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Popular Article

Total Mixed Ration for Ruminants

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Abstract

Total Mixed Ration (TMR) has revolutionized dairy farming by providing a comprehensive solution to meet the nutritional needs of dairy cattle and buffaloes. This article examines the principles, preparation methods, advantages, and disadvantages of TMR, emphasizing its significant impact on animal health, productivity, and farm economics. By combining all essential nutrients into a single blend, TMR ensures consistent intake, optimal rumen fermentation, increased dry matter intake, and improved milk production. Additionally, TMR minimizes selective feeding, streamlines labor requirements, and reduces the need for supplementary mineral or vitamin supplementation. Despite challenges such as equipment costs and mixing complexities, the widespread adoption of TMR underscores its value as a key driver of efficiency and sustainability in modern dairy operations.

Introduction

Total Mix Ration (TMR) is an effective method for providing essential nutrients (Energy, protein, vitamin and minerals) to dairy cattle and buffaloes. The practice of feeding "complete rations" or TMR has been widely adopted in developed nations since the 1950s. The TMR feeding system has become the most prevalent method for nourishing high-yielding dairy cattle in intensive rearing operations worldwide since its introduction. Previous research has demonstrated that increased dry matter intake and effective nutrient utilization significantly contribute to higher daily weight gain in young animals. A well-balanced diet is essential for the health and productivity of dairy cows. Their ration should include high-quality roughage, grains for energy and protein sources, as well as essential vitamins and minerals. These feed sources provide the necessary nutrients for growth, reproduction and milk production. Implementing a comprehensive TMR feeding strategy, which incorporates all essential feeds and nutrients, represents an effective, efficient, and economically advantageous

approach to rear dairy cows.

Total Mixed Ration

Total Mixed Ration (TMR) is a comprehensive feed mixture that combines all necessary forages, grains, protein sources, vitamins, minerals, and feed additives into a single, precisely formulated blend. In essence, TMR is a complete nutritional package that ensures a balanced intake of essential nutrients with every bite. So, feeding TMR solves the problem of animals not getting enough nutrients. In the context of TMR feeding, consistency is of paramount importance. Providing the same quantity of the identical mixture at the same time each day is crucial to ensure optimal animal performance. This feeding approach not only reduces labor intensity but also allows for customization to meet the specific requirements of individual animals (Sklan and Dariel, 1993). The implementation of TMR feeding eliminated selective feeding behaviors and ensured adequate nutrient provision, optimizing feed utilization efficiency. This approach resulted in enhanced feed consumption, improved digestibility, and stimulated rumen microbial activity, ultimately leading to increased productivity in dairy cows. A crop residue based TMR, also known as "dry TMR," is better suitable in India, where smallholder dairy production is the major mode of operation.

Steps to prepare a total mixed ration

1) Nutritional Analysis: Begin with a nutritional analysis of the available feed ingredients. This typically includes forages, grains, proteins, vitamins, and minerals. The goal is to determine the nutritional content (e.g., crude protein, energy, fibre *etc*.).
2) Determine Nutritional Requirements: Understand the nutritional needs of your livestock and formulations should be updated regularly based on Factors such as age, weight, production stage (*e.g.,* lactation), milk quality and quantity, parameters like body weight, Age, breed specifications, moisture percentage in feed stuffs, price of fodder, area specific mineral requirements, etc and health status influence these requirements. For dairy cows, the National Research Council (NRC) guidelines are often used.
3) Formulate the Ration: Using the nutritional analysis and the livestock's requirements, formulate the TMR.Accurate weighing & thorough mixing(blending) of ingredients is essential to achieve uniform distribution & consistency This process usually involves software or consultation with a nutritionist to balance the nutrients (protein, energy, fibre, vitamins, and minerals).
4) Mixing Ingredients: Accurately weigh and combine all the ingredients in a TMR mixer. Ensure uniform distribution to prevent selective feeding and to ensure each bite contains the correct balance of nutrients.

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5) Adjustments and Monitoring: Regularly monitor the health and productivity of the livestock and adjust the TMR formulation as needed. Regularly test the TMR for consistency and nutritional content

Key considerations to prepare TMR

Ingredient Quality: Use high-quality feed ingredients to ensure the best nutritional outcomes. Monitor for contaminants like mycotoxins is also very important.

Palatability: Ensure the TMR is palatable to encourage consistent consumption. Feed intake monitoring is absolutely critical

Cost-effectiveness: Balance the nutritional needs with the cost of ingredients to maintain economic feasibility.

Storage and Handling: Proper storage of ingredients to prevent spoilage and nutrient loss.

Advantages of feeding TMR

1. Effects on rumen fermentation: When animals given access to TMR feed throughout the day, they eat small amounts more frequently throughout the day. Thus, overall, increasing the feed intake in rumen all the ingredients spread evenly during day. This prevents one time concentrate feeding that overloads the rumen and fermentation disturbed. If given TMR rumen processes are optimized, pH stabilizes digestibility improves, and bloats are minimized. This is because the rumen microflora receives all nutrients required for rumen fermentation towards an even outcome every time giving enough sources of carbohydrates and nitrogen that differ in their capacity and pace of rumen breakdown, and creating a more stable and optimal environment for the rumen bacteria. This leads to continuous supply of microbial protein in ruminants throughout the day

2. The dry matter intake of the animal increases as with continuous feed availability, cows eat more dry matter and habit of animals to eat selective feed is reduced, leads to increase efficiency of feed utilization and comparatively less residual feed Thereby increased dry matter intake.

3. It increases the milk production of lactating animals. The increased milk production is due to higher DM intake, enhanced fermentation and better nutrient utilization.

4. It improves the feed efficiency in animals. The animal eating every bite is nutritionally balanced. This gives the rumen microorganisms a suitable environment in which to grow and function efficiently. Proteins and carbohydrates will be regularly supplied to rumen microorganisms for microbial protein synthesis (Allen *et al.*, 2019). This leads to a decrease in metabolic diseases such as acidosis, alkalosis, low milk fat, laminitis, etc.

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5. When concentrates and forages are fed separately, animals often prefer the feed that is concentrate. Digestion problems and nutritional imbalances follow from this. This selected feeding option was reduced in TMR feeding, which improved feed efficiency and utilization.
6. Labour saving is another important aspect. Feeding concentrates and forages separately will consume more time. By knowing the correct amount of daily feed and dry matter intake, feed wastage can be prevented.
7. The main ingredients of dry TMR are crop residues like paddy straw and wheat straw *etc*. By including these agricultural left overs, the negative environmental effects like air pollution are mitigated.
8. TMR increased the fat percentage in milk due to enhanced rumen fermentation and the rumen's optimal pH leading to better cellulose digestion and the creation of acetic acid, the precursor to generate butter fat.
9. Extra supplementation of mineral or vitamin is not needed, as TMR includes all of this.

Disadvantages of feeding TMR

The equipment and maintenance cost of the equipment used for mixing is a costly approach. Furthermore, it is crucial to combine according to the manufacturer's instructions. Excessive grinds and mixing disintegrates the feeds. Less efficient feed usage by the cows may be the consequence of inadequate mixing. It is imperative to use calibrated scales for accurate weighing, which may need additional maintenance and costs. The cow's performance will decrease if the feed is improperly blended or balanced. Owing to the higher expense of the feeding system, a TMR system could not be cost-effective for many herds, especially small herds or those that use pasture feeding for a long time.

Conclusion

Total Mixed Ration (TMR) emerges as a comprehensive and efficient feeding strategy for dairy cattle and buffaloes, offering numerous benefits to both farmers and animals By amalgamating all essential nutrients into a single blend, TMR ensures consistent and balanced intake, fostering optimal rumen fermentation, increased dry matter intake, and improved milk production.

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