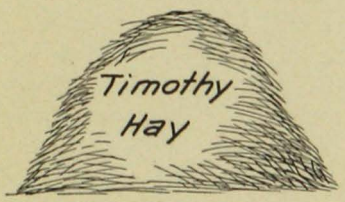
Special Bulletin No. 123 December 1928

INCREASING THE DAIRY INCOME

by E.A. Hanson
Agricultural Extension Division
and O.G. Schaefer
Division of Dairy Husbandry
Agricultural Experiment Station

A Minnesota Dairy Herd Fed



Limited grain ration

Produced 177 lbs. Butter Fat and $28.00 over Feed Cost per Cow.

The Same Cows Fed

Liberal home grown ration

Produced 246 lbs. Butter Fat and $57.88 over Feed Cost per Cow.

UNIVERSITY OF MINNESOTA
AGRICULTURAL EXTENSION DIVISION

Published by the University of Minnesota, College of Agriculture, Extension Division, F. W. Peck, Director, and distributed in furtherance of the purposes of the co-operative agricultural extension work provided for in the Act of Congress of May 8, 1914

PROFITABLE production of milk and butterfat is the aim of all dairymen. The largest single factor influencing profit is the amount of milk and butterfat produced. The amount of milk and butterfat that a cow will produce depends upon her dairy capacity and the feed and care that she receives. Dairy capacity is measured by the amount of milk and butterfat produced when proper conditions of feeding and management are maintained. The dairy capacity of a cow is inherited and can not be made through feeding and management. High production and efficiency in the herd can best be secured by introducing better blood and by culling out the poorer producers. The second factor controlling milk production, namely, feed and care, lends itself to immediate change. By improving the feed and care, many herds now fairly well bred can be made more profitable.

The cows in average Minnesota dairy herds produce between 150 and 190 pounds of butterfat per year. Returns over cost of feed from cows of average production are not large enough to be encouraging to beginners in the dairy business. It is the purpose of this publication to point out, by showing actual results, how herds may be improved and incomes increased by introducing methods of feeding that have stood the test.

The 36,000 cows in Minnesota herd improvement associations (cow testing associations) average 280 pounds of fat per year and give an average return of $75 to $80 per cow above feed cost. Other figures from the same source show that the herds averaging 380 pounds of fat per year give an income of $112 per cow above feed cost. Two cows, each producing 380 pounds of fat, returned $224 income over feed cost yearly. It takes five or six average cows to yield the same income. The labor required to care for the better producers is only a little more, and other expenses, including barn, equpiment, and risk, are essentially the same for the range of production given.

A study in which 412 herds in the dairy herd improvement associations were divided into four groups, according to their production, clearly illustrates the points set forth in the preceding paragraph. This information is contained in the following table:

Group	Herd	Average fat production for year	Yearly feed cost	Income over feed cost	Dairy breeding of herds	Following recommended feeding practices
		lb.			per cent	per cent
1	44	177	$38	$46	40	51
2	270	248	47	71	69	63
3	73	320	60	92	91	83
4	25	380	68	112	96	94

As production increased from 177 to 380 pounds of butterfat, an average increase of 67.6 pounds per group, an astonishing increase in net returns is shown. Each gain of 67.6 pounds of butterfat between groups required additional feed to the amount of $10 but resulted in an increase of $22 in the net return. It will be noted that the higher producing group was made up almost entirely of cows of dairy breeding and that they were fed according to recommended practices—legume hay, corn silage, pasture supplements, and grain according to production; and feeding during the dry period. These data clearly indicate that maximum net returns are secured only when cows of good dairy breeding are properly fed.

OBJECT OF THE FEEDING EXPERIMENTS

Experience growing out of herd improvement association work indicated that poor feeding is one of the chief causes of low production. There is no justice in condemning a cow as unprofitable if she has never had a chance. In order to determine what increase in milk production and income over cost of feed can be made by better feeding, the Division of Dairy Husbandry of the Minnesota Agricultural Experiment Station planned a definite experiment.

PLANS FOR EXPERIMENT

A survey was made of the herds in Minnesota herd improvement associations in order to locate a dairy herd that illustrated some of the feeding problems confronting Minnesota dairymen. A herd entered for the previous two years in one of the associations was selected. Detailed feed and production records were available for making comparisons.

Four cows from this herd were brought to University Farm and were fed and cared for according to recommended practices. The ration consisted entirely of such home-grown feeds as can be grown on most Minnesota farms. The cows were fed and milked twice daily during the winter months. An average of the production for a two-year period under these conditions was compared to that under the original conditions for the two years previous.

Description of Herd and Cows Selected

The herd from which these four cows were selected consisted of twenty cows, including well bred grade Holsteins, grade Guernseys, and some common red cows. Two Holsteins, one Guernsey, and one red cow were purchased and brought to University Farm.

The cows selected were mature when the records were made, but not old enough to be on the down grade. All were due to freshen in the fall. E-23 was a common red cow, 8 years old, weighing 1075 pounds. Cow E-24 was a well bred grade Guernsey, 7 years old, weighing 1000 pounds. Cows E-25, 7 years old, weighing 1140 pounds, and E-26, 6 years old, weighing 1150 pounds, were well marked grade Holsteins.

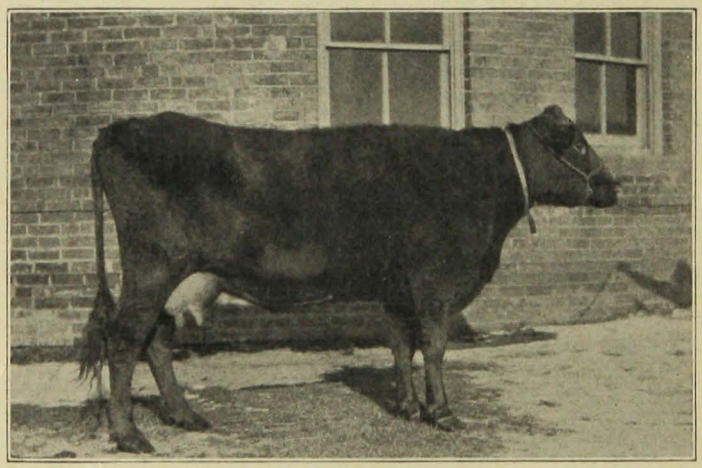


Fig. 1. This common red cow under improved feeding conditions produced four pounds less butterfat but $8 greater gain above cost of feed than was secured on the original owner's farm under poor feed conditions. She was lacking in dairy capacity and did not respond to better feeding as did the others.

Feeding Practices on Original Owner's Farm

The owner had maintained a dairy herd for 8 years and was receiving the major portion of his income from this source. During this time the common red cows were being replaced by cows of dairy breeding. Very little was being done to grow crops best suited to the needs of the cows. The roughages grown were timothy and upland hay; neither legume hay nor silage was available. Some oats and corn were grown but none were fed to the cows. Instead, the owner purchased his feeds from a local feed dealer. The grain mixture for the two-year period consisted of bran 46 per cent, middlings 42 per cent, molasses feed 9 per cent, and oilmeal 3 per cent of the grain mixture. No effort was made to feed the cows according to production, each cow received practically the same allowance regardless of her size or the amount of milk and butterfat she was producing. During the summer the cows were allowed the run of the pasture for 184 days. Some green corn was fed during the period of scant pasture, but no

grain was fed. The cows were given a rest period of six weeks a year, during which time they received no grain.

The cows were given good care and comfortable surroundings. The barn was modern, with cement floors and gutters, a ventilating system, and enough windows to provide light. Drinking cups had not been installed. The milk-house was separate from the cow barn.

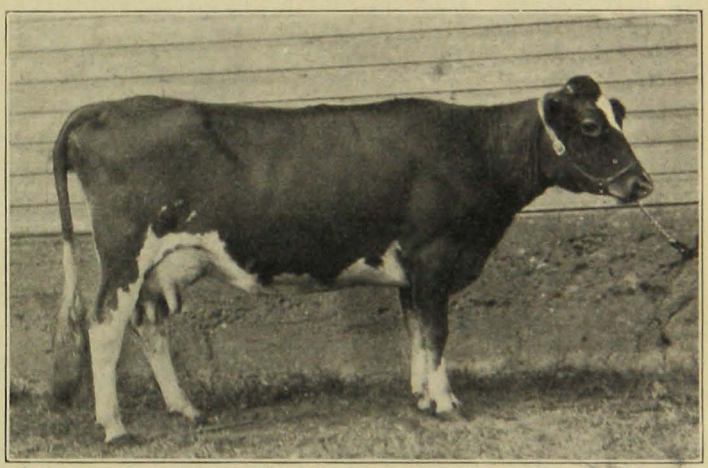


Fig. 2. This grade Guernsey cow under improved feeding conditions produced 99 pounds more butterfat and $47 greater gain above feed cost than was secured on the original owner's farm under poor feed conditions.

Feeding Practices at University Farm

The ration furnished these cows after they were brought to University Farm was limited to feeds that can be successfully grown on most Minnesota farms. Alfalfa hay and corn silage constituted the roughages, while corn, oats, and barley made up the grain ration. The grains were mixed in the following proportions: Oats 200 pounds, corn 100 pounds, and barley 100 pounds. Alfalfa hay was fed in such amounts as they would consume and 3 pounds of corn silage was allowed for each 100 pounds live weight. Grain was added in such amounts as were necessary to balance the ration according to the Morrison feeding standard. Grain was consumed at the rate of one pound for each 3 pounds of milk produced.

All four cows were given a dry period of two months. During this time they were on pasture and in addition, during the latter part of the period, received a grain allowance, the amount depending upon the condition of the cow. However, no cow received more than 8 pounds per day. They were allowed the run of the pasture for 155 days.

The barn and equipment at University Farm are not very different from those on the original owner's farm. The cows were fed twice a day and were milked with a machine twice each day. Lighting and ventilating conditions are much the same, tho at University Farm the cows had water before them at all times.

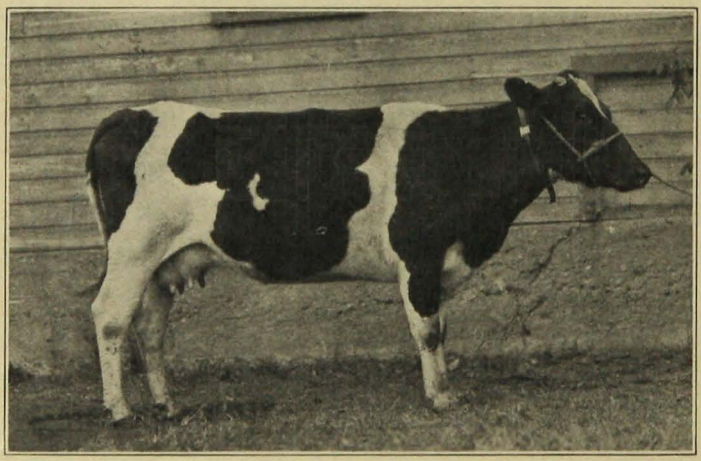


Fig. 3. This grade Holstein cow under improved feeding conditions produced 90 pounds more butterfat and $34 greater gain above feed cost than was secured on the original owner's farm under poor feed conditions.

Market Prices Used in this Study

Prices prevailing in the community from which these cows were purchased were used in figuring the costs of feeds furnished while on the original owner's farm and while at University Farm. While none of the feeds furnished at University Farm were fed by the original owner, the prices used are those that other members of this cow testing association used during the same time. The original owner sold his product as whole milk. As the large majority of dairymen in Minnesota sell butterfat instead of whole milk, these data are figured on the butterfat basis. The average price paid dairymen by the state creamery at Albert Lea for the two years while the cows were in the testing association was used in figuring the value of the product while on the original owner's farm and while at University Farm.

DISCUSSION OF RESULTS

No attempt was made to secure phenomenal production, but every effort was made to feed and care for the cows according to recommended practices. Much larger production could have been reached, if that had been the sole aim, but the aim was to secure the most

economical and profitable production that could be had with home-grown feeds.

There was a remarkable increase in income over cost of feed at University Farm as compared to that secured on the original owner's farm, for two reasons: (1) the larger production per cow and (2) the proportionally lower feed cost. Feed costs per unit of milk and butterfat were reduced because more suitable feeds were furnished. Feeding alfalfa hay instead of timothy hay increased the protein content of the ration so that it was not necessary to purchase high priced, high protein feeds. If timothy hay had been fed instead of alfalfa hay it would have been necessary to purchase approximately 700 pounds of linseed oilmeal or some other equally valuable high protein concentrate to get the same results. This amount of linseed oilmeal would have cost $18. The actual increase in yearly feed cost per cow would have been $11. The difference is due to the smaller quantity as well as lower cost of the timothy hay consumed. Substituting timothy hay for alfalfa hay and purchasing the necessary high priced protein concentrates, which were not necessary when alfalfa hay was fed, would have increased the yearly feed cost 17 per cent and decreased the net income 20 per cent.

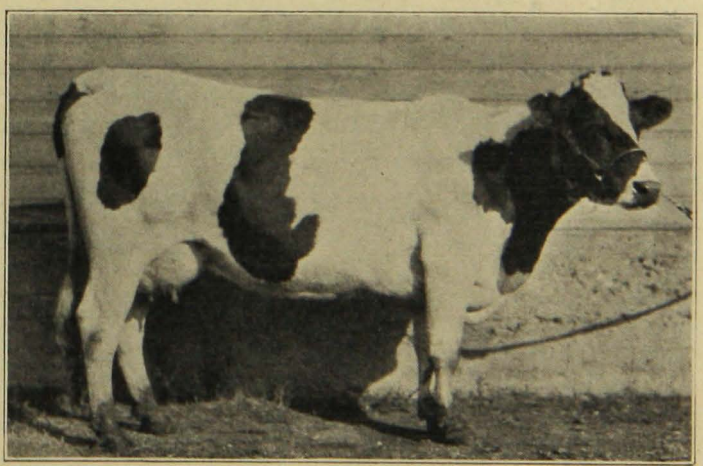


Fig. 4. This grade Holstein cow under improved feeding conditions produced 91 pounds more fat and $32 greater gain above feed cost than was secured on the original owner's farm under poor feed conditions.

This feeding trial clearly demonstrates the fact that it pays to feed a good dairy cow a liberal amount of the proper feeds. The investment in the cow, barn, and equipment, as well as the time given to care for her, make it imperative that she be worked to full capacity. Furnishing her with only a limited amount of feed means that the

portion she can use for production, over and above the amount used for body support, is small and that low production can be expected. Feeding to full capacity makes use of her inherited ability and results in more efficient production.

If all of Minnesota's dairy cows were fed as these cows were they would have produced more than 133 million pounds additional butterfat in a year. The extra product sold at prevailing prices would have given Minnesota dairymen an additional revenue of more than 60 million dollars. Such increased production in dairy sections throughout the country might have a tendency to reduce the price received and in part defeat the very object of better feeding. The safer policy, therefore, would unquestionably be to cull out the poorer cows and furnish the better ones with a liberal supply of the proper feeds. If 682,000, or 40 per cent, of the poorer cows could have been culled out and the rest fed as these cows were, the gross income would still have been as great.

In this discussion of the feeding demonstration and the results obtained, constant reference is made to the gain in production and increase in income due to improved feeding practices. The significance of this is self-evident. Another angle of the business side of dairying presents itself which may not have received the consideration that its importance justifies. Labor, barn equipment, depreciation, interest on the investment, and other overhead costs except that of feed remain practically constant in grade dairy herds when they are milked twice a day, and average production remains within a range of from 177 to 350 pounds of fat per cow. Applying these facts to the results obtained with the four grade cows concerned in this feeding trial, it is found that under poor feeding conditions they returned $28 per cow annually over feed cost, which represents the income to be distributed to labor and other overhead costs except feed. Under improved feeding conditions the same cows returned $57 per cow annually above feed cost. All overhead costs except feed remained about the same at University Farm as on the original owner's farm. Feed costs increased 10 per cent, or $5.94 per cow. Returns over feed cost increased 107 per cent. Dairymen may profit immensely by recognizing the possibilities of increasing production and profits through better feeding without increasing labor and other costs in proportion.

SUMMARY OF RESULTS

A complete summary of the records of the four cows, covering two years on the original owner's farm and two years at University Farm, are given in the following table:

AVERAGE FOR FOUR COWS

	On original owner's farm	At University Farm	Increase	Percentage increase
Milk produced, pounds	4545	6271	1726	38
Fat produced, pounds	177	246	69	39
Value of butterfat (1 year)	$86.88	$122.68	$35.80	41
Feed cost (1 year)	58.86	64.80	5.94	10
Returns over feed cost (1 year)	28.02	57.88	29.86	107
Feed cost per pound of fat	0.34	0.25	—0.09	—26
Returns per $1.00 spent for feed	1.46	1.89	0.43	29

These four cows produced 1726 pounds more of milk containing 69 pounds more of butterfat at University Farm than on the original owner's farm. The additional product was worth $35.80 and was obtained at an outlay of only $5.94, leaving a net income of $29.86. Thus it can be seen that for each added dollar spent for feed the cows returned $5.00. The unusually large returns secured for the small increase in yearly feed cost may be accounted for by the increase in production and economy of home grown feeds as compared to rations made up entirely of purchased by-products. In the roughage provided at University Farm an abundance of protein and mineral matter was supplied, both of which were decidedly lacking in the original owner's ration. Silage furnished succulence, a very important factor in efficient milk production. When these cows were producing an average of 177 pounds of fat yearly, the income per cow over feed cost was $28, while with the increased production of 69 pounds of fat per cow the returns over feed cost per cow were $57.88, a gain of 107 per cent with an increase of only 10 per cent in feed cost. That more economical production of butterfat resulted is shown by the decrease in the cost of feed required to produce a pound of butterfat as well as the increase in returns per dollar spent for feed.

SIMILAR RESULTS SECURED IN DAIRY HERD IMPROVEMENT ASSOCIATIONS

Many examples could be cited from Minnesota dairy herd improvement associations to illustrate that individual herds are not only duplicating but actually surpassing the results obtained in this feeding demonstration. In this trial the increased production was due entirely to better feeding, while in a dairy farmer's herd production and income are increased by culling out the poorer cows and by better feeding of the good cows. An excellent example of what can be accomplished in a relatively short time by following such practices is shown in the following table, which gives information regarding a dairy herd at Garfield, Minnesota.

CTA year	No. of cows	Average fat per cow	Yearly feed cost	Income over feed cost
		lb.		
1923	16	192	$32.65	$58.55
1924	15	273	44.35	85.32
1925	14	325	53.69	100.68
1926	15	317	48.29	102.28

The production of this herd was increased an average of 125 pounds of butterfat per cow during the four-year period. This resulted in a $639 greater net income from the herd in 1926. In response to an inquiry as to the factors responsible for this improvement, the owner says "The increase in production is attributed to weeding out a few boarder cows, raising heifers from a few of my best cows, and improving my feeding practices. When I started testing I found that my cows were under-fed, and the ration lacked protein. At first linseed oilmeal supplied the protein, later alfalfa hay and soybeans took its place in the ration with good results. Corn silage, oats, and barley comprised the rest of the ration. Regularity in feeding, milking, and management plays an important part in successful dairying. The records of the cow testing association made possible the improvement that my herd has shown. Continued testing pays well. It is constant watching and attention to details that count."

FIT GRAIN MIXTURES TO ROUGHAGE AVAILABLE

In the preceding pages the ideal home-grown ration for economical milk production has been discussed. All dairymen do not have the high grade roughage and grains mentioned. In spite of the well recognized advantage of silage and leguminous roughage for the foundation of dairy feeding, many feeders will be obliged to feed more complex mixtures to supply an adequate ration. For those who wish to adjust their feeding practices to obtain greater production and larger returns, the following groups of grain mixtures are recommended. They are taken from Minnesota Experiment Station Bulletin No. 218, "Feeding the Dairy Herd," by C. H. Eckles and O. G. Schaefer.

"As will be noted, the use of alfalfa, clover, or other legume hay will greatly decrease the cost of the grain mixture. Silage or other succulence is desirable in all rations. If no succulence is furnished, the same grain mixture can be fed in somewhat larger amounts, but the results will be less satisfactory. It is assumed in all cases that the cow will be given what roughage she will eat up clean."

Group I

When the roughage consists of corn silage or roots and a legume hay such as alfalfa, clover, or soybean hay, feed one of the following mixtures at the rate shown under "Rules for Feeding."

(1)	Lb.	(3)	Lb.	(5)	Lb.
Ground oats	200	Ground barley	200	Ground corn	200
Ground corn	100	Ground oats	100	Ground oats	100
Ground barley	100	Wheat bran	100	Wheat bran	100

(2)	Lb.	(4)	Lb.	(6)	Lb.
Ground barley	200	Ground oats	300	Ground oats	400
Ground oats	100	Ground corn	200	Ground corn	300
Gluten feed	100	Ground wheat	100	Ground rye	100

Note 1: For cows producing more than one pound of fat daily, add one pound of linseed meal.
Note 2: When silage is not available, feed the same grain mixture but in somewhat larger amounts.

Group II

When the roughage consists of corn silage and mixed hay, one half of which is leguminous and the other half timothy or wild hay, feed one of the following mixtures at the rate shown under "Rules for Feeding."

(1)	Lb.	(3)	Lb.	(5)	Lb.
Ground oats	300	Ground oats	200	Ground corn	200
Linseed meal	150	Ground barley	200	Ground oats	200
Ground barley	100	Wheat bran	100	Wheat bran	200
Ground corn	100	Linseed meal	100	Cottonseed meal	100

(2)	Lb.	(4)	Lb.	(6)	Lb.
Ground oats	200	Ground oats	400	Wheat bran	100
Ground wheat	150	Ground barley	300	Ground barley	100
Wheat bran	100	Linseed meal	200	Gluten feed	100
Linseed meal	100				

Note: When silage is not available, feed the same grain mixture but in somewhat larger amounts.

Group III

When the roughage consists of corn silage and timothy hay, wild hay, or corn stover, feed one of the following mixtures at the rate shown under "Rules for Feeding."

(1)	Lb.	(3)	Lb.	(5)	Lb.
Ground barley	100	Ground corn	100	Ground oats	300
Ground oats	100	Ground oats	100	Linseed meal	200
Wheat bran	100	Wheat bran	100	Ground corn	100
Linseed meal	100	Cottonseed meal	100	Ground barley	100

(2)	Lb.	(4)	Lb.	(6)	Lb.
Ground oats	300	Ground barley	400	Ground oats	250
Wheat bran	300	Wheat bran	300	Ground barley	250
Cottonseed meal	200	Linseed meal	300	Linseed meal	200
Ground barley	150				

Note: When silage is not available, feed the same grain mixture but in somewhat larger amounts.

Rules for Feeding

"1. Feed all the roughage a cow will eat. This should include a succulent roughage and legume hay.

"2. With a good roughage, as alfalfa, soybean, or clover hay, feed a Jersey or Guernsey one pound of grain to each 2½ to 3 pounds of milk; a Holstein, Ayrshire, Brown Swiss, or Shorthorn, one pound of grain for each 3 to 3½ pounds of milk.

"3. With a poor roughage such as timothy or wild hay, feed a Jersey or Guernsey one pound of grain for each 2 pounds of milk; a Holstein, Ayrshire, Brown Swiss, or Shorthorn, one pound of grain for each 2½ to 3 pounds of milk."

Any of the grain mixtures when fed with the roughages indicated will make balanced rations for cows producing up to a pound of fat per day. For cows producing a pound or more per day, some high protein feed should be added.

CONCLUSIONS

1. Profitable production of butterfat was secured from average Minnesota cows fed entirely on home-grown feeds.

2. A comparison of results secured by changing a group of poorly fed cows to a suitable ration shows an increase of 10 per cent in feed cost, 38 per cent in milk production, 39 per cent in butterfat production, and 107 per cent in income over feed cost.

3. The larger production secured with the use of home-grown feeds resulted in lowering the cost of production per pound of butterfat 26 per cent and increasing the returns per dollar spent for feeds by 29 per cent.

4. When alfalfa hay replaced timothy hay it was possible to obtain an adequate ration having the proper balance of nutrients from such farm-grown feeds as corn silage, alfalfa hay, corn, oats, and barley.

5. Increased production secured through better feeding practices invariably shows a substantial increase in net return over feed cost, which is secured without materially increasing labor and other overhead costs.

6. The results of the feeding practices here described present two alternatives to the dairyman: (1) To increase his present income through adequate feeding of good cows and maintain the number of cows for which he is equipped. (2) To cull his cow herd by about one-third and have as large an income from those remaining as he formerly obtained from the entire herd.