The TMR Feeding Program

Dr. Jim Linn
University of Minnesota
St. Paul, Minnesota
Keys to a Successful Dairy Feeding Program

1. Properly formulated rations
2. Skilled and conscientious people feeding
3. Mixing and feeding accurate amounts of ration
4. High quality feeds
5. Good communication between technical experts and dairy manager
6. Good record keeping
7. Good working equipment
What is a TMR?

Complete mix of all feed ingredients
- Forages
- Grains
- Byproducts
- Protein feeds
- Minerals and Vitamins
- Feed additives – yeast culture
Why Feed a TMR?

- Increase milk production
- Decrease feed costs
- Improve cow health
- Ability to feed feeds that are:
  - Hard to feed individually
  - Fed in small amounts
- Deliver consistent ration to cow every day
The TMR Equation

Formulated Ration

Feed Ingredients

= Milk Production

Cow Health

$
Ration Formulation

Cow Nutrient Requirements

Fiber
Protein
Energy
Minerals

RATION – Lactation – 35 kg/day

<table>
<thead>
<tr>
<th>Component</th>
<th>Kg/day/cow</th>
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</thead>
<tbody>
<tr>
<td>HAY</td>
<td>3.6</td>
</tr>
<tr>
<td>Corn silage - 35% DM</td>
<td>9.7</td>
</tr>
<tr>
<td>Haylage - 40% DM</td>
<td>18.2</td>
</tr>
<tr>
<td>CORN</td>
<td>8.4</td>
</tr>
<tr>
<td>COTTONSEED,FZ</td>
<td>2.5</td>
</tr>
<tr>
<td>PROTEIN MIX</td>
<td>3.8</td>
</tr>
</tbody>
</table>

DRY MATTER NUTRIENT ANALYSIS

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>Value</th>
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<tbody>
<tr>
<td>Wet Feed Intake kg</td>
<td>46.2</td>
</tr>
<tr>
<td>Ration DM %</td>
<td>48.7</td>
</tr>
<tr>
<td>DM Intake kg</td>
<td>22.5</td>
</tr>
<tr>
<td>Crude Protein %</td>
<td>16.5</td>
</tr>
<tr>
<td>NDF Fiber %</td>
<td>34.6</td>
</tr>
<tr>
<td>NDF From Forage %</td>
<td>23.8</td>
</tr>
<tr>
<td>NFC %</td>
<td>34.9</td>
</tr>
<tr>
<td>Fat %</td>
<td>5.3</td>
</tr>
<tr>
<td>TDN %</td>
<td>70.3</td>
</tr>
<tr>
<td>NE Lactation Mcal/kg</td>
<td>1.63</td>
</tr>
<tr>
<td>Calcium %</td>
<td>.93</td>
</tr>
<tr>
<td>Phosphorus %</td>
<td>.39</td>
</tr>
<tr>
<td>Magnesium %</td>
<td>.38</td>
</tr>
<tr>
<td>Potassium %</td>
<td>1.33</td>
</tr>
<tr>
<td>Salt %</td>
<td>.46</td>
</tr>
<tr>
<td>Iodine ppm</td>
<td>1.51</td>
</tr>
<tr>
<td>Selenium ppm</td>
<td>.34</td>
</tr>
<tr>
<td>Vitamin A, IU/ day</td>
<td>203437</td>
</tr>
<tr>
<td>Vitamin E, IU/day</td>
<td>990</td>
</tr>
</tbody>
</table>
Formulating the Ration

- Identify group of cows to be fed
  - Milk production
  - Days in milk
  - **Dry Matter (DM) Intake**

- Minimize variation in the group
  - Group cows that are similar in milk production and DM intake
Cow Groupings for TMR

Lactating cow groups

1. Fresh Cow
   - 1 to 21 days in milk

2. 1st Lactation cows

3. High Production - older cows
   - 21 to 180 days in milk

4. Mid-lactation – older cows
   - 180 to 250 days in milk

5. Late Lactation
   - Older and 1st lactation cows
   - 250 days in milk to dry off
Cow Groupings - Variations

Lactating cow groups

1. Fresh Cow
   - Low DM intake
   - Dry forage (2 – 3 kg/cow/day)

2. 1st Lactation cows
   - Smaller cows
   - Low DM intake
   - Slower to reach peak milk production and DM intake
   - Persistent milk production and DM intake

3. High Production - older cows (21- 180 days in milk)
   - Larger cows -
   - Reach peak milk production (> 40 kg/day) 45 days in milk
   - Reach peak DM intake (25 – 30 kg/day) by 60 days in milk
   - Breeding group
Cow Groupings - Variations

Lactating cow groups

1. Mid-lactation – older cows
   - 180 to 250 days in milk
   - Pregnant cows
   - Lower DM intake and milk production than high production group

2. Late Lactation (250 days in milk to dry off)
   - Older and 1st lactation cows similar DM intake and milk production
   - Avoid over conditioning of cows
   - High forage – medium energy ration
WEEK OF LACTATION

DRY MATTER INTAKE (kg/day)

- **Dry Matter Intake (Multiparous Cows)**
- **Dry Matter Intake (Primiparous Cows)**

WEEK OF LACTATION
Cow Groupings for TMR

Dry cow groups

1. Far Off dry cows
   - 220 to 260 days pregnant
   - High forage TMR

2. Close-up or Pre-Fresh cows
   - 2 to 3 weeks before calving
   - Low DM intake – 10 kg/day
   - High fiber, nutrient dense TMR
     - 3 kg gain
     - 2-3 kg good quality forage
     - Minerals, Feed Additives and vitamins
The Feeding Objective

Formulated ration

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Wet Feed Intake kg 46.2
Ration DM % 48.7
DM Intake kg 22.5

Crude Protein % 16.5
NDF Fiber % 34.6
NDF From Forage % 23.8
NFC % 34.9
Fat % 5.3
TDN % 70.3
NE Lactation Mcal/kg 1.63

Calcium % .93
Phosphorus % .39
Magnesium % .38
Potassium % 1.33
Salt % .46
Iodine ppm 1.51
Selenium ppm .34
Vitamin A, IU/day 203437
Vitamin E, IU/day 990
TMR Feeding Goal

- Consistency is the key

The *same* AMOUNT of
the *same* MIX at
the *same* TIME each day.
Mixing the TMR

- Dry matter of feeds – feed amounts
- Order of ingredient addition
- Mixer capacity
- Mixing time
Dry Matter

- 100-% moisture = % DM

- Nutrients are contained in DM
  - Ration formulated on DM
  - Cows consume DM

TMR ingredients are as fed
DM errors result in over or under feeding as fed feeds
Check Forage DM

Determine DM of forage at least once per week.

Adjust amounts of forage in TMR when DM changes more than 2% units.
Common TMR Mixing Errors

Scale and Weighing Inaccuracies

- Scale not accurately weighing

- Feeder not accurately weighing feed amounts
TMR Mixing - Adding Ingredients

Auger or Reel Mixers

- Ingredient Order
  - Grains and proteins
  - Small inclusion feeds
    - Minerals, vitamins
    - Feed additives
  - Forages
    - Chopped hay
    - Ensiled forages

Maximum 200 kg long stem forage in 4500 kg TMR mix, about 2 kg/cow/day

CHOP HAY BEFORE ADDING
TMR Mixing - Adding Ingredients

Vertical or Screw mixers

- Ingredient order
  - Long dry forage
  - Grains and proteins
  - Small inclusion feeds
    - Minerals, vitamins
    - Feed additives
  - Ensiled forages
Common TMR Mixing Errors

Over Filling Mixers

DO NOT OVERFILL

- Results in
  - Incomplete mixing
  - Sorting of feeds
  - Cows not getting balanced ration
Common TMR Mixing Errors

TMR Mixer Capacity

- **TMR density**
  - 0.2 to 0.25 kg per cubic meter
  - Average is 0.22 kg per cubic meter

- **TMR mixer capacity per cow**
  - With 10% long dry forage - 0.2 cubic meters/cow
  - No dry long forage – 0.14 cubic meters/cow

- **Best mixing capacity** – 70 to 80% of maximum
Common TMR Mixing Errors
Incorrect Mixing Times

- Incomplete mixing
  - General guide is 3 to 5 minutes after last ingredient added.

- Over mixing
  - Reduces particle size
**Keys to Good TMR Mixing and Feeding**

**Ration Physical Form**

**Maintain Rumen “mat”**
- stimulate rumen contractions
- maintain muscle tone
- stimulate cud chewing
- buffer the rumen

**Optimize Rumen Fermentation**
- stimulate appetite
- max production of VFA’s
- max microbial protein
Ration Physical Form

Physical characteristics of the ration that can greatly influence performance

Physical Characteristics are affected by:

- Amount of forage
- Quality of forage
- Type of forage
- Level of NDF
- Moisture of ration
- Length and shape of particles
- TMR mixing time
# TMR Particle Size Recommendations

<table>
<thead>
<tr>
<th>Sieve</th>
<th>3 Boxes</th>
<th>4 Boxes</th>
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<tbody>
<tr>
<td>Upper Sieve</td>
<td>6 - 8</td>
<td>6 - 10</td>
</tr>
<tr>
<td>Middle Sieve</td>
<td>&gt;50</td>
<td>30 - 50</td>
</tr>
<tr>
<td>Lower Sieve</td>
<td>----</td>
<td>30 to 50</td>
</tr>
<tr>
<td>Bottom Pan</td>
<td>&lt;40</td>
<td>&lt;20</td>
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</tbody>
</table>
TMR Ration - Particle Size
Over Mixing - Example

How can we tell? - Penn State Particle Separator

- **Top** (Long Fiber) | **Actual** 4.5% | **Goal** 6-8%
- **Middle** (Short Fiber) | **Actual** 39.0% | **Goal** 40-50%
- **Bottom** (Fines) | **Actual** 56.5% | **Goal** <50%
TOO FINE-OVERMIXING

SYMPTOMS

- Milk Production Decrease
- Milk Fat:Protein Inversions
- Consistently Loose Manure
- Lack of Cud Chewing
- Increase in free choice salt or buffer consumption
- Eating of Bedding, Wood
- Variable DM intake
- Late Lactation Displaced Abomasums
- Off-feed Cows
- Lameness
TMR Evaluation - Too fine?

- Check mix time - decrease if necessary
- Dry long forage is very low in moisture – brittle and chops easily: reduce mix time
- Mix order - add dry long forages last
- Not enough forage in diet - check
  - Correct ration formulation
  - Forage moisture,
    - As DM of forage decreases, less forage DM is being fed
Symptoms of Under-Mixing

- Clumping of ingredients such as hay, haylage
- Cows sort feeds and slug fed grain
- Inconsistent - loose manure
- Off-feed cows
- Variable DM intake
- Lower fat test
- Lameness
Under Mixing – Too coarse

How Can we tell - Penn State Particle Separator

- **Top** (Long fiber)  
  Actual: 15.4%  
  Goal: 6-8%

- **Middle** (Short fiber)  
  Actual: 55.5%  
  Goal: 40-50%

- **Bottom** (Fines)  
  Actual: 29.1%  
  Goal: <50%
TMR Evaluation - Too coarse?

- Check mix time - increase if not over 6 minutes
- Dry forages over 15% moisture don’t mix well without chopping before mixing
- Check wear on mixer knives - change if worn, add more knives if needed
- Mix order - add dry coarse forage earlier if possible
- Too much long coarse forage in mixer
- May require tub-grinding all dry forage if it is very coarse
Feeding the TMR
Times per Day

Number of times to feed per day

• Optimal – twice per day

• Once per day okay
  • Cool weather
  • Good feed push in

• Minimal benefit to more than twice per day
Feed Bunk Management
Evaluating the TMR Mix
Uniform TMR Distribution
Good feed bunk management:

- Cows have access to feed at least 18-20 hours per day

- Cows have adequate bunk space
  a. 45 to 60 cm per milk cow
  b. 60 to 90 cm dry and transition cows
  c. 45 cm for heifers
Cows eat best off a smooth surface
Good feed bunk management:

Push feed up at least 5 times per day if TMR is fed once per day.

If they can not reach the feed,
They can not eat it
Good feed bunk management:

24 hour refusal weight be less than 3% of fed TMR

Refusals should look like original TMR
Cow Goal:
Unmix the TMR mix
**Good feed bunk management:**

- Do not give cows the opportunity to sort feed
  - Push up feed often
  - Chop forages
  - Adequate moisture in ration

SORTING RESULTS IN SYMPTOMS COMMON TO BOTH UNDER AND OVER MIXING OF TMR
Feed Intake

Measure daily
<table>
<thead>
<tr>
<th>Date</th>
<th>Feeder initials</th>
<th>TMR Fed, kg</th>
<th>Time fed</th>
<th>Weighback, kg</th>
<th>Cow number</th>
<th>Feed comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mon</td>
<td>JL</td>
<td>2948</td>
<td>5:45</td>
<td>105</td>
<td>69</td>
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<tr>
<td>Tues</td>
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<td>Wed</td>
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<td>Sat</td>
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<tr>
<td>Sun</td>
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Feed Intake

- Per cow amounts
  - TMR = Formulated Ration

- When amounts not equal
  - Check forage moisture
  - Check number of cows fed TMR mix
  - Reformulate ration
Daily As Fed Intake (lb)

GOAL IS TO MINIMIZE VARIATION
Record Management

Daily feed information feeders should record:

1. Date
2. Feeder name
3. Actual total amount of ration mixed and fed per pen or group
4. Weighback amount from pen/group
5. Number of animals in pen/group
6. Time fed
Adjusting TMR Feed Intakes

Adjusting amount of TMR fed
- Change all feeds proportionally
  - Up or down

Maximum adjustment
- 3 kg/cow
- 8% of total weight
Forage Management

Feeding fresh, unspoiled forages every day is essential to TMR success.
Forage Management

Manage the feeding face of the bunker or pile

WANTED
Smooth Surface
Smooth Faces Minimize DM and Nutrient Deviations Within a Silo

| NDF     | 44.5% | 41.2% | 36.6% |

20% variation in NDF from top to bottom

From Bill Stone, NY
Good Face Management and Top Cover
Silage Management

- Keep face of pile smooth and straight
- Feed a minimum of 15 cm off face daily
- Remove no more than 1 m of top cover at a time
- Remove and discard moldy or rotten silage before shaving pile
- Inform technical expert of concerns or changes
In Summary

A correctly formulated and fed TMR will
- Provide excellent nutrition for the cow
- Minimize feed cost
- Optimize cow health and production

Management essentials for TMR Feeding
- Correctly formulated ration
- Quality forage and other feed ingredients
- Accurate mixing of the TMR
- Monitoring feed intakes
- Good bunk management
  - Particle sizing
  - Feed availability – push ups
- Good feed data recording

Communication between feeder, nutritionist and dairy manager
Lets Go Feed The Cows!

THANK YOU