

Total Mixed Ration Feeding of Dairy Cows

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I. Total mixed ration (TMR)

A TMR is a method of feeding cows that combines feeds formulated to a specific nutrient content into a single feed mix. The mix contains the Forages, Grains, Protein feed, Mineral and Vitamins, and Feed additives. The TMR feeding system is based on feeding balanced diet to dairy cattle so that each bite should provide the required amount of energy, protein, fibre and minerals, in order to boost and economize the productive performance.

Feeding a total mixed ration (TMR) helps a dairy cow to achieve maximum performance. Since its inception in the 1950s, it is now the most adopted method for feeding high producing, indoor-housed dairy cows in the world. Earlier studies revealed that higher dry matter intake and efficient utilization of nutrient were responsible for considerably higher daily live weight gain in young buffalo calves (Singh *et al.*, 1988, 2000) fed pelleted complete feed as compared to those fed by conventional feeding system.

This is accomplished by feeding a nutritionally balanced ration at all times, allowing cows to consume as close to their actual energy requirements as possible and maintaining the physical or roughage characteristics, which we now refer to as feed particle size, required for proper rumen function. Good feeding management practices must be followed to achieve maximum performance from cows. Proper nutrition leads to healthy and high-performance dairy cows. Cow ration must contain good quality roughage, balance of grains and proteins sources, vitamin and minerals. These feed source provide nutrients needed for milk production, growth and reproduction. Feeding a total mixed ration that contains all the feeds and nutrients the cow needs is an effective, efficient and profitable way to feed dairy cows.

II. TMR Feeding Management

Good feeding management practices must be followed to achieve maximum performance from cows. First, monitor forage and feed inventory on a regular basis and allocate to the appropriate animal group. Second, test forages and feeds several times throughout the year or when any noticeable change occurs. Lastly, update ration formulations based on milk production, milk fat and milk protein percent, current body weight and body condition scores, moisture changes in forages or high moisture feed ingredients, and prices of current feeds. Checking forage moisture on a frequent basis is critical to implementing a successful TMR system.

As feed costs continue to rise and impact the bottom line, feed efficiency is becoming increasingly important to producers. While the formulated ration is critical to keeping feed costs within reason, on-farm feed management should be a focus to ensure that formulated rations are effectively delivered to all cows.

Critically important in total mixed ration (TMR) feeding systems is the consistency of the ration delivered to cows. Rations varying in weights of each ingredient, total weight delivered, particle size distribution, mixing order, or mixing time could impact individual cow performance.

Total weight delivered and the weight of each ingredient included in rations is impacted by the feedstuffs' dry matter (DM). If feed DM changes from the previous week or with weather events, this could impact the actual amount of feed being added to the mixer. Shifts in the amount of each ingredient added can alter the nutrients making it to the bunk. It is a best practice to check feed DM weekly to ensure adequate and consistent amounts of each ingredient are incorporated into rations.



Figure 1. Different varying particle sizes in feed.

Particle size distribution within rations is also important to cow health and performance. A TMR lacking adequate particle size could negatively affect health and result in production issues associated with inadequate fibre. Herds with low physically effective fibre could experience milk fat depression. Additionally, low physically effective fibre can lead to metabolic problems if saliva production drops as additional chewing is no longer stimulated. On the other hand, having long chopped forages or forages that do not mix well could lead to sorting. This would appear as though ration nutrients are being adequately delivered to the bunk, but issues with cow health and performance could result from rations too low in physically effective fibre.

Mixing time also plays a part in particle size distribution. If rations are mixed for too long, forages could become too fine. Similarly, if rations are not mixed long enough, hay or long-chopped forages could come out in clumps and be easily sorted. Mixing time will vary from farm to farm based on the mixer's recommendation. Manufacturer's instructions should be followed and after all ingredients are added to the mixing wagon, allow for standing mixing time on a flat, even surface before delivering feed to the bunk. To avoid varying post mixing time from day to day keep a timer present at the time of mixing.

Daily monitoring of refusal amounts can offer insights into forage or feed moisture changes as well as group dynamics. High-producing dairy cows should have from 1-3% refusals, while low producing or dry cows can be fed to 0.5-3% refusal levels. Properly adjusting the percent refusals up or down requires daily monitoring. To ensure milk production is not negatively impacted, adjust management strategies when the targeted refusal amount is not met. Refusals amounts lower than the desired percentage may indicate the cow requires more energy, and the delivery amounts should be increased. Similarly, when refusals are high, energy intake may decrease, and initial delivery amounts can be reduced. Further investigation is warranted when drastic swings in the amount of feed remaining at the bunk are detected. Collecting daily refusal weights and using this information to calculate estimated feed intake per cow allows producers to more effectively monitor feed efficiency.

Advantages of a TMR feeding system

- ✓ In TMR, each mouthful of feed that the cow consumes contains the proper amount of ingredients for a balanced ration, resulting in a more stable and ideal environment for the rumen microbes and providing adequate carbohydrates and nitrogen sources that vary in their ability and rate of rumen breakdown.
- ✓ A 4% increase in feed utilization can be expected when using a TMR compared to a conventional ration of forage and grain fed separately, twice daily.
- ✓ Farmers can also utilize a greater variety of by-product feeds with a TMR, thereby allowing for possible ration cost savings.

- ✓ The incidence of digestive and metabolic problems often decreases when a TMR is fed, and milk production has been shown to be as much as 5% higher with a TMR compared to conventional rations as a result of these benefits.
- ✓ A TMR provides greater accuracy in formulation and feeding if managed properly.
- ✓ When a TMR is mixed properly, a cow cannot consume significantly more or less of a forage or concentrate than planned in the ration formulation.
- ✓ The TMR system is well adapted to mechanization with a mixer wagon or a stationary mixer with conveyors or mobile feeders.
- ✓ One of the major advantages of blending all the feeds together in a TMR is that it can mask the flavour of less palatable feeds.

Disadvantages of a TMR Feeding System

- ✓ Mixing or blending devices needed for the ration require small to moderate expenditures for equipment and maintenance. Further, it is important to follow the manufacturer's recommendations for mixing.
- ✓ Over mixing can cause serious problems due to grinding and pulverizing the feed. Under mixing can result in less effective feed utilization by the cows.
- ✓ Accurate weighing with calibrated scales, which also may involve additional cost and maintenance, is essential. Care must be taken in formulating and mixing the ration.
- ✓ If the diet is not balanced correctly or mixed properly, the cow ultimately will suffer reduced performance.
- ✓ TMR, cows have no other option for a diet and depend solely on the ration for a balanced diet to achieve production and health.
- ✓ In some cases, existing buildings, feed alleys, and mangers may make a TMR system nearly impossible to use.

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