



Pasture for Organic Ruminant Livestock:

Understanding and Implementing the National Organic Program (NOP) Pasture Rule

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Contents	
Introduction.....	1
National Scope of Organic Ruminant Livestock Operations.....	1
Organic System Plan (OSP) and Recordkeeping Requirements	2
Recordkeeping Resources for Organic Livestock Producers.....	3
The Pasture Management Plan.....	4
Assessing Pasture Condition.....	5
Calculating Forage Dry Matter Availability and Determining Carrying Capacity	6
Irrigated and Improved Pasture in Temperate Regions.....	6
Native Rangeland.....	9
NOP Regulations for Organic Ruminant Livestock; Calculating Dry Matter Demand (DMD) and Dry Matter Intake (DMI)	13
Dry Matter Demand.....	14
Dry Matter Intake.....	15
Dry Matter Content of Feeds.....	15
Simple Hand Method to Estimate Dry Matter Intake (DMI) on Pasture.....	16
Calculating DMI with Downloadable Online Spreadsheets.....	18
Calculating Dry Matter Intake on Rangeland	19
Summary	20
References.....	20
Appendix 1: Dry Matter Intake (DMI) Calculation Worksheets A and B.....	22
Appendix 2: Grazing Days/Season Record.....	26
Appendix 3: USDA NOP Regulations Pertaining to Ruminant Feed and Pasture Management.....	27

The National Organic Program (NOP) regulations establishing parameters for pasture grazing of ruminant livestock became law on June 17, 2010 (USDA, 2010d). Existing certified organic operations must be in compliance by June 17, 2011, while operations certified after June 17, 2010, must be in compliance before attaining certification.

This publication offers a summary of several key provisions within the NOP regulations (see Appendix 3) as they pertain to pasture management, access to pasture, feed, and grazing intake by ruminant livestock—collectively, referred to as the “Pasture Rule”. It also assists producers in implementing the provisions of the rule. It includes tools for calculating dry matter intake (DMI) and conducting grazing management.

Introduction

This publication provides a thorough picture of what organic producers are required to do to maintain compliance with the Pasture Rule. When applying the new requirements to their current farming practices, many producers with well-developed pasture resources find that their operations are already compliant or quite close to compliance. All organic ruminant livestock producers, whether certified or transitioning, need to understand the new recordkeeping requirements. Keeping good records is essential for producers to achieve and document compliance, so this publication also discusses recordkeeping practices and resources to assist producers in developing a pasture management plan.

The central components of the Pasture Rule relate to grazing and pasture management. Ruminant animals must graze pasture during the grazing season for their geographic region, which must be at least 120 days per year. Over the course of the grazing season, the animals must obtain an average of at least 30 percent dry matter intake by grazing. Additionally, animals must have year-round access to outdoors, and roughages used for bedding must be certified organic. Temporary confinement is allowed for some management and health care procedures, as well as during inclement weather and to reduce risk to soil and water quality. Lactation is not an acceptable reason for confinement. In addition, producers must have a pasture management plan and manage pasture as a crop to meet the feed requirements for grazing animals and to protect soil and water quality.

National Scope of Organic Ruminant Livestock Operations

The National Organic Program regulates organic ruminant farms and ranches across the United States. (Operations outside the United States pursuing NOP organic certification must comply with the Pasture Rule the same as U.S. operations.) Given the variation in climate and agricultural productivity across the country, there are necessarily large variations in the types of animal operations the National Organic Program covers. Organic

ruminant farms include sheep and goat farms, dairy farms, and beef cattle farms and ranches, and any other ruminants raised organically for meat, milk or fiber (i.e. bison, llamas, deer, etc.). Aside from these differences, there are also variations in pasture productivity. For example, dairy and beef farms in New England, the mid-Atlantic, the upper Midwest, the deep South, the Pacific Northwest, and some parts of the West are characterized by adequate precipitation that fosters the use of intensive grazing systems such as rotational grazing. Beef cattle and small ruminant ranches in the semi-arid western regions of the United States are typified by less precipitation, shallower soils, and slower nutrient cycling on pastures. Grazing operations in these regions range from rotational systems to continuous grazing on rangeland.

It is important to note that the NOP Pasture Rule was developed to encompass all types of operations and regions of production. Whether a dairy grazer in Pennsylvania or a beef rancher in Arizona, this publication will help producers maintain compliance with the Pasture Rule.

Organic System Plan (OSP) and Recordkeeping Requirements

Under the NOP regulations, every certified organic livestock farm or handling operation must submit an Organic System Plan (OSP) when applying for certification and update that plan annually (or more frequently if operational changes are made). A well-prepared plan and detailed records make inspections much easier, and allow the producer to conduct a yearly audit of his or her plan and make changes where necessary. The NOP regulations outline the specific requirements for a complete OSP. In addition, the publication *Organic System Plan (OSP) Templates for Certifiers* discusses OSP requirements in detail through a form that is used by many certifiers. This publication focuses only on the OSP requirements as they pertain to the Pasture Rule.

The following need to be described or addressed in the Organic System Plan:

- Management of pasture to provide sufficient forage quality and quantity to graze throughout the grazing season
- Description of all feeds (including pasture) and supplements for each type and class of animal, including source, percentage and amounts fed, and changes to rations
- A grazing season specific to the geographical region, of a minimum 120 days (breaks from grazing are permitted during the grazing season; the grazing season may be non-continuous)
- Dry matter intake of at least 30 percent from vegetation rooted in pasture or residual forage (forage cut and left in the pasture for grazing) during the grazing season
- Method for calculating dry matter demand and dry matter intake for feeds and pasture
- Sources of values for animal daily dry matter demand and dry matter content of feeds fed

Length of Grazing Season

The grazing season must be at least 120 days long within each 1-year period. Organic producers should strive to maximize the number of days their animals are on pasture. The intent of the Pasture Rule is to ensure that organic ruminant operations are pasture-based systems, as well as to increase pasture productivity and pasture quality over time.

The grazing season should be determined by the producer and verified by a certifying agent on the basis of site-specific conditions and the typical grazing season timeframes for the region in which the farm is located. The expected grazing season must be documented in the Organic System Plan. Certifiers will review the OSP and verify that the planned grazing season is adequate. In any given year, however, the actual length and timing of the grazing season could vary from the grazing season described in the OSP. For instance, if producers within a region are generally able to graze by the first of May and the grazing season normally ends in mid-October, then the planned grazing season described in the OSP would be 168 days for a farm in that vicinity. During a year in which spring arrives early, however, a producer may let the livestock out to pasture in mid-April. The next year could bring a late spring during which wet soil conditions may keep the animals off pasture until mid-May. Although the actual grazing start dates are variable given the environmental conditions of a specific year, the OSP could continue to describe the start of the grazing season as May 1. The dates of the actual grazing season will be recorded in the producer's records (see Appendix 2 for a sample form). Organic inspectors will review the records of the actual grazing season on-site so that the certifier can determine compliance with the requirement to provide pasture for grazing throughout the grazing season.

Remember, the grazing season need not be continuous. For example, a producer might get 90 days of grazing from April to July, then remove animals from pastures during a 2-week summer-slump period. Grazing could then resume in late July or August for 60 to 90 days until frost. It is important to remember that grazing conditions are very site specific. In addition, the grazing season may be extended through various strategies, such as stockpiling forage in place on pasture for winter grazing. Specifically, this strategy might be successful in the Midwest with fescue pastures, in the Northern Plains and Intermountain West with forages such as Altai wildrye, and in the humid South with bermudagrass.

Recordkeeping Resources for Organic Livestock Producers

Recordkeeping is a critical component of organic production, and the new Pasture Rule requires that organic livestock producers maintain feed and pasture records. Records demonstrate implementation of the pasture management plan. They can also help producers learn from tracking their own observations and practices systematically, and improve their production systems. A good resource for recordkeeping is the publication *Organic Livestock Documentation Forms*, available online at www.attra.ncat.org/attra-pub/livestockforms.html or by calling 800-346-9140. Appendix 2 provides an excerpt from this publication.

Slaughter Stock Production Exemption

Ruminant livestock that are raised for slaughter must be maintained on pasture during the finishing period when that period overlaps with the grazing season. However, slaughter stock are exempt from the 30% dry matter intake from grazing pasture requirement during the finishing period. The finishing period may be a maximum of 120 days or one-fifth of the animal's life, whichever is shorter. Outdoor access must be provided during the finishing phase, and feedlots or yards must be of ample size to allow adequate animal movement without crowding and without competition for food. In summary, dry matter intake from pasture does not have to be calculated for ruminant slaughter stock during the finishing period. And, when the finishing period coincides with the grazing season, slaughter stock must have pasture access.

The Pasture Management Plan

Organic ruminant livestock producers must include a pasture management plan with their OSP. The plan should document the management practices used to provide quality forage for the grazing season. Maintaining sufficient quality and quantity of pasture to graze throughout the grazing season can be accomplished by understanding how much forage is available, how much forage the livestock will consume, and matching the two to use the pasture resource most efficiently. Some simple measurements and calculations, pasture maps, and a record of days grazing each pasture are all that is needed. Certifiers may accept an estimate of available forage in lieu of calculations. However, taking forage measurements and documenting forage supply and demand will help producers to determine pasture or paddock size and length of grazing period. Good management and a pasture management plan can improve pasture productivity and utilization.

The Pasture Management Plan (part of the Organic System Plan) should describe the following practices:

- Types of pasture: plant species, perennial pastures, annual pastures, etc.
- Pasture management practices to maintain pasture quality and at least 30% dry matter intake (DMI) from grazing
- Length of grazing season
- Grazing system used: rotational, high-density, rest-rotation, etc.
- Locations and types of fences, shade, and water
- Soil fertility plan
- How forages and forage crops are seeded
- Erosion control practices used to protect soil and water quality

Grazing Management Resources for Planned Grazing

The Grazing Systems Planning Guide developed by the University of Minnesota Extension Service is a good resource for developing a grazing system plan. It is available online at www.extension.umn.edu/distribution/livestocksystems/DI7606.html or by calling 800-876-8636.

Other resources to help develop a grazing system:

Temperate and Introduced Pastures

Pastures for Profit: A Guide to Rotational Grazing, University of Wisconsin Extension
<http://learningstore.uwex.edu/%2FPastures-for-Profit-A-Guide-to-RotationalGrazing-P96.aspx>

University of Kentucky Cooperative Extension Rotational Grazing Guide
www.ca.uky.edu/agc/pubs/id/id143/id143.htm

University of Vermont Pasture Network
www.uvm.edu/~pasture/

Dairy & Livestock Resources, Northeast Organic Farming Association of Vermont
<http://nofavt.org/programs/tech-assistance-education-dairy-farming/dairy-livestock-resources>

Rangeland and Pasture

Grazing Lands Technical Publications, USDA Natural Resources Conservation Service
Grazing Lands Technology Institute
www.glti.nrcs.usda.gov/technical/publications/index.html

Pasture and Grazing Technical Information & Tools, Michigan NRCS
www.mi.nrcs.usda.gov/technical/grazing.html
Includes excellent resources for writing a pasture management plan.

continued on page 5

Holistic Management International

www.holisticmanagement.org

Educational workshops and tools, including publications and worksheets for holistic ranch management and grazing planning.

The following ATTRA publications are particularly useful in designing grazing systems:

Rotational Grazing IP086

Paddock Design, Fencing and Water Systems for Controlled Grazing IP152

Assessing Pasture Condition

Organic livestock producers strive for continual improvement of their pastures. Under organic management, producers should notice pastures becoming not only more productive but also more resilient to fluctuating environmental situations.

Producers can realize continuous pasture improvement by implementing a grazing system that rations out forage according to animal requirements, allows for full plant recovery, and minimizes forage waste (Murphy, 1995). The elements of a sustainable grazing system are:

- timing of grazing (corresponding to plant physiological stage)
- intensity of grazing (duration on the pasture)
- assessment of residue or plant height after grazing
- allowing for plant recovery time after grazing
- adaptive management of grazing practices, depending on pasture recovery rates (i.e., grazing time on a pasture may increase during less-productive times of the year to allow for more plant recovery time after grazing)

The goal of organic pasture management should be the continual improvement of the following ecological characteristics, which can easily be assessed by observing pasture growth and plant recovery throughout the grazing season and over several years of organic management:

- High leaf-area index—an increase in the leaf-to-land-area ratio in the pasture; this is a measure of the amount of vegetative plant cover as a proportion of the overall area of a given part of the pasture.
- High plant density/close plant spacing—related to leaf-area index; soil structure improves and forage plants become healthier; tillering is encouraged through grazing management, and bare soil is reduced.
- High plant diversity and pasture complexity—more plant species begin to occupy the pasture; pasture species complexity allows for greater resilience from environmental pressures.
- Plant growth throughout growing season—plants stay vegetative longer and become more competitive, producing a pasture of higher quality for a longer grazing season.
- Decrease in unproductive plants (over-mature, stunted, weeds) —grazing selectivity is decreased, especially through high-density grazing, and plants are grazed before they become unpalatable.
- More perennial plants—plant succession tends toward perennial plants with deeper root systems; this allows for better soil conditions and fosters vegetative reproduction in some forage-plant species.

Resources for Assessing Pasture Health and Productivity

The USDA Natural Resources Conservation Service (NRCS) publication *Guide to Pasture Condition Scoring* (Cosgrove et al., 2001) lists several key indicators for assessing pasture health and resiliency. Some of the indicators to observe and track include: percent desirable plants, plant residue, plant diversity and vigor, insect and disease pressure, percent legumes in the pasture, and soil fertility and compaction. Producers can use these indicators to assess how well they are managing their pastures.

The *Guide to Pasture Condition Scoring* has an accompanying Score Card that producers can use to evaluate their pastures. These materials are available from local USDA NRCS Service Centers, or can be downloaded from the NRCS website at www.glti.nrcs.usda.gov/technical/publications/index.html.

The Jornada Experimental Range, a USDA-Agricultural Research Service activity in Las Cruces, New Mexico, offers detailed publications on rangeland monitoring and health assessment. These materials are available for download at http://usda-ars.nmsu.edu/monit_assess/monitoring.php.

Calculating Forage Dry Matter Availability and Determining Carrying Capacity

The term “pasture” encompasses many different types of forage-based systems that support grazing by livestock. These span extensive, native range to seeded, fertilized and irrigated “improved” pasture.

Determining how much forage is available (forage yield available for grazing) in a particular pasture is crucial to meeting the needs of grazing animals. Calculating forage dry matter availability helps allocate forage resources for the duration of the grazing season and aids producers in complying with recordkeeping requirements. According to the Pasture Rule, producers must manage pasture as a crop and submit a pasture management plan. This plan includes documentation of the management practices used to provide pasture of a sufficient quality and quantity for livestock throughout the grazing season in order to obtain, at minimum, an average of 30% dry matter intake from pasture.

Forage yield determinations first start with observation. Weekly or daily pasture walks can bring trouble spots to the producer’s attention. Differences in soil types and animal behavior (such as congregating in one area) often result in wide variations in forage yield and utilization across any given pasture. Awareness of trouble spots helps to direct management practices to those areas and enables producers to assess more accurately the actual forage yield across the pasture.

Irrigated and Improved Pasture in Temperate Regions

The factors to consider in determining forage yield for temperate pasture include forage height, density, maturity, and plant species composition. A forage stand should be dense, not overly mature, of appropriate height before grazing, and diverse in plant species. Producers who walk their pastures consistently have a keen eye for the health of the forage stand and learn to estimate forage yield by repeated observation. Walking pastures enables producers to encounter less-productive areas (and trampled areas) that are candidates for pasture improvement.

An easy way to measure forage yield is with a pasture ruler. A pasture ruler is placed on end at ground level, with forage height measured in inches. Each inch of forage height equals anywhere from 100 to 400 pounds per acre of dry matter, depending on the location, soil moisture, season of use, forage species, etc. Table 1 lists estimated pounds of forage available per inch for various temperate forages. Multiple measurements throughout the pasture should be recorded and averaged because not all areas of the pasture may grow or

produce at the same rate and density. This method works well in the eastern and southern United States, and on irrigated pastures in the West, where soil moisture allows dense, vegetative forage stands. The pasture ruler method should be calibrated for local conditions by clipping and weighing forage samples (see below) to determine forage yield on a per-acre basis. This combination will help improve accuracy in measuring forage yield with a ruler.

**Table 1: Pounds of forage available per inch
(dry matter, eastern and southern United States)**

Forage species	Dry matter pounds/acre/inch	
	Average	Range
Alfalfa and grass mixes	225	75-400
Arrowleaf clover	200	100-300
Bermudagrass	260	150-500
Caucasian bluestem	180	75-350
Crimson clover	200	100-300
Kentucky bluegrass	160	100-175
Native warm season grasses	100	50-250
Orchardgrass	180	75-300
Orchardgrass + clover	200	100-300
Red clover	220	100-300
Annual ryegrass	250	75-400
Oats, wheat, rye	150	75-250
Tall fescue	210	100-350
Tall fescue + clover	190	80-325

Source: Ball et al., 2006

Clip and Weigh Forage Yield Measurement

To determine annual plant productivity, a producer clips all the current year's forage from within a 1.92 square foot quadrat and weighs the sample in grams. The quadrat is constructed from PVC pipe and measures 11.5 inches by 22 inches. The quadrat is thrown randomly on the ground, and all the current year's forage inside the quadrat is harvested with shears or scissors. This sampling procedure is repeated at least 10 times to get a representative sample of the area.

The weights of the samples (grams) are summed and multiplied by the percent dry matter of the forage that was harvested. Fresh vegetative forage in most improved pastures has a moisture content of 75 to 85%. Generally, the more mature a forage is, the less the moisture content. The dry matter forage weight is then multiplied by a conversion factor – in this case, the conversion factor is 50 for a 1.92 sq.ft. quadrat. Multiplying the dry weights of the forage in grams by 50 results in lb/ac yield, which is the forage dry matter yield for the site sampled.

More information on conducting a clip-and-weigh forage assessment is widely available from Cooperative Extension services, as well as from ATTRA by calling 800-346-9140. Also, local NRCS staff or Cooperative Extension Agents usually have estimates of forage yield for specific locations.

Determining Paddock Size and Carrying Capacity

A paddock is a pasture subdivision in a rotational grazing system. Animals are moved periodically from paddock to paddock to ensure the availability of high-quality forage for the grazing animals while maintaining forage productivity. To best allocate forage resources, either the size of the paddock for a given number of animals—or conversely, the number of animals for a given paddock size—must be determined. Before determining paddock size, it is important to determine the amount of forage that is available for grazing in the paddock. Determining forage yield on a pound-per-acre/inch basis has already been introduced, and this is used to calculate grazable forage. Grazable forage is the forage that will be grazed, leaving a predetermined forage residue height after grazing.

Once a determination of dry matter yield per acre/inch has been made, the height of the after-grazing residue is subtracted from the total forage height. Then, the forage yield in pounds per acre/inch is multiplied by the difference in forage height to give the amount of forage available for grazing in pounds per acre. This is accomplished with the following formula:

$$\text{Total forage height} - \text{Forage residue} = \text{Grazable forage height}$$

$$\text{Grazable forage height} \times \text{Pounds per acre/inch} = \text{Grazable forage in pounds per acre (on a dry matter basis)}$$

Producers need to determine how to use this forage. Things to know include (1) the daily forage dry matter demand (in lbs) of grazing livestock, (2) the number of days grazing each pasture or paddock, and (3) the size of the pasture or paddock needed for a given number of animals. To determine the daily forage dry matter demand (in lbs) of grazing livestock, use the following formula:

$$\text{Number of animals} \times \text{Average animal weight} \times \text{Percent dry matter intake (or a forage utilization measure)} = \text{Daily forage demand (lbs) of grazing livestock}$$

Note: Percent dry matter intake is expressed as a percent of animal body weight, which is a utilization value. For example, lactating dairy cattle consume between 2.5% and 4% of their body weight per day. Some producers choose to include in this utilization value an account of forage wasted through trampling, etc. (usually about 0.5% of animal body weight). Therefore, forage utilization may include more than dry matter intake, to account for wasted forage.

Determine the number of days animals can graze a paddock by using the following formula:

$$\text{Grazable forage in pounds per acre (dry matter)} \div \text{Daily forage demand (lbs) of grazing livestock} = \text{Number of days grazing each paddock}$$

The final thing a producer needs to do is determine the size of a pasture or paddock for a given number of animals. Use the following formula:

$$(\text{Daily forage demand (lbs) of grazing livestock} \times \text{Days in the grazing period}) \div \text{Grazable forage in pounds per acre (DM)} = \text{Paddock size in acres}$$

Resources that include worksheets for measuring forage availability and determining livestock forage demand are listed in the Assessing Pasture Condition section above.

Paddock size and grazing period example: 1,150 lb lactating cows

Assumptions:

50 lactating cows, average weight 1,150 pounds

3.5% daily dry matter intake (as a percentage of body weight)

Average forage height at the beginning of grazing – 10 inches

After-grazing forage residue height – 2 inches

Average pounds of forage per acre/inch – 250 pounds (dry matter)

Grazable forage height

10 inches – 2 inches = 8 inches

Grazable forage in pounds per acre (dry matter)

8 inches x 250 lb/acre/inch = 2,000 pounds

Daily forage demand of grazing livestock (dry matter)

50 x 1,150 lb x .035 = 2,012 lbs/day

Number of days grazing each paddock

2,000 lb ÷ 2,012 lb = 1 day

Paddock size in acres

2,012 lb x 1 ÷ 2,000 = 1 acre

Leaving adequate forage residue after grazing is vital to obtain sufficient forage re-growth, both vegetative and root growth, prior to the next grazing event. For more information, see the ATTRA publication *Rotational Grazing* available online at www.attra.ncat.org/attra-pub/livestockforms.html or by calling 800-346-9140.

Optimum Post-Grazing Residue Heights for Selected Forages

Cool-season perennial bunchgrasses – 3 inches

Warm-season perennial bunchgrasses – 6 inches

Warm-season annual grasses – 8 inches

Cool-season annual grasses, including cereals – 3 inches

White Clover – 1 inch

Other Clovers – 3 inches

Tall Fescue – 2 inches

Bermudagrass – 1 inch

Kentucky Bluegrass – 1 inch

Source: Ball et al., 2006

Native Rangeland

The per-acre/inch forage yield assessments (as noted above) are seldom used on arid and semi-arid rangeland. Instead, rangeland managers rely on such criteria as plant species composition, frequency of key species, forage productivity (annual yield), and percentage of cover to get an overall assessment of the health of the whole rangeland ecosystem. This rangeland health assessment is useful for determining yield and livestock carrying capacity on rangeland. For detailed informational resources on rangeland health assessment and yield determination, see the accompanying box on Rangeland Resources.

Rangeland Resources

Rangeland Health and Planned Grazing Field Guide

http://quiviracoalition.org/Detailed/QC_Publications/Field_Guides/Rangeland_Health_and..._83.html

An introduction to planned grazing on arid and semi-arid rangelands.

USDA-NRCS National Range and Pasture Handbook

www.glti.nrcs.usda.gov/technical/publications/nrph.html

How to Measure Forage Production For the Astute Producer, Texas USDA-NRCS

www.texasglti.org/docs/forage.pdf

Native rangeland annual productivity values can be obtained from the USDA Natural Resources Conservation Service Soil Survey. Each county in the United States has been historically mapped according to soil type and native plant composition. Annual productivity values for each plant are also listed, including data for periods of below average annual precipitation, normal periods, and periods of high annual precipitation. It is important to remember that these values are for the native plant population historically associated with these sites. Native vegetation on many rangeland sites across the western United States has been replaced by introduced species such as crested wheatgrass or Old-world bluestem that may yield more dry matter than the native plants. In addition, introduced noxious weeds such as knapweed and downy brome (cheatgrass) may also be present, which will further reduce the accuracy of the soil survey annual yield values.

Local USDA Natural Resources Conservation Service centers can assist producers with interpreting soil surveys. The entire soil survey is also available online. Entitled the Web Soil Survey, it is a database of soils and soil characteristics that allows users to enter their location to pull up a map of their area. A particular ranch can be located, and soil and plant data can then be extracted from tables. The Web Soil Survey is available online at <http://websoilsurvey.nrcs.usda.gov/app/HomePage.htm>.

If the soil survey is not available, or if introduced grasses are prominent, forage productivity on rangeland can be measured very effectively by the clip-and-weigh method as introduced above, using a 1.92 sq. ft. quadrat. After the weights of the samples in grams are summed and multiplied by the percent dry matter and the conversion factor (50), the forage dry matter annual yield for the site sampled is obtained. Table 2 shows common dry matter values for various range forages, whereas Table 3 depicts the calculations used to arrive at annual dry matter yield.

For best results, forage samples should be taken in the late summer from ungrazed enclosures to most accurately determine annual dry matter yield on rangeland.

Table 2: Percent Dry Matter for Rangeland Forages					
Plants	Before heading	Headed out	Seed ripe	Leaves dry	Dormant
Cool-season grasses	35	45	60	85	95
Warm-season grasses					
Tall grasses	30	45	60	85	95
Mid grasses	40	55	65	90	95
Short grasses	45	60	80	90	95
Forbs					
Leafy	20	40	60	90	100
Fibrous	30	50	75	90	100

Source: adapted from Mosley, Mark. Texas NRCS.

Table 3: Calculating Annual Forage Yield (lb/ac)

Forage	Forage Samples, grams										Sum	Conv. factor	%DM	lb/ac yield
	1	2	3	4	5	6	7	8	9	10				
Gramma	2	1	0	0	2	2	1	0	3	2	13	50	55%	357
Bluestem	10	12	12	10	14	15	13	13	11	15	125	50	45%	2,812
Total														3,169

Source: adapted from Mosley, Mark. Texas NRCS.

Determining Carrying Capacity on Rangeland by Forage Yield

Determining carrying capacity, or how many animals you can graze on a pasture, is a matter of measuring or estimating annual plant productivity and matching it to the dry matter intake of the grazing animal.

Tables 4, 5, and 6 are used to calculate annual carrying capacity. Table 4 is helpful in figuring projected yearly intake of forage by grazing livestock. The average weight is multiplied by daily intake as a percentage of body weight (BW). Then, the daily intake is multiplied by 365 to get the projected yearly demand for forage intake.

Table 4: Calculating Annual Animal Intake (example)

Animal wt	% intake (BW)	Daily intake	Yearly intake
1,100 lb angus cows	2.5%	27.5 lb	10,037 lb

Once yearly forage demand is calculated, Table 6 is used to calculate the pasture carrying capacity. Information from Table 3 (calculating annual forage yield, above) is transferred to Table 6 in the Yield (lb/ac) field. A utilization value is used to represent the amount of forage actually grazed. On rangeland, a “take half, leave half” rule is often used to allow adequate forage residue for forage regrowth. Research has shown that when forage leaf removal exceeds 50%, a significant percentage of root growth stops (see Table 5). In addition, many range practitioners suggest leaving an additional 25% of the forage to account for trampling, wildlife use, and natural plant death.

Table 5: Correlation between grazing and root growth

Percent leaf removal	Percent root growth stopped
10%	0%
20%	0%
30%	0%
40%	0%
50%	2-4%
60%	50%
70%	78%
80%	100%
90%	100%

Source: Gadzia and Sayre, 2009

The carrying capacity example in Table 6 uses a 25% forage utilization rate. Assuming 2,000 acres of grazing with an average 3,169 pounds per acre dry matter yield, the grazable acreage and number of livestock the ranch will support are easily calculated.

Table 6: Calculating Annual Pasture Carrying Capacity (example)

Pasture	Yield (lb/ac) (Table 3)	Acres	Total yield pounds DM	% utilization	Grazable forage lbs. DM	Livestock demand pounds DM (Table 4)	Number of livestock
1	3,169	2,000	6,338,000	25% (0.25)	1,584,500	10,037	157

Source: adapted from Mosley, Mark. Texas NRCS.

Calculating Carrying Capacity on Rangeland with Animal Days per Acre (ADA)

Animal days per acre (ADA) is a subjective measure of how long a pasture or paddock will supply forage to a given number of animals. It is an estimate of how many days an acre will support one animal, or how many days a given number of acres will support a herd of a given size. The ADA method is useful if a producer has a good idea of how much land area an animal will need for grazing for 1 day. In fact, it can be a very good method once the producer, through observation and monitoring, becomes more accurate at estimating the amount of area needed for one animal for 1 day. The ADA method can be used to estimate carrying capacity for pastures during the growing season or for grazing winter stockpiled forage.

The ADA method is useful in planning grazing, but, as was stated above, is only as good as the initial estimate of animal daily forage needs. Producers need to take into consideration: (1) yield estimates for the forage; and (2) forage stubble height after grazing when determining the area needed for one animal for 1 day (yield measurements derived from Table 3 may be appropriate). The ADA method is especially useful for estimating the number of days grazing for stockpiled forage or for strip-grazed systems where the animals graze along a front and do not return to previously grazed pasture until plants have recovered fully.

To calculate animal days per acre, an area is first paced off that represents the amount of land an animal needs for 1 day. For example, suppose a producer knows that an animal needs an area of 20 yards by 20 yards of forage to provide enough dry matter intake for 1 day. $20 \text{ yards} \times 20 \text{ yards} = 400 \text{ square yards}$.

Next, divide 4,840 (number of square yards in an acre) by 400 square yards to get 12.1 stock days per acre (SDA). This means that 1 acre will support one animal for 12.1 days. SDA is multiplied by the total number of acres in the pasture to arrive at the number of stock days in the pasture (SD). To continue the example, $12.1 \text{ SDA} \times 2,000 \text{ acres} = 24,200 \text{ stock days}$ for the pasture.

To get an estimate of the number of days a herd can graze the pasture, divide SD by the number of animals in the herd. In the example, $24,200 \text{ SD} \div 157 \text{ animals} = 154$. So, in this example a producer could graze 157 animals on 2,000 acres for 154 days.

NOP Regulations for Organic Ruminant Livestock; Calculating Dry Matter Demand (DMD) and Dry Matter Intake (DMI)

The NOP requirements for ruminant grazing and feed from pasture rely heavily on calculations of dry matter demand (DMD) and intake to verify compliance with the standards requiring organic ruminants to consume at least 30% of their dry matter intake (DMI) from grazing. These concepts may not be familiar to all producers, but can readily be calculated using a series of simple formulas. Organic standards do not require any specific method of calculation. The producer can choose and explain the method used to determine DMD and DMI, which will then be verified by the certifying agent.

The NOP regulations specify that the ruminant livestock producer must describe, for each type and class of animal, the total feed ration (all types of feed used on-farm including pasture, feed purchased, feed produced, the percentages of each type of feed in the total ration, and a list of all feed supplements and additives). The producer must also document the amount of each feed type actually fed. Furthermore, the producer must document any changes made to this plan and provide the method used for calculating dry matter demand and dry matter intake.

For some types of livestock operations, such as those raising animals that graze pasture throughout the grazing season and receive no feed supplements or additives (i.e., grass-fed or grass-finished), a straightforward description of their practices and "rations" may suffice as providing a method for calculating dry matter intake.

Many livestock producers, however, provide some type of supplemental feed (for example, hay) during the grazing season and will therefore need to provide more detail on their method for calculating dry matter demand. The section below provides detailed steps for one method of calculating dry matter demand that allows for documenting compliance with the Pasture Rule.

Organic producers first estimate the DMD that each group of animals (e.g., lactating, dry, heifers) needs to consume each day. Then, producers document the ration for each group of animals, showing the dry matter intake (DMI) and percentage of each type of feed in the ration designed to meet the needs of each group of animals.

An initial DMI should be calculated for each group at the beginning of the grazing season, and an additional calculation made whenever a change in the feed ration occurs. Feed rations may change due to the animals' nutritional needs (as animals grow, move through a lactation cycle, etc.) or due to changes in pasture availability. For instance, pasture availability is often much higher in the early summer than it is during spring transition when grasses are just beginning to grow. Whereas animals may obtain less than 30 percent of their daily dry matter intake from pasture in early spring, intake increases to well over 30 percent on quality pasture during the summer. Producers will likely feed much less non-pasture feed when pasture is more available. Therefore, DMI should be recalculated when feed rations change. Producers need to demonstrate an average intake value over the entire grazing season.

Even though dry matter intake needs to be calculated over the whole grazing season, the grazing season itself does not have to be continuous. The producer will be able to exclude time periods when inclement weather or climate conditions may cause the grazing season to be discontinuous (e.g., storm events, poor growing conditions). Producers must document when climatic conditions warrant a break in the grazing season.

Dry Matter Demand

Livestock need to consume a certain amount of nutrients from feedstuffs each day (measured in pounds per day) to maintain health and production (growth or lactation). The amount of feedstuffs livestock need is referred to as dry matter demand (DMD). Predicting or estimating DMD is further explained in Step 1 of the section Simple Hand Method to Estimate Dry Matter Intake (DMI) below. Through some combination of grazing on pasture and consuming supplemental feed, animals consume enough nutrients (expressed as dry matter intake) to meet their requirements (expressed as dry matter demand).

Estimating Dry Matter Demand from Published Tables

The NOP website (first three sources below) provides resources for calculating dry matter demand (DMD) and dry matter intake (DMI) including DMD tables for Beef, Dairy Cows and Dairy Goats. Organic certifiers and educational organizations, including Cooperative Extension, also provide explanations and examples of ways to estimate DMD and calculate DMI for different types of ruminant livestock (two sources listed). Producers may choose DMD references that best fit the characteristics of each type and class of ruminant livestock they manage, and describe their methods for calculating DMI. The factors that influence actual DMD include forage quality, weather, animal condition, genetics, health, and activity.

USDA Dairy Cattle DMD tables

www.ams.usda.gov/AMSV1.0/getfile?dDocName=STELPRDC5082662&acct=noprulmaking

USDA Beef Cattle DMD tables

www.ams.usda.gov/AMSV1.0/getfile?dDocName=STELPRDC5082663&acct=noprulmaking

USDA National Organic Program, Dry Matter Demand Tables For Classes of Dairy Goats

www.ams.usda.gov/AMSV1.0/getfile?dDocName=STELPRDC5087914&acct=noprulmaking

Sheep 201: Flock nutritional requirements

www.sheep101.info/201/nutritionreq.html

Includes tables for nutritional requirements for various classes of sheep. DMI% values on these tables are equivalent to daily dry matter demand.

Langston University

Goat Ration Balancer and Nutrient Requirement Calculator

www.luresext.edu/goats/research/nutritionmodule1.htm

Calculates rations as well as daily dry matter demand.

The NOP does not specify allowed or required information sources; it only requires that the producer indicate in the OSP what methods are used to determine (estimate and calculate) DMD and DMI.

Dry matter intake is often expressed as a percentage of live animal body weight. Table 7 lists the intake ranges for various species and classes of ruminant livestock. Producers should use published tables to get a more accurate value for their livestock.

Table 7: Dry Matter Demand (DMD) by Percentage of Body Weight for Ruminant Groups

Ruminant group	% body weight (DMD = % x animal body weight)
Beef cattle, lactating	2.0 – 2.5 **
Beef cattle, growing and finishing slaughter stock	2.25 – 3.35 **
Dairy heifers	2.5 *
Dairy cows, dry (small and large breed)	1.8 *
Dairy steers	See beef slaughter stock
Goats, weaned, slaughter or replacement stock	2.25 *
Goats, brood or lactating	4.0 *
Sheep, weaned, slaughter or replacement stock	3.3 *
Sheep, brood or lactating stock	3.65 *

Sources: (**) DMD tables on the NOP website; (*) Pennsylvania Certified Organic, 2010

Dry Matter Intake

Nutrients in feedstuffs are measured according to their percent dry matter. Feedstuffs differ in the amount of moisture they contain. Fresh pasture has high water content and has a lower percentage of dry matter than an equivalent weight of drier feed, such as hay or grain. For example, dry hay is around 15-20% moisture, corn about 15% moisture, and fresh forages up to 90% moisture. By reducing all feedstuffs to their percent dry matter, feedstuffs can be compared regardless of their moisture content. This makes it much easier to determine dry matter intake (DMI) and develop rations that include feeds from different sources—grazing and/or supplemental feeds (USDA, 2010a).

Dry Matter Content of Feeds

Dry matter content of feedstuffs can be estimated two different ways. The first (and the easiest) is to use published reference tables that list the percent dry matter in various dry (hay and grain), fresh (pasture) and ensiled feeds. Published tables for feed dry matter content are easily obtained from university Extension services. The NOP website also recommends several resources for estimating feed dry matter composition (see text box Resources for Estimating Dry Matter Composition of Feeds).

Resources for Estimating Dry Matter Composition of Feeds

National Research Council (NRC) Nutrient Requirements for Domestic Animals

Beef Cattle 7th revised edition, 2000
www.nap.edu/catalog.php?record_id=9791

Dairy Cattle 7th revised edition, 2001
www.nap.edu/catalog.php?record_id=9825

Small Ruminants (sheep and goats), 2000
www.nap.edu/catalog.php?record_id=11654

Feed Composition Tables from Beef Magazine, March 2010 (updated annually):
<http://beefmagazine.com/nutrition/feed-composition-tables/feed-composition-value-cattle--0301/index1.html>

continued on page 16

United States-Canadian Tables of Feed Composition:
Nutritional Data for United States and Canadian Feeds, Third Revision
www.nap.edu/catalog.php?record_id=1713

Dairy One Feed Composition Library
www.dairyone.com/Forage/FeedComp/disclaimer.asp

On-line Interactive Feed Library, The Samuel Roberts Noble Foundation
www.noble.org/Ag/FeedLib/Disclaimer.aspx?ReturnUrl=%2fAg%2fFeedLib%2fIndex.aspx

Percent Dry Matter in Common Feedstuffs:

Feed	Percentage Dry Matter
Grain	89
Dry hay	90
Grain Silage	25-35
Haylage/Baleage	35-60

Source: USDA. 2010b.

Simple Hand Method to Estimate Dry Matter Intake (DMI) on Pasture

Calculating dry matter intake on pasture is relatively simple. The following formulas determine dry matter intake on pasture by the “substitution method.” Basically, the amount of non-pasture feeds (hay, grains, etc.) fed per day is subtracted from the daily dry matter demand of the animals. The resulting value is inferred as the daily intake of pasture dry matter. Steps 1 through 4 should be used for each ration period during the grazing season. Step 5 is used to average the pasture DMI for all of the ration periods that occur during the grazing season. Two DMI worksheets with examples that use the following procedures are included in Appendix 1.

NOTE: A ration period is defined by a certain set of feed ration—type and amount of feeds fed—in addition to grazing. DMI must be calculated for each ration period during the grazing season for each type and class of ruminant livestock. Ration periods may change over the course of the grazing season based on forage availability and/or quality. A rule of thumb is to calculate a new DMI on pasture each time feed rations change during the grazing season.

Step 1: Predict Dry Matter Demand (DMD) (in pounds)

Dry Matter Demand (lbs) = Body Weight (lbs) x (DMI % Body Weight Value/100 lb)

Example:

Dairy cattle consume approximately 2.0% to 4.0% of their body weight in dry matter per day, depending on their stage of production (milk production and % milk fat). Lactating dairy cows weighing an average of 1,200 lbs consume approximately 3.0% of their body weight in dry matter intake daily. Thus, the dry matter demand is approximately 36 lbs of dry matter per day for that class of animal.

Dry Matter Demand (lbs) = 1,200 x (3.0/100) = 36 lbs

Step 2: Determine Dry Matter Intake from Feed Sources Other than Pasture

Example:

Assume 1,200-lb lactating cows are eating a ration of hay and grain in addition to pasture. The dry matter contents of feed sources other than pasture are expressed below in the following example:

Dry matter content of hay: 90%

Dry matter content of corn grain: 89%

5 lbs hay per day x (90/100) = 4.5 lbs Dry Matter (DM)

11 lbs corn grain per day x (89/100) = 9.79 lbs DM

4.5 + 9.79 = 14.29 lbs per day total intake of dry matter from non-pasture feed sources

Step 3: Determine Dry Matter Intake from Pasture

Estimated DMD per animal (lbs) – Total lbs dry matter intake from feed sources other than pasture = Estimated pasture DMI

Example:

Estimated dry matter intake for 1,200 lb lactating cows is 36 lbs – 14.29 lbs from feed sources other than pasture = 21.71 lbs per day pasture DMI

Step 4: Calculate the Percent Dry Matter Intake from Pasture for the Grazing/Ration Period

Percent DMI from pasture = (Estimated lbs DMI from pasture ÷ estimated DMD (lbs)) x 100

Example:

Percent DMI from pasture = (21.71 ÷ 36) x 100 = 60.31%

The 30% minimum DMI on pasture requirement for this grazing/ration period is satisfied.

Step 5: Calculate a Weighted Average of the Dry Matter Intake Values for all Grazing/Ration Periods in the Grazing Season

After calculating the DMI on pasture for all grazing/ration periods in the grazing season, an average for the entire grazing season should be calculated. For this step, the producer needs to know:

- Number of days in each grazing/ration period
- DMI from pasture for each grazing/ration period (from Steps 1 through 4)
- Total days in the grazing season

Continue with the example from Step 4, assuming 60.31% DMI from pasture for the summer grazing/ration period that was 110 days in length. Also assume the following values for spring and fall grazing:

Spring grazing: 20% DMI for 30 days

Fall grazing: 30% DMI for 30 days

To calculate average DMI from pasture for the entire grazing season, first multiply the % DMI for each grazing/ration period by the number of days in that period, then divide the sum of those numbers by the total number of days in the grazing season (all grazing/ration periods), and multiply by 100 to convert this number to a percentage. The result of this

calculation is an average percent DMI from pasture for all grazing/ration periods in the grazing season for this year.

Spring grazing: 20% DMI X 30 days = 6

Summer grazing: 60.31% DMI X 110 days = 63.34

Fall grazing: 30% DMI X 30 days = 9

Sum: 6 + 63.34 + 9 = 78.34. Divide: $78.34 \div 170 = .46$ Multiply: $.46 \times 100 = 46\%$ average DMI from pasture for this grazing season.

As shown above, sum the figures for each grazing ration period ($6 + 63.34 + 9 = 78.34$), divide by (\div) the total days in the grazing season (170), and multiply the result by 100 to arrive at 46% DMI for the grazing season. This calculation shows that the operation meets the requirement of >30% DMI from pasture for this grazing season.

NOTE: This example was developed assuming three grazing/ration periods: spring, summer, and fall. These periods will likely vary from region to region and farm to farm. It is important to calculate DMI for each grazing/ration period based on the pasture availability and amount of non-pasture feeds actually fed. A rule of thumb is to calculate a new DMI on pasture each time a ration changes significantly.

DMI worksheets with examples that use these procedures are included in Appendix 1.

Calculating DMI with Downloadable Online Spreadsheets

Pennsylvania Certified Organic and California Certified Organic Farmers are two USDA-accredited certifying agencies that have developed very similar, useful two-part spreadsheets that can be downloaded from their websites at www.paorganic.org/ or www.ccof.org, respectively. A Bee Organic offers a compact Ruminant DMI Calculation Worksheet at www.abeorganic.com. These Excel spreadsheets can be used to record feed rations and calculate DMI for each type and class of ruminant animal for each grazing/ration period. After calculating the DMI for each grazing/ration period, the Average DMI Calculation for Grazing Season spreadsheet may be used to calculate the average DMI from pasture for each type/class of ruminant animal for the entire grazing season.

The University of Wisconsin Extension Forage Team has developed an online spreadsheet that calculates DMI on pasture with a few simple inputs (Cooper and Cosgrove, no date). This Excel spreadsheet is available at www.uwrf.edu/grazing/DMI.xls.

Although it is designed for dairy cows and regional feeds, this Excel spreadsheet could be adapted for different animal species or feed types. The inputs needed for the program are feeding and production records:

- Daily milk production per cow in pounds
- Percent milk fat
- Cow weight in pounds
- Grain fed per day in pounds
- Hay fed per day in pounds
- Haylage fed per day in pounds
- Corn silage fed per day in pounds

There are some default values for feed DM and energy levels, or producers can input their own values. Using the information supplied by a producer, the program will calculate forage DMI and total feed DMI per animal per day. Percent DMI from pasture can be derived by dividing forage DMI by total feed DMI.

Calculating Dry Matter Intake on Rangeland

Most rangeland-based livestock operations do not feed as many concentrated feeds as do dairy farms. Beef cattle operations, especially cow-calf and stocker operations, are grass-based by definition and concentrated feeds, when fed, are usually fed as supplements. Hay is fed quite often in the winter, though many operations provide no supplemental feeds at all during the grazing season. For these operations, calculating dry matter intake on pasture may be a little easier than it is for the dairy grazer who feeds concentrates during the winter and even some during the grazing season.

The following example illustrates how a rangeland manager might calculate dry matter intake for a herd of organic beef cows on native range in late summer.

Step 1: Predict Dry Matter Demand (DMD) (in pounds)

Dry Matter Demand (lbs) = Body Weight (lbs) x (DMI % Body Weight Value/100 lb)

Example:

Beef cattle consume approximately 2.5% of their body weight in dry matter per day. Assuming 1,200 lb Angus-cross cows, the dry matter demand is approximately 30 lbs of dry matter per day.

Dry Matter Demand (lbs) = 1,200 x (2.5/100) = 30 lbs

Step 2: Determine Dry Matter Intake from Feed Sources Other than Pasture

Example:

Assume 1,200 lb beef cows are eating 1 pound per day of cottonseed meal and 10 pounds of hay in addition to pasture. The dry matter content of the cottonseed meal is 92% and the 85% for the hay.

1 lb cottonseed meal per day x (92÷100) = 0.92 lbs DM per day

10 lbs hay per day x (85÷100) = 8.5 lbs DM per day

0.92 + 8.5 = 9.42 lbs total intake of dry matter from non-pasture feed sources.

Step 3: Determine Dry Matter Intake from Pasture

Estimated DMD per animal (lbs) – Total lbs dry matter intake from feed sources other than pasture = Estimated DMI from pasture.

Example:

Estimated dry matter intake for 1,200 lb. beef cows is 30 lbs – 9.42 lbs from feed sources other than pasture = 20.58 lbs per day DMI from pasture.

Step 4: Calculate the Percent Dry Matter Intake from Pasture for the Grazing/Ration Period

Percent DMI from pasture = (Estimated lbs DMI from pasture ÷ estimated DMD (lbs)) x 100

Example:

Percent DMI from pasture = (20.58 ÷ 30) x 100 = 68.6%

Thus the 30% minimum DMI on pasture requirement for this grazing/ration period is satisfied.

Summary

Recordkeeping is crucial for maintaining compliance with NOP regulations. Producers need to show organic certificates and purchase records for all organic feed and roughages for bedding, keep track of feed rations fed, and describe their pasture management plan in detail. DMI calculations and DMD references must be documented. Pastures must be identified and pasture access recorded for each day animals are on pasture during the grazing season. Forage supply and allocation calculations are not specifically required but may help producers to better manage pasture, thus ensuring success in obtaining at least 30 percent dry matter intake while on pasture for a grazing season of at least 120 days per year.

If assistance is needed in calculating dry matter intake or developing a pasture management plan, producers are welcome to contact the ATTRA information service either through the website (www.attra.ncat.org) or through the helpline at 800-346-9140.

There are many excellent national and regional resources to assist organic livestock producers, including the following:

National Organic Program Handbook

www.ams.usda.gov/AMSv1.0/NOPProgramHandbook
or call 202-720-3252

Midwest Organic and Sustainable Education Service (MOSES)

www.mosesorganic.org/productioninfo.html

The Southern Sustainable Agriculture Working Group

www.ssawg.org/organicfarmer.html

eOrganic – Organic Dairy Production System Topics

Organic resource directory hosted at Oregon State University.

www.extension.org/article/18624

Northeast Organic Dairy Producers Alliance

www.nodpa.com

Rodale Institute New Farm website

www.newfarm.org

Holistic Management International

www.holisticmanagement.org

Tools, publications, and worksheets for holistic ranch management and grazing planning.

How To Go Organic, Pasture Management and Grazing

www.howtogoorganic.com/index.php?page=pasture-management

Extensive resource listing of websites and publications on organic pasture and forage management.

Other sources of assistance include local county Extension agents and USDA-NRCS conservationists, grazing specialists, or rangeland management specialists.

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www.ams.usda.gov/NOP (select "NOP regulations" from the menu on the right side of the page, then select "Electronic Code of Federal Regulations (eCFR) (Standards)" from the list in the center of the page)

Appendix 1A and 1B: Dry Matter Intake (DMI) Calculation Worksheets

Grazing Season Ration Period Dry Matter Intake Calculation Worksheet A (Example):

DMI from Non-Pasture Feed Sources and from Grazing

Instructions: Use this form to document Dry Matter Intake (DMI) during the grazing season. Use separate worksheets for each type and class of livestock. Complete one Worksheet A for each distinct grazing/ration period (each time the feed ration changes during the grazing season). Then use Worksheet B to calculate the average DMI from pasture over the entire grazing season.

Please note: While these worksheets provide one way to document your compliance with organic standards, these are not required forms; you may provide another method for calculating DMD and DMI.

Operation Name <i>Example</i>		Date and Year <i>January 1, 2011</i>									
Ration Name/Type <i>Early lactation corn, hay, pasture</i>		Livestock Type (species, breed, average weight): <i>Early-lactating Holstein cows, 1,200 lb</i>									
Time period this ration is fed (during grazing season ONLY) Season: <input type="checkbox"/> Winter <input checked="" type="checkbox"/> Spring <input type="checkbox"/> Summer <input type="checkbox"/> Fall Number of Days: <i>30</i>		Class of Animal <input type="checkbox"/> Calf / Lamb / Kid <input type="checkbox"/> Heifer / Young Stock <input checked="" type="checkbox"/> Lactating <input type="checkbox"/> Dry <input type="checkbox"/> Breeding <input type="checkbox"/> Slaughter <input type="checkbox"/> Other (specify):									
Number of Animals: <i>30</i>	Dry Matter Demand (in lbs): <i>34 lbs/day</i>		Source of DMD values: <i>NOP Dairy tables for large-breed milk cows</i>								
			Source of Feed Dry Matter values: <i>NRC Nutrient Required for Dairy Cattle</i>								
Feed type (list all other than pasture)	Average weight (lbs) fed per animal per day	x	Dry Matter Content of feed source as %	=	DMI Fed (in lbs)						
<i>Corn</i>	<i>18</i>	<i>x</i>	<i>.89</i>	<i>=</i>	<i>16.02</i>						
<i>Hay</i>	<i>15</i>	<i>x</i>	<i>.90</i>	<i>=</i>	<i>13.5</i>						
		<i>x</i>		<i>=</i>							
		<i>x</i>		<i>=</i>							
Total DMI fed from non-pasture (sum of DMI lbs of each type)					<i>29.52</i>						
Dry Matter Demand (lbs)	-	Total DM fed	=	DMI from pasture	÷	Dry Matter Demand	=	DMI ratio	x 100	=	% DMI from Pasture
<i>34</i>	-	<i>29.52</i>	<i>=</i>	<i>4.48</i>	<i>÷</i>	<i>34</i>	<i>=</i>	<i>.13</i>	<i>x 100</i>	<i>=</i>	<i>13%</i>

Dry Matter Demand: The DMD for a given type and class of animals will likely change during the course of the grazing season because animals grow and milk production changes over time. Each calculation should use a DMD value based on your best estimate of average weight/productivity during each ration period.

Dry Matter Content: Feed sources may vary in moisture contents, especially for fresh and ensiled feeds. Please provide the source and accuracy of each material's dry matter content, and explain any significant variation from reference values.

Grazing Season Ration Period Dry Matter Intake Calculation Worksheet A: DMI from Non-Pasture Feed Sources and from Grazing

Instructions: Use this form to document Dry Matter Intake (DMI) during the grazing season. Use separate worksheets for each type and class of livestock. Complete one Worksheet A for each distinct grazing/ration period (each time the feed ration changes during the grazing season). Then use Worksheet B to calculate the average DMI from pasture over the entire grazing season.

Please note: While these worksheets provide one way to document your compliance with organic standards, these are not required forms; you may provide another method for calculating DMD and DMI.

Operation Name				Date and Year							
Ration Name/Type				Livestock Type (species, breed, average weight):							
Time period this ration is fed (during grazing season ONLY) Season: <input type="checkbox"/> Winter <input type="checkbox"/> Spring <input type="checkbox"/> Summer <input type="checkbox"/> Fall Number of Days:				Class of Animal <input type="checkbox"/> Calf / Lamb / Kid <input type="checkbox"/> Heifer / Young Stock <input type="checkbox"/> Lactating <input type="checkbox"/> Dry <input type="checkbox"/> Breeding <input type="checkbox"/> Slaughter <input type="checkbox"/> Other (specify):							
Number of Animals:		Dry Matter Demand (in lbs):		Source of DMD values:							
				Source of Feed Dry Matter values:							
Feed type (list all other than pasture)		Average weight (lbs) fed per animal per day	x	Dry Matter Content of feed source as %	=	DMI Fed (in lbs)					
			x		=						
			x		=						
			x		=						
			x		=						
Total DMI fed from non-pasture (sum of DMI lbs of each type)											
Dry Matter Demand (lbs)	-	Total DM fed	=	DMI from pasture	÷	Dry Matter Demand	=	DMI ratio	x 100	=	% DMI from Pasture
	-		=		÷		=		x 100	=	

Dry Matter Demand: The DMD for a given type and class of animals will likely change during the course of the grazing season because animals grow and milk production changes over time. Each calculation should use a DMD value based on your best estimate of average weight/productivity during each ration period.

Dry Matter Content: Feed sources may vary in moisture contents, especially for fresh and ensiled feeds. Please provide the source and accuracy of each material's dry matter content, and explain any significant variation from reference values.

Grazing Season Ration Period Dry Matter Intake (DMI) Calculation for Organic Ruminant Livestock

Worksheet B (Example):

Calculating the Average DMI from Pasture for the Grazing Season

Instructions: Use this Worksheet B to calculate the average DMI from grazing for each type and class of animal over the entire grazing season. Use all completed Grazing/Ration Period DMI Calculation Worksheet A's for a type and class of animal to provide input into this worksheet. Please note: While these worksheets provide one way to document your compliance with organic standards, they are not required forms; you may provide another method for calculating DMD and DMI.

Operation Name / Year: <i>Example</i>	Class of Animal <input type="checkbox"/> Calf / Lamb / Kid <input type="checkbox"/> Heifer / Young Stock <input checked="" type="checkbox"/> Lactating <input type="checkbox"/> Dry <input type="checkbox"/> Breeding <input type="checkbox"/> Slaughter <input type="checkbox"/> Other (specify):
Total # Days in Grazing Season (from table below = Total # of Days Fed during the Grazing Season): <i>170</i>	# Animals in Group: <i>30</i>

Using your completed Worksheets A, enter the ration dates, number of days fed, and % DMI from pasture for each distinct feed ration period during the grazing season in the table below. To calculate the weighted average DMI from pasture for the entire grazing season, multiply the % DMI for each grazing/ration period by the number of days in that period, then divide the sum of those numbers by the total number of days in the grazing season (all grazing/ration periods), and multiply by 100 to convert this number to a percentage.

Ration Name/Type/ID	Dates Fed	# of Days Fed	x	Daily DMI from Pasture (from DMI worksheet)	=	DMI from Pasture during period
<i>Spring transition</i>	<i>April 10 – May 10</i>	<i>30</i>	<i>x</i>	<i>.13</i>	<i>=</i>	<i>3.9</i>
<i>Summer grazing</i>	<i>May 11 – Sept 30</i>	<i>110</i>	<i>x</i>	<i>.70</i>	<i>=</i>	<i>77</i>
<i>Fall grazing</i>	<i>Oct 1 – Nov 1</i>	<i>30</i>	<i>x</i>	<i>.25</i>	<i>=</i>	<i>7.5</i>
Totals		<i>170</i>				<i>88.4</i>
Total DMI from Pasture	÷	Total Days in Grazing Season (x 100 to convert to percent)		=	Grazing Season Average % DMI	
<i>88.4</i>	÷	<i>170 (x 100)</i>		=	<i>52.0%</i>	

Note: The spring transition number above is from the example Worksheet A. The summer and fall grazing/ration period examples above are assumed. These calculations would be documented on two additional Worksheet A's. Producers need to complete a separate Worksheet A for each distinct ration period (each time rations change) during the grazing season in order to calculate the DMI from pasture to input into this worksheet. These are only examples. Individual farms will likely have different grazing season ration periods depending on feeds fed and pasture availability.

Grazing Season Ration Period Dry Matter Intake (DMI) Calculation for Organic Ruminant Livestock

Worksheet B:

Calculating the Average DMI from Pasture for the Grazing Season

Instructions: Use this Worksheet B to calculate the average DMI from grazing for each type and class of animal over the entire grazing season. Use all completed Grazing/Ration Period DMI Calculation Worksheet A's for a type and class of animal to provide input into this worksheet. Please note: While these worksheets provide one way to document your compliance with organic standards, they are not required forms; you may provide another method for calculating DMD and DMI.

Operation Name / Year:	Class of Animal <input type="checkbox"/> Calf / Lamb / Kid <input type="checkbox"/> Heifer / Young Stock <input type="checkbox"/> Lactating <input type="checkbox"/> Dry <input type="checkbox"/> Breeding <input type="checkbox"/> Slaughter <input type="checkbox"/> Other (specify):
Total # Days in Grazing Season (from table below = Total # of Days Fed during the Grazing Season):	# Animals in Group:

Using your completed Worksheets A, enter the ration dates, number of days fed, and % DMI from pasture for each distinct feed ration period during the grazing season in the table below. To calculate the weighted average DMI from pasture for the entire grazing season, multiply the % DMI for each grazing/ration period by the number of days in that period, then divide the sum of those numbers by the total number of days in the grazing season (all grazing/ration periods), and multiply by 100 to convert this number to a percentage.

Ration Name/Type/ID	Dates Fed	# of Days Fed	x	Daily DMI from Pasture (from DMI worksheet)	=	DMI from Pasture during period
			x		=	
			x		=	
			x		=	
			x		=	
Totals						
Total DMI from Pasture	÷	Total Days in Grazing Season (x 100 to convert to percent)		=	Grazing Season Average % DMI	
	÷			=		

Appendix 3: USDA NOP regulations Pertaining to Ruminant Feed and Pasture Management

The following paragraphs are verbatim excerpts from NOP standards. The full text of the NOP standards can be found on the United States Department of Agriculture website, Code of Federal Regulations Part 205 National Organic Program: <http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&sid=38b80f0015e532cedc5bf9ec3734920a&rgn=div5&view=text&node=7:3.1.1.9.32&idno=7>. Producers may also wish to read the ATTRA publication entitled *Organic Standards for Livestock Production* for a larger set of excerpts that cover most aspects of livestock production.

§ 205.237 Livestock feed.

(b) The producer of an organic operation must not:

(8) Prevent, withhold, restrain, or otherwise restrict ruminant animals from actively obtaining feed grazed from pasture during the grazing season, except for conditions as described under § 205.239(b) and (c).

(c) During the grazing season, producers shall:

(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). This shall be calculated as an average over the entire grazing season for each type and class of animal. Ruminant animals must be grazed throughout the entire grazing season for the geographical region, which shall be not less than 120 days per calendar year. Due to weather, season, and/or climate, the grazing season may or may not be continuous.

(2) Provide pasture of a sufficient quality and quantity to graze throughout the grazing season and to provide all ruminants under the organic system plan with an average of not less than 30 percent of their dry matter intake from grazing throughout the grazing season: Except, That,

(i) Ruminant animals denied pasture in accordance with § 205.239(b)(1) through (8), and § 205.239(c)(1) through (3), shall be provided with an average of not less than 30 percent of their dry matter intake from grazing throughout the periods that they are on pasture during the grazing season;

(ii) Breeding bulls shall be exempt from the 30 percent dry matter intake from grazing requirement of this section and management on pasture requirement of § 205.239(c)(2); Provided, That, any animal maintained under this exemption shall not be sold, labeled, used, or represented as organic slaughter stock.

(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.

§ 205.238 Livestock health care practice standard.

(a) The producer must establish and maintain preventive livestock health care practices, including:

- (2) Provision of a feed ration sufficient to meet nutritional requirements, including vitamins, minerals, protein and/or amino acids, fatty acids, energy sources, and fiber (ruminants);
- (3) Establishment of appropriate housing, pasture conditions, and sanitation practices to minimize the occurrence and spread of diseases and parasites;
- (4) Provision of conditions which allow for exercise, freedom of movement, and reduction of stress appropriate to the species.

§ 205.239 Livestock living conditions.

(a) The producer of an organic livestock operation must establish and maintain year-round livestock living conditions which accommodate the health and natural behavior of animals, including:

- (1) Year-round access for all animals to the outdoors, shade, shelter, exercise areas, fresh air, clean water for drinking, and direct sunlight, suitable to the species, its stage of life, the climate, and the environment: Except, that, animals may be temporarily denied access to the outdoors in accordance with §§ 205.239(b) and (c). Yards, feeding pads, and feedlots may be used to provide ruminants with access to the outdoors during the non-grazing season and supplemental feeding during the grazing season. Yards, feeding pads, and feedlots shall be large enough to allow all ruminant livestock occupying the yard, feeding pad, or feedlot to feed simultaneously without crowding and without competition for food. Continuous total confinement of any animal indoors is prohibited. Continuous total confinement of ruminants in yards, feeding pads, and feedlots is prohibited.
- (2) For all ruminants, management on pasture and daily grazing throughout the grazing season(s) to meet the requirements of § 205.237, except as provided for in paragraphs (b), (c), and (d) of this section.
- (3) Appropriate clean, dry bedding. When roughages are used as bedding, they shall have been organically produced in accordance with this part by an operation certified under this part, except as provided in § 205.236(a)(2)(i), and, if applicable, organically handled by operations certified to the NOP.
- (4) Shelter designed to allow for:
 - (i) Natural maintenance, comfort behaviors, and opportunity to exercise;
 - (ii) Temperature level, ventilation, and air circulation suitable to the species; and
 - (iii) Reduction of potential for livestock injury;
- (5) The use of yards, feeding pads, feedlots and laneways that shall be well-drained, kept in good condition (including frequent removal of wastes), and managed to

prevent runoff of wastes and contaminated waters to adjoining or nearby surface water and across property boundaries.

(b) The producer of an organic livestock operation may provide temporary confinement or shelter for an animal because of:

- (1) Inclement weather;
- (2) The animal's stage of life: Except, that lactation is not a stage of life that would exempt ruminants from any of the mandates set forth in this regulation;
- (3) Conditions under which the health, safety, or well-being of the animal could be jeopardized;
- (4) Risk to soil or water quality;
- (5) Preventive healthcare procedures or for the treatment of illness or injury (neither the various life stages nor lactation is an illness or injury);
- (6) Sorting or shipping animals and livestock sales: Provided, that, the animals shall be maintained under continuous organic management, including organic feed, throughout the extent of their allowed confinement;
- (7) Breeding: Except, that, bred animals shall not be denied access to the outdoors and, once bred, ruminants shall not be denied access to pasture during the grazing season; or
- (8) 4-H, Future Farmers of America and other youth projects, for no more than one week prior to a fair or other demonstration, through the event and up to 24 hours after the animals have arrived home at the conclusion of the event. These animals must have been maintained under continuous organic management, including organic feed, during the extent of their allowed confinement for the event.

(c) The producer of an organic livestock operation may, in addition to the times permitted under § 205.239(b), temporarily deny a ruminant animal pasture or outdoor access under the following conditions:

- (1) One week at the end of a lactation for dry off (for denial of access to pasture only), three weeks prior to parturition (birthing), parturition, and up to one week after parturition;
- (2) In the case of newborn dairy cattle for up to six months, after which they must be on pasture during the grazing season and may no longer be individually housed: Provided, That, an animal shall not be confined or tethered in a way that prevents the animal from lying down, standing up, fully extending its limbs, and moving about freely;
- (3) In the case of fiber bearing animals, for short periods for shearing; and
- (4) In the case of dairy animals, for short periods daily for milking. Milking must be scheduled in a manner to ensure sufficient grazing time to provide each animal with an average of at least 30 percent DMI from grazing throughout the grazing season. Milking frequencies or duration practices cannot be used to deny dairy animals pasture.

(d) Ruminant slaughter stock, typically grain finished, shall be maintained on pasture for each day that the finishing period corresponds with the grazing season for the geographical location: Except, that, yards, feeding pads, or feedlots may be used to provide finish feeding rations. During the finishing period, ruminant slaughter stock shall be exempt from the minimum 30 percent DMI requirement from grazing. Yards, feeding pads, or feedlots

used to provide finish feeding rations shall be large enough to allow all ruminant slaughter stock occupying the yard, feeding pad, or feed lot to feed simultaneously without crowding and without competition for food. The finishing period shall not exceed one-fifth (1/5) of the animal's total life or 120 days, whichever is shorter.

(e) The producer of an organic livestock operation must manage manure in a manner that does not contribute to contamination of crops, soil, or water by plant nutrients, heavy metals, or pathogenic organisms and optimizes recycling of nutrients and must manage pastures and other outdoor access areas in a manner that does not put soil or water quality at risk.

§ 205.240 Pasture practice standard.

The producer of an organic livestock operation must, for all ruminant livestock on the operation, demonstrate through auditable records in the organic system plan, a functioning management plan for pasture.

(a) Pasture must be managed as a crop in full compliance with §§ 205.202, 205.203(d) and (e), 205.204, and 205.206(b) through (f). Land used for the production of annual crops for ruminant grazing must be managed in full compliance with §§ 205.202 through 205.206. Irrigation shall be used, as needed, to promote pasture growth when the operation has irrigation available for use on pasture.

(b) Producers must provide pasture in compliance with § 205.239(a)(2) and manage pasture to comply with the requirements of: § 205.237(c)(2), to annually provide a minimum of 30 percent of a ruminant's dry matter intake (DMI), on average, over the course of the grazing season(s); § 205.238(a)(3), to minimize the occurrence and spread of diseases and parasites; and § 205.239(e) to refrain from putting soil or water quality at risk.

(c) A pasture plan must be included in the producer's organic system plan, and be updated annually in accordance with § 205.406(a). The producer may resubmit the previous year's pasture plan when no change has occurred in the plan. The pasture plan may consist of a pasture/rangeland plan developed in cooperation with a Federal, State, or local conservation office: Provided, that, the submitted plan addresses all of the requirements of § 205.240(c)(1) through (8). When a change to an approved pasture plan is contemplated, which may affect the operation's compliance with the Act or the regulations in this part, the producer shall seek the certifying agent's agreement on the change prior to implementation. The pasture plan shall include a description of the:

- (1) Types of pasture provided to ensure that the feed requirements of § 205.237 are being met.
- (2) Cultural and management practices to be used to ensure pasture of a sufficient quality and quantity is available to graze throughout the grazing season and to provide all ruminants under the organic system plan, except exempted classes identified in § 205.239(c)(1) through (3), with an average of not less than 30 percent of their dry matter intake from grazing throughout the grazing season.
- (3) Grazing season for the livestock operation's regional location.
- (4) Location and size of pastures, including maps giving each pasture its own identification.
- (5) The types of grazing methods to be used in the pasture system.
- (6) Location and types of fences, except for temporary fences, and the location and source of shade and the location and source of water.
- (7) Soil fertility and seeding systems.
- (8) Erosion control and protection of natural wetlands and riparian areas practices.

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