IS A ONE TMR APPROACH RIGHT?

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Take Home Messages

- Determine the optimal economic approach when deciding the optimal number of groups and number of rations.
- Multiple TMR can reduce feed cost per cow per day IF milk yield drop is less than 3 pounds per cow per day.
- Explore different ways to use the same TMR using under dressing, top dressing, and other feeding approaches.
- Monitor on an individual herd basis strategic benchmarks to decide how TMR patterns should change: milk price, feed prices, lead factors, amount of weigh back, forages available, reproductive success, and body condition score.

Feed delivery systems continue to change and evolve as herd sizes increase, by-product feeds become economically attractive, and milk and feed prices shift monthly. Hoard's Dairyman 2008 market survey of U.S. dairy managers reported 58.2 percent of surveyed herds were feeding total mixed rations. With current market changes and the loss of rBST in some milk markets, questions on using one ration mix compared to several ration approach have been raised. This paper will respond to questions and concerns raised by dairy managers, nutritionists, and veterinarians. Answers are farm specific and will depend on current feeds available, herd profile, and future milk prices.

What is a one group TMR?

The "one ration" approach in this paper will be one ration that is mixed for all lactating cows balanced for one level of nutrients and fed to all groups or milk production strings. Guidelines for a one ration TMR are listed in Table 1. Most rations will be balanced at 80 to 90 pounds of milk allowing for higher dry matter intake to meet the nutrient needs of cows over 100 pounds of milk. Also, balancing at 80 to 90 pounds of milk results in maximum levels of fats/oils and starch with minimum levels of fiber and protein. Some managers will fine tune the use of one ration in the

following ways.

- Top dress the one group ration with a stress pack for fresh and early lactation cows.
- Under dress the one group ration by adding forages or bulky feed ingredients to dilute nutrient levels.
- Feed 25 to 33 percent of the one ration to close up dry cows to increase nutrient intake and adjust the cows to feed ingredients in the lactating ration.
- Feed the one group ration to calves from 3 to 7 months of age as an accelerated heifer growth feeding program.

Why is a one ration approach popular?

When feed prices are moderate and milk prices favorable, a number of reasons can be used to defend the use of one ration on dairy farms.

- Simplicity to mix and deliver one ration to the herd varying only the amount delivered
- Errors in adding the wrong amount of an ingredient
- Incorrect delivery of the specific ration to the intended group
- Labor saving by reducing the number of mixes
- Ability to top off feed bunks as needed

TMR mixer size becomes a factor depending on number of cows and feed delivery capacity. If more than one batch is needed, multiple rations become more viable.

Do cows drop in milk production when moved between groups?

One controversial concern is the potential drop in milk production when cows are shifted from group to group. These factors should be considered:

- The change in nutrient content in the new ration
- Social impact of moving cows
- Impact on dry matter when shifting cow

The potential drop in dry matter intake after moving cows appears to be a risk when the lactation and dry matter intake curves have been established for the current lactation. Data from Illinois and Israel indicated if cows are moved before peak dry matter intake has been reached, the impact on milk production when moving cows is minimal. Social interactions (boss cow fighting, pecking order,

and feed bunk space) can lead to 3 to 8 pounds decreases in milk yield which may not recover. One strategy to reduce the potential drop in dry matter intake leading to lower milk yield is to increase nutrient intake with digestible fiber sources (such as soy hulls, corn gluten feed, or citrus pulp). This approach avoids changing the rumen environment and shifting nutrients to body weight gain and away from milk yield. Another field approach is to move cows in a consistent pattern (such as weekly) resulting in negative social interactions as groups do not stabilize. Cow moves could include moving far to close pen, close to fresh cow pen, fresh cow to early lactation pen, and early lactation pen to late lactation pen every week. If individual cow daily milk recording occurs, dairy managers can assess the impact of moving cows under their conditions.

What grouping alternatives can be considered?

Dairy managers can group cows based on several factors. Once grouping pattern and alternatives have been determined, the decision to use one or multiple rations can be made. Several alternatives are listed below with guidelines favoring one ration or multiple rations.

- First lactation cows and older cows — One ration strategy
- High producing and low producing cows — Multiple rations strategy
- BSC (cows over 3.25 and cows under 3.25) — Multiple rations strategy
- Open cows, bull pen, and/or pregnant cows — One ration strategy
- Low SCC and high SCC group — One ration strategy
- Expensive feed additives — Multiple rations strategy
- Herds average 25 percent above state average — One ration strategy
- Herds with over 50 percent first lactation cows — One ration strategy
- Herds experiencing metabolic disorders — Multiple ration strategy
- Herd with average days in milk over 225 days — Multiple ration strategy

What are advantages with multiple ration approaches?

The potential economic benefits increase as feed prices increase and milk prices decline. Feeding rations based on their physiological response can increase profitability by improving milk yield (such as early lactation cows) while avoiding health risks (late lactation cows). Cows in early lactation have the "drive" to produce milk and partition nutrients to higher milk yields (hormonal responses). Another ration lower in nutrient content for lower producing cows can improve profit margins by reducing feed costs while maintaining milk yield. Feed and nitrogen efficiency can be improved by shifting to a lower nutrient dense diet reducing nitrogen excretion and manure output.

A key advantage for multiple rations is the ability to manage body condition score without sacrificing milk yield. Heavy cows are high risk cows for metabolic disorders in the next lactation, impaired immune function, and delayed conception. Other factors to consider include the ability to get cows rebred (less than a 14 month calving interval), the availability to use rBST, and the percent of cows over a body condition score (BCS) of 3.75 at dry off time. If a one ration system is used resulting in heavy cows, shifting to a less fermentable and bulky ration using other feed ingredients may be needed (grass-legume forages and fibrous by-product feeds).

What is the economic impact when evaluating one or two rations?

Key factors will be the price of milk, dry matter intake, price of dry matter per pound of dry matter, and anticipated change in milk yield. Two levels of milk production were selected (80 pounds for the high ration, and 60 pounds for the low ration) were compared using Midwest dairy feed ingredients and feed prices. Spartan II computer ration software was used to calculate least cost rations using the same ration ingredients. The results are listed below:

- 80 lb TMR costs $6.15 per cow per day, 51.9 lb of dry matter, and 11.8 cents per pound of dry matter.

- 60 lb TMR cost $4.90 per cow per day, 45.2 pounds of dry matter, and 10.8 cents per pound of dry matter.

The difference between the two rations represents $1.25 per cow per day. However, the lower producing group consumed 6.7 pounds less dry matter compared to the high group. Because the low group consumed 6.7 pounds less dry matter at 11.8 cents per pound, the potential difference is 51 cents per cow per day ($1.25 – $0.74). If milk production decline three pounds of milk, it would negate the cost savings). No feed additives or fat sources were included in either ration.

What lead factors can be used to decide a ration balancing point?

Lead factors are the level of milk to balance rations above the herd or group average based on feed prices, milk prices, and herd characteristics (range in milk production in the group or herd, age of cows, and body condition status). Several alternatives are listed below.

- Virginia researchers suggested lead factors depending on the number of groups (values were rounded for ease of calculation):

    - One group or ration: Add 30 percent to the group average
      Example: 70 lb x 30% = 21 lb + 70 lb = 91 lb

    - Two groups or rations: Add 20 percent to the group average
      Example: 80 lb x 20% = 16 lb + 80 lb = 96 lb
      60 lb x 20% = 12 lb + 60 lb = 72 lb

    - Three groups or rations: Add 10 percent to group average
      Example: 90 lb x 10% = 9 lb + 90 lb = 99 lb

70 lb x 10% = 7 lb + 70 lb = 77 lb
50 lb x 10% = 5 lb + 50 lb = 55 lb

- Calculate one standard deviation in milk yield for the group of cows (meeting the nutrient needs for two thirds of the cows in the group). This lead factor varied from 9 to 12 pounds of milk (middle to late lactation Holstein groups) to 17 to 20 pounds (early lactation Holstein groups).

- Add six pounds of milk to the lead factor for first lactation groups (growth factor for young cows).

- Add two pounds of milk to the lead factor for groups requiring an increase of 0.5 BCS in 200 days.

Are metabolic factors a consideration when building ration?

Michigan workers suggest that highly fermentable rations can depress dry matter intake, increase BSC, and lead to milk test depression for lower producing cows as insulin drives glucose to be stored as body weight and reduces milk yield. Glucose demand for late lactation cows decline as milk lactose synthesis is lower (less milk produced). Because of insulin sensitivity and lower growth hormone secretion, late lactation cows drive circulating glucose to body condition gain from high fermentable rations.

High producing cows require more glucose (from highly fermentable rations leading to propionate production in the rumen converted to glucose in the liver and starch digestion in the lower tract) to synthesize lactose. These cows respond to rations with more fermentable carbohydrates (from digestible fiber, starch, and sugars) and less bulky ingredients (legume-grass forages) which can limit dry matter intake. High yielding cows have the ability to eat more dry matter unless feed intake is limited by gut fill (high fiber rations and rations lower in digestible fiber).

What role does forage quality have?

The fill factor in a ration is determined by the level of fiber and digestibility of the forage. Research at Michigan State has demonstrated that a one unit increase in forage NDF digestibility (NDFD) increases milk yield by 0.55 pound of 3.5% fat corrected milk within a forage type. High producing cows responded to a greater extent with cows from 70 to 120 pounds of milk increasing from zero to two pounds of milk per unit increase in forage NDFD. Michigan workers also reported grass based forages had greater fill factors compared to high quality legume and corn silage forages due to slower passage rates with grass. Based on these studies, using grass and legume grass mixtures could be used by lower producing cows when gut fill is less important and can be metabolically favorable.

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Table 1. Nutrient guidelines for one ration for high producing lactating dairy cows.

Nutrient	Suggested level
Protein	
Crude protein (%)	16.5 to 17.5
Metabolizable protein (%)	11 to 12
Soluble protein (% of crude)	28 to 34
Lysine (% MP)	6.6 to 7.2
Methionine (% MP)	2.2 to 2.4
Fiber	
Neutral detergent fiber (%)	28 to 34
Acid detergent fiber (%)	18 to 21
Lignin (%)	3 to 4
Carbohydrate	
Starch (%)	20 to 26
Sugar (%)	4 to 6
Fermentable fiber (%)	10 to 12
Fat/oil (%)	5 to 6