Management Programs and Techniques used in some Top California Dairies

D.L. Bath, Ph.D.
Extension Dairy Nutritionist
University of California, Davis

As herd sizes have become larger and milk production potential has increased due to genetic progress, it has become more difficult to fulfill the nutrient requirements of high producing dairy cows, especially in early lactation. The problem is compounded by the fact that maximum voluntary feed intake usually is not reached by dairy cows until about 14 weeks following parturition whereas maximum milk production usually occurs about seven weeks after calving. This results in a negative energy balance and weight loss by cows in early lactation due to use of body fat reserves as a source of energy for milk synthesis. To take advantage of the milk production potential of modern dairy cows, feeding programs must be designed to maximize nutrient intake in early lactation. This is important for several reasons. It allows the cow to reach her maximum milk production per lactation because full lactation milk production is heavily dependent on the peak production attained by the cow during the first two months. High nutrient intake also reduces the time that a cow is in negative energy balance and the amount of body weight lost in early lactation. This is important for reproduction as well as for milk production. Conception rates are higher if cows are bred when they are gaining weight rather than losing weight.

Rations for cows in mid-lactation, late lactation, and during the dry period should be lower in nutrients, particularly energy, than rations for early lactation cows. This usually is accomplished by feeding more roughages and less concentrates to cows as they go through the lactation cycle. If cows are fed high levels of concentrates in late lactation and the dry period, they become overly fat and are more susceptible to a variety of metabolic disturbances commonly referred to as the "fat cow" syndrome. This includes dystocia, retained placenta, metritis, displaced abomasum, ketosis, and milk fever. Frequently more than one occur almost simultaneously making it difficult to know which is the primary problem and which is secondary. Thus, it is important to design a feeding program which allows cows to regain body weight lost in early lactation without allowing them to become overly fat before their next parturition.

Feeding varying amounts of concentrates to cows at different levels of milk production is the most common method of allotting feed according to the nutrient needs of lactating cows. This method is relatively easy to implement in small herds where cows are fed individually in stanchion barns. However, it is more difficult in large herds, particularly if the cows are in a loose housing arrangement and are milked in a milking parlor.

One of the methods used by many California dairymen to overcome the problems of feeding according to production in large herds is to divide the herd into several groups according to level of milk production and stage of lactation. Some of the advantages and disadvantages of this method of feeding management are:
ADVANTAGES

1. Concentrates can be liberally fed to high producers without overfeeding low producers, resulting in better feed efficiency.

2. Better control of both roughage and concentrate feeding is possible, which facilitates adjustment to changes in concentrate-roughage price relationships.

3. All or part of the concentrates can be fed outside.

4. Fresh cows are together, making it easier to locate those requiring post-calving treatment.

5. Cows to be bred can be limited to 1 or 2 corrals for easier heat detection.

DISADVANTAGES

1. It is difficult to keep all the purebred cows together in herds that include both purebreds and grades.

2. Cows must be moved regularly.

3. Injuries from fighting may occur and milk production of some cows may drop when they are moved, particularly if feeding space is inadequate. This problem tends to subside with time as cows become accustomed to periodic movement between strings.

4. Construction of additional facilities may be required.

5. Remodeling of the milking system may be necessary to handle the large flow of milk in the milk lines when the higher-producing cows are milked together as a string.

GUIDELINES

A sound management approach is necessary to make the feeding system work when cows are grouped by level of production. Some guidelines that have proven helpful on many large dairies using this system are as follows:

1. Divide a herd by production level into 4 strings if possible to reduce milk production variation within strings. More strings are desirable in large herds where corrals and facilities are available. Milk production of cows moved from one string to another is not likely to drop markedly if rations between strings do not drastically differ. Dry cows should be handled in a separate group. Handling first-calf heifers in a separate string also has many advantages because of their smaller size.

2. When fresh cows have recovered from calving and are ready to enter the milking herd, put them in the string fed the most concentrates and leave them there for at least 2 months to allow them to reach their maximum inherited ability for milk production.
3. Regulate the number of cows in a string to fit into regular milking and feeding procedures.

4. Move cows between strings on a regular schedule and move small groups of cows. This requires a catch pen or lock-in stanchions. Cows can then be released and moved to a new corral without disrupting the whole string.

A system for moving cows that has worked well is illustrated in Figure 1. The example is for a 400-cow milking herd, but the principle can be adapted to other sizes. The herd is divided into 4 strings of milking cows with 100 cows per corral. Cow movement is based on a 10 to 15 day cycle.

![Diagram of cow movement](image)

**FIG. 1. Movement of cows between production strings.**

All fresh cows enter Corral 1 a few days after calving. Let us assume that 10 cows (one per day) have entered Corral 1 during the past 10 days. The 10 lowest-producing cows (fat-corrected milk basis) in Corral 1 that have been fresh more than 60 days are moved to Corral 2. The procedure is repeated in Corrals 2 and 3. In Corral 4, 10 cows are dried up and moved to the dry cow pen. This procedure is repeated every 10 to 15 days so that there are never large numbers of cows to move, thus minimizing the commotion and confusion that results when large groups of cows are moved from corral to corral.

5. Provide each string with adequate manger space so all cows can eat at the same time. For mangers equipped with stanchions there should be about 110% as many stanchions as cows normally in the string to allow for temporary variations in numbers. This permits recently moved cows to eat without necessarily going through the string's pecking order.

6. Feed each string based on the requirements of that string's higher producers. Milk production of higher producers will decrease if the ration is formulated for the average production of the string.

7. Reformulate the total feeding program for each string whenever there is a change in the basic ingredients fed, particularly the roughages.

8. Concentrates can be allotted in various ways:
   a. All concentrates can be mixed with the roughages into a complete ration and fed outside of the milking barn.
b. The same amount of concentrates can be fed to all cows in the milking barn with different amounts group-fed with the roughages outside according to the level of production of the string.

c. Amounts can be varied both in the milking barn and in the outside mangers.

9. Allot enough extra feed to cows in late lactation for development of unborn calves and for regaining any weight lost in early lactation. Weight gain in late lactation is more efficient than during the dry period.

10. When hay and concentrates are mixed for outside feeding, less feed separation and dustiness occur if the mix is moistened prior to feeding. Moistening is not necessary when silage or other succulent feeds are included in the mixed ration.

11. Provide adequate water facilities for each string.

12. Design the corral and/or free stall housing to provide easy movement of cattle to and from the milking barn.

DHI-EDP REPORTS

Some computing centers processing DHIA records also provide on request a listing of all cows in the herd ranked by fat-corrected milk for the previous test day. This list can be used by dairymen to decide which cows should be moved to the lower-producing groups as fresh cows enter the milking herd, thus making it much easier to set up and maintain milk production strings in large herds.

COMPUTER-FORMULATED RATIONS

Another tool utilized by some California dairymen is on-farm computer terminals. Computer terminals connect over telephone lines with a large computer on the university campus. The university computer has programs available that formulate least-cost and maximum-profit rations. The dairymen uses his terminal to enter prices of feeds that are available to him and the cow size, fat test and level of production for which he wants a ration formulated. For a maximum-profit ration, he also enters the blend price that he receives for his milk. The computer uses his input data to calculate rations which fulfill the nutrient requirements of the cow, or group of cows, according to the National Research Council feeding standards. Rations can be formulated for several levels of production within a herd if it is divided into groups according to level of milk production.

Rations formulated for four levels of milk production within a herd are summarized in Table 1. All rations are based on the same feed prices, milk prices, cow size, and fat test. Alfalfa hay and corn silage were the only roughages available and were entered with minimum constraints of 10 and 20 pounds as fed, respectively.
Table 1. Optimum rations for a herd divided into four production groups

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<tr>
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<th>Low</th>
<th>Medium</th>
<th>Med-High</th>
<th>High</th>
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<tbody>
<tr>
<td>Milk (lb)</td>
<td>36</td>
<td>56</td>
<td>75</td>
<td>91</td>
</tr>
<tr>
<td>Corn silage (lb)</td>
<td>59</td>
<td>25</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>Alfalfa Hay (lb)</td>
<td>10</td>
<td>18</td>
<td>17</td>
<td>13</td>
</tr>
<tr>
<td>Concentrate mix (lb)</td>
<td>11</td>
<td>22</td>
<td>30</td>
<td>36</td>
</tr>
<tr>
<td>Feed cost/cow</td>
<td>$1.96</td>
<td>$2.61</td>
<td>$3.16</td>
<td>$3.58</td>
</tr>
<tr>
<td>Income-Feed cost/cow</td>
<td>$2.72</td>
<td>$4.67</td>
<td>$6.62</td>
<td>$8.22</td>
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<td>Roughage: Concentrate</td>
<td>73:27</td>
<td>54:46</td>
<td>43:57</td>
<td>36:64</td>
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Feed cost per cow for the four rations increased as level of production increased. However, milk income increased more rapidly than feed costs. Increasing milk production resulted in average daily income above feed costs of $2.72, $4.67, $6.62, and $8.22 per cow for cows producing 36, 56, 75, and 91 pounds of milk.

The increased income above feed cost from higher producers illustrates the importance of identifying superior milk producers within a herd and feeding them accordingly. A dairyman cannot afford to underfeed high-producing cows because they are the most profitable in a herd. They cannot continue to produce well unless they are provided the required nutrients to do so. Conversely, a dairyman cannot afford to overfeed low-producers, particularly when feed prices are high. Not only are profits reduced by overfeeding low-producers, but overfeeding increases the probability of subsequent health problems if lactating cows become overly fat. Therefore, for many reasons, including nutritional adequacy, maximum profitability, and health status, it is necessary to formulate rations for several levels of production within a herd to receive maximum benefit from a computer-designed feeding program.

RESULTS FROM THE PROGRAM

The data in Table 2 are from a large herd in California that started computer-formulated rations in April, 1973. These data are taken from the April DHIA records for each year. In April, 1973, the herd consisted of about 600 milking cows housed in three drylot corrals. Dairy Herd Improvement Association rolling herd average was 14,429 lb of 3.5% fat-corrected-milk (FCM). During the following year the herd was expanded, and a fourth corral was built. Rations were formulated at four levels of production according to production of each group. Mean milk production of each group increased markedly, and the DHIA rolling herd average in April 1974, increased to 15,857 lb of 3.5% FCM.
Table 2. Milk production in a herd divided into production groups.

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<tr>
<td>1</td>
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<td>67</td>
<td>78</td>
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<td>92</td>
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<td>37</td>
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<tr>
<td>Rolling Herd Average (April 1)</td>
<td>14,429</td>
<td>15,857</td>
<td>16,751</td>
<td>17,714</td>
<td>19,514</td>
<td>20,371</td>
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The herd continued to expand in 1975 and 1976, and two more corrals were added. When six corrals were available, first-calf heifers were allotted to separate groups. Rations were formulated at four levels of production for mature cows and two levels for first-calf heifers. Rolling herd average continued to increased each year to a maximum of 20,371 lb. in 1978 (Table 2). During this same period, the milking herd increased from about 600 to over 1,300 cows. These data illustrate how successful a computer-formulated feeding program can be in a large herd divided into production groups.