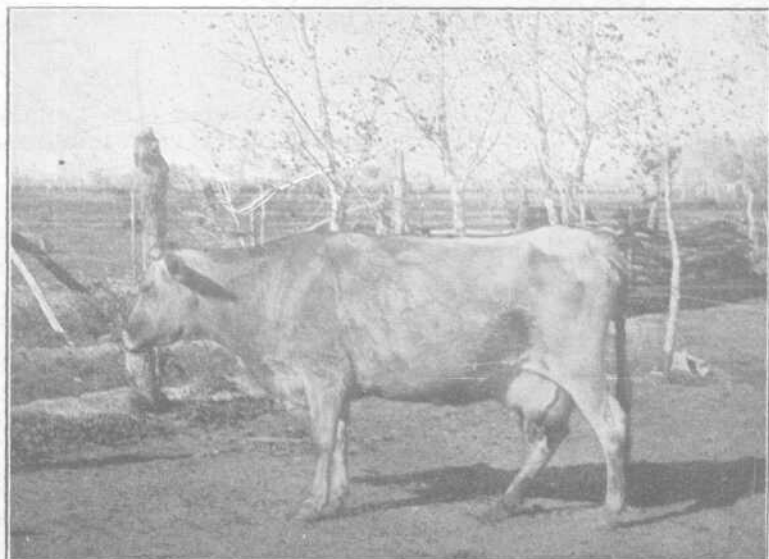


University of Arizona
Agricultural Experiment Station.

Bulletin No. 39.



Cow No. 1. Record 7945 Pounds of Milk. 352 Pounds of Butter Fat.

Dairy Herd Records.

BY GORDON H. TRUE.

Tucson, Arizona, August 20, 1901.

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DAIRY HERD RECORDS.

By *Gordon H True*

INTRODUCTION.

ARIZONA AS A MARKET FOR DAIRY PRODUCTS.

Among the agricultural pursuits of Arizona the dairy industry is one of much importance. The home market for agricultural products, including those of the dairy, will always be good. It is generally estimated that less than half of the butter and cheese consumed in the Territory is of home production, and, with an already great mining industry increasing from year to year, and with agriculture limited by the meager rainfall upon which it must depend for its necessary irrigation water, this must always be the case.

With a good market for his product assured, the dairyman will find that his profits depend largely upon certain conditions, all of which are in part and some entirely under his own control. Among these may be mentioned the cost of manufacture, the quality of butter and cheese made, and the quality of cows kept. It is the object of this bulletin to give the results of some investigations bearing on the one condition mentioned which is entirely within the control of the dairyman,—the quality of cows kept, but it may not be out of place in this introduction to touch upon the other conditions named.

COST OF MANUFACTURE.

The cost of production, if he be a creamery patron, is not controlled by the single dairyman; but experience has taught that the co-operative system of manufacture is most successful, and in the dairy districts factories operated by stock companies have followed the co-operative plan. The best of results can be attained only when the spirit of co-operation exists between the manufacturers and the patrons. At present much butter is made in private dairies on account of the cost of manufacture at the creameries. This is not to be wondered at when it is known that the

factories pay three to five cents per pound less for butter fat than they receive for butter, which amounts to a charge of from seven to ten cents per pound for manufacture. Some of this dairy butter is of better quality than average creamery product, which is a good reason for its being made, but the bulk of it is inferior in quality and is sold at a loss to its makers and all who handle it, and to the detriment of the general market. If all this butter could be made in the factories the cost of manufacture could be reduced, as it should be, for it costs no more to run a factory at its full capacity than it does at less. For the benefit of all concerned, producers and manufacturers should recognize their mutual interests and work together. In the opinion of the writer the best interests of the producers are served through the medium of the factory; but it should be within the power of the patrons of a factory to prevent unnecessary expense in the manufacture and sale of their product.

QUALITY.

The quality of butter and cheese made at a factory depends chiefly upon the quality of the milk used in its manufacture. Upon every individual patron, therefore, rests a responsibility for the general market value of his line of goods. The value of the whole output of a factory is often very much lessened by the lack of care on the part of a very few of its patrons. The factory operator has enough of adverse conditions due to climate to contend with without having the shortcomings of his patrons to work against. Arizona butter competes in its home markets with Kansas and California butters. In some cases the result of this competition has been that the imported butter has held the trade while the home product has been exported to sell as a low grade butter on a poorer market. This failure to hold our own trade is in the opinion of the writer, due to the lack of care in **handling** milk before it reaches the factory. Climatic conditions are conditions to be overcome and not to be given as an excuse for the delivery of a poor quality of milk.

CARE OF MILK.

We should bear in mind always in considering the matter of caring for milk that the changes in milk such as souring

and curdling, always take place as a result of the introduction of some sort of germ life after the milk leaves the udder of the cow, that the best of butter and cheese can be made from milk only when these changes are under the control of the maker; and that it is therefore most important that the handling of milk should be such that it will remain in the condition in which it leaves the udder of the cow as long as possible. The first point, therefore, in the care of milk is to prevent the introduction of anything into it, and the second to prevent the development of any germ life that may have gotten in. The first is effected by cleanliness in milking and in the care of the utensils in which the milk is handled. All milk pails and cans should be thoroughly scalded and exposed to the sun. Sour milk or whey should not be brought home from the factory in the same cans used for the sweet milk. Cows should be milked in a clean place free from dust, and the flanks and udders of each cow should be carefully brushed and dampened with a wet cloth or sponge before milking, to prevent the falling of any dust or hair into the milk. Milk should be immediately strained, preferably through a cloth strainer that has been scalded since last used. Cans of milk should be left uncovered in a place free from all bad odors. By wrapping the cans in wet burlap the temperature of the milk may be much lessened. Aeration and cooling not only retard the development of germs in the milk but free it from so-called animal odors. By following these rules in the care of the milk from the Station herd we have always gotten our milk to the factory in such condition that we have had no complaint. While the Arizona dairyman's income is somewhat effected by the price of dairy products, dependent upon quality of the same, it is, we think, affected most by the quality of the cows of his herd. We do not hesitate to state our belief that the profits of the dairy farmers of the Territory could be doubled by a judicious selection of dairy cows without increasing the number.

A COMPARISON OF THE YIELDS OF DAIRY HERDS.

During the year ending with the month of October, 1900, the writer kept as nearly as possible a record of the number of cows milked by each creamery patron of Salt River valley, the amount of milk and butter fat produced by each herd and the cash received for the same. The number of cows was ascertained by the milk weighers at the creameries and the other figures were furnished by the creamery managers. In spite of an earnest effort to have this record complete, the desired information was secured only concerning the herds of less than half the creamery patrons of the valley. In some cases there was a suspicion on the part of the ranchman that some one wanted to know too much about his private business and information was withheld. Many sent milk to the creamery only a part of the year. The data obtained, however, seemed to be sufficient to demonstrate the point that the writer wishes to emphasize, that there are too many unprofitable cows in the dairy herds of our Territory.

With too many of our ranchmen a steer is a steer and a cow is a cow regardless of the individual animal. This indifference exists to such an extent that in some cases entire herds fail to pay the cost of their keeping.

In some localities the difference in profit returned by different herds might be attributed in a large degree to the different methods of handling and feeding. To a certain extent this may be true in Arizona, but in a far less degree perhaps than in any other state or territory. In Arizona the almost universal practice is to feed cows alfalfa hay or pasture, or a combination of the two, without shelter. If there is a difference in feed it is in amount. So we consider it fairly safe to attribute differences in profit to differences in quality of the cows.

The year during which this record was kept was a particularly hard one on account of the very severe drouth, and the returns from the dairy herds of the Territory are probably somewhat below the average on that account. The difference between different herds is, we think, in but few cases to be accounted for by the difference in feed.

The facts collected are given in the tables following. The first table relates to herds concerning which data were collected for the year.

In the second column is given the average number of cows milked each month. This number is probably somewhat less than the actual number of cows in the herd, as no account has been taken of the number of dry cows, of which there are nearly always some in a herd. On account of the habit Arizona ranchmen have of buying, selling and renting cows, seldom keeping the same herd for a year, it was considered that in most cases the average number reported as in milk each month would most nearly represent the number of the herd for the year.

The third column shows the average number of pounds of milk per cow for the year. The figures are obtained by dividing the total number of pounds of milk delivered at the factory by the number of cows given in the second column.

The last column gives the gross return per cow. This is obtained by dividing the total cash returns by the number of cows milked, or by multiplying the number of pounds of butter fat by 20 cents. The price paid for butter fat at the different creameries for the year varied a fraction of a cent, but we have assumed that the same price, 20 cents per pound, was paid in all cases, thus having a single basis for the comparison of all herds.

We have estimated the cost of keeping a cow a year to be thirty-two dollars, twelve dollars for care and milking and twenty dollars for feed. The latter figure would be high in ordinary years, but during the unusually dry year in which this record was made prices of feed were high enough, we think, to warrant this estimate.

In the table the figures relating to herds failing to give a gross return of thirty-two dollars per cow are printed in black faced type.

TABLE I.—SHOWING THE AVERAGE YIELD OF MILK AND BUTTER FAT PER COW, WITH GROSS CASH RETURNS FOR THE SAME, IN FIFTY-EIGHT ARIZONA HERDS.

No.	No. of cows.	Av. lbs. of milk.	Av. lbs. of butter fat.	Av. cash return	No.	No. of cows.	Av. lbs. of milk.	Av. lbs. of butter fat.	Av. cash return
1	21	7409	274	\$54.80	30	25	4865	191 15	\$38.23
2	8	7587	269 20	53 84	31	9	5240	189.30	37.86
3	43	5936	247	49 40	32	19	4795	188	37.80
4	48	6676	236.60	49.32	33	11	5167	187 90	37 58
5	23	5659	243	48 60	34	54	5150	185 20	37 04
6	4	6019	238.15	47 63	35	19	4302	183.60	36.72
7	9	3447	233 85	46.77	36	9	5312	183.60	36 72
8	21	4438	234	46.00	37	7	5229	179.25	35.85
9	12	6176	222	44.40	38	5	4833	178 55	35 71
10	31	6442	219.10	43 82	39	6	4667	177.35	35.47
11	24	6048	214 40	43 00	40	8	4632	176.30	35.28
12	16	5672	214 85	42 97	41	9	5095	169 05	33 81
13	23	4972	214	42 80	42	9	4655	161.10	32 22
14	29	5363	214	42 80	43	11	4292	158.20	31 64
15	9	5255	213.85	42.77	44	7	4154	154.70	30 94
16	25	5778	210	42 00	45	12	4282	150.40	30.08
17	12	5659	208 15	41.63	46	7	4187	145.20	29.04
18	55	5681	205.15	41 03	47	6	4411	144.25	28.85
19	15	5944	204.60	40 92	48	12	4248	127.55	25.51
20	11	5607	202.50	40 50	49	3	2973	125.80	25.16
21	15	Cream	201	40.20	50	10	4085	125.75	25.15
22	6	5942	200 45	40 09	51	11	3520	124.25	24.85
23	43	5505	200	40 00	52	6	3735	113.	22.60
24	4	4774	200	40 00	53	4	3075	109.10	21.82
25	10	4819	199 50	39 90	54	5	3059	102.50	20.50
26	17	4658	199.50	39 90	55	20	3297	101.65	20.33
27	6	5886	198.10	39 62	56	5	2585	99.80	19.96
28	44	5232	197.50	39.50	57	5	2642	87.15	17.43
29	9	5462	192.25	38.45	58	11	2019	66.40	13.28

An examination of the above table reveals the fact that of the fifty-eight herds reported, sixteen failed to pay what we have estimated to be the cost of keeping. The difference between the return of the average cow of the poorest herd and the average cow of the best herd is the difference between a loss of \$18 22 and a profit of \$22.80.

Besides the fifty-eight herds reporting for a year, forty-three herds reported for six to eleven months. We have collected the results of these reports in the following table, giving the number of cows milked, the number of months reported and the average gross returns for those months. As in the preceding table the figures relating to herds not paying their keeping are printed in heavy type.

TABLE II.—SHOWING AVERAGE GROSS RETURNS PER COW IN FORTY-THREE HERDS REPORTING FOR A PART OF A YEAR.

	No. of cows.	No. of months	Average gross returns per month		No. of cows.	No. of months	Average gross returns per month
1	19	10	\$5.20	23	8	6	\$2 72
2	6	8	4.84	24	8	7	3 15
3	18	9	4.78	25	18	10	2 90
4	6	7	4.21	26	10	10	2 89
5	5	7	4.20	27	8	9	2.65
6	22	6	4 07	28	11	9	2.63
7	25	6	4.00	29	6	7	2.57
8	19	6	3.88	30	10	11	2.55
9	9	8	3.83	31	16	11	2.40
10	15	9	3.80	32	5	9	2.21
11	15	7	3.77	33	7	8	2.15
12	11	10	3.76	34	8	8	2.12
13	17	6	3.73	35	5	8	2.05
14	4	10	3.55	36	8	9	2.03
15	21	7	3.53	37	12	8	2.00
16	6	7	3.44	38	6	8	2.00
17	18	9	3.40	39	7	8	1.97
18	8	6	3.37	40	5	9	1.97
19	7	9	3.35	41	6	9	1.85
20	7	11	3.20	42	33	9	1.56
21	14	6	3.19	43	18	5	1.22
22	12	9	3.15				

These two tables should furnish dairymen food for thought. Here is demonstrated the fact referred to above, that there are too many unprofitable cows in our dairy herds.

These figures, however, do not show how many, for, in order to do this, a record of individual cows must be kept. In some of

the herds that failed to pay expenses there may have been some good cows while in the herds showing fair returns there were undoubtedly many unprofitable ones. In all probability there are few herds reported above from which the profit could not have been increased by selling some members of the herd for beef. One must go farther than to simply determine the gain or loss of his herd ; he must know which particular cows are responsible for gain and which for loss. That this is essential is demonstrated in the following part of the bulletin.

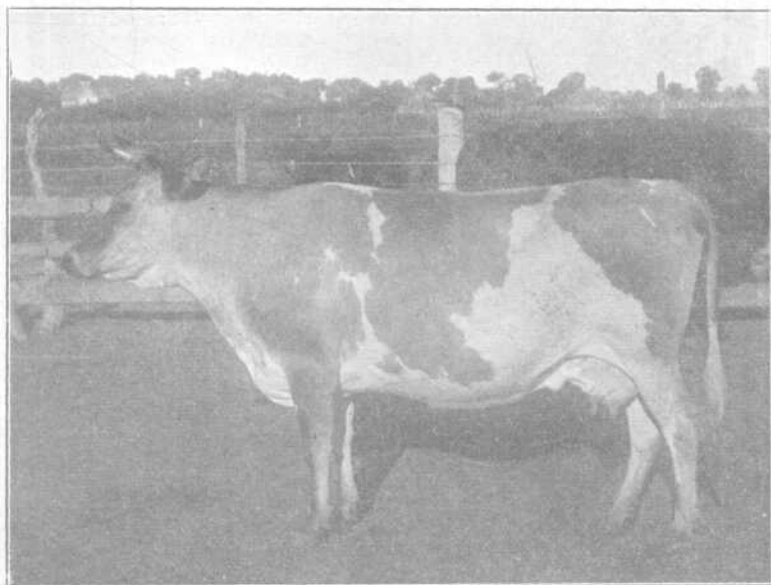
A DAIRY HERD RECORD.

For a year the writer kept a record of the individual cows of two herds. The milk was weighed and sampled at every milking and the samples tested twice a month, the writer testing the milk and keeping the record as his share of the work. The owners of the herds state that the extra time required to weigh the milk, record the weight and take the samples, did not exceed one minute per cow. The samples tested every two weeks were composite samples consisting of a part of the milk from each milking during the two weeks, and were kept in condition for testing by the addition of bichromate of potash and bichloride of mercury in about equal parts. The time required for testing the samples for the two herds was about a half day. The Babcock test was used.

It was the original idea to secure herds fairly representing the different breeds used for dairy purposes, but the men owning Shorthorn and Holstein herds failed to co-operate when the time came to begin the test. Of the two herds of which records were kept, one consisted of twelve full-blood Jerseys. The other consisted of thirty-five cows of mixed breeding ; some high grade Shorthorns, some grade Jerseys and others of various admixtures of blood. Only thirty cows in the latter herd completed the year's record.

In the following tables the record is given as of a single herd, except that the figures relating to the cows of the full blood herd are in italics in Table III. The record as it was kept shows the amount of milk and butter fat given by each cow of

the two herds for each period of two weeks during the year, and from each we have taken the following summary which gives not only the number of pounds of milk and butter fat produced during the year, with the average per cent of fat, but an estimate of the gross and net returns from each cow for that time. As in the preceding part of the bulletin, gross returns are figured on the basis of 20 cents per pound for butter fat and thirty-two dollars per head as the cost of keeping a cow a year. The table hardly needs any explanation.



Cow No. 2. Record: 7978 Pounds of Milk. 348 Pounds of Butter Fat.

TABLE III.—SHOWING INDIVIDUAL RECORD OF FORTY-TWO COWS.

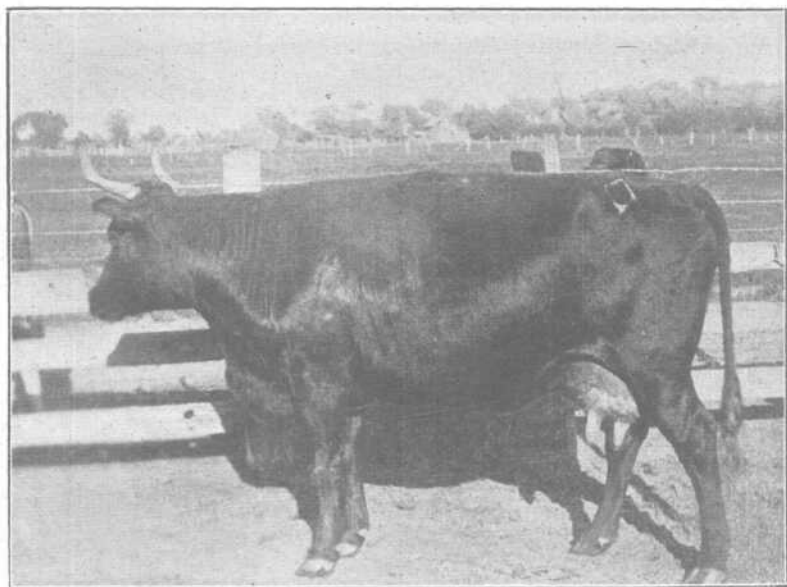
No. of cow	Age	Days in milk	Pounds of milk	Per. cent of fat	Pounds of fat	Gross receipts	Net receipts
1	11	353	7945	4.43	352.23	70.45	38.45
2	5	357	7978	4.36	348.74	69.75	37.75
3	10	335	8727	3.66	319.13	63.83	31.83
4	7	315	7294	4.27	311.74	62.35	30.35
5	14	340	6489	4.60	298.75	59.75	27.75
6	5	350	6614	4.45	294.82	58.96	26.96
7	12	345	6527.5	4.5	293.85	58.77	26.77
8	7	365	6433	4.39	282.99	56.60	24.60
9	4	365	6535.5	4.25	277.51	55.50	23.50
10	12	348	5990	4.36	261.44	52.29	20.29
11	8	330	5363	4.84	258.96	51.79	19.79
12	5	333	5383	4.72	254.36	50.87	18.87
13	7	365	4933	5.1	253.79	50.76	18.76
14	4	351	6851	3.98	253.31	50.66	18.66
15	15	288	7770	3.25	252.42	50.48	18.48
16	7	284	7052	3.40	239.85	47.97	15.97
17	5	365	5118	4.66	238.55	47.71	15.71
18	7	256	5305	4.50	238.38	47.68	15.68
19	4	324	5192.5	4.58	238.00	47.60	15.60
20	4	291	4459	5.28	235.74	47.15	15.15
21	3	343	5862	4.02	235.74	47.15	15.15
22	4	350	4654	5.04	234.76	46.95	14.95
23	5	315	4951	4.73	234.34	46.87	14.87
24	12	360	5728.5	3.87	221.58	44.32	12.32
25	7	345	5940	3.73	221.27	44.25	12.25
26	5	365	4855	4.51	219.21	43.84	11.84
27	3	338	4327	5.01	217.02	43.40	11.40
28	7	228	4766	4.49	214.27	42.85	10.85
29	4	233	5434	3.89	211.12	42.22	10.22
30	7	344	4470	4.69	209.53	41.90	9.90
31	3	367	4180.5	4.95	207.2	41.44	9.44
32	15	271	6727	3.07	206.31	41.26	9.26
33	6	311	5041	3.94	198.57	39.71	7.71
34	3	356	4557.5	4.35	197.99	39.60	7.60
35	7	241	5838	3.36	196.19	39.24	7.24
36	7	285	4239	4.53	191.94	28.39	6.39
37	8	319	5402	3.58	190.51	38.10	6.10
38	13	365	3830	4.82	184.45	36.89	4.89
39	4	365	3964	4.41	174.74	34.95	2.95
40	3	342	3741	4.39	163.70	32.74	0.74
41	4	305	3559	4.43	57.87	31.57	0.43
42	5	335	3126	4.51	141.13	28.23	3.77

For the sake of comparison it will be interesting to know that these two herds gave an average gross return for the year of \$53.28 and \$48.60 respectively, thus ranking among the very

best herds in the Territory, and yet two cows failed to pay the requisite thirty-two dollars.

COMPARISON OF METHODS.

Certain writers on dairy subjects have suggested various short cut methods of keeping so-called dairy herd records. It has been stated, for example, that an average of the samples taken at the end of six weeks and of six months after calving would be fairly representative of the milk for the whole year, and that a



Cow No. 3. Record: 8726 Pounds of Milk. 319 Pounds of Butter Fat.

sample taken toward the end of the fourth month would be the same. In cases where the comparison could be made, the writer has compared the average per cent of fat for the year with that of the two week period about the end of the fourth month, as suggested, and he found that in several cases the difference was as high as one half of one per cent, and in one case eight-tenths of one per cent, making a calculated difference in the year's return of a cow of from thirty to fifty pounds of fat. The writer

believes that in building up or maintaining a dairy herd enough is involved to make it profitable for the dairyman to know what his cows are doing and not to be satisfied with estimates. Any method which does not involve the weighing and testing of all the milk is a method of estimating and not of determining the value of his cows.

Many dairymen who have never tested any of the cows of their herds think they know which are the best ones, usually judging by the amount of milk given or the supposed richness of the milk. To such and to others it will be interesting to note the ranking of the cows of these herds according to cash returns, richness of milk, and amount of milk given in the following table, which shows that the most profitable cow stood twentieth in richness of milk and third in amount of milk and so on. The cows are numbered in this, as in all the tables, in the order of their true value as shown by the amount of butter fat produced,

TABLE IV.—SHOWING RANK OF COWS ACCORDING TO REAL VALUE, RICHNESS OF MILK AND AMOUNT OF MILK.

Number	Richness	Amount	Number	Richness	Amount
1	20	3	22	3	31
2	25	2	23	8	27
3	37	1	24	34	19
4	28	5	25	36	16
5	12	11	26	15	19
6	19	8	27	4	33
7	17	10	28	18	39
8	23	12	29	33	20
9	29	9	30	10	35
10	26	15	31	5	37
11	6	23	32	42	7
12	9	22	33	32	26
13	2	28	34	27	32
14	31	13	35	40	17
15	41	4	36	14	36
16	39	6	37	38	21
17	11	25	38	7	39
18	35	14	39	22	38
19	13	24	40	24	40
20	1	34	41	21	41
21	30	18	42	16	42

VARIATIONS IN PER CENT OF FAT.

From the original record we have taken the figures which appear in the following table showing the extreme variation in per cent of fat in each cows' milk during the year and the greatest variation between two consecutive two-week periods. The variation in per cent of fat in milk is, with most dairymen, a knotty problem, and is sometimes a source of trouble between the creamery man and his patrons. That variations occur is shown in the table; why they occur would be hard to explain,

TABLE V.—SHOWING EXTREME VARIATIONS IN THE PER CENT OF FAT IN THE MILK OF EACH COW DURING THE YEAR AND BETWEEN CONSECUTIVE TESTS.

No.	Year	Test periods	No.	Year	Test periods
1	3.6—4.8	3.6—4.4	22	3.8—5.7	3.8—4.6
2	3.5—4.8	3.5—4.4	23	3.4—5.2	3.4—4.8
3	3.6—5.1	3.8—4.4	24	3.6—4.2	3.8—4.2
4	3.5—5	3.5—4	25	2.—5.3	4.6—5.3
5	3.8—5.8	4.6—5.5	26	3.5—4.8	4—4.6
6	3.8—6.1	3.8—4.4	27	3.8—5.4	3.8—5.4
7	3.7—5.6	3.7—4.8	28	4.—6.6	4.2—5.1
8	3.8—4.4	4.2—4.8	29	2.5—5.6	2.8—3.4
9	3.6—5.4	4.4—5	30	3.6—5.6	4—5.5
10	3.6—5.4	3.6—4.4	31	3.8—5.8	3.9—4.9
11	4—5	4—5	32	2.6—3.6	3.3—3.6
12	3.9—5.5	3.9—4.8	33	3.4—4.4	3.6—4.4
13	4.6—6.2	4.4—5.4	34	3.4—5.4	4.3—5.4
14	3.4—4.4	3.4—3.8	35	3.1—5.3	3.1—3.6
15	2.7—4.1	3.2—4	36	3.8—5.6	3.8—4.6
16	3—4.5	4—4.5	37	3.—4.2	3—3.4
17	4.1—5.6	4.1—4.6	38	4.—5.5	4.6—5.2
18	3.3—4.2	3.5—4	39	3.8—4.9	3.8—4.6
19	3.6—7.5	5.8—7.5	40	3.6—5.	3.9—4.9
20	3—5.2	3—3.5	41	3.8—4.8	3.8—4.3
21	3.5—5.4	3.6—4.2	42	3.5—6.1	3.5—4.2

With such wide variations in the per cent of fat in the milk of the same cow, the lack of value of single tests should be apparent. This is another illustration of the importance of keeping the year's record of our dairy cows.