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Limited-Grain Feeding and All-Year Pasture for Dairy Cows

University of Tennessee Agricultural Experiment Station

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THE UNIVERSITY OF TENNESSEE
AGRICULTURAL EXPERIMENT STATION

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By

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Half-grain group.

KNOXVILLE, TENNESSEE

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LIMITED-GRAIN FEEDING AND ALL-YEAR PASTURE FOR DAIRY COWS

By

C. E. WYLIE AND L. R. NEEL[1]

INTRODUCTION

Pasture is a large factor in the cost of milk production. The better the grazing, the less need for concentrates. It is important, therefore, that a study be made of the effect of pasture on milk production, and the feed cost of milk when cows have ample pasture and when they have not. The object of the experiment reported in this bulletin was to compare limited-grain feeding and all-year pasture with full-grain feeding and summer pasture. The experiment was begun February 15, 1933, and continued 4 years, to February 15, 1937.

CATTLE

The cattle used were registered Jerseys, located at the Middle Tennessee Experiment Station, Columbia. They were divided into two groups, as nearly equal as possible in milk production, age, period of lactation, and condition. Heifers, as they came fresh, were added to the groups alternately. From time to time, for various reasons, cows were dropped from the experiment. In the number of cows, the groups were kept as nearly balanced as possible so that each group consisted of 7 cows, on the average, for the entire period. A total of 14 cows were used in each group.

RATIONS

The rations fed were as follows:

Group 1—Full-grain:

Alfalfa hay, ad libitum
Corn silage, 3 lbs. per 100 lbs. live weight
Concentrates, 1 lb. to 3 lbs. milk
Pasture, April to October, inclusive

Group 2—Half-grain:

Alfalfa hay, ad libitum
Corn silage, 3 lbs. per 100 lbs. live weight
Concentrates, 1 lb. to 6 lbs. milk
Pasture, winter and summer (as weather permitted)

In midsummer the pasture included bluegrass, lespedeza, and Sudan grass. During the remainder of the year it included bluegrass, hop clover, white clover, and barley and rye. The concentrate mixture consisted of equal parts of cottonseed meal, corn-and-cob meal, and ground oats. In all cases the hay used was medium-to-good alfalfa. The silage was a good grade of corn-sorghum.

[1]Miss Monroe Biddle and Mr. H. B. Henderson rendered valuable assistance in tabulating and checking records.

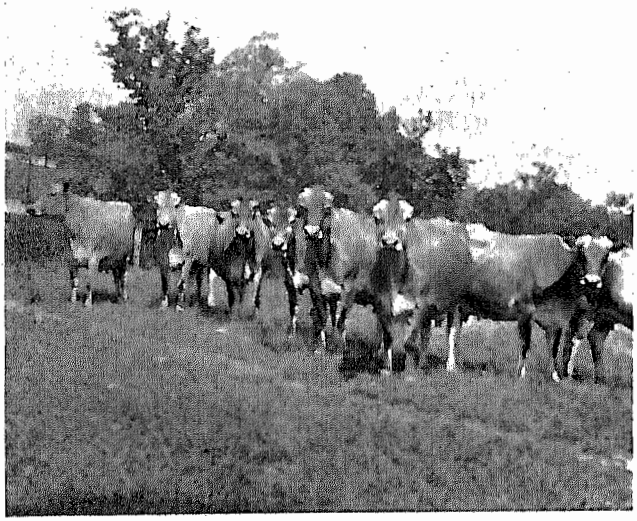

Fig. 1—Full-grain group.

SEASONS AND CROPS

1933.—This was a nearly normal year; the summer temperature, however, was somewhat above long-time average. Rye and crimson clover pasture was abundant, except in the 1932-33 midwinter period of about 2 months. The bluegrass and white- and hop-clover pasture was excellent from early April until sometime in July, and was medium during the latter part of September and through October. Throughout the experiment the Sudan grass generally was not used before July, being good through July and August and medium to fair in September.

1934.—The winter of 1933-34 was normal, and was followed by good growing weather in the spring. The late summer drouth was broken by rain in September, which produced unusually favorable pasture conditions in the fall and early winter. The lespedeza pasture was used to good advantage during part of the summer. Otherwise, the pasture was about the same as in 1933.

1935.—The winter temperature of 1934-35 was below normal, and there was a 7-inch snow that lasted 3 weeks. This lowered the value of winter pasture. The good growing weather in the spring and summer was followed by a rather unfavorable dry fall. In the summer, Korean lespedeza was used during part of the hot weather.

1936.—The 1935-36 winter temperature was much below normal. There was a long-continued freeze, and zero and sub-zero temperatures occurred several times. The spring and early summer were dry,

breaking all records. The drouth ended early in July, with a record rainfall for the month. The fall was drier and colder than normal. On the whole it was an unsatisfactory pasture year. No Sudan grass was used in the summer, but fields of Korean and common lespedezas were available. For this reason the feeding of hay during the pasture season was very heavy.

FEED CONSUMED

Table 1 shows the average feed consumed per cow per year for the 4 years. It will be noted that group 2 (half-grain) consumed approximately half as much concentrates per cow as group 1 (full-grain), and 554 pounds less hay and 655 pounds less corn silage. At the same time, group 2 was on pasture about 150 more days per year than group 1.

TABLE 1—*Feed consumed per cow per year.*

4-year average for 7 cows

Group	Grain	Concentrates	Hay	Silage	Pasture
		Pounds	Pounds	Pounds	Days
1	Full, 1:3	1836	3348	4988	198
2	Half, 1:6	974	2794	4328	346

PRODUCTION

As shown in table 2, group 1 produced slightly more milk and butterfat than group 2, but the difference was too small to be considered of any significance.

TABLE 2—*Production per cow per year.*

4-year average for 7 cows.

Group	Grain	Milk	Butterfat
		Pounds	Pounds
1	Full, 1:3	6442	376
2	Half, 1:6	6265	367

FINANCIAL STATEMENT

The prices given in table 3 for feed and butterfat were based on market prices for each month throughout the 4 years. This illustrates the situation which a dairyman must face. It will be noted that the

TABLE 3—*Financial statement.*

4-year average for 7 cows.

Group	Grain	Feed cost per cow per year	Value of butterfat per cow per year	Feed cost per cwt. milk	Feed cost per pound fat	Income over cost of feed per cow per year
1	Full, 1:3	$55.87	$129.42	$0.835	$0.143	$73.96
2	Half, 1:6	$44.53	$127.13	$0.677	$0.116	$82.59

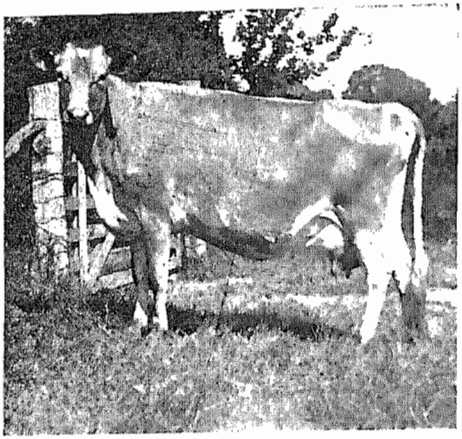

Fig. 2—U. T. Fauvic Bessie 975110, in the full-grain group, produced 433 pounds of butterfat in one year.

total value of the fat per cow per year was almost the same for the two groups, being slightly higher for group 1, with a total of $129.42. The feed cost per 100 pounds of milk was considerably lower for group 2, being 67.7 cents, as compared with 83.5 cents for group 1. A similar difference is noted in the feed cost per pound of butterfat, which was 11.6 cents for group 2 and 14.3 cents for group 1. The difference in the feed cost of production accounts for the difference in the income over feed cost per cow. The income over feed cost per cow per year was $73.96 for group 1 and $82.59 for group 2.

The prices used for home-grown feeds are based on wholesale prices at supply houses. Purchased feeds are counted at prices actually paid. Prices given for milk are those received at the milk plant in Columbia.

SEASONAL VARIATION

There was considerable variation from year to year in the milk production and in the feed cost. The highest milk production occurred in the year 1934, when group 1 produced 403 pounds of butterfat per cow and group 2 produced 363 pounds. The lowest production occurred in the year 1935, when group 1 produced 325 pounds of butterfat per cow and group 2 produced 349 pounds.

The month-to-month variations are of no significance, as one group would lead for awhile and then the other, according to dates of calving. The lowest feed cost of milk production was recorded in the year 1934, when it averaged 71 cents per 100 pounds for group 1 and 61 cents for group 2. The feed cost of butterfat in the same year was 12 cents per pound for group 1 and 10.3 cents for group 2. The lowest feed cost per 100 pounds of milk produced in any one month was 33 cents for group 1 and 31 cents for group 2, in May, 1934. In the same month the feed cost per pound of butterfat was 5.6 cents for group 1 and 5.1 cents for group 2. The highest feed cost for any one month in 1934 occurred in March. For group 1 the feed cost was $1.17 per 100 pounds of milk and 18.4 cents per pound of

butterfat; for group 2 the feed cost was $1.43 per 100 pounds of milk, and 24 cents per pound of fat.

The milk and butterfat production of group 1 was greater than that of group 2 for the years 1933 and 1934, but less for 1935 and 1936.

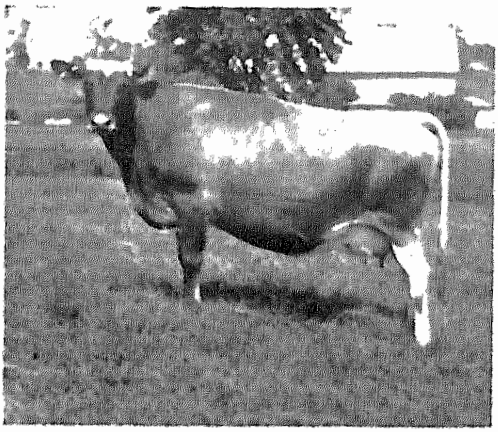

Fig. 3—G. T. Fauvic Lass 975189, in the half-grain group, produced 348 pounds of butterfat in one year.

PERCENTAGE COMPARISON OF GROUPS

A comparison of the two groups is given in table 4—group 1 being taken as 100 percent in all items. Group 2 rates 53 percent in consumption of concentrates, and 83 and 87 percent, respectively, in consumption of hay and silage. In number of days on pasture, group 2 is 175 percent, or 75 percent above that for group 1. In production of both milk and butterfat, group 2 stands at 97 percent, while in income over feed cost it is 111 percent, or 11 percent higher than group 1.

TABLE 4—*Comparison of full-grain and half-grain groups on a percentage basis.*

Item	Group 1	Group 2
	Percent	Percent
Concentrates consumed per cow	100	53
Hay consumed per cow	100	83
Silage consumed per cow	100	87
Pasture days	100	175
Milk produced per cow	100	97
Butterfat produced per cow	100	97
Feed cost per cow	100	80
Value of butterfat per cow	100	98
Feed cost per cwt. of milk	100	81
Feed cost per pound of fat	100	81
Income over cost of feed per cow per year	100	111

RESULTS AT OTHER STATIONS

A number of other experiment stations have followed a similar plan in the feeding of dairy cows.

The Montana Station (1), in cooperation with the United States Bureau of Dairy Industry, obtained the results shown in table 5.

TABLE 5—*Production and feed cost of production at Montana Station.*

Ration	Actual production		Feed cost	
	Milk	Butterfat	100 pounds milk	1 pound butterfat
	Pounds	Pounds		
Roughage	13295.2	464.1	$0.595	$0.170
Limited-grain (1:6)	16607.2	576.5	$0.595	$0.172
Full-grain (1:3)	15793.3	544.4	$0.755	$0.219

The following is from the Massachusetts Station (3):

"This bulletin reports the results of an investigation, three and one-half years in length, on the relative merits of two systems of feeding dairy cows. One of these systems involved the feeding of a relatively large amount of roughage and a relatively small amount of grain; the other involved the feeding of a relatively small amount of roughage and a relatively large amount of grain. The Station herd was divided into two groups which for convenience have been designated the high roughage and low roughage groups. The high roughage group received approximately one pound of grain for each 4½ pounds of milk produced, 35 pounds of silage, and as much hay as they would clean up. The low roughage group received approximately one pound of grain for each 2½ pounds of milk produced, 20 pounds of silage, and hay as above . . . .

"The cows in the low roughage group produced more milk on both a daily and a yearly basis. Their lactations were slightly shorter but so also were their dry periods, so that their average productive period per calendar year was slightly higher . . . .

"Feed cost of milk production was practically the same for both groups. The high roughage system, however, involves a smaller cash outlay; and an additional saving may be effected where that system is used if the farmer is able to grow his roughages for less than the current market price."

The Louisiana Station (4) used full grain, limited grain, and no grain, and found that "Cows full fed on grain apparently increased milk production 60 percent over roughage alone, 10 to 15 percent over low grain, and 10 percent or less over limited grain feeding."

Results at the Wyoming Station (6) from the feeding of 13 cows, divided into two groups, in a grain versus no-grain experiment, are shown in table 6.

TABLE 6—*Production in Wyoming experiment.*

Group	Milk	Butterfat
	Pounds	Pounds
No grain	9,386	310
1:5 grain	10,180	328

The results of an experiment comparing a full-grain with a no-grain ration at the West Tennessee Station (2) are given in table 7. In this case the two groups grazed together throughout the year on excellent pasture.

TABLE 7—*Feed consumed and production per cow per year.*

Group	Grain	Alfalfa hay	Silage	Pasture	Milk	Fat
	Pounds	Pounds	Pounds	Days	Pounds	Pounds
No-grain	0	2246	2206	340	5883	342
Full-grain	1979	1864	1933	340	6659	373

The U. S. Bureau of Dairy Industry (5) reports the results of an experiment at Lewisburg, Tennessee, as follows:

"The roughage feeding experiment, in which Jersey cows are fed a ration of machine-dried hay and pasture with no grain for entire lactation periods, has progressed to the point where there are 16 records made under this system of feeding that are comparable to records made by the same cows in another lactation period when they received a full-grain ration. The 16 records on roughage alone average 6,333 pounds of milk and 329 pounds of butterfat, which was 67 percent as much milk and 62 percent as much butterfat as the same cows produced when fed grain in addition to roughage."

SUMMARY AND CONCLUSIONS

Good cows may make a reasonable production with a limited amount of grain if adequate pasture and roughage are provided.

Good pasture and roughage reduce the amount of grain required and at the same time lower the feed cost per unit of milk production.

The milk and butterfat production was slightly lower on a limited-grain ration than on a full-grain ration, but the income over feed cost was greater.

A half-grain ration required, in addition to good pasture, approximately ½ ton concentrates, 1½ tons hay, and 2 tons silage per cow per year.

A good all-year pasture for dairy cows may reduce the concentrate requirements as much as ½ ton per cow per year, or approximately 50 per cent, below the requirements of average summer-pasture practice.

An all-year program of good pasture, with adequate concentrates and silage, reduces the cost of milk production and the amount of land and labor required for grain growing.

LITERATURE CITED

1. Dickson, W. F., and Kopland, D. V. Feeding dairy cows with and without grain. Mont. Agr. Exp. Sta., Bul. 293. 1934.

2. Hazlewood, Ben P. All-year pasturing with and without concentrates for dairy cattle. Tenn. Agr. Exp. Sta., Cir. 58. 1936.

3. Lindsey, J. B., and Archibald, J. G. Two systems of feeding dairy cows: High roughage and low grain versus low roughage and high grain. Mass. Agr. Exp. Sta., Bul. 291. 1932.

4. Lush, R. H. Grain as a supplement to pasture and other roughage for milk production. La. Agr. Exp. Sta., Bul. 241. 1933.

5. Reed, O. E., Report of the Chief of the Bureau of Dairy Industry, U. S. D. A., 1937, pages 17, 18, and 34.

6. Willard, H. S. Grain versus no grain for dairy cows. Wyo. Agr. Exp. Sta., Bul. 202. 1934.