How to Calculate Pasture Dry Matter Intake on Your Organic Dairy Farm

Sarah Flack, Sarah Flack Consulting

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Today's Presentation

1. The new pasture rule.
2. What affects DMI from pasture?
3. Methods to calculate DMI from pasture:
   - Direct measurement of pasture – tools, limitations.
   - Subtraction method.
4. How to calculate DMI from pasture using the subtraction method.
5. Additional resources.

Summary of Rule Changes

- New Definitions.
- New pasture practice standard section 205.240.
- Changes to 205.239 – livestock living conditions.
- **Changes to 205.237 – livestock feed.**

Summary of Amendments

- Provide ruminants with pasture throughout the grazing season for their geographical location.
- Grazing season will be 120 to 365 days.
- Ensure ruminants derive not less than **an average of 30 percent of their dry matter intake (DMI) from pasture** during the grazing season.

Record Keeping Requirements in 205.237

(d) Ruminant livestock producers shall:

- (1) Describe the total feed ration for each type and class of animal. The description must include:
  - (i) All feed produced on-farm;
  - (ii) All feed purchased from off-farm sources;
  - (iii) The percentage of each feed type, including pasture, in the total ration; and
  - (iv) A list of all feed supplements and additives.
- (2) Document the amount of each type of feed actually fed to each type and class of animal.
- (3) Document changes that are made to all rations throughout the year in response to seasonal grazing changes.
- **(4) Provide the method for calculating dry matter demand and dry matter intake.**

Calculating DMI from Pasture

- § 205.237 Livestock feed (c)(1-2) DMI is calculated as an average over the entire grazing season **for each type and class of animal**.
- Examples:
  - Lactating Dairy Cow group
  - Bred Heifer group
- Note: If animals are managed in multiple, separate class/type sub-groups, then the DMI must be calculated as an average for each class/type sub-groups.
- Remember that some animals are exempt.

Why on a Dry Matter basis?

- Puts feeds on an equal basis so amount of nutrients from each feed can be known.
- Allows more accurate evaluation of rations.
- NOP rule is based on DM.

Definitions

- **Dry Matter**: The weight of feed with all moisture taken out of it.
- **DMI or Dry Matter Intake**: The amount of dry matter being eaten.
- **DMD or Dry Matter Demand**: The expected DMI.

Definitions

- 205.237 Livestock feed (c)(1): Provide not more than an average of 70 percent of a ruminant's dry matter demand from **dry matter fed** – dry matter fed does not include dry matter grazed from residual forage or vegetation rooted in pasture.

Getting Started

- What are the animal groups?
- Determine what the length of the grazing season is expected to be.
- Calculate the DMI from pasture for each group.
- Re-calculate the DMI from pasture each time the ration changes, then take the average over the grazing season.
- Are all groups over 30%?

What affects DMI from pasture?

DMI from pasture will vary due to many factors including:

- Pasture quality
- Pasture density
- Pasture height
- Type and quantity of supplemental feeds fed
- Pasture management system

Methods to calculate DMI from pasture

- **Direct measurement** of the pastures.
- Calculate pasture DMI using the **subtraction method**.

Direct measurement of the pastures

- Measurement of amount of DM available to graze per acre can be done with a variety of tools and methods including:
  - Clipping, drying and weighing
  - Electronic capacitance meter
  - Rising plate meters
  - Grazing sticks
- These all require some training.
- Direct measurement can be a very helpful way for farmers to verify that pastures are really providing enough feed.


Sarah Flack demonstrating the use of a “grazing stick” to measure available DM per acre in an intensively grazed pasture system.

Additional Methods for Estimating Amount of Pasture DM Available

Refer to NOP article: “Pasture Worksheet for Rotational/Stocking Systems” at: http://bit.ly/cFtr0Y

(OPTION 1) For every inch of forage height in a pasture above a 2-inch residual, the following DM is available per acre:	
Density	Pounds per Acre per inch*
Low	150-200
Medium	200-250
High	250-300
* Varies with plant density and species	

Calculating DMI from pasture using the Subtraction Method

- Many certifiers are sending farmers forms to do these calculations.
- If you are also doing direct measurement of your pastures, keep records of that so you can show your inspector.

Calculating DMI from pasture using the Subtraction Method

1. Determine Dry Matter Demand (DMD).
2. Determine DMI from feed sources (grain, hay, silage) other than pasture.
3. Determine DMI from pasture.
   - Subtract DMI from feed from DMD.
4. Calculate percentage of DMI from pasture.

Step 1: Determining DMD

What makes DMI / DMD vary so much?

- Animals' stage of production, size, body condition.
- Environment: temperature, feeding and housing system.
- Feed ration: quality and digestibility of forages, amounts and types of other supplemental feed.

Step 1: Determining DMD

Which method to use?

1. Actual amount of DMI fed during the non grazing season.
   - This is ok so long as there are not significant changes in DMD between grazing season and non-grazing season.
   - Check it against NRC tables.
2. DMD from NRC (National Research Council) tables or other tables.
   - May be % of body weight or lbs or kg.
   - % of BW more typical for beef & sheep.

Note: Tables are available on the NOP website and some certifiers are putting tables in the OSP pasture sections.

Table 1 - 3: Daily Dry Matter Demand Requirements in Kilograms and Pounds

Mid Lactation *Small Breed Dairy Cows

10 - 30 Kilograms or 22 - 66 Pounds Daily Milk Production

68% Total Digestible Nutrients Diet

Daily Milk Production (kg)	Milk Fat (%)	DMD (kg)	Daily Milk Production (lb)	Milk Fat (%)	DMD (lb)
10	4.0	12.4	22.05	4.0	27.34
10	4.5	12.7	22.05	4.5	28.00
10	5.0	12.9	22.05	5.0	28.44
20	4.0	16	44.09	4.0	35.27
20	4.5	16.5	44.09	4.5	36.38
20	5.0	17	44.09	5.0	37.48
30	4.0	19.5	66.14	4.0	42.99
30	4.5	20.3	66.14	4.5	44.75
30	5.0	21.1	66.14	5.0	46.52

Abbreviations used in table:
DMD = Dry Matter Demand, kg = Kilogram, lb = Pound

*Small Breed Live Weight = 454 Kilograms or 1,001 Pounds

Table 1 - 6: Daily Dry Matter Demand Requirements in Kilograms and Pounds

Mid Lactation *Large Breed Dairy Cows

25 - 45 Kilograms or 55 - 99 Pounds Daily Milk Production

68% Total Digestible Nutrients Diet

Daily Milk Production (kg)	Milk Fat (%)	DMD (kg)	Daily Milk Production (lb)	Milk Fat (%)	DMD (lb)
25	3.0	19.6	55.12	3.0	43.21
25	3.5	20.3	55.12	3.5	44.75
25	4.0	21	55.12	4.0	46.30
35	3.0	22.7	77.16	3.0	50.04
35	3.5	23.6	77.16	3.5	52.03
35	4.0	24.5	77.16	4.0	54.01
45	3.0	25.7	99.21	3.0	56.66
45	3.5	26.9	99.21	3.5	59.30
45	4.0	28.1	99.21	4.0	61.95

Abbreviations used in table:
DMD = Dry Matter Demand, kg = Kilogram, lb = Pound

*Large Breed Live Weight = 680 Kilograms or 1,499 Pounds

MOSA DMD Table

DAIRY COWS DRY MATTER DEMAND (DMD)		
AVERAGE MILK PER DAY	SMALL BREED <900-1200#+ DMD	LARGE BREED 1200-1400#+ DMD
10#	21#	27#
15#	23#	28#
20#	24#	30#
25#	26#	31#
30#	28#	33#
35#	30#	34#
40#	31#	36#
45#	33#	37#
50#	35#	39#
55#	36#	40#
60#	38#	42#
65#	40#	43#
70#	42#	45#
75#	43#	46#
80#	45#	48#

MOSA DMD Table

RUMINANT GROUPS: DRY MATTER DEMAND AS A PERCENTAGE OF BODY WEIGHT	
Dry dairy cows	1.8%
Bred dairy heifers (14-24 months of age)	2.5%
Unbred dairy heifers (6-14 months of age)	2.5%
Beef cattle (more than 1 year of age)	2.25%
Beef cattle (weaned, less than 1 year of age)	2.75%
Sheep (brood or milking animals)	3.65%
Goats (brood or milking animals)	4.0%
Sheep (weaned, slaughter or replacement stock)	3.3%
Goats (weaned, slaughter or replacement stock)	2.25%

Step 2: Determine DMI fed from other (non-pasture) feed sources

- If you work with a nutritionist, they may be providing you with a ration sheet which shows the **pounds of DM of each feed being fed per day.**
- If not…you will need to figure this out!

Step 2: Determine DMI fed from other (non-pasture) feed sources

- Most feed information will be on an “as fed” basis and will need to be converted to dry matter.
- Information may be on a per group or per week basis and will need to be converted to a per head per day basis.
  - Bales per day per herd.
  - Lbs of TMR per cow per day or per group per day..

Step 2: Determine DMI fed from other (non-pasture) feed sources

How do you know what matter content of each type of feed is?

- Most accurate source of information is DM from feed tests.
- If not… then use a “table of general assumptions.”

MOSA DMI Table

PERCENTAGE DRY MATTER (%DM) OF COMMON FEEDS*
Hay (dry, both legume and grass) =85% DM
Haylage (any chopped forage except corn)=35% DM
Green chop (any green chopped forage)=20% DM
Baleage (any baled and wrapped forage)=60% DM
Corn silage=40% DM
High moisture corn=76% DM
Grain (dry corn, beans, small grains)=89% DM

Example: Ration #2

Holsteins dairy herd being fed a TMR in the free stall barn during the winter. This is the ration per cow per day:

Feed type	lbs as fed	x	%DM = DM
Dry hay	5lbs	x	90% = 4.5
Haylage	50 lbs	x	46% = 23
Corn meal	8 lbs	x	89% = 7.12
Small grain mix	12 lbs	x	88% = 10.56

Total lbs DMI from feed fed = 45.18 lbs

Example: DMI Calculation #1

From NOP article "Calculating DMI from Pasture" – available on NOP website.

Lactating dairy cows weighing 1200 lbs. DMD for this example is predicted to be 3% of their body weight in DMI per day.

Step one: What is DMD?

DMD = 1200 x .03 = **36 lbs**

Example: DMI Calculation #1

From NOP article "Calculating DMI from Pasture" – available on NOP website.

Step two: what is the DMI from feed sources other than pasture?

They are being fed 5 lbs of hay and 11 lbs of grain per cow per day.

Example: DMI Calculation #1

From NOP article "Calculating DMI from Pasture" – available on NOP website.

Step two: What is the DMI from feed sources other than pasture?

Feed source	lbs as fed	x DM%	= lbs DM
Hay	5	x 90%	= 4.5 lbs
Grain	11	x 89%	= 9.79 lbs

Total lbs DMI from feed sources = **14.29**

Example: DMI Calculation #1

From NOP article "Calculating DMI from Pasture" – available on NOP website.

Step three: What is the DMI from pasture?

Subtract DMI from feed from DMD.

Example:

Estimated DMD per animal	**36 lbs**
- Total DMI from other feed	**-14.29 lbs**
= Estimated Pasture DMI	**=21.71 lbs**

Example: DMI Calculation #1

From NOP article "Calculating DMI from Pasture" – available on NOP website.

Step four: Calculate the percent DMI from pasture.

Estimated DMI from pasture
divided by estimated DMD x 100

Example:

(21.71/36) x 100 = **60.31%** DMI from pasture

What if a group of animals are getting 100% DMI from pasture during the grazing season?

Photo by Sarah Flack

Averaging

- Do the pasture DMI calculation at the beginning of the grazing season.
- If you feed the same ration throughout the entire grazing season, you do not need to do the calculation again.
- If you change your ration during the grazing season, you will need to do the calculation each time it changes and take the average over the grazing season.
- **Check with your certifier to make sure you are meeting all the record keeping requirements**

Keeping Records

- Ration change records can be kept in many ways:
  - On a wall calendar.
  - In a ration change form which may be provided by the certifier.
  - By saving nutritionists ration sheets and putting the date you started feeding each ration to the group.
  - In a notebook.

Additional Resources

- NOP website has DMD tables and useful articles: http://www.ams.usda.gov/AMSv1.0/nop
- United States-Canadian Tables of Feed Composition: Nutritional Data for the United States and Canadian Feeds, Third Revision: http://www.nap.edu/catalog.php?record_id=1713
- Beef Magazine's 2009 Feed Composition Tables – http://beefmagazine.com/nutrition/feed-composition-tables/0301-feed-composition-tables_3/
- Cooperative Extension
- www.extension.org/organic_production

DMD Resources

- UC Davis Robinson Dairy DMI Predictor.
- Some certifiers are providing tables.
- NOP website has NRC tables for beef and dairy.
- *Nutrient Requirements of Small Ruminants: Sheep, Goats, Cervids, and New World Camelids (2007, http://www.nap.edu/catalog.php?record_id=11654)*
- www.luresext.edu/goats/research/nutritionmodule1.htm

Reminder…

Always check with your certifier

to make sure you are keeping

all the required records

Example: DMI Calculation #2

Holstein herd fed dry hay, grain & pasture. Milk production is 55 lbs/cow.

What is DMD? _____

Feed type	lbs as fed	x	%DM	= DM
Dry hay	25lbs	x	90%	= _____
Grain	12 lbs	x	90%	= _____

Total lbs DMI from feed fed = _____

Example: DMI Calculation #2

Holstein herd fed dry hay, grain & pasture. Milk production is 55 lbs/cow.

What is DMD? 44.75

Feed type	lbs as fed	x	%DM	= DM
Dry hay	25lbs	x	90%	= 22.5
Grain	12 lbs	x	90%	= 10.8

Total lbs DMI from feed fed = 33.3 lbs

Example: DMI Calculation #2

How much DM is from pasture?

DMD – DM fed = estimated pasture DMI

44.75 – 33.3 = 11.45 lbs of DM from pasture

Pasture DMI/DMD x 100 = % from pasture

(11.45/44.75)x100 = 25.5% DM from pasture

Find the Webinar recording at:
http://www.extension.org/organic_production

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