

Using a Total Mixed Ration

for Dairy Cows

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The term total mixed ration (TMR) may be defined as, "The practice of weighing and blending all feedstuffs into a complete ration which provides adequate nourishment to meet the needs of dairy cows." Each bite consumed contains the required level of nutrients (energy, protein, minerals and vitamins) needed by the cow (Table 1).

Table 1. Nutrient specifications for three group system (100% dry matter basis) 1300 lb cow.¹

	Production Level		
	High ²	Medium	Low
Milk production (lbs)	Over 75	55-75	Under 55
Dry matter intake/day (lbs) ³	48	40	34
NE _L Mcal/lb	0.78	0.74	0.70
ADF (% dry matter)	19	20	21
NDF (% dry matter) ⁴	25	28	28
Protein (% ration DM)	18	17	15
Calcium (% ration DM) ⁵	0.8	0.7	0.5
Phosphorus (% ration DM) ⁵	0.5	0.4	0.4

¹ Based on nutrient requirements of dairy cattle of NRC (1989)

² Some type of fat source (i.e. sunflower seeds) may be used

³ Estimated – dry matter intake will depend on body size and milk production.

⁴ This is only appropriate when not feeding high fiber concentrates, such as corn gluten. If high fiber concentrates are fed, these values should be increased to 35, 38, and 41, respectively.

⁵ Increase 30% when fed fat supplements (e.g. sunflower seeds).

I. ADVANTAGES OF A TOTAL MIXED RATION

1. The dairyman has more control over the feeding program.
 - a. All forages grains, protein supplements, minerals and vitamins are thoroughly mixed. Therefore, the cow can do very little sorting for individual ration ingredients.
 - b. Completely blended feeds, coupled with grouping the cows, permits greater flexibility in feeding exact amounts of nutrients (energy, protein, etc.) to more nearly nourish cows for their particular stage of lactation and level of milk yield.
 - c. Grain mixtures can be liberally fed to grouped high producers without over-feeding the late-lactation or lower-producing cows, resulting in more efficient use of feeds.

II. DISADVANTAGES OF THE COMPLETE RATION

1. Cows should be grouped by production levels.
 - a. Grouping cows is not feasible in small herds (less than 50 cows).
 - b. If not grouped according to production, cows in late lactation are likely to get too fat.
2. Special equipment is needed.
 - a. The equipment must have the capability to thoroughly blend the feed ingredients.
 - b. The mixer, preferably mobile, must be capable of accurately weighing each ingredient.

III. GUIDELINES FOR GROUPING BY PRODUCTION LEVELS

1. How many groups?
 - a. A minimum of two and preferably three production groups should be arranged.
 - b. Dry cows should be separated from the lactating strings.
 - c. In small herds, where three or even two groups are not feasible, computerized concentrate feeders (magnet feeders or other feeding device) can theoretically provide a separate feeding group. Some grain feeding in the parlor can, in effect, make grouping possible, but this practice is losing popularity.
2. Shifting cows:
 - a. Shifting small groups of cows, rather than one cow at a time, is best.
 - b. Monthly intervals are frequent enough, preferably using the DHI or similar test report as reference for shifting.
 - c. Use judgement, on an individual cow basis, based on your knowledge of time in lactation, physical condition, level of production, pregnancy, temperament, age, etc., before shifting.
 - d. Cows eat numerous small meals throughout the day, resulting in greater feed intake and better utilization of ingredients, such as urea.
 - e. Fewer cows have digestive upsets and go off feed.
 - f. Concentrate ingredients can be purchased in bulk at considerable savings and blended with forages on the farm.
3. It is no longer necessary to feed grain in the milking parlor:
 - a. The costs of parlor construction and maintenance of feeding equipment are reduced.
 - b. Cows are quieter and defecate less during milking.
 - c. There is less feed dust in the parlor.
 - d. Movement through the parlor is quicker because cows do not delay to finish eating.
 - e. More cows per man hour are possible when parlor operators do not spend time dispensing grain.
4. Labor for feeding the cows is less. Equipment and rations used for feeding the lactating herd can be used for feeding dry cows, heifers, and calves:
5. Cost for housing and feeding facilities is less:
 - a. Mangers are simplified and less manger space is needed per cow.
 - b. It is possible to mechanize a conventional tiestall barn for complete feeds (small mobile mixer carts, etc.).
6. Rations:
 - a. Formulate the ration for each group using the average production, size and fat test for each group.
 - b. If a magnet feeder is used, consider only the criteria for the cows without the magnet for calculating the ration.
 - c. Keep feed in the manger for the cows at all times. This is especially important for the higher-producing groups and where manger space may be inadequate to allow all cows to eat at one time.
 - d. Reformulate the rations whenever a change in forage quality occurs. Test the forages at least monthly and more frequently if type or quality of silage changes.
 - e. Savings in feed cost and better conditioning of cows for the subsequent lactation is possible if concentrate fed to the low-producing and dry-cow groups is reduced considerably. This is one area where feed cost can be lowered.
 - f. Provide adequate water for each group.
 - g. Silage should not be chopped too fine. A ¼ to ½ inch cut is recommended.
 - h. Long hay, if fed separately, should be group fed in a separate rack or manger. An accurate measurement in pounds of hay eaten per cow per day is essential for accurate calculation and reformulation of rations.
7. Frequency of feeding:
 - a. Two or more feedings daily encourage cows to eat more frequently. Once a day may be sufficient for low-producing groups during cool weather.
 - b. Regardless of frequency of feeding, providing adequate bunk volume for free-choice feeding at all times is very important.

IV. SUMMARY

1. Complete rations feature the blended approach – all forages, concentrates, protein supplements, minerals and vitamins are mixed together and offered as a single feed (Table 1).
2. Complete ration system can save labor and reduce overall feeding cost.
3. It is extremely important to keep the mixture exactly the same day after day and to make big changes gradually.
4. Early detection of problems with the ration system is possible by observing the bulk-tank milk level after each milking.
5. Forage analysis is necessary and should include dry matter, crude protein, acid detergent fiber, neutral detergent fiber, calcium and phosphorus.
6. TMR can be used effectively by many dairymen, but it is not a substitute for good management. In fact, the intensity of management may be increased. Most of all, management skills and competency of the dairyman is critical to make this system work effectively.

For more information on this and other topics, see: www.ag.ndsu.edu

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