# AEM Tier 2 Worksheet
# Management of Feed Nutrients

## Glossary

**Digestibility:** Percentage of feed or a feed nutrient that is absorbed through the digestive tract. It can be calculated as: [(lbs. nutrient intake - lbs. nutrient in feces) ÷ lbs. nutrient intake] X 100%.

**Dry Matter Content:** Also expressed as Percent (%) Dry Matter. The portion of a feed remaining after all the water is driven off. It is this portion that contains all the nutrients for which a ration is balanced.

**Dry Matter Intake:** Amount of feed dry matter content a cow will voluntarily eat in a day. The larger the dry matter intake, the lower the percentage of nutrients required to supply the daily requirements.

**Dry Period:** Period of time in which a cow is not giving milk. Prior to calving, a mammary gland requires a period of rest in which old lactating tissue is reabsorbed and new milk-secreting tissue replaces it. Without the dry period, the gland will not produce to its potential.

**(Continued on Page 2)**

## Background

Effective management of nutrients is a primary goal of Comprehensive Nutrient Management Plans (CNMPs). These plans aim to reduce a livestock farm's risk of discharging nutrients to surface and ground waters. Although feeding management adjustments are not always components of CNMPs, changes in the feeding program can have significant influence on farm nutrient management. Generally, more than two-thirds of the nutrients annually delivered to livestock farms are in the form of imported or purchased feeds. Farms that intensively manage their feeding program reduce nutrient excretion in the manure, increase feed nutrient utilization and subsequently improve production and the farm's mass nutrient balances.

From an environmental perspective, three areas of feed management significantly influence effective feed nutrient use:

1. Digestible nutrient content of homegrown forages produced and fed,
2. Accuracy of estimating feed nutrient intakes, and
3. Employment of scientific standards to determine nutrient requirements and ration levels.

**(Continued on Page 2)**

## Agricultural Water Quality Principle:

Apply sound animal feeding and husbandry practices to achieve targeted levels of production and minimal excretion of nutrients in manure.

## Glossary Continued…

**Forages:** Feed containing the vegetative parts of a plant. Haycrop forages (i.e. alfalfa hay or silage) do not contain any grains, while grain crop forages (i.e. corn silage) contain both vegetative and grain portions of the plant. Cattle feeds are generally classified into forages or concentrates (grains).

**Forage Quality:** A qualitative measure of the nutritive value and digestibility of a forage. It is best quantified by measuring the structural fibers of the feed.

**NDF (Neutral detergent fiber):** In the laboratory, the residual after digesting a sample of feed in a neutral detergent solution. It contains the structural fiber component (cellulose, hemicellulose and lignin) of plant cell walls. It is closely related to the amount of a forage a cow will voluntarily eat.

**NRC-National Research Council:** Scientific body that sets nutritional standards for feeding animals in the U.S.

**Rumen Degradable Protein:** Fraction of protein sources that supply peptides, amino acids and ammonia for rumen microbial growth.

**Rumen Undegradable Protein:** Fraction of protein sources that essentially escape digestion in the rumen and deliver intact protein to the lower digestive tract.

**"Wet" Feeds:** Forages, grains, or by-product feeds (generally with less than 87% dry matter) such that moisture content can vary significantly over time or between batches (i.e. ensiled forages, high moisture corn, wet brewer's grains).

**Wet Chemistry:** Complete chemical analysis of feeds to quantify nutrients or minerals in feeds. Two methods of feed analysis are available from most labs: wet chemistry and near-infrared refractance (NIR). Wet chemistry is more accurate for mineral analysis of feeds.

## Background Continued…

Digestibility of nutrients in a forage, commonly referred to as forage quality, determines the amount of that forage cattle will consume. The greater the quality of homegrown forages produced and fed, the less purchased feeds must be imported to achieve production. Maximizing the feeding of homegrown forages more effectively recycles nutrients from the crop, to the cow, to the manure, to the soils and back to the crop.

Inaccurate estimates of feed consumption can lead to large imbalances in nutrient intake, ineffective rumen digestion and reduced lower tract absorption. Packaging the nutrients required for animal maintenance, growth, production and reproduction within the meal size the animals are actually eating is a critical component of ration balancing. Rations regularly balanced to supply required nutrients will result in high production and a smaller proportion of feed nutrients excreted in the manure.

General animal husbandry is also critical to insure effective feed nutrient utilization. A feeding program will best perform when animals are kept healthy, comfortable, and housed in a stress-free environment. Furthermore, clean, fresh feed and water must be readily available to achieve maximum feed intake and the projected level of milk or meat production.

| **AEM Tier 2 Worksheet: Management of Feed Nutrients** | | **Potential Concern** | | |
|---|---|---|---|---|
| **Factors Needing Assessment:** | Lower<br>1 | 2 | 3 | Higher<br>4 |
| **What is the quality of homegrown hay crop forages?** | More than two-thirds of the hay crop produced has NDF levels: <=60% (grass)<br><=45% (legumes) | More than half of the hay crop produced has NDF levels:<br><=60% (grass)<br><=45% (legumes) | | More than half of the hay crop produced has NDF levels:<br>>60% (grass)<br>>45% (legumes) |
| **How much homegrown forages are being fed? (Lactating dairy herds only. See page 6 for sample calculations.)** | Homegrown forage dry matter fed is greater than 2.2% of the average herd body weight. | Homegrown forage dry matter fed is between 2.0 and 2.2% of the average herd body weight. | Homegrown forage dry matter fed is between 1.8 and 2.0% of the average herd body weight. | Homegrown forage dry matter fed is less than 1.8% of the average herd body weight. |
| **How is dry matter intake for various groups of cattle determined?** | Reliably measured by weighing amounts fed and feed refused **AND** cattle are consuming appropriate amounts. | Reliably estimated by weighing amounts fed and estimating feed refused **AND** cattle are consuming appropriate levels. | Reliably estimated by weighing amounts fed and estimating feed refused **AND** cattle are **not** consuming appropriate amounts. | Book values for dry matter intake are used to balance rations and amounts fed or refused are not weighed. |
| **How often is dry matter intake measured or estimated?** | Weekly. | Every 2 weeks. | Monthly. | Infrequently. |
| **How often are feeds analyzed for nutrient and dry matter content?** | Feeds are analyzed for nutrient content at least monthly **AND** dry matter content of "wet" feeds is determined weekly on the farm. | Feeds are analyzed for nutrient content at least monthly **AND** dry matter content of "wet" feeds is determined less than weekly on the farm. | Feeds are analyzed for nutrient content only when a new feed or forage crop is fed **OR** on-farm forage dry matter determination of "wet" feeds is not practiced. | Feeds are not regularly analyzed. |

| **AEM Tier 2 Worksheet:**<br>**Management of Feed Nutrients** | | **Potential Concern** | | |
|---|---|---|---|---|
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| **How often are rations balanced?** | Rations are balanced more than six times a year **OR** when changes in feel quality are anticipated. | Rations are balanced when a change in production or feed is noticed. | | No systematic or regular ration balancing is practiced. |
| **How is protein balanced in rations?** | Protein levels are fed at NRC recommendation **AND** balanced for rumen-degradable and undegradable protein fractions **AND** a program that models rumen carbohydrate and protein interactions is used. | Protein levels fed at NRC recommendation **AND** balanced for rumen degradable and undegradable protein fractions. | Protein levels fed at NRC recommendation. | Protein fed in excess or below recommended levels **OR** protein levels fed are not reliable known. |
| **How are phosphorus (P) and potassium (K) levels in rations determined?** | P and K levels are fed at NRC recommendation **AND** low K forages are fed to dry cows. | P and K levels are fed in NRC recommendations. | P and K fed in excess or below recommended levels. | P and K levels fed are not reliably known. |

# Additional Information

## Herd Health and Performance Issues:

Is the herd on a regular health program with a local veterinarian?

Is the incidence of calving difficulties or post-calving disorders (ketosis, milk fever, retained placenta, displaced abomasums or mastitis) less than 5% in the herd?

Are cattle growing and producing up to industry standards or producer's expectations?

## Herd Health and Performance Issues Continued:

For milking cows, are adequate dry periods allowed? (First calf heifers at least 55 days; older cows at least 45 days)

Does the herd show signs of lameness, abnormal hoof growth, or other foot problems?

## Cow Comfort and Housing Stress Issues:

Are stalls of proper design, adequate size and in good repair?

Are animal beds/packs clean and dry with plenty of bedding?

Do animals show signs of bruising on hocks, thurls or around shoulders or pinbones?

Is there adequate watering and feeding space for animals?

Are barns adequately ventilated with no detectable drafts or stale air?

## General Nutrition and Feeding Issues:

Do high-producing dairy cows have access to feed at least 20 hours a day?

Are feedbunks cleaned daily to avoid fouling of fresh feed?

Is fresh clean water readily available to animals?

Is the herd adequately grouped and fed by production or nutritional needs?

Is wet chemistry used to determine mineral analysis of feeds?

# Notes:

# Sample Calculations: Calculating Homegrown Forage Dry Matter Fed as a Percent of Average Herd Bodyweight

**Information Needed:** Total amount of each forage fed to lactating herd **(lbs For$_n$)**
Dry matter content of each forage fed **(%DM$_n$)**
Percentage estimate of annual needs of each forage produced on farm **(%Homegrown$_n$)**
Average herd bodyweight **(Herd Bdwt)**

**Equation:** Ý[[(lbs For$_n$) X (%DM$_n$) X (%Homegrown$_n$)] ÷ [(Herd Size X HerdBdwt)]] X 100%

Where "n" defines each forage fed to the lactating herd.
If average herd bodyweight is unknown, use 1400 for large Holstein, 1300 for small Holstein, 1200 for Guernsey and Brown Swiss, and 1000 for Jersey herds.

**Example:** A 95-cow Holstein herd is grouped by production and fed forages according to table below. The average herd bodyweight is 1350 lbs.

| | **Pounds as Fed per Production Group** | | | |
|---|---|---|---|---|
| **Feed** | **High Group** | **Low Group** | **% Dry Matter** | **% Homegrown** |
| Corn Silage | 2150 | 2350 | 34% | 100% |
| Alfalfa Haylage | 1185 | 975 | 41% | 90% |
| Mixed Grass Hay | 0 | 450 | 88% | 70% |

**Pounds Homegrown Forage Dry Matter Fed as a Percent of Average Herd Bodyweight**

| | | | | |
|---|---|---|---|---|
| Corn Silage | [[(2150 + 2350) X 0.34 X 1.00]÷ [(95 X 1350)]] | X 100 | = | 1.19% |
| Alfalfa Haylage | [[(1185 + 975) X 0.41 X 0.90] ÷ [(95 X 1350)]] | X 100 | = | 0.62% |
| Mixed Grass Hay | [[(0 + 450) X 0.88 X 0.70] ÷ [(95 X 1350)]] | X 100 | = | 0.21% |
| | | | Pounds Homegrown Forage Dry Matter Fed/Cow | 2.02% |

This would be considered #2 level of potential concern for amount of homegrown forage feeding.

**Note:** Since a herd ration generally changes many times over the year, it is best to calculate this parameter periodically.