moisture milo for the balance of the trial. The change from barley to milo was not abrupt, since the milo was stored on top of the barley and some mixing occurred as the grain was augered from the tank. Prior to blending with the hay-and-molasses mix, the high-moisture grain was run through a crimper which was powered by a 10 h.p. electric motor. The speed setting on the auger motor had to be adjusted from time to time to insure a precalculated delivery rate of high-moisture grain from the tank. An error in the setting during part of the trial resulted in the high-moisture-grain group receiving somewhat less than 15 lbs per head daily over a three-week period.

Once each month during the course of the trial the heifers were weighed individually. Standard monthly DHIA production records were used in determining the milk production of the cows in the trial. The moisture contents and proximate analyses of the feed ingredients (on a dry matter basis) fed during the trial are shown in table 1. Milk production and weight gain data are shown in table 2. None of the differences between the two groups shown in table 2 was statistically significant. Five cows in the control group and two in the high-moisture grain group were culled during the trial. This left 23 in the control and 26 in the high-moisture grain group from which the milk production data was calculated. Weight gain data were used from all 56 cows while they were in the groups, whether or not they completed the full seven months of the trial.

Even though production data from the two groups were not statistically different, an economic analysis of the input-output relationships showed a monetary advantage for the high-moisture-grain group—under the price structure and operating conditions at this particular dairy.

Whether high-moisture grain is more economical to feed than dry grain, or a concentrate mix, is dependent on several factors: (1) the price of the high-moisture grain; (2) the price of dry grain or a concentrate mix; (3) whether the silo is filled once or twice each year; and (4) overhead charges (silo cost, interest, electricity, repairs, etc.). These factors are variable from one dairy to the next and each dairyman must figure the economics of high-moisture-grain feeding for his own situation.

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Effects of hay quality on milk production and hay intake by dairy cows

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ALFALFA HAY usually provides at least half of the roughage used for California milk production by dairy cows during some portion, if not all, of the 365 days of the year. It may be the only source of nutrients for dairy cows on grade B dairies during the winter season. Selection of alfalfa hay is a major management consideration for California dairymen because the nutritive value and feeding quality are highly variable. An accurate gauge of the nutritive value of a given lot of hay is the level of crude fiber it possesses. A method for evaluating nutritive value from the crude fiber content has been developed by the California Experiment Station. Commercial laboratories, using this method, have been available to test samples of hay submitted by progressive dairymen.

A special opportunity to test the hay sampling and evaluation concept occurred in 1965 when, on August 12, a 0.97-inch rain fell in the Sacramento Valley town of Orland, wetting approximately 10 tons of fourth cutting alfalfa hay in the swath. It was sold to Chico State College dairy at a discounted price. The previous cutting of hay from the same field, which had a lower crude fiber content, had also been purchased by the college. Both lots of hay were leafy, retained good green color, were free of weeds or any signs of mustiness, and showed bloom in the bale.

A trial testing production response of milk cows fed the low quality hay as compared with higher quality hay (made from the same field at the previous cutting) was conducted at the Chico State College dairy in cooperation with the University of California Agricultural Extension Service. The higher quality, lower fiber hay is referred to as the "control hay" in this report.

Twenty-two cows were selected for a double reversal trial, and were divided into two groups of 11 cows each, penned in adjoining lots. One cow became ill and was removed from her group; a like animal was taken from the other group to compensate. One group of cows was fed the low quality hay for the first three weeks of the trial. For the next three weeks they were fed the control hay, and then returned to the low quality hay for the final three weeks of the trial. The other group started on the control hay, was switched to the low quality hay during the second period, and returned to the control hay during the third period. Milk production and feed consumption data from the last two weeks of each period were used in the analysis of the results, with the first week used as a changeover period.

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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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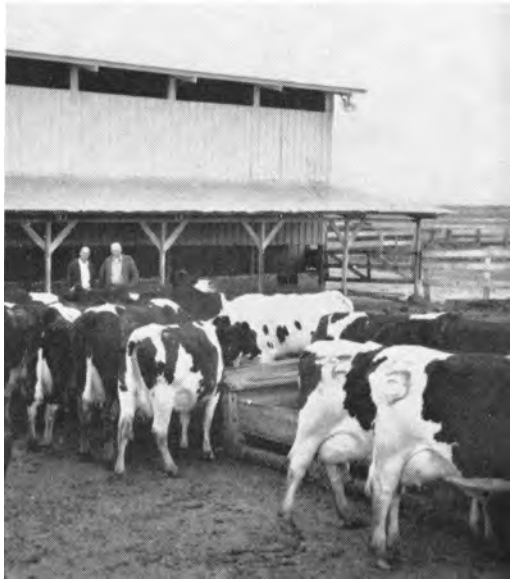

CORN SILAGE production in San Joaquin County has doubled in the last five years because of higher yields, as well as increased acreage. Because much of this silage is used for dairy cattle feed, and little information has been available as to its relative value under current California conditions, feeding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