TABLE 1. AVERAGE CHEMICAL COMPOSITION OF HAY

	Crude protein	Modified crude fiber
	Per cent (Dry matter basis)	
Hay fed		
Control	19.56	30.07
Low quality	18.71	36.50
Hay refused		
Control	12.08	43.70
Low quality	10.28	51.77

TABLE 2. DAILY MILK PRODUCTION AND COMPOSITION

	Mean	Control minus low quality hay
Milk, lb	39.1	2.3**
Fat, lb	1.53	0.08**
4% FCM, lb	38.6	2.2**
S.N.F., lb	3.46	0.26**
S.N.F., %	8.85	0.14**
Fat, %	3.92	0.03

** Significantly different at $P<0.01$

TABLE 3. DAILY DRY MATTER AND CRUDE PROTEIN CONSUMPTION FROM HAY

	Mean	Control minus low quality hay
Dry matter, lb	27.30	5.79**
Crude protein, lb	5.94	1.43**

** Significantly different at $P<0.01$

Hay was fed "free choice" morning and evening. Core samples were taken from each bale of hay, and the hay was weighed for each feeding. The weight of the refused hay was recorded each week, and grab samples were taken for analysis.

The cattle in both groups received the same concentrate mix which was fed in the milking parlor at the ratio of 1 lb of concentrate to 4 lbs of milk. A "teaser" of 4 lbs per day was given to all cows. Average concentrate intake by all cows on the trial was 13.8 lbs per day.

Milk weights were recorded at each milking, and proportionate samples of milk were taken to make a weekly composite for fat and solids-not-fat determinations. The Babcock testing method was used for fat, and the Golding bead testing method was used for solids-not-fat determinations.

The U.C. modified crude fiber content (MCF) method for prediction of total digestible nutrients was used on all hay samples. Crude protein analyses were conducted on all feed samples. The results of these analyses are shown in table. 1. The control hay was 0.85% higher in protein and 6.43% lower in MCF than the lower quality hay.

Milk production data are shown in table 2. The average amount of milk produced during the trial was 39.1 lbs per day. When fed the control hay, the cows produced 2.3 lbs more than when fed the low quality hay. There were differences of 0.08 lb of milk fat, 2.2 lbs of 4% fat-corrected milk (FCM), 0.26 lb of solids-not-fat (SNF) and 0.14% SNF in favor of the control hay. All of the above differences were statistically highly significant ($P<0.01$). Of the measurements recorded, only the milk-fat percentage showed no significant difference between treatments.

The palatability of the low quality hay also was affected as evidenced by the hay consumption figures in table 3. Average dry matter consumption of hay was 27.3 lbs per day with a difference of 5.79 lbs in favor of the control hay. The crude protein intake was 1.43 lbs greater on the control hay. Both of these differences also were statistically highly significant ($P<0.01$).

The economic analysis of the trial would be difficult to extend to other management conditions. The decrease in feed costs in this trial, due to the decreased consumption of the lower priced, low quality hay, was greater than the monetary value of the milk lost due to the low quality hay. However, it should be recognized that the trial lasted only nine weeks and the cattle were fed the low quality hay for periods of only three weeks. The effects of feeding low quality hay might have brought about a greater decrease in production and loss in income if the fat reserves of the cows fed the lower quality hay were depleted by a longer feeding period.

The results of this trial demonstrate the depression in hay intake and milk production that takes place when poor quality hay is fed to dairy cows. Grade B dairymen may be able to make short-term savings in feed costs by using discounted low quality hay. However, grade A dairymen desiring to maintain a continuous high level of milk production in their herds must continually feed high quality hay. The economic advantages in purchasing discounted low quality hay, if they exist, may be nullified at a later date if the cows deplete their body fat reserves.

The best method for assuring the purchase of high quality hay remains the modified crude fiber analysis for prediction of total digestible nutrient content developed by the California Experiment Station. When this chemical analysis is used in conjunction with visual inspection of the hay, the dairyman can be sure that he is using the best tools available today for evaluation of hay quality.

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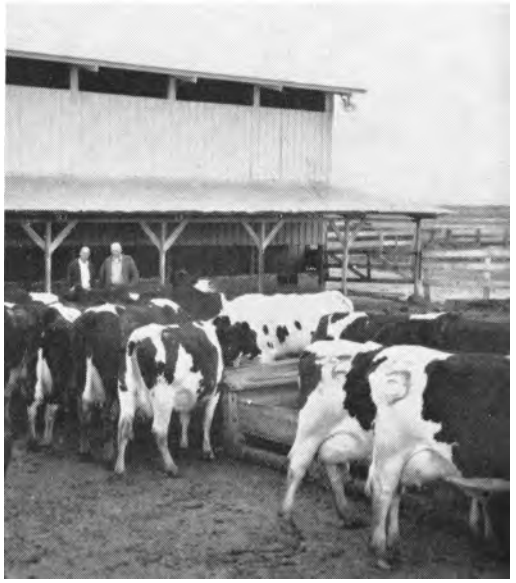

CORN SILAGE production in San Joaquin County has doubled in the last five years because of higher yields, as well as increased acreage. Because much of this silage is used for dairy cattle feed, and little information has been available as to its relative value under current California conditions, feeding trials were needed.

The trial reported here involved a comparison between corn silage and alfalfa hay, each fed once a day, and alfalfa hay fed twice a day for four-week periods. It was conducted in cooperation with Deuel Vocational Institution, Tracy. Sixty Holstein cows, averaging 80 days post-calving (range 23 to 135 days) were paired according to lactation number, stage of lactation, and previous and present milk production. One member of each pair was allotted randomly to one of two experimental groups and its pair-mate was put into the other group.

A double-reversal design was used in the feeding trial. One group was fed corn silage (S) at the morning feeding and alfalfa hay (H) at the afternoon feeding for four weeks. During the second 4-week period, they received alfalfa hay twice a day (H-H). The S-H schedule was then repeated during the third 4-week period. The other group of cows started on the H-H schedule, were changed to S-H during the second period, and returned to H-H for the third period. No digestive or physiological disturbances were noticed when abrupt changes were made at the beginning of each period. Milk production and feed intake data from the last three weeks of each period were used in the statistical analysis of the results—treating the first week as a change-over period.

CORN SILAGE AND ALFALFA HAY FOR LACTATING DAIRY COWS

GRANVILLE A. HUTTON, JR. · DONALD L. BATH

Corn silage for the trial was stored in bunker silos and covered with black polyethylene. Baled alfalfa hay was purchased locally. Daily weights of alfalfa hay fed were estimated by multiplying the number of bales fed by the average bale weight. Corn silage was fed from a trailer which was weighed each morning before and after feeding.

Corn silage and alfalfa hay were fed free-choice in generous amounts to insure refusals, which were weighed weekly. A commercial concentrate mix was fed in the milking barn at the rate of 1 lb for each 3 lbs of milk produced. Grain allotments were adjusted at the beginning of each period, based upon the milk production of the previous month. An average of 16 lbs of a concentrate mix was fed to each cow during the trial.

Representative samples of all feeds fed (and refused) were taken weekly for dry-matter determinations and proximate analyses. Modified crude fiber content also was determined on alfalfa hay fed to estimate its total digestible nutrient (TDN) content. The TDN content of the corn silage was calculated from the Pennsylvania State University Forage Testing Service formula which is based upon the crude protein and crude fiber content of the silage. The average chemical analyses of all feeds, fed and refused, are listed in table 1.

Daily milk weights were recorded for all cows to the nearest pound. One-day composite samples of milk were taken weekly for milk-fat determinations. The occurrence of mastitis caused four cows and their pair-mates to be removed from the trial, leaving data from 26 cows per test for the statistical analysis of the results.

TABLE 1. COMPOSITION OF FEEDS

Feed	Dry matter	Crude protein	Ash	Fat	Crude fiber	N.F.E.	Modified crude fiber	Calculated TDN (as fed)
Offered:	%	Per cent (dry matter basis)						
Alfalfa hay	89.4	18.4	12.4	2.0	27.4	39.8	29.4	50.0
Corn silage	28.8	7.7	7.4	4.4	23.1	57.4	...	20.1
Concentrate mix	89.7	18.6	8.2	3.0	7.1	63.1	...	...
Refused:								
Alfalfa (H–H)	82.6	12.2	26.0	1.0	29.8	31.0		
Alfalfa (S–H)	78.0	12.1	37.9	1.2	22.7	26.1		
Corn silage	26.7	9.1	19.6	2.2	20.0	49.1		

Results

There was a highly significant difference ($P<0.01$) in milk fat test, milk fat, and 4% fat-corrected milk (FCM) in favor of the S-H feeding schedule (table 2). On the basis of a 30-day month, the cows receiving the corn silage and alfalfa hay produced 1.8 lb of fat and 29.4 lbs of FCM more than cows receiving alfalfa hay as the only roughage.

The S-H cows consumed less dry matter and produced more milk than the H-H cows, but these small apparent differences were not statistically significant. The average dry matter percentages of the corn silage and alfalfa hay were 28.8% and 89.4%, respectively (table 1); therefore, it required 3.1 lbs of corn silage to provide the same amount of dry matter as 1 lb of hay.

It should be noted that the alfalfa hay used in this trial was below average quality (only 50% TDN as fed, compared with average alfalfa hay fed to dairy cows in California estimated at 52% TDN by the California State Department of Agriculture). The calculated TDN of the corn silage used in this trial was 20.1% on an as-fed basis.

Milk fat production might not have been increased by corn silage feeding if the alfalfa hay with which it was compared had been the average quality fed to dairy cows in California. However, with corn silage and alfalfa hay of the quality used in this trial, a dairyman could expect a slightly higher milk fat test and milk fat production from his cows when both corn silage and alfalfa hay are fed rather than hay alone.

TABLE 2. AVERAGE DAILY MILK PRODUCTION AND FEED CONSUMPTION

	Mean	Increase from S-H over H-H
Milk (lb)	48.27	0.06
Milk fat (%)	3.51	0.13**
Milk fat (lb)	1.69	0.06**
4% FCM (lb)	44.61	0.98**
Roughage DM intake (lb)	29.90	–0.61

** Statistically significant at the .01 level.

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